,

Grant County
PUBLIC UTILITY DISTRICT

Priest Rapids Coordinating Committee

Wednesday, February 26, 2014
9:00 – 2:00
WebEx Teleconference

PRCC Members

Scott Carlon/Bryan Nordlund, NMFS
Bob Rose, YN
Jeff Korth, C. Andonaegui, P. Verhey, WDFW
Tom Dresser/Curt Dotson, GCPUD
Jim Craig, USFWS
Kirk Truscott, CCT
Carl Merkle, CTUIR
Denny Rohr, Facilitator

Attendees

Scott Carlon/Bryan Nordlund, NMFS
Bob Rose, YN @ 9:56 a.m.
Jeff Korth, WDFW
Debbie Williams, GCPUD
Jim Craig, USFWS
Kirk Truscott, CCT
Tom Dresser/Curt Dotson, GCPUD
Denny Rohr, Facilitator

Decision Summary:

1. PRCC members affirmed their email vote approving $79,906.00 from the NNI fund for the "Subyearling Survival Study through the Hanford Reach.
2. The PRCC agreed to forgo GBT sampling in 2014, unless gas levels reach 120% or greater. Fish that are excess from the survival study will be used to conduct GBT sampling; including non-target fish that haven't experienced surgery.
3. Affirmation of PRCC vote to approve changing of funding amount from for Mid-Columbia Screening Project. The PRCC affirmed that the dollar amount of their email vote was changed from $102,814.58 to $102,838.58.
4. The PRCC approved an extension of Contract 601-8H to extend the time period for the approved funding through January 31, 2015, for the Upper Columbia Fish Screen Monitoring Program.

Distributed Items:

1. Calendar Year 2013 Activities Under Priest Rapids Hydroelectric Project
2. FCWG Briefing Report – February 2014
3. Final Wanapum Dam Advanced Turbine Total Dissolved Gas Evaluation Study Plan Final Report
4. 2014 On-going NNI Screening Projects
5. WDFW Cost-Share Partnerships

6. Columbia River Hanford Reach New Zealand Mud Snail Management Response
7. Agenda – WDFW Aquatic Invasive Species Unit meeting
8. Photos of bird dissuasion activities on Goose Island
9. Priest Rapids Fish Bypass PowerPoint

Action Items:

1. PRCC members should send Korth an email if you would like to participate in the New Zealand Mud Snail meeting.
2. Dotson will send Priest Rapids Bypass pictures to PRCC members.
3. Rose will check with Phil Rigdon, Yakama Nation, about attending the Priest Rapids Bypass celebration.

Final Meeting Minutes

I. Welcome and Introductions

II. Meeting Minutes Approval – January 29, 2014 – PRCC members will send approval via email.

III. Agenda Review – No additions were made to the agenda.

IV. Action Items Review – January 29, 2014 Meeting

1. Comments due January 31, 2014 for the "Evaluation of Total Dissolved Gas Related to the Operation of Advanced Turbines at Wanapum Dam." Complete
2. Williams and Dresser will make sure that Chris Fisher's comments are included in the draft of the "PRCC and PRCC Habitat Subcommittee Active and Pending Habitat Projects." Complete
3. Comments due January 31, 2014 for the "PRCC and PRCC Habitat Subcommittee Active and Pending Habitat Projects." Complete
4. Read Section 14.5 of the Salmon Steelhead Settlement Agreement in preparation of the Habitat Project Evaluation proposal. Complete
5. Williams will send the Box.net link for LiDar maps to the PRCC. Ongoing
6. Williams will send Truscott a small copy of the Salmon Steelhead Settlement Agreement. Complete
7. Comments due March 7, 2014 for the "Draft Report of Geochemical Analysis of Scales and Fin Rays." Complete
8. Williams will send hard copies of the "Draft Report of Geochemical Analysis of Scales and Fin Rays" to PRCC members. Complete
9. Langshaw will send hard copies of the "Draft Report of Geochemical Analysis of Scales and Fin Rays" to the PRCC Hatchery Subcommittee. Complete
10. Williams will distribute a PRCC mailing list to members. Complete
11. Williams will schedule the April 22nd PRCC WebEx - Complete

V. REMINDER of Close of Comment on March 7, 2014 for "Draft Report of Geochemical Analysis of Scales and Fin Rays"

VI. AFFIRMATION: Additional Funding Approved by Pacific Salmon Commission Regarding the Proposal for the "Subyearling Survival Study through the Hanford Reach". – PRCC members affirmed their email vote approving $79,906.00 from the NNI fund for the "Subyearling Survival Study through the Hanford Reach," which was contingent upon receiving $128,932.00 from the Pacific Salmon Commission (PSC). The PSC approved the funding of $128,932.00.

VII. 2014 Gas Bubble Trauma Sampling – Grant PUD proposed that because of survival studies being conducted this year, and concern of secondary handling effects of test fish, that Gas Bubble Trauma (GBT) sampling not be conducted this year. GBT testing is conducted once a week throughout the season. Historically, GBT occurrences have been low. Based on projections for run off events, 2014 flows are expected to be low, similar to 2008 and 2009. In lieu of not conducting GBT, Grant PUD proposed that Rock Island be the marker as to what is occurring in the river. Based on 2010 studies, 70-75% of tagged fish use the Wanapum fish bypass during out migration. The PRCC agreed to forgo GBT sampling in 2014, unless gas levels reach 120% or greater. Fish that are excess from the survival study will be used to conduct GBT sampling; including non-target fish that haven't experienced surgery.

VIII. New Zealand Mud Snail Detection in the Hanford Reach – Korth reported that New Zealand Mud snails have been detected in the Hanford Reach, just upstream of Richland, WA. Core samples were taken in 2013. Density was a single digit number of snails from one or more core samples. Snails are spreading upstream, but are not numerous enough to be a problem in the Hanford Reach, at this time. WDFW will conduct a stakeholders meeting to explain what precautionary measures will be conducted. PRCC members should send Korth an email if you would like to participate and Korth will send you a Doodle poll, in order to select a date. Korth will notify PRCC members when the meeting will be held.

IX. Public Disclosure Request (PDR) for WDFW Operated/Managed Steelhead Programs – WDFW has two events that will result in documentation release on steelhead management effects; both are coming from the Wild Fish Conservancy. They are looking for all communications between state, federal and tribal entities. The intent of at least one of the PDRs is to sue regarding hatchery steelhead program effects on natural origin steelhead. Korth wasn't aware of how many, or of specific documents WDFW will send. Because of the way the Upper Columbia is managed, a large amount of documentation will be sent.

X. Affirmation of PRCC vote to approve changing of funding amount from for Mid-Columbia Screening Project. The PRCC affirmed that the dollar amount of their email vote was changed from $102,814.58 to $102,838.58.

XI. Updates

A. Inland Avian Predation Work Group (IAPWG) Activities – Dotson showed what perimeter marking at the Goose Island tern colony will look like for dissuasion. Materials were funded by ACOE and BOR; staged last week, and placed yesterday. Blocks are being placed on the grid, today. The dissuasion grid will be in place by the end of this week.

B. Priest Rapids Bypass – April Ceremony (POSTPONED)– The ceremony will be on April 23, 2014, from 9:30 – 1:00; the meeting will begin at the new turbine generator building. Dotson presented a slideshow of construction pictures. Friday will be the last day of concrete pours. Bulk heads have been removed and bays have been flooded. The project is on schedule to

meet the April 1st completion date. Dotson will send pictures to PRCC members. Rose will check with Phil Rigdon about attending the Ceremony.

C. Priest Rapids Turbine Installation – A white paper regarding biological testing of turbines will be distributed to PRCC for review before next month's PRCC meeting on March 26th.

D. Hatchery Construction Activities

1. Carlton Acclimation Facility – Certificate of Occupancy was received. This facility is complete.
2. Nason Creek Acclimation Facility – Will be complete in June 2014.
3. PR Hatchery Modifications – Critical modifications identified by WDFW and Grant PUD staff will be completed prior to September 1, 2014. A ribbon cutting ceremony will be held; the date hasn't been selected yet.

E. Hatchery Permits (Section 10 for Summer Chinook and Section 7 Consultation for Bull Trout) – Ongoing, will hopefully be complete by July 2014.

F. NNI Funded Projects

1. Upper Columbia Fish Screen Monitoring Program – Rose encouraged WDFW to submit another proposal to the PRCC for the operations and maintenance (O&M) of this project. Nordlund explained that Julie Henning made a proposal to the UCSRB for this funding. UCSRB support the idea, but thought funding should be sought through state or federal entities, either through legislation or from BPA. WDFW will submit a draft proposal for NNI funds in March 2014.

   Korth explained that approximately $190,000 is left in the current contract, because supplemental funding partners were found, and that WDFW requests that those funds be extended through January 2015. The PRCC approved an extension of Contract to extend the time period for the funding through January 2015.

2. "Mid-Columbia River Intake Screen and Diversion Assessment" – Contract between WDFW and Grant PUD should be complete within 2 weeks.

G. Reminder: April Meeting will be a Webinar on Tuesday, April 22nd, 1:00 pm

H. Committee Reports – FCWG was distributed by Rohr. No PRFF report was sent. They held a sturgeon workshop in place of their regular meeting.

I. NNI and Habitat Funds Report - As of January 27, 2014. Annual funding to Habitat Accounts was deposited on February 14th. NNI $1,909,231.30, Habitat Supplemental $1,010,191.99, Habitat BiOp $360,863.24. Year-end reports are currently being worked on by Grant PUD accounting staff.

Fund	Balance	Unencumbered Balance
No Net Impact Fund 601	$5,755,923	$4,776,707
Habitat Supplemental Fund 602	$ 4,971,955	$3,099,604
Habitat Fund 603	$ 1,013,351	$ 600,893
Total	$11,741,229	$8,477,204

XII. Dresser reported that on February 24, District staff noticed unusual movement at Pier 4 at Wanapum Dam. It was confirmed that movements had occurred outside of historical trends. At

5:30 pm on February 25 Wanapum forebay was reduced from 571.5 kcfs (normal) to 568 kcfs. The reduction will remain in effect until additional investigations can be completed.

XIII. Review of Next Month's Agenda Topics – Ongoing Updates – Turbine white paper.

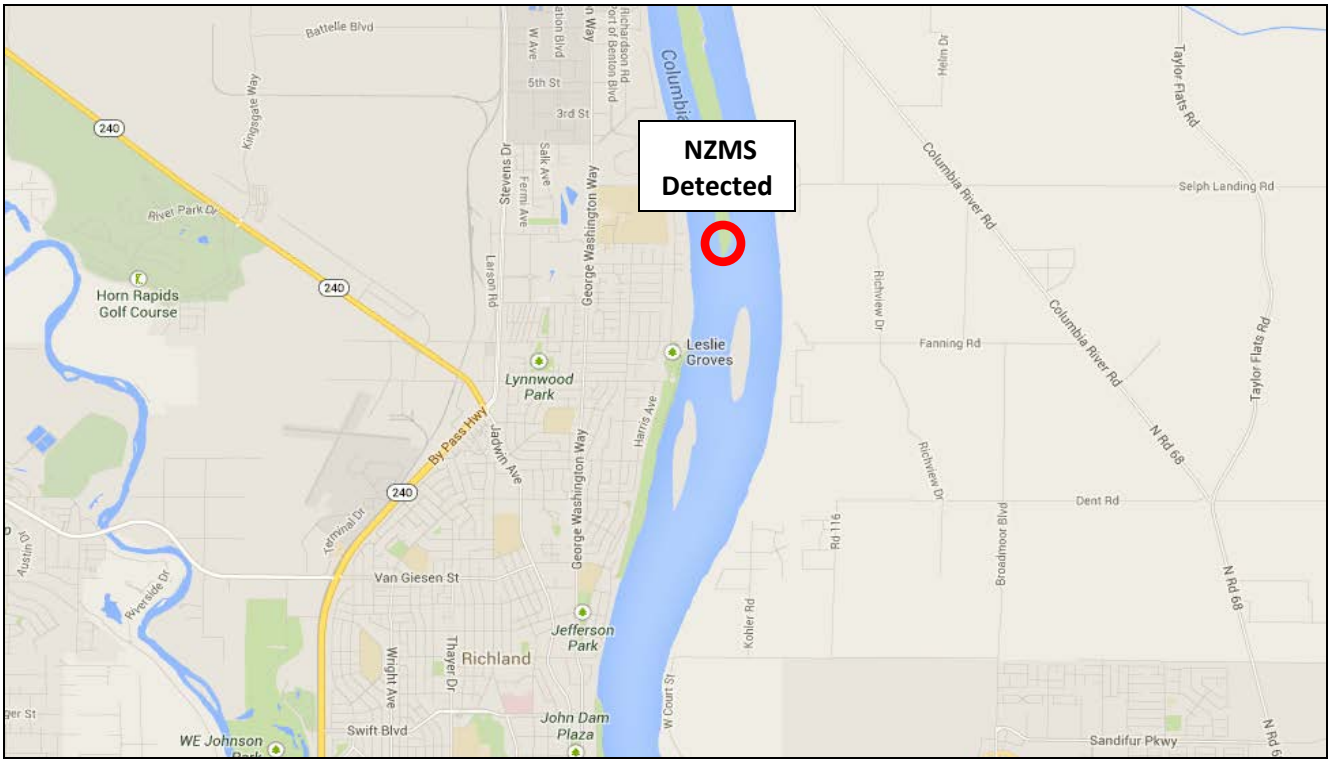
XIV. Next Meeting – March 26, 2014, Grant PUD SeaTac Office

Columbia River Hanford Reach New Zealand Mudsnail Management Response

Overview

February 10, 2014, Edward Johannes of Deixis Consultants identified two juvenile New Zealand mudsnails (NZMS) from a freeze core sample taken September 24, 2013. The NZMS were detected on an island in Hanford Reach of the Columbia River, Benton County (Figure 1). The site is located approximately two miles north of Richland (N 46.322742 W -119.255546). The department is designating the area within an approximate 2 mile radius as an infested site until more information on extent of infestation is known to help prevent further spread. The department has implemented highest level decontamination requirements for staff working in this area and encourages other state and federal agencies, tribes, and other groups to do the same.

Figure 1. Site of NZMS Detected.



WDFW Management Response

WDFW is leading the initial coordination to develop management options for the NZMS in Hanford Reach. The initial management goal is containment to minimize pathways of spread by public and private entities. Objectives in achieving this goal are:

A. Post signage notifying the public that site is infested and how they can help prevent spread (completed – see figure below);
B. Ensure all key stakeholders for that region have been alerted of the infestation and provided with a copy of the department's decontamination protocols (http://wdfw.wa.gov/publications/01490/wdfw01490.pdf); and
C. Coordinate meeting of key stakeholders to discuss management options and next steps.

Other NZMS Web Links:

- King County: http://www.kingcounty.gov/environment/animalsAndPlants/biodiversity/threats/Invasives/Mudsnails.aspx
- US Geologic Survey: http://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=1008
- Mark Dybdahl, Washington State University: http://public.wsu.edu/~dybdahl/researchsum.html
- Aquatic Nuisance Species Task Force: http://www.anstaskforce.gov/spoc/nzms.php
- Southern California http://mudsnails.com/
- Protect Your Waters http://www.protectyourwaters.net/hitchhikers/mollusks_new_zealand_mudsnail.php
- Portland State University http://www.clr.pdx.edu/projects/ans/nzms.php
- Julian Olden, University of Washington http://www.fish.washington.edu/research/oldenlab/research_invasives.html

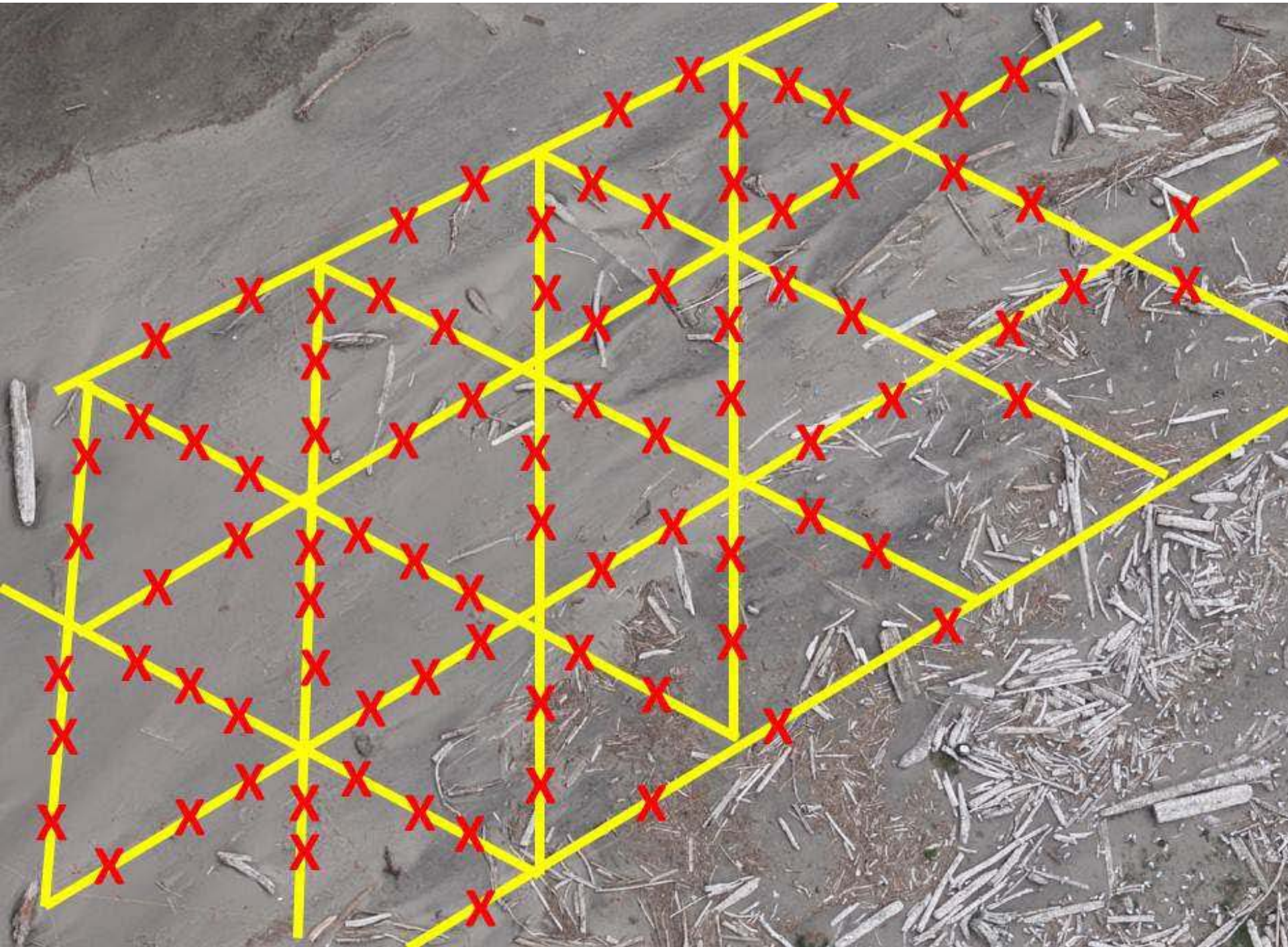
Legend

Goose Island CATE

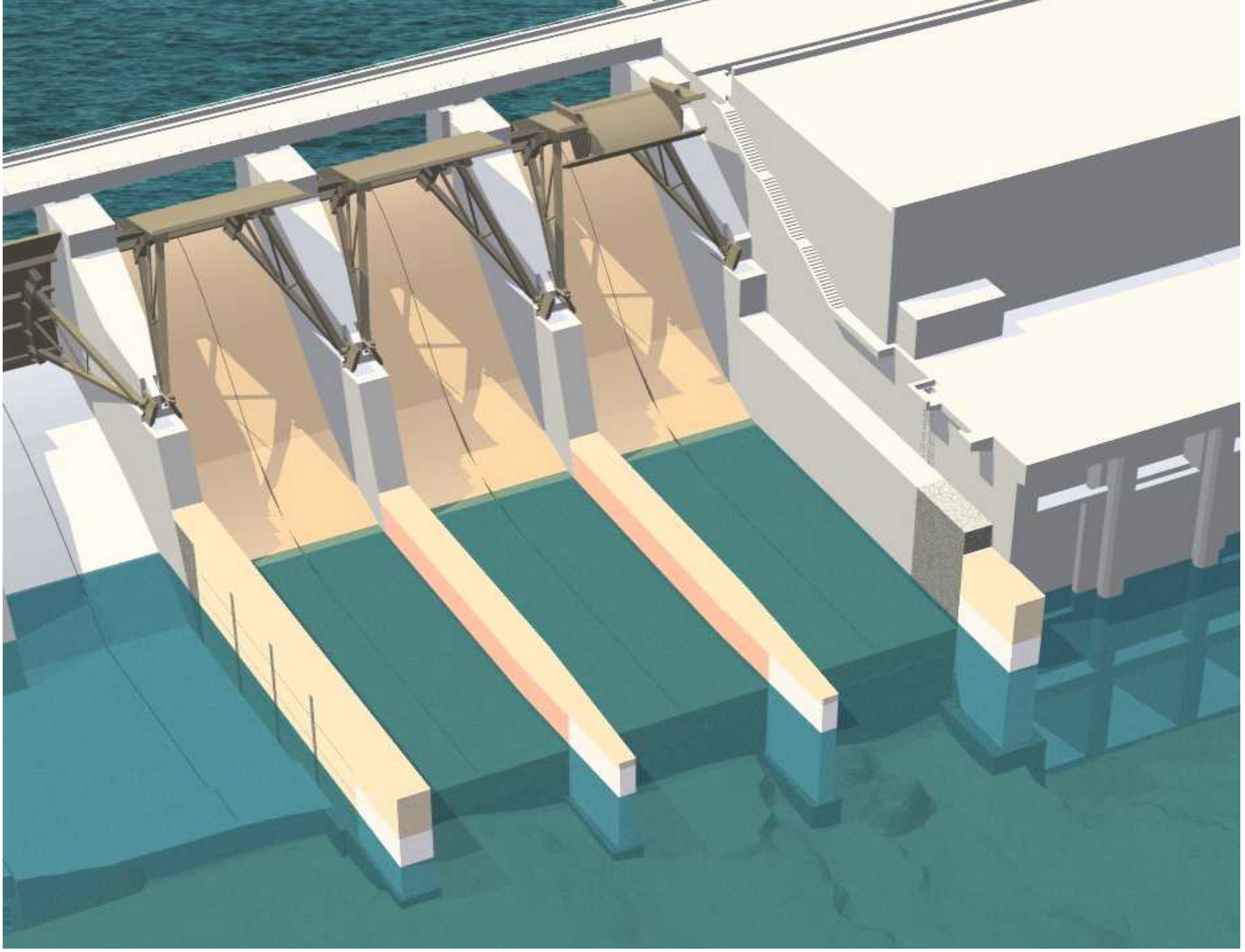
Caspian Tern Nesting Colony
Goose Island, Potholes Reservoir
Grant County, Washington

0 110 220 330 Feet

Data Source: Washington Dept. of Natural Resources
Disclaimer: This map is for planning purposes only.
Created On: August 30, 2013



Priest Rapids Fish Bypass Project (PRFB)



2014 On-going NNI Screening Projects

*All projects benefit ESA listed fish by preventing stranding, injury, or mortality associated with irrigation.

WDFW existing NNI funded fish screening project expires 30 April 2014, and roughly $190,000 of the $696,311 total will remain. Surplus funds were the result of successful cost share partnerships on several projects (see list). WDFW proposes a 10 month extension through January 2015 from the current contract date to use the surplus funds. The funding would allow us to complete the following list of projects during the 2014-15 non-irrigation season this next year.

MAINTENANCE/Refurbishments

Upper Wolf Creek Diversion

- Clear dam out of overflow control channel.

- Modify return channel from fish bypass to mainstem (Establish 5 yr. HPA, NEPA required).

- Post 2014 Irrigation (due to FS permitting constraints)

Lower Wolf Creek Diversion

Replace Parts, screen cloth and re-paint gantry/footprint.

Chiwawa Diversion

- Re-paint gantry

Tandy Diversion

- Replace Parts, screen cloth and re-paint gantry

Pashastin Diversion

-Replaced seals, bearings, paddle-wheel blades and repaint

Marrachi

- Provide technical assistance to ensure no negative impacts to fish screen/bypass during MSRF construction to modify roughened channel/adjust weirs.

Fort-Thurlow

- Provide technical assistance to ensure no negative impacts to fish screen/bypass during MSRF construction to modify roughened channel/adjust weirs.

Skyline

- Provide technical assistance while MSRF expands the forebay to reduce the sediment load approaching the screen & Investigate potential fish bypass modifications.

CAPITAL PROJECTS:

Goat Creek

- Foresee construction winter (after 2014 irrigation season) if permits are obtained

- NEPA (need cost estimate & timeline from FS)

-HPA (WDFW)

Chiwawa Diversion

- Foresee construction (after 2014 irrigation season) if permits are obtained.

- Assist WCID with renewing their Special Use Permit with the FS, NEPA required.

- NEPA for Spillway project-cultural resource survey required.

-Currently working on engineered design

Roaring Creek Diversion

- Well/Pump-Rite Screen (1.3cfs) – trout unlimited

-DFW will decommission existing screen

WDFW partnerships for 2013-14 NNI Funding, and the cost-share capital projects accomplished or in progress:

Partnership	Projects
Trout Unlimited	Pioneer, Roaring Creek, Peshastin
Natural Resource Conservation Service	Miller, Lampson
Methow Salmon Recovery Foundation	Miller, Lampson
USDA Forest Service	Chiwawa, Goat Creek
Wenatchee-Chiwawa Irrigation District	Chiwawa
Icicle-Peshastin Irrigation District	Peshastin

Future cost-share projects for new NNI funding:

Cascade Columbia Fisheries Enhancement Group – 2
Methow Salmon Recovery Foundation – 4
USDA Forest Service – 1
Chelan County Natural Resources Department – 2
Upper Wolf Creek Irrigation District – 1
Okanogan Conservation District – 1+
Cascadia Conservation District – 1+

BioAnalysts, Inc.
4725 N. Cloverdale Rd.
Suite 102
Boise, Idaho 83713
Phone: 208.321.0363
Fax: 208.321.0364

Memorandum

To: Denny Rohr

From: Tracy Hillman

Date: 17 February 2014

Re: FCWG Meeting Progress Report

The Fall Chinook Working Group (FCWG) met at Grant PUD in Ephrata, WA, on Tuesday, 4 February from 10:00 am to 12:00 pm.

Study Plan Updates

- The FCWG received the draft predation report from Blue Leaf Environmental. Comments from the FCWG are due on Tuesday, 18 February. The final is due in early March.
- Grant PUD is preparing a study plan to evaluate the density dependence that was identified in the productivity assessment. The study plan should be available for review by early March.
- WDFW will prepare a final report or memo by late March that identifies the number of eggs retained by fall Chinook in the Hanford Reach through 2013. This report addresses the component of the "evaluation and quantification of the effects of redd superimposition study" that was approved as a Phase II study by the FCWG.
- The FCWG began discussing Phase III studies. At this time, those include fall Chinook productivity modeling every five years, ongoing egg retention sampling to address density dependence effects, and updating the models used in stranding and entrapment assessments. The FCWG will continue to identify and discuss Phase III studies.

Hanford Reach Working Group Updates

- Fall Chinook emergence is predicted to occur around 17 March. Snow pack is currently low and represents about 46 million acre-feet of water. So far, precipitation this year is similar to 2010.
- Grant PUD continues to examine historic stranding and entrapment data to identify data and sampling gaps. They are also evaluating ways to reduce the large variance associated with entrapment estimates. Because of other pressing issues, the next update on this modeling work will be in March 2014.
- The estimated fall Chinook escapement to the Hanford Reach was 174,841 fish (157,848 adults and 17,356 jacks). WDFW is working on the fall Chinook forecast for 2014.

Next Steps

The FCWG will next meet on Tuesday, 4 March 2014 at Grant PUD in Ephrata, WA.

Grant County
PUBLIC UTILITY DISTRICT

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February 20, 2014

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
Mail Code: DHAC, PJ-12
888 First Street, N.E.
Washington, D.C. 20426

Re: Priest Rapids Hydroelectric Project No. 2114 – Final Wanapum Dam Advanced Turbine Total Dissolved Gas Evaluation Study Plan Final Report

Dear Secretary Bose,

Attached please find for the Federal Energy Regulatory Commission's (FERC) approval the final report titled, *Evaluation of Total Dissolved Gas Related to the Operation of Advanced Turbines at Wanapum Dam* consistent with the requirements of License Article 401(a)(17) of the Priest Rapids Hydroelectric Project (Project) issued by FERC on April 17, 2008 and Condition 6.4.4(b) of the Washington State Department of Ecology (WDOE) 401 Water Quality Certification (WQC) dated April 3, 2007 and amended March 6, 2008.

The evaluation was conducted in accordance with the study plan titled, *Wanapum Dam Advanced Turbine Total Dissolved Gas Evaluation*, which was developed in consultation with the WDOE and the Priest Rapids Coordinating Committee (PRCC). The study plan was submitted to FERC on September 28, 2012, supplemented on October 2, 2012 and modified and approved by FERC on March 8, 2013. The final report summarizes the total dissolved gas (TDG) evaluation conducted downstream of Wanapum Dam with varying Project operations during the non-spill season (mid-October) of 2013.

Consistent with Section 6.4.4(b) of the WQC, the draft report was provided to WDOE and the PRCC on December 13, 2013 for a 30 day review and comment period. No comments were received.

FERC staff may contact Tom Dresser at 509-754-5088, ext. 2312 or tdresse@gcpud.org with any questions regarding this final report.

Sincerely,

Ross Hendrick
License Compliance Manager

ADDRESS PO Box 878
Ephrata, WA 98823
PHONE 509 766 2505
FAX 509 754 6770
grantpud.org

cc: Jeff Grizzel, Grant PUD
Tom Dresser, Grant PUD
NR Records 1.6, Grant PUD
Priest Rapids Coordinating Committee
Priest Rapids Fish Form
Patrick McGuire, WDOE
James Bellatty, WDOE

ADDRESS PO Box 878
Ephrata, WA 98823
PHONE 509 766 2505
FAX 509 754 6770
grantpud.org

Priest Rapids Hydroelectric Project (P-2114)

EVALUATION OF TOTAL DISSOLVED GAS RELATED TO THE OPERATION OF ADVANCED TURBINES AT WANAPUM DAM

FINAL REPORT

License Article 401(a)(17)

By Carson Keeler

Public Utility District No. 2 of Grant County, Washington
Priest Rapids Project
FERC Project Number 2114

February 2014

Executive Summary

The evaluation of total dissolved gas (TDG) related to the operation of all ten of the advanced turbines at Wanapum Dam was conducted in accordance with the study plan titled, *Wanapum Dam Advanced Turbine Total Dissolved Gas Evaluation* (Keeler 2012), which was developed in consultation with the Washington Department of Ecology (WDOE) and the Priest Rapids Coordinating Committee (PRCC). The study plan was submitted to the Federal Energy Regulatory Commission (FERC) on September 28, 2012, supplemented on October 2, 2012 and modified and approved by FERC on March 8, 2013.

As stated in the study plan, the primary objective of this evaluation was to assess TDG across the river channel with all ten of the advanced turbines operating at varying conditions to determine whether the operation of all ten of the advanced turbines significantly affects TDG levels during normal Project operations. To complete this objective, a TDG sensor array arranged in a lateral transecting pattern was placed approximately 2000 feet downstream of Wanapum Dam to monitor changes in TDG levels compared to TDG levels recorded upstream at the Wanapum Dam forebay fixed-site monitoring station (FSM station) and downstream at the Wanapum Dam tailrace FSM station.

In order to quantify TDG production associated with the operation of all ten of the advanced turbines, TDG data was collected during the following operational conditions between October 12 and 14, 2013:

1). **Test 1 – Minimum operations** with the turbine gate opening at approximately 60%, under 80 feet of head, which passed an average flow of 9.1 kcfs per turbine unit, equaling an average total powerhouse flow of 93.3 kcfs; and
2). **Test 2 – Average operations** with the turbine gate opening at approximately 77%, under 80 feet of head, which an average flow of 13.1 kcfs per turbine unit, equaling an average total powerhouse flow of 132.5 kcfs; and
3). **Test 3 – Maximum operations** with the turbine gate opening at approximately 95%, under 80 feet of head, which passed an average flow of 19.2 kcfs per turbine unit, equaling an average total powerhouse flow of 193.5 kcfs.

The operational conditions stated above were held steady for at least three consecutive hours to allow conditions to stabilize in the tailrace; depth, temperature, and TDG values were collected at 15-minute intervals (starting at the top of the hour) during the test conditions. The field study period was extended for ten additional days (to October 24, 2013) in order to record any incidental periods when operational requirements were inadvertently met and the resulting data could possibly be used for further evaluation of the advanced turbine operation. After further analysis of the project operation data it was determined that there were ten additional periods during the study period when consistent operating conditions were met for a minimum of three consecutive hours. It is important to note that the ice/trash sluiceway was not operational during the three targeted test periods, but spill through the sluiceway did occur (1.5 - 2.3 kcfs) during all other periods of the TDG evaluation. This sluiceway is operated to provide adult fall back for migrating salmonids, and because of the record fall run of adult Chinook salmon in 2013, Grant PUD was not able to close the sluiceway for the entire study period. Additionally, during these incidental test periods it is important to note that Wanapum Dam was operated as a nine-unit project. A unit was taken offline in order to perform the generator replacement project. For more

information on the additional testing periods identified during the study period see Appendix A of this report.

The difference in TDG %SAT between the Wanapum forebay and the TDG array transect for the targeted test periods (without sluiceway spill) were 0.1 %SAT for Test 1, -0.6 %SAT for Test 2, and 0.4% SAT for Test 3 for an overall mean difference of -0.02%. Given that the sensors used to the collect TDG values for this study have an accuracy ± 0.15 %SAT and sensitivity/resolution of 0.1 %SAT, the differences observed during the targeted tests suggest that the new turbines at Wanapum Dam do not materially increase TDG levels during minimum, average, and maximum operating conditions.

The difference in TDG %SAT between the Wanapum forebay and the TDG array transect for the incidental test periods (with sluiceway spill) ranged from -0.1 %SAT to 2.0 %SAT for an overall mean difference of 0.9 %SAT. Given that the sluiceway was operating during these incident test periods, these incidental test results further suggest that the new turbines at Wanapum Dam do not materially increase TDG levels during regular operation conditions.

Table of Contents

List of Figures

List of Tables

List of Appendices

List of Abbreviations

%SAT	percent saturation
bp	ambient atmospheric barometric pressure
FERC	Federal Energy Regulatory Commission
FSM	fixed-site monitoring
GPS	global positioning system
Grant PUD	Public Utility District No. 2 of Grant County
kcfs	thousand cubic feet per second
license	Federal Energy Regulatory Commission License No. 2114
mm Hg	millimeters of mercury
Project	Priest Rapids Hydroelectric Project
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RM	river mile
TDG	total dissolved gas
WAC	Washington Administrative Code
WDOE	Washington Department of Ecology
WFB	Wanapum Fish Bypass
WQC	Water Quality Certification

1.0 Introduction

The Public Utility District No. 2 of Grant County, Washington (Grant PUD) owns and operates the Priest Rapids Hydroelectric Project (Project). The Project is licensed as Project No. 2114 by the Federal Energy Regulatory Commission (FERC) and includes the Wanapum and Priest Rapids developments. A 401 water quality certification (WQC) for the operation of the Project was issued by the Washington Department of Ecology (WDOE) on April 3, 2007 (WDOE 2007), amended on March 6, 2008, and effective on issuance of the FERC license (license) to operate the Project in April of 2008 (FERC 2008).

Sections 6.4.4(b) and 6.4.9 of the 401 WQC (WDOE 2007) required Grant PUD to conduct a field study to evaluate total dissolved gas (TDG) after the installation of the tenth and final Wanapum Dam advanced turbine to determine the effect, if any, the operation of the advanced turbines have on TDG downstream of Wanapum Dam. Article 401(a)(17) of the license (FERC 2008) required FERC approval of the study plan prior to implementation.

The evaluation of TDG related to the operation of all ten of the advanced turbines at Wanapum Dam was conducted in accordance with the study plan titled, *Wanapum Dam Advanced Turbine Total Dissolved Gas Evaluation* (Keeler 2012), which was developed in consultation with the WDOE and the Priest Rapids Coordinating Committee (PRCC). The study plan was submitted to FERC on September 28, 2012, supplemented on October 2, 2012 and modified and approved by FERC on March 8, 2013 (FERC 2013).

The following report summarizes the TDG evaluation conducted downstream of Wanapum Dam with varying Project operations during the non-spill season (October 12-14) of 2013.

1.1 Background

Grant PUD began installation of the first advanced turbine in 2004 and completed the tenth and final turbine in September of 2013. In accordance with Section II of the advanced turbine installation project's 401 WQC (WDOE 2004), Grant PUD conducted a field study in the winter of 2005 to assess the potential TDG production between an advanced turbine (Turbine 8; W-8) and an existing turbine (Turbine 4; W-4) at Wanapum Dam (Lenz and Dresser 2005). The evaluation was designed to verify that the advanced turbine did not materially increase TDG during normal Project operations. For the field study, WDOE (2004) required a single fixed transect be located approximately 2000 feet downstream of the powerhouse during the non-spill season to collect TDG values associated with turbine operations (both advanced and extant) between the minimum and maximum hydraulic capacities at the cavitation limit and at normal Project operating conditions. Depth, temperature, and TDG were collected every ten-minutes during the sampling period (February 20 – March 5, 2005). Results from this evaluation showed that the advanced turbine did not materially increase TDG during normal Project operations (Lenz and Dresser 2005). The Project's 401 WQC required Grant PUD to conduct additional testing once all ten units were installed (WDOE 2007).

1.2 Regulatory Framework

The WDOE establishes Washington state water quality standards for TDG during the non-fish and fish-spill seasons (see Washington Administrative Code (WAC) 173-201A-200(1)(f); WDOE 2006). The current standard for TDG (in percent saturation (%SAT)) during the non-fish spill season (September 1 through March 31) is 110 %SAT for any hourly measurement. The current standard for TDG (in %SAT) during the fish-spill season (April 1 through August 31) is

115 %SAT in the forebay and 120 %SAT in the tailrace, based on the average of the 12-highest consecutive hourly readings in a 24-hour period. A one-hour, 125 %SAT maximum standard for TDG also applies throughout the Project.

The study plan titled, *Wanapum Dam Advanced Turbine Total Dissolved Gas Evaluation Study Plan* (Keeler 2012) was designed to satisfy the requirements of Sections 6.4.4(b) and 6.4.9 of the 401 WQC for operation of the Project by collecting TDG data above and below Wanapum Dam during the minimum, average, and maximum operating conditions associated with the operation of all ten of the advanced turbines. The TDG data collected allowed TDG production to be quantified and compared to upstream/incoming TDG and thus allowed for the determination of potential impacts to TDG production (see Section 3.0 for more information).

1.3 Site Description

Wanapum Dam is located at river mile (RM) 415 near Vantage, Washington (Figure 1 and Figure 2). The total length of Wanapum Dam is 8,637 feet, with the axis of the powerhouse being almost parallel with the general direction of river flow and two 'elbows' in its layout. The normal pool operating range is between 560.0 and 571.5 feet above mean sea level. The powerhouse contains ten turbine units which operate at a design head of 80 feet and associated discharge of 178 thousand cubic feet per second (kcfs); the advanced turbines were designed, following installation of new generators, to pass up to 188 kcfs at 80 feet of head. Wanapum Dam also contains a 12-gate spillway to pass excess river flow, right and left-bank fish ladders (for upstream passage) and a Wanapum Fish Bypass (WFB) that passes outmigrating salmonids during the fish-passage season (typical operated between April 1 and August 31).

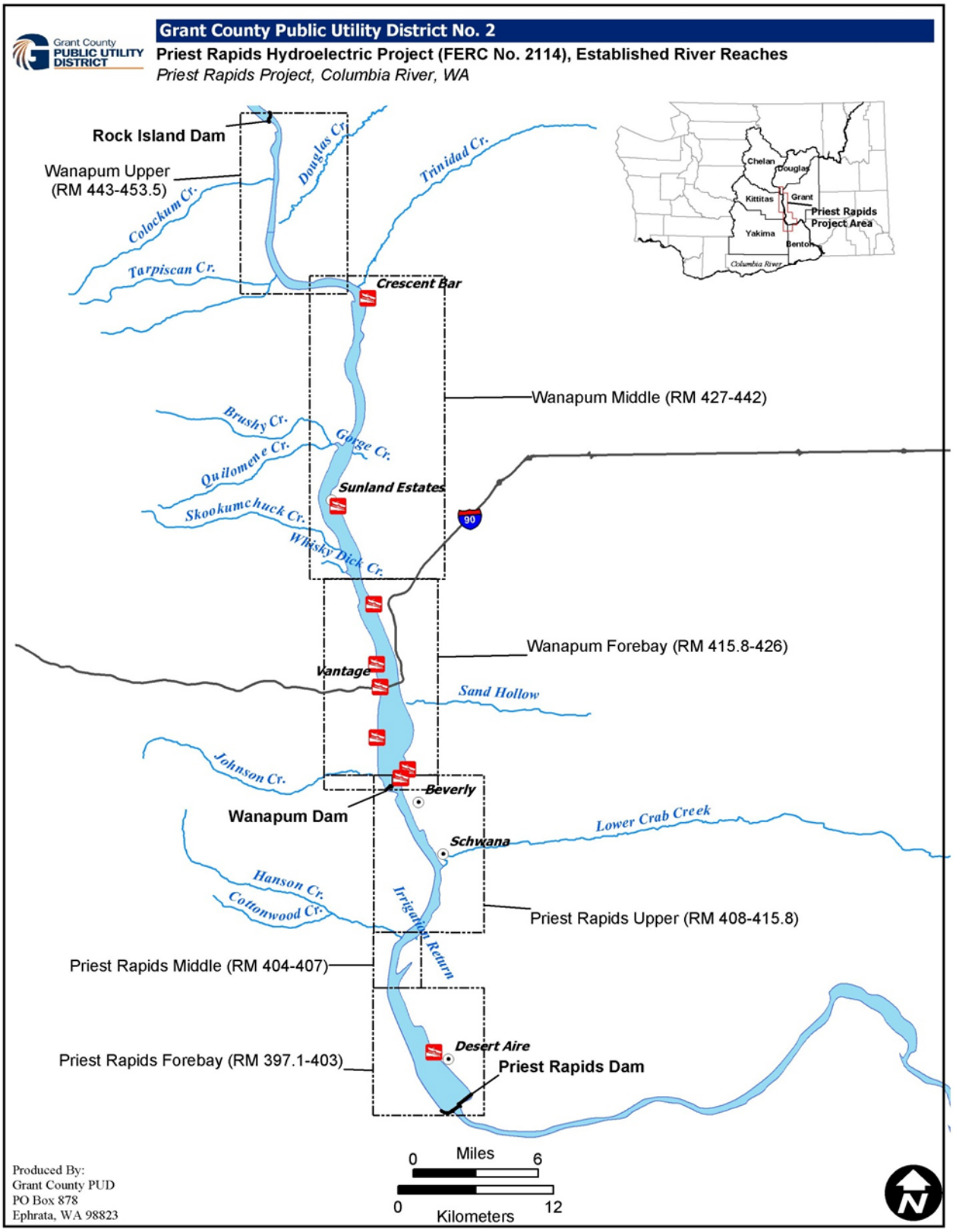

Figure 1 **The Priest Rapids Hydroelectric Project and established river reaches presented by river mile (RM), mid-Columbia River, WA.**

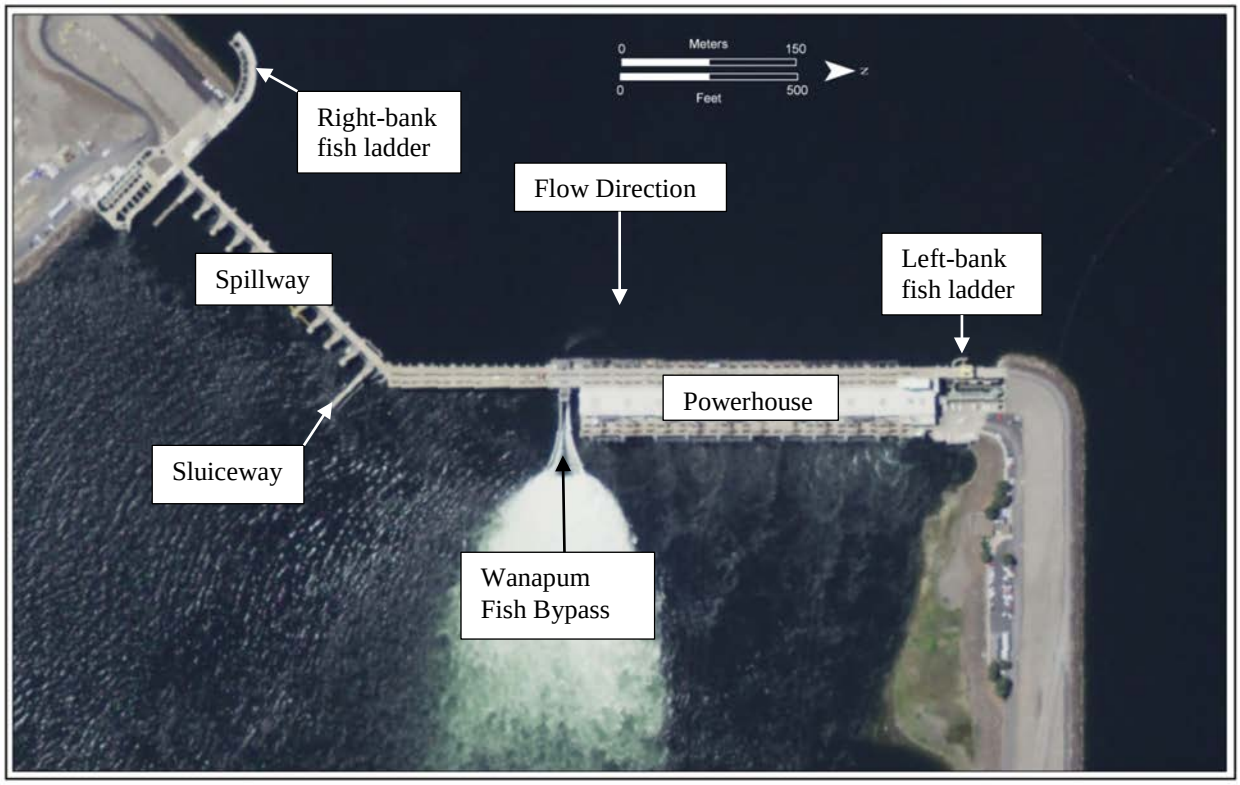

Figure 2 Aerial photograph of Wanapum Dam, mid-Columbia River, WA.

1.4 Objectives

Per Sections 6.4.4(b) and 6.4.9 of the 401 WQC (WDOE 2007), Grant PUD conducted a field study to evaluate TDG across the river channel and at the downstream FSM station of Wanapum Dam during the non-spill season (mid-October, 2013) to evaluate TDG exchange associated with the operation of all ten of the advanced turbines at Wanapum Dam during varying Project operations.

To complete this objective, a TDG sensor array arranged in a lateral transecting pattern was placed approximately 2000 feet downstream of Wanapum Dam to monitor changes in TDG levels compared to TDG levels recorded upstream at the Wanapum Dam forebay FSM station with all ten of the advanced turbines operating at minimum, average, and maximum operating conditions (see Section 2.4 for more details).

2.0 Methods

The following sections describe the methods that were used during the evaluation period, including descriptions of TDG sensors, calibration and quality assurance/quality control (QA/QC) methods, location of the TDG sensor array, and the operational conditions. In addition, TDG %SAT were calculated using ambient air pressure and TDG pressure. Measurements were recorded at 15-minute intervals (starting at the top of the hour) from October 11, 2013 at 0900 hours to October 24, 2013 at 0800 hours for the purpose of this TDG evaluation.

As with past TDG evaluations at Wanapum Dam, this evaluation utilized an array of remote instruments capable of logging time histories of TDG pressures at numerous locations up and

downstream of Wanapum Dam. Instruments used during the evaluation were Hydrolab Corporation water quality sondes equipped with, at a minimum, TDG, temperature, and depth sensors. The TDG sensors on these instruments have a stated accuracy of +/- 1.5 millimeters of mercury (mm Hg; ~0.15 %SAT, Hach Company 2006) and a sensitivity/resolution of 1.0 mm Hg (~0.1 %SAT, Hach Company 2006). Additionally, according to Grant PUD's Quality Assurance Project Plan (QAPP; Hendrick 2009), the smallest reference level for decision making is 1.0 %SAT for TDG.

The evaluation concentrated on TDG dynamics in the near-field of Wanapum Dam (within the immediate forebay, tailrace/tailwater, and downstream to the FSM station). Instruments were placed at two depths for some of the deeper stations where vertical gradients in TDG may exist. A total of twelve TDG instruments, two at the existing real-time FSM stations and ten logging instruments at the transect were used to monitor TDG, temperature, and depth at seven stations or locations.

2.1 Monitoring Locations

Water quality data collected during this evaluation included TDG (mm Hg) and %SAT (relative to atmospheric pressure), water temperature (°C), and depth (m). These parameters were collected at the following locations (see also Figure 3):

1). WANF – Wanapum Dam forebay FSM station, an existing real-time FSM station located near turbine unit 10, mid-channel, at an average depth of five meters, depending on forebay elevations. This data provided information on incoming/background TDG levels for comparison to TDG levels downstream of Wanapum Dam during the evaluation period. An additional sensor was placed at this location during the study period (October 11-24, 2013) for the purpose of this study.

2). T1 – A five-station/nine-sensor TDG transect located approximately 2000 feet downstream of Wanapum Dam. Stations were distributed evenly with flow. The station at the far left-bank side of the transect had one instrument at approximately three- meters deep, while the other four internal transect stations had two instruments each attached together at the same depth to perform as replicates. An average composite TDG value were collected from this transect to determine TDG values produced by the advanced turbines compared to forebay TDG levels. The use of the simpler arithmetic average (e.g. compared to flow-weighted average) is justified at this location based on information collected during the WFB TDG study (Hendrick et. al 2009). During the WFB TDG study (Hendrick et. al 2009), minimal vertical or lateral gradients were observed in TDG data collected at this same location, and a strong correlation between the flow weighted average TDG and arithmetic average TDG was found for the entire study period (July 26 to August 24, 2008).

3). WANT – Wanapum Dam tailrace FSM station, an existing real-time FSM station attached to a pier-nose (nearly mid-channel) of Beverly Bridge, located 3.2 RM downstream of Wanapum Dam. Data collected at this location was used to compare TDG values collected at the transect location (T1) and to verify the advanced turbines ability to meet tailrace TDG water quality standards. An additional sensor was placed at this location during the study period (October 11-24, 2013) for the purpose of this study.

4). BPBU – A backup instrument was placed near the Wanapum Dam tailrace boat launch during the study period to log barometric pressure near the water surface.

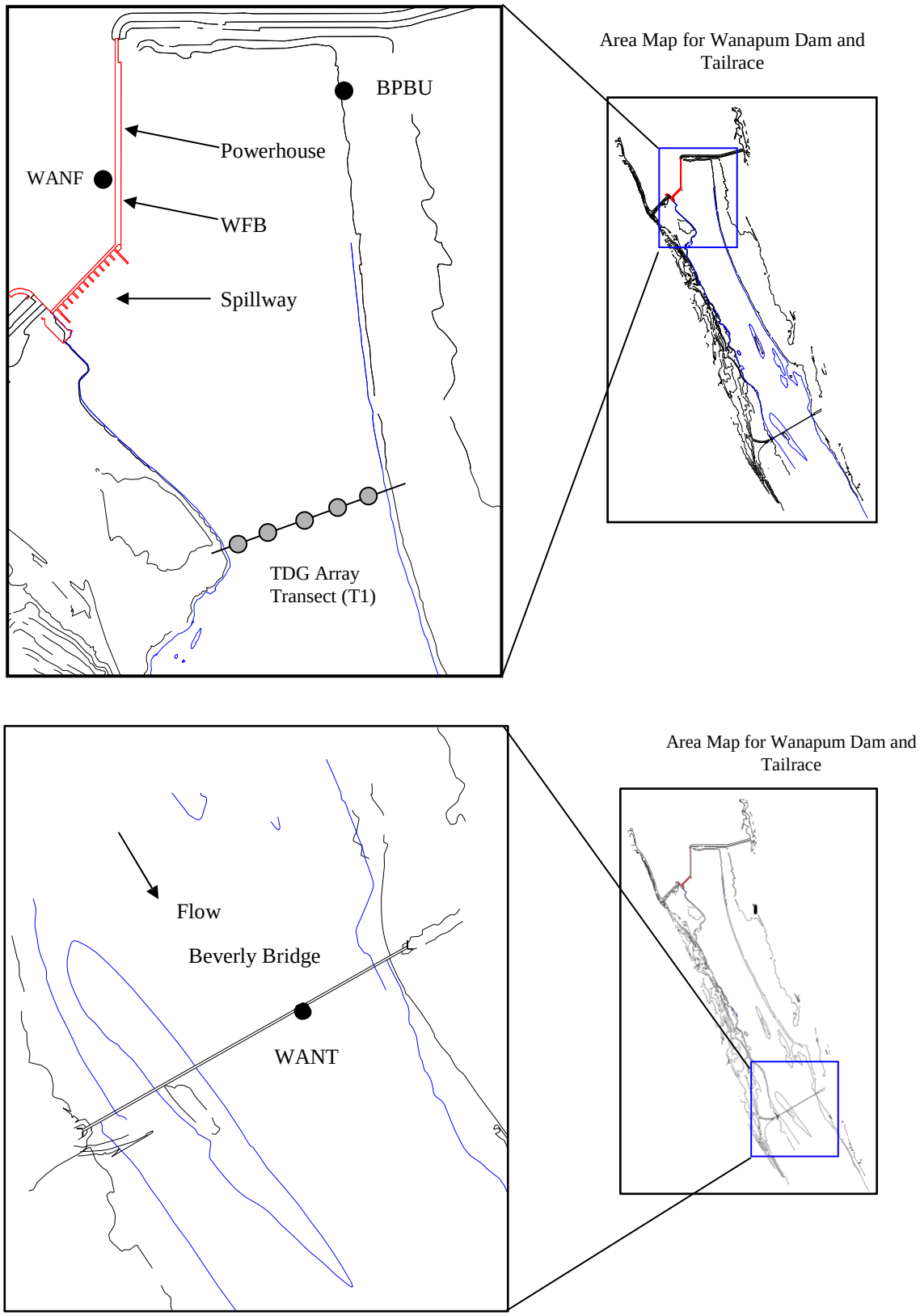

Figure 3 **TDG monitoring stations: Wanapum forebay (WANF), barometric pressure backup (BPBU), transect array (T1) and Wanapum tailrace (WANT).**

2.2 Water Quality Monitoring Instruments

Logging and/or reporting instruments were used exclusively for the water quality monitoring during the evaluation at Wanapum Dam. The 12 instruments used for this study were wireless and capable of remote logging. All of the monitoring instruments used for this study measure and record date, time, temperature (˚C), depth (m), TDG (mm Hg), and instrument battery voltage (v) for the entire deployment period (October 11-24, 2013).

Programming, calibration, and maintenance procedures of the instruments followed manufacturers' recommendations per instrument manuals (Hach Company 2006) as well as Grant PUD's QAPP (Hendrick 2009). Calibration checks and adjustments were performed on all instruments on October 9, 2013. Post deployment checks on calibration were completed the day after retrieval (October 25, 2013) for evaluation of instrument drift and accuracy (see Appendix A, Table A-2).

2.3 Deployment Methods

Instrument deployment methods for the TDG transect array varied depending on water conditions. In general, instruments were set using normal anchor and buoy cabling for deployment, which included the use of 200 lb. steel housings and anchors attached to a series of surface floats via 5/16 inch diameter steel cable which allowed for the deployment and retrieval of instruments by boat (Figure 4). Surface instruments were deployed inside ABS housings and attached directly to the mainline cable near the floats. All instruments were positioned either near the channel bed or at depths equal to or greater than the compensation depth for TDG, which is the depth in a water column at which the TDG pressure is equal to the hydrostatic pressure. As a rule of thumb, this corresponds to roughly one meter for every ten percent of saturation above 100. The positions of each sampling station or instrument were documented using a standard global positioning system (GPS) instrument onboard the deployment boat.

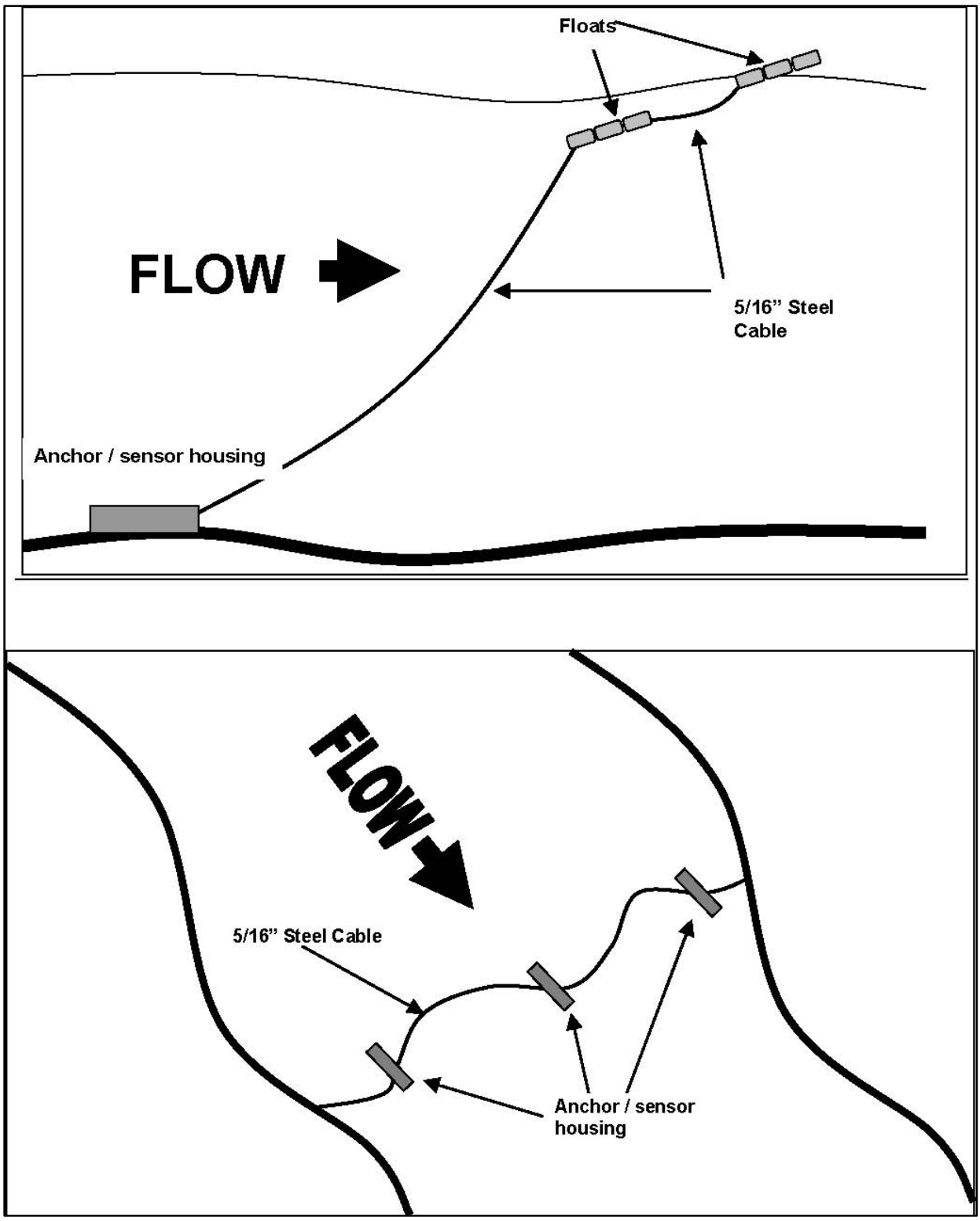

Figure 4 **Schematic of TDG sensor array transects used 2000 feet downstream of Wanapum Dam, mid-Columbia River, WA.**

2.4 Operational Conditions

In order to quantify TDG production associated with operation of all ten of the advanced turbines, TDG data was collected during the operational conditions as displayed in Table 1 below.

Table 1 Proposed vs. Actual operating conditions for the total dissolved gas exchange study at Wanapum Dam, October 2013.

		Proposed			Actual			
Test	Test Description	Gate Opening	Turbine Flow	Powerhouse Flow	Gate Opening	Turbine Flow	Powerhouse Flow	Date Completed
T1	Minimum	60%	9.3	93	60%	9.1	93.3	10/12/2013
T2	Average	77%	13.9	139	77%	13.1	132.5	10/13/2013
T3	Maximum	95%	18.8	180	93%	19.2	193.5	10/14/2013
Note: Flow values shown in kcfs, values for the actual test conditions were averaged over the ~3 hr test period.								

Proposed conditions were defined in the study plan (see Keeler 2012), while the actual conditions were those preformed during the TDG evaluation at Wanapum Dam, and those shown in Table 1 are the average values over each three-hour test periods. For T2, the actual turbine flow was slightly less than predicted for 77% gate opening (13.1 kcfs per unit vs. 13.9 kcfs per unit proposed); however it is unlikely that this difference impacted the results of the test. In addition, for T3 the actual gate opening was 2% less than proposed, but the total flow per unit was, on average, 0.4 kcfs higher than proposed and total average flow was 13.5 higher than proposed.

The difference in the gate opening was due to an over-estimation of the anticipated “maximum” operating condition during the development of the study plan; e.g. the actual maximum operational gate opening is 93%. The additional flow per unit at 93% gate opening was not anticipated, as this was the first time all ten units have been operated at “maximum”; however, the higher flow per unit would, if anything, likely increase any chance for TDG production, and thus any impacts on the TDG test, would have been to increase the “worst-case” scenario of TDG production.

Depth, temperature, and TDG values were collected at 15-minute intervals (starting at the top of the hour) from October 11, 2013 at 0900 hours to October 24, 2013 at 0800 hours for the purpose of this TDG evaluation. Project operational data (flow per unit, total powerhouse flow, percent gate opening, etc.) were collected during the entire study period and are included in this evaluation (see Section 3.0 for more details).

3.0 Results

The following section describes the results of the TDG evaluations performed at Wanapum Dam during mid-October, 2013 to quantify and summarize the TDG values associated with the operation of all ten advanced turbines.

3.1 Targeted Tests

Project operations were held steady for at least three consecutive hours to allow conditions to stabilize during the test. Figure 5 below displays the three targeted test periods (T1, T2, and T3) with corresponding powerhouse discharge and TDG at the WANF, WANT, and transect (T1) locations. Targeted tests 1, 2, and 3 had corresponding discharges of 93.3 kcfs, 132.5 kcfs, and 193.5 kcfs respectively. Note that the remaining TDG values shown on Figure 5 correspond with

periods of time when the sluiceway was spilling between 1.5-2 kcfs, and thus likely accounts for the slight differences between upstream and downstream TDG levels during the non-targeted test periods (see Appendix A for additional detail).

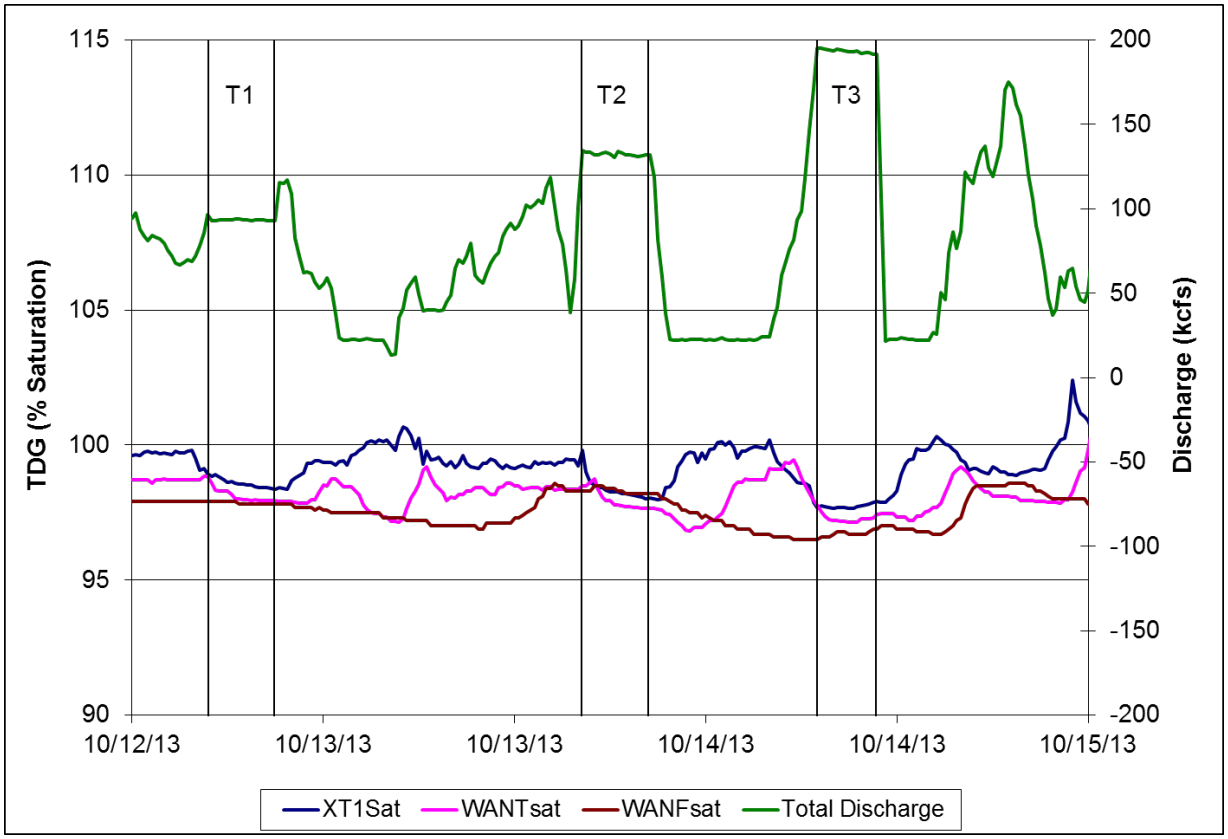

Figure 5 **Average total dissolved gas percent saturation for transect (T1) stations, Wanapum Dam tailrace fixed-site monitoring station (WANT) and forebay (WANF) station with total project discharge.**

Table 2 below displays the summary values of TDG %SAT for each of the three targeted test periods along with the difference in TDG %SAT from forebay (WANF) to transect (T1).

Table 2 **Summary values of total dissolved gas during the targeted test periods.**

Test	Total Discharge (kcfs)	Gate Opening (%)	WANF (%SAT)	T1 (%SAT)	WANT (%SAT)	Delta TDG (T1 – WANF)
T1	93.3	60	98.3	98.4	98.2	0.1
T2	132.5	77	98.7	98.1	97.9	-0.6
T3	193.5	93	97.4	97.8	97.7	0.4

3.2 Incidental Tests

The field study period was extended for ten additional days in order to record any incidental periods when operational requirements were inadvertently met and the resulting data could possibly be used for further evaluation of the advanced turbine operation. After further analysis of the project operation data it was determined that there were ten additional periods during the

study period when consistent operating conditions were met for a minimum of three consecutive hours.

The difference in TDG %SAT between the Wanapum forebay and the TDG array transect for the incidental test periods (with sluiceway spill) ranged from -0.1 %SAT to 2.0 %SAT for an overall mean difference of 0.9 %SAT. Given that the sluiceway was operating during these incident test periods, these incidental test results further suggest that the new turbines at Wanapum Dam do not materially increase TDG levels during all operating levels. It is important to note that the ice/trash sluiceway was not operational during the three targeted test periods, but spill from the sluiceway did occur (1.5 - 2.3 kcfs) during all other periods of the TDG evaluation. This sluiceway is operated to provide adult fall back for migrating salmonids and because of the record fall run of adult Chinook salmon in 2013, Grant PUD was not able to close the sluiceway for the entire study period. Additionally, during these incidental test periods it is important to note that Wanapum Dam was operated as a nine-unit project. A unit was taken offline in order to perform the generator replacement project. For more information on the additional testing periods identified during the study period see Appendix A of this report.

4.0 Conclusions

The difference in TDG %SAT between the Wanapum forebay and the TDG array transect (T1) for the targeted test periods (without sluiceway spill) were 0.1 %SAT for Test 1, -0.6 %SAT for Test 2, and 0.4% SAT for Test 3 for an overall mean difference of -0.02%. Given that the sensors used to the collect TDG values for this study have an accuracy ± 0.15 %SAT and sensitivity/resolution of 0.1 %SAT (see Section 2; Hach Company 2006), the differences observed during the targeted tests suggest that the new advanced turbines at Wanapum Dam do not materially increase TDG levels during minimum, average, and maximum operating conditions.

The difference in TDG %SAT between the Wanapum forebay and the TDG array transect (T1) for the incidental test periods (with sluiceway spill) ranged from -0.1 %SAT to 2.0 %SAT for an overall mean difference of 0.9 %SAT (see Appendix A for additional information related to the results of the incidental tests). Given that the sluiceway was operating during these incidental test periods, these incidental test results further suggest that the new advanced turbines at Wanapum Dam do not materially increase TDG levels during regular operation conditions.

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Appendix A
Wanapum Dam Advanced Turbine TDG Evaluation Data Report

1.0 Introduction

The following sections provide supplementary details related to the Wanapum Dam Advanced Turbine Total Dissolved Gas Evaluation study that was conducted during October 2013. The objective of this study was to evaluate total dissolved gas (TDG) across the river channel downstream of Wanapum Dam with the advanced turbines operating at varying conditions (at minimum/maximum capacity within the cavitation limits and within standard water elevation levels) to determine whether the operation of the advance turbines significantly affects TDG saturation during normal project operations.

Below is a summary of the details contained in this appendix:

- Information on the type of instruments that were deployed, including GPS- determined locations, depths of deployment, and quality assurance/quality control (QA/QC);
- Details on flow rates, water levels, water temperatures and barometric pressures associated field testing of the study;
- Details on the methods and results of data reduction and analysis, including:
    - Discussion of the raw TDG data recorded on each TDG sensor from all the monitoring stations during the study period, including QA/QC results;
    - Elimination of two T1 transect sensors from the analyses due to sensor failure;
    - Determination of the arithmetic mean TDG across the entire T1 transect, and its comparison to upstream and downstream TDG values under varying flow conditions.

2.0 Data Collection Methods, QA/QC and Operational Conditions

The following sections provide a summary of the data collection methods that were used during the study period, including descriptions of TDG sensors, calibration and quality assurance/quality control methods, location of the TDG sensor array, and proposed operational conditions. The study period began on October 10, 2013, with the installation of the in-field TDG sampling instruments approximately 2000 feet downstream of Wanapum Dam. The study period ended on October 24, 2013 with the removal of all test instruments. For a more detailed description of the methods used for this study, see the study plan (Keeler 2012).

This study utilized an array of remote instruments capable of logging time histories of TDG pressures at numerous locations up and downstream of Wanapum Dam. Hach Corporation Hydrolab MiniSondes and DataSondes with TDG sensors, temperature, and depth sensors were used to record data. A total of 12 TDG instruments were used to monitor TDG (millimeter of mercury (mm Hg)), temperature (°C), and depth (m) at seven stations or locations. Instruments were paired at the same depth for all of the deeper stations to avoid data loss and to examine sampling error associated with instruments. In addition TDG percent saturation (%SAT) were calculated using ambient air pressure and TDG pressure. Measurements were made on 15-minute intervals for the duration of the study. Project operations data including total river flow, powerhouse discharge, spillway discharge, Wanapum sluiceway discharge, forebay and tailrace elevations were also collected on 15-minute intervals.

Atmospheric conditions of air temperature, barometric pressure (not corrected to sea level), and wind speed and direction were collected at the Wanapum Dam weather station to determine

potential atmospheric influences on TDG levels. Barometric pressure/air pressure data was also collected just above the water surface near the forebay and tailwater fixed-site monitoring stations (FSM stations) owned and operated by the Public Utility District No. 2 of Grant County, Washington (Grant PUD). A temporary logging instrument was maintained at/near the tailwater boat launch during the field-testing period to be used as backup barometric pressure data. The actual barometric pressure for each sample station location was determined from the closest logging barometer operated by Grant PUD.

2.1 Monitoring Locations

Water quality data collected during this study included TDG (in mm Hg and %SAT relative to atmospheric pressure), water temperature, and sample depth. These parameters were collected at the following locations (see also Figure A-1):

- WANF - Wanapum Dam forebay FSM station, an existing real-time TDG monitor located near turbine unit 10, mid-channel, at an average depth of five meters, depending on forebay elevations. A second logging instrument was placed at this location for the purpose of this study. This data provided information on incoming/background TDG levels for comparison to TDG levels downstream of the project during project test operations.
- T1 - A five-station/nine-instrument TDG transect located approximately 2000 feet downstream of Wanapum Dam. Stations were distributed as evenly as possible across the river. The left bank instrument was placed in shallow water at approximately ten feet of depth; the remaining four stations had two paired instruments each. The paired instruments were attached together with the sensors positioned at two feet up from bottom. The location of the transect was selected because of its position in the river where it narrows, developing uniform flowlines that are essentially parallel to the left bank and parallel across the section. There are minimal back eddies at this river section to confound the data analysis based on velocity transects collected at this section previously (see Carroll et al. 2001, Schneider et al. 2001).
- WANT - Wanapum Dam tailrace FSM station, an existing real-time TDG monitor attached to a pier-nose (mid-channel) on Beverly Bridge, located 3.2 river miles downstream of Wanapum Dam. A second logging instrument was placed near the river bottom at this station for the purpose of this study. Data collected at this location was used to compare TDG values collected at the T1 transect and to verify the advanced turbines ability to meet tailrace TDG water quality standards.
- BPBU – A backup instrument was left near the Wanapum Dam tailrace boat launch for the duration of the study to log barometric pressure near the water surface.

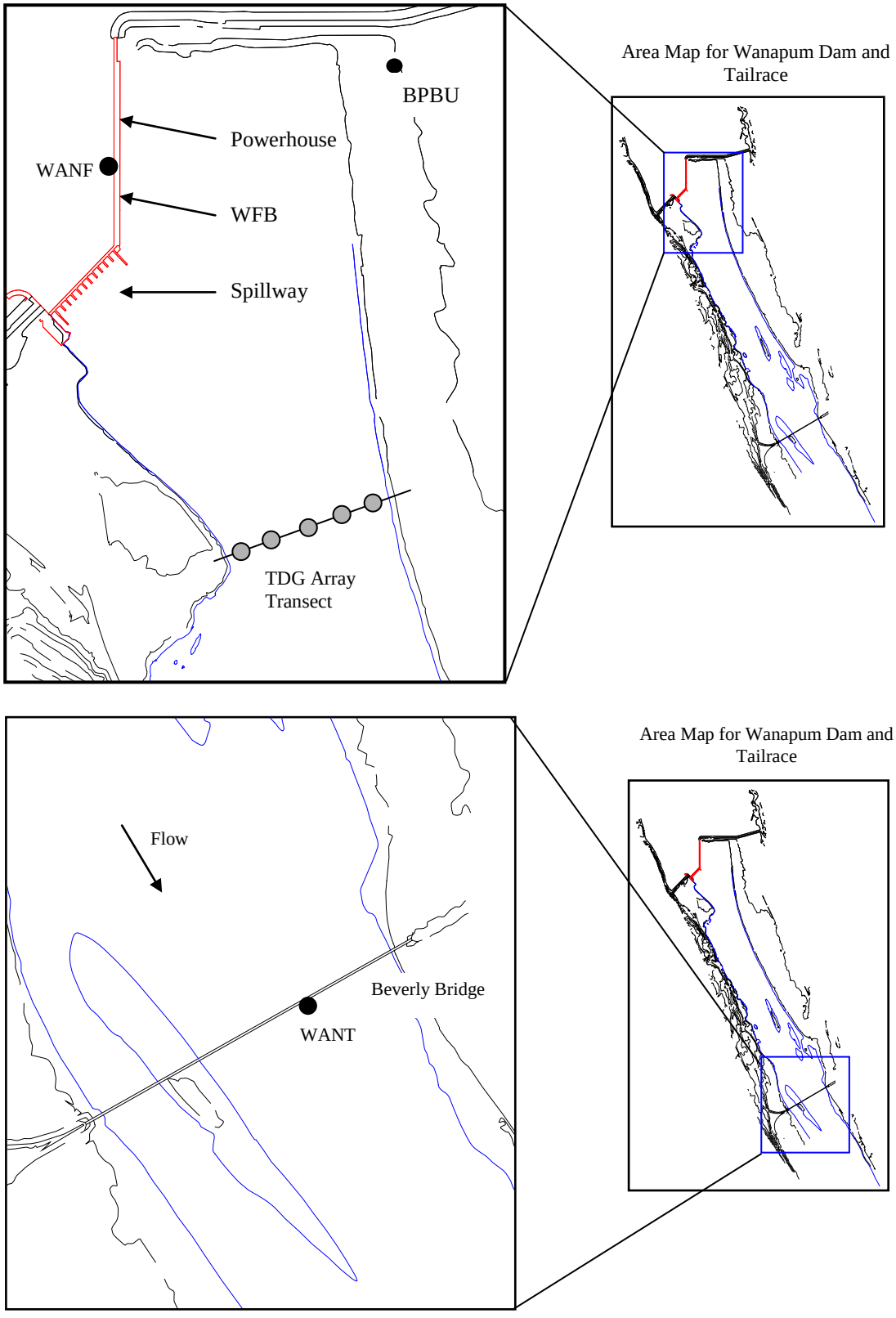

Figure A-1 TDG monitoring stations: Wanapum forebay (WANF), barometric pressure backup (BPBU), transect array (T1) and tailrace (WANT).

2.2 Water Quality Monitoring Instruments and Deployment Methods

A total of twelve TDG monitoring instruments were deployed for this study using rigging methods as described in the study plan developed for this project (Keeler 2012). The instruments were programmed to record measurements of TDG pressure (mm Hg), water temperature (°C), depth (m), and battery voltage on 15-minute intervals for the duration of the study. Pre-deployment instrument calibrations were completed on October 9, 2013, per manufacturer's specifications (Hach Corporation 2006).

Ten instruments were deployed on October 10, 2013. Nine were distributed laterally across the T1 transect as described in the study plan (Keeler 2013). The transect is approximately 1400 feet in length and 2000 feet downstream of Wanapum Dam and consists of five stations arranged laterally across the river channel. Starting on the river left downstream, the stations were given the names of T1P1, T1P2, T1P3, T1P4, and T1P5. The "T1" stands for Transect 1 and the "P" indicates the position across the river. Stations T1P2, T1P3, T1P4, and T1P5 all had two instruments deployed on the same cable. The paired instruments were attached together at the same depth to perform as replicates. Station T1P1 had only one instrument attached to the cable near the river bottom. Adding an "A" or "B" to the label, T1P3A or T1P3B was used to identify replicate instruments. The last station to be deployed on October 10, 2013, labeled WANTBU, was placed adjacent to the Grant PUD's Wanapum Dam tailrace FSM station, on the river bottom at approximately 23 feet of depth.

Deployment of the transect instruments was determined by distance from the right bank. The entire transect from bank to bank was approximately 1400 feet wide, and project discharge ranged from approximately 80 up to 123 kcfs during deployment.

An additional TDG station was established on October 11, 2013. This one named WANFBU was placed adjacent to the Grant PUD's Wanapum Dam forebay FSM station near the intake for turbine unit 10 on the powerhouse at approximately 20 feet of depth. Lastly, a second instrument labeled BPBU was placed near the Wanapum Dam tailrace boat launch at 10' elevation above the tailwater surface to log barometric or air pressure during the test period.

The deployment information for each station and instrument is shown in Table A-1 below. The information displayed includes station, replicate (A or B), instrument type/model, serial number, deployment date, time, way point position (WGS84 decimal degrees), approximate station depth, approximate distance from left bank. The position of each sampling station or instrument was documented using a Garmin GPSMAP 76© onboard the deployment boat.

Table A-1 Station and instrument information during initial deployment.

Station	Hydrolab Model	SN	Date	Time	Latitude Longitude	Depth (ft)	Dist (ft)
WANTWBU	MS5	62950	10/10	1550	46.8335° 119.9419°	24	
WANFBU	DS4a	39850	10/11	0900	46.8748° 119.9717°	20	
T1P1	DS4a	39851	10/10	1415	46.8680° 119.9634°	10	150
T1P2A	MS5	44948	10/10	1525	46.86790° 119.9645°	33	400
T1P2B	DS4a	37261	10/10	1525	46.86790° 119.9645°	33	400
T1P3A	MS5	44927	10/10	1500	46.86760° 119.9656°	29	690
T1P3B	DS4	31405	10/10	1500	46.86760° 119.9656°	29	690
T1P4A	MS5	44945	10/10	1512	46.86706° 119.9668°	26	1000
T1P4B	DS5	39849	10/10	1512	46.86706° 119.9668°	26	1000
T1P5A	DS5	39855	10/10	1440	46.86656° 119.9676°	14	1300
T1P5B	DS4	30948	10/10	1440	46.86656° 119.9676°	14	1300
BPBU	DS4a	37260	10/10	1200	46.876981° 119.9576°		

Instrument deployment methods varied depending on the location, water condition, and depth. In general, instruments were set using a normal anchor and buoy system and/or shore based cabling for deployment. Anchor and housing weighed approximately 200 pounds and were attached to a series of surface floats via 5/16 in diameter steel cable that allows deployment and retrieval of instruments by boat. All instruments were deployed inside ABS housings and attached directly to the mainline cable near the anchors at depths greater than the equivalent of one half-atmosphere pressure (approximately 15 feet) where possible.

2.3 Calibration and Maintenance

Quality control in the field was assured by completing accurate and thorough field notes and other necessary documentation. Programming, calibration, and maintenance procedures of the instruments followed manufacturers' recommendations per instrument manuals (Hach Corporation 2006). Calibration checks and adjustments were performed on all instruments within one day prior to initial deployment. Post deployment checks on calibration were completed for evaluation of instrument drift and accuracy on the day following retrieval (October 25, 2013).

During the pre-deployment calibrations all instruments were set to read within +/-1 mm Hg of the atmospheric pressure. The instruments were also corrected to read +/- 1 mm Hg of the air pressure plus 200 mm Hg for the slope checks. During the post deployment checks all instruments were within +/- 2 mmHg of the atmospheric pressure and no corrections or changes

were required. The calibration information for both the pre- and post-deployment checks is included in Table A-2 below.

Table A-2 Instrument calibration, pre-deployment, 10/09/2013, and post-retrieval calibration check, 10/25/2013.

Station	Model	SN	Pre Test BP (ΔmmHg)	Pre Test Span BP+200 (ΔmmHg)	Post Test BP Check (ΔmmHg)	Post Test Span BP+200 (ΔmmHg)
WANTBU	MS5	62950	0	0	0	1
WANFBU	DS4a	39850	0	0	-1	2
T1P1	DS4a	39851	0	0	1	1
T1P2A	MS5	44948	0	0	0	1
T1P2B	DS4a	37261	0	0	0	1
T1P3A	MS5	44927	0	0	0	1
T1P3B	DS4	31405	-1	0	N/A	N/A
T1P4A	MS5	44945	0	0	-1	2
T1P4B	DS5	39849	-1	0	0	1
T1P5A	DS5	39855	0	0	0	1
T1P5B	DS4	30948	-1	0	N/A	N/A
BPBU	DS4a	37260	1	0	0	1
N/A=not applicable. These two instruments had faulty membranes and thus were not given post-deployment checks.						

The tensionometers used for measuring TDG pressures employ semi-permeable membranes connected to pressure transducers with associated electronics to directly measure *in-situ* total dissolved gas pressure in water.

Air calibrations for TDG were performed using a certified mercury column barometer. The TDG sensors were calibrated by comparing the instrument readings (in mmHg) to those of the standard barometer at atmospheric conditions. Response slope or span checks were performed by adding 200 mm Hg of pressure directly to the transducer, and then adjusting the instrument span reading accordingly to properly span the range of interest. The calibration process was repeated as needed to verify and readjust the calibration points.

The condition of the membrane and any condensation trapped inside it can influence readings and result in erroneous data or instrument calibration. An inspection for leaks was performed on the membrane itself before completing the calibration routine. Defective membranes were replaced. Two of the instrument membranes failed as soon as the equipment was placed at depth at the station. This resulted in no data logs from the T1P3B and the T1P5B instruments.

2.4 Data Completeness, Quality, and Consistency with Conditions

The TDG datasets resulting from the study were complete for all stations. The only data losses resulted from the two replicate instruments membrane malfunctions at T1P3B and T1P5B resulting in no actual loss for the stations. There were no power failures for any of the instruments. Grant PUD's Wanapum forebay FSM station barometric pressure data was used to determine %SAT for the two forebay instruments and the Wanapum Dam tailrace FSM station barometric pressure data was used to calculate all of the downstream or tailwater station TDG %SAT. Instrument calibration post checks revealed only minor differences with the known standard pressures, +/- 1 mm Hg. This would have minimal impact on instrument operation

during field- testing. The data quality and consistency is considered good for completion of the evaluation testing.

2.5 Operating Conditions

Every attempt was made to hold project operations steady for at least three consecutive hours to allow conditions to stabilize in the tailrace. This was done to achieve equilibrium in flow conditions/patterns, tailwater elevations, and a resulting equilibrium in TDG characteristics downstream of the project to the Wanapum Dam tailrace FSM station. The project test operations began on October 10, and continued until October 24, 2013. The three individual specified tests were completed by mid-day October 14. The field study was continued for ten additional days in order to document any incidental periods when test requirements were inadvertently met and the resulting data may be used for further evaluation of the advanced turbine operation. There were ten additional periods during the study when relatively constant operating conditions were met for a minimum of three hours. Note that the Wanapum sluiceway operation was shut down completely during the three targeted test periods but spilled between 1.5 - 2.3 kcfs during all other periods of the field study, which likely resulted in minor increases in TDG levels downstream of Wanapum Dam. Additionally, it should be noted that during these additional test periods the project was operated as a nine-unit project, as one unit was taken out of service in order to begin preparation for the generator replacement project. Table A-3 below displays the applicable information on the proposed vs. actual operational conditions during the test periods.

Table A-3 Proposed vs. Actual operating conditions for the total dissolved gas exchange study at Wanapum Dam, October 2013.

		Proposed			Actual			
Test	Test Description	Gate Opening	Turbine Flow	Powerhouse Flow	Gate Opening	Turbine Flow	Powerhouse Flow	Date Completed
T1	Minimum	60%	9.3	93	60%	9.1	93.3	10/12/2013
T2	Average	77%	13.9	139	77%	13.1	132.5	10/13/2013
T3	Maximum	95%	18.8	180	93%	19.2	193.5	10/14/2013
Note: Flow values shown in kcfs, values for the actual test conditions were averaged over the 3 hr test period.								

2.6 Data Collection Schedule

The study began in the field with the installation of all monitoring instruments at 1600 hrs on October 10, 2013. The study ran for a total of 14 days and was completed on October 24 at 0800 hr with the final retrieval of all instruments. Powerhouse operation was variable as required for power production for the entire study period.

Retrieval of all test instruments was completed on October 24 with no equipment loss. All 12 of the test instruments functioned properly through all or most of the test period meeting the manufacturers specifications for accuracy at standard pressure based on recommended calibration procedures. However two of the 12 instruments experienced TDG membrane failure early in the testing period.

Data was reviewed for completeness, quality and consistency with conditions. There were no data gaps (time or parameters) identified for the instruments. The FSM station data logs had missing data only during a one-hour period of equipment maintenance on October 16, 2013. The water quality data (TDG and temperature) were merged with operations data according to date

and time. All data including operations information was reported at 15-minute intervals (on the hour and quarter hours).

Limited analysis of TDG measures paired at the same stations and depths was reviewed for sample precision. Outliers and data that that were outside of the quality objectives were evaluated to determine the cause of the problem. Slight exceedances of <1 %SAT were tolerated with the data quality and the accuracy taken into account in the data analysis. Exceedances that were traced to membrane failure resulted in the rejection of the data from the dataset. As described in Sections 2.3 and 2.4 two of the TDG membranes for instruments T1P3B and T1P5B failed early in the test resulting in the data being biased to read the hydrostatic pressure from depth. The resulting data logs were not used in the final analysis.

3.0 Data Reduction

The following sections provide additional information related to the QA/QC results from the data collected during the study, and also provides more detail on the hydrology and project operations, operational test results, together with raw and reduced TDG data from each monitoring location.

3.1 Hydrology and Project Operations

The mean daily discharge at Wanapum Dam ranged from 60 kcfs up to 108 kcfs (Figure A-2) during the test period. The project operations data included total river flow, powerhouse discharge, spillway discharge, sluiceway discharge, forebay elevation, and tailwater elevation were collected as part of the normal Wanapum Dam data collection program on 15-minute intervals. The project operations data were then merged with the field study water quality data sets for TDG and water temperature.

Figure A-3 displays detailed 15-minute interval time histories of the operations/discharge data during testing. This close interval project data was highly variable depending on total river flows, power requirements, and testing needs. During the non-targeted test periods the sluiceway was operated fairly constant at approximately 2 kcfs and the total project operation varied from 22 to 195 kcfs. The sluiceway was held to 0 kcfs operation during the targeted testing periods. The fish ladder operation was maintained at 2 kcfs throughout the entire test period. The spillway was not operated during the field testing.

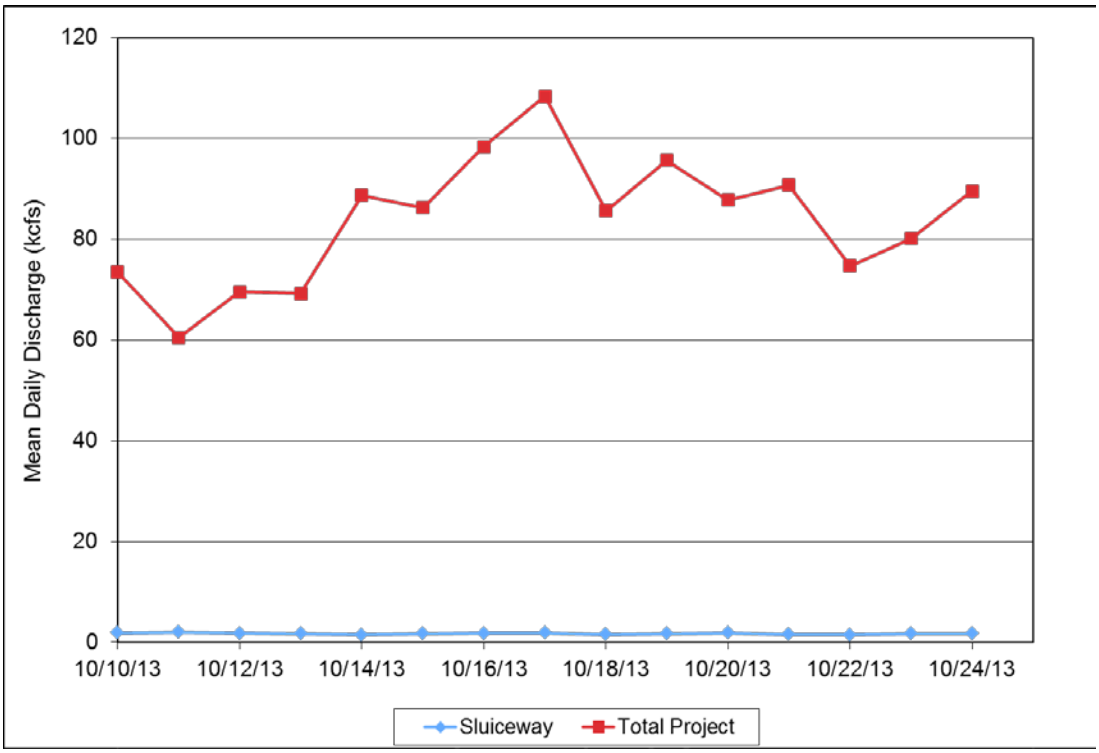

Figure A-2 Columbia River mean daily discharge at Wanapum Dam during the field testing.

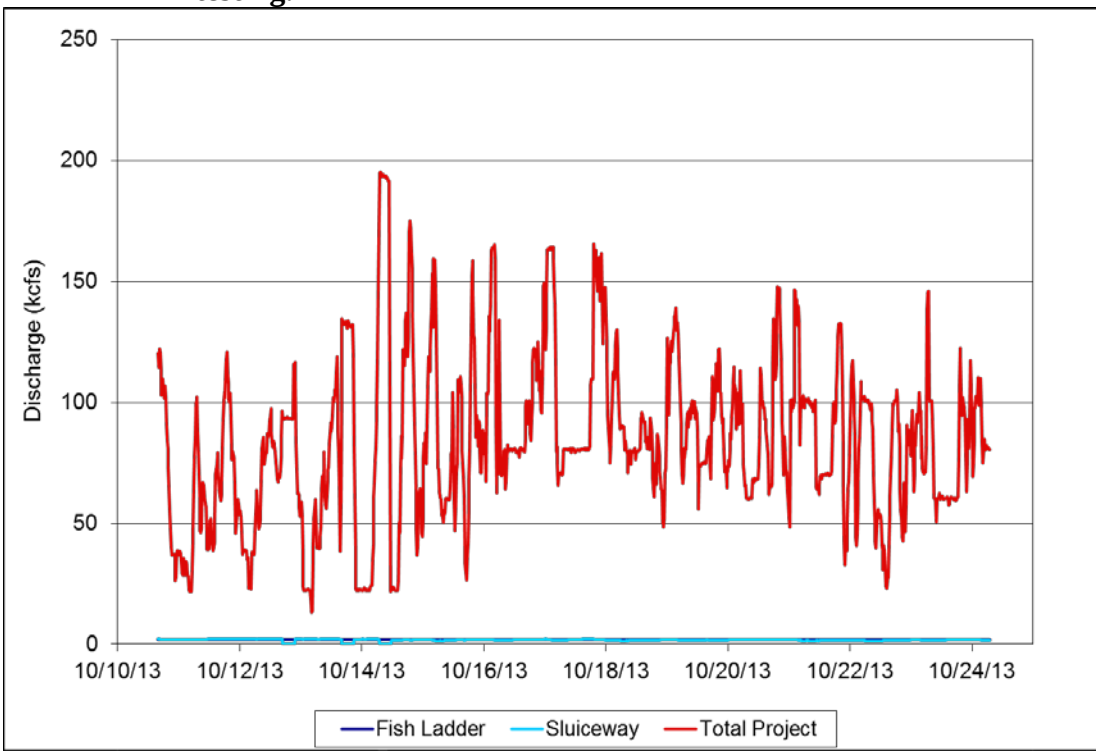

Figure A-3 Columbia River 15-minute interval discharge at Wanapum Dam during the field testing.

The Wanapum Dam forebay and tailwater surface elevations (ft msl) are presented as 15-minute detailed time histories in Figure A-4. Both fluctuated during the study as determined by river flow conditions. Forebay elevations varied over a range of 3.3 ft from 567.9 ft to 571.2 ft msl with a mean daily average of 569.6 ft for the duration of the testing. Tailwater elevations varied over 9.5 feet with project flow changes from a minimum of 484.5 ft to a maximum of 494.0 ft msl and averaged 488.7 ft msl for the test period.

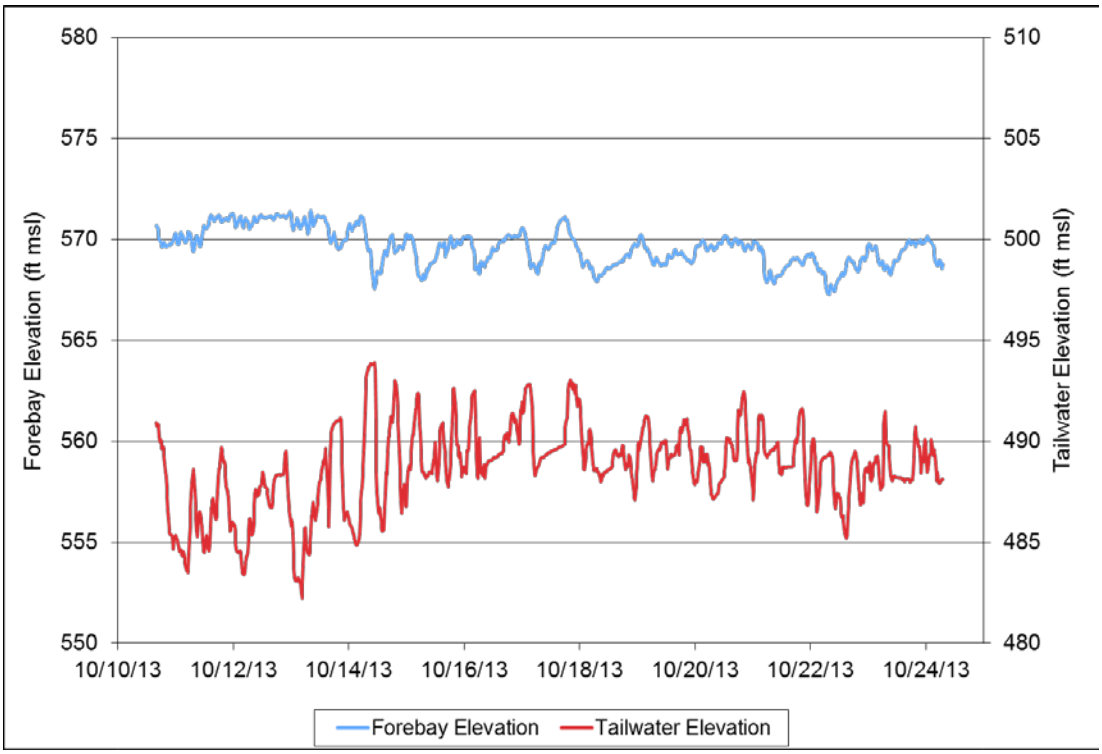

Figure A-4 Forebay and Tailwater 15-minute interval elevations for Wanapum Dam during the field testing.

3.2 Operational Tests/Target Operations

As previously stated, the field study was designed to evaluate TDG downstream of Wanapum Dam during operation of all ten advanced turbines, with the sluiceway operation at zero discharge for as long as possible under the river flow and power production constraints. The initial time required for reaching equilibrium conditions in downstream hydrodynamics and associated TDG was three hours. The three targeted conditions are described in Section 2.4 that also describes the occurrence of ten periods when conditions were constant for a minimum of three hours due to incidental constant project operations. Unlike the targeted test during these incidental test periods the sluiceway was spilling approximately 2 kcfs and unit operation was non-uniform across the powerhouse and consisted of only nine units. A total of 13 test periods (three targeted tests and ten incidental tests) were identified during the study meeting the time requirements for controlled operating conditions.

Average conditions both in project operations and water quality conditions were determined for each identified tests. Average operations were calculated from the beginning to end of each test period. The average TDG for a test was determined from data representing the steady state

period for a particular station. For the downstream stations a time lag was determined using visual observations of data time histories and average velocities and travel time as determined from numerical model results for the various river discharges. The time lag determined for the T-1 transect stations were two hours following initiation of a test. The test data collection period extended 30 minutes beyond the end of steady state operating conditions. For a three hour test period this would result in a minimum of one hour of data or four readings per instrument. The Wanapum Dam tailrace FSM station data representing each test was collected from 2.5 hours following test initiation and continued until one hour following the test ending. Based on the time of each controlled test this approach resulted in an approximate range of 3.5 to 8 hours of data collection at 15 minute intervals for use in calculating the test statistic or average by station.

Figure A-5 details the three targeted test periods with powerhouse discharge and resulting downstream TDG %SAT. Targeted test 1, 2, and 3 had corresponding discharges of 93.3 kcfs, 132.5 kcfs, and 193.5 kcfs respectively. The corresponding TDG can be identified on the plot as well. This type of data plots were used extensively in determining equilibrated TDG conditions to associate with the individual tests.

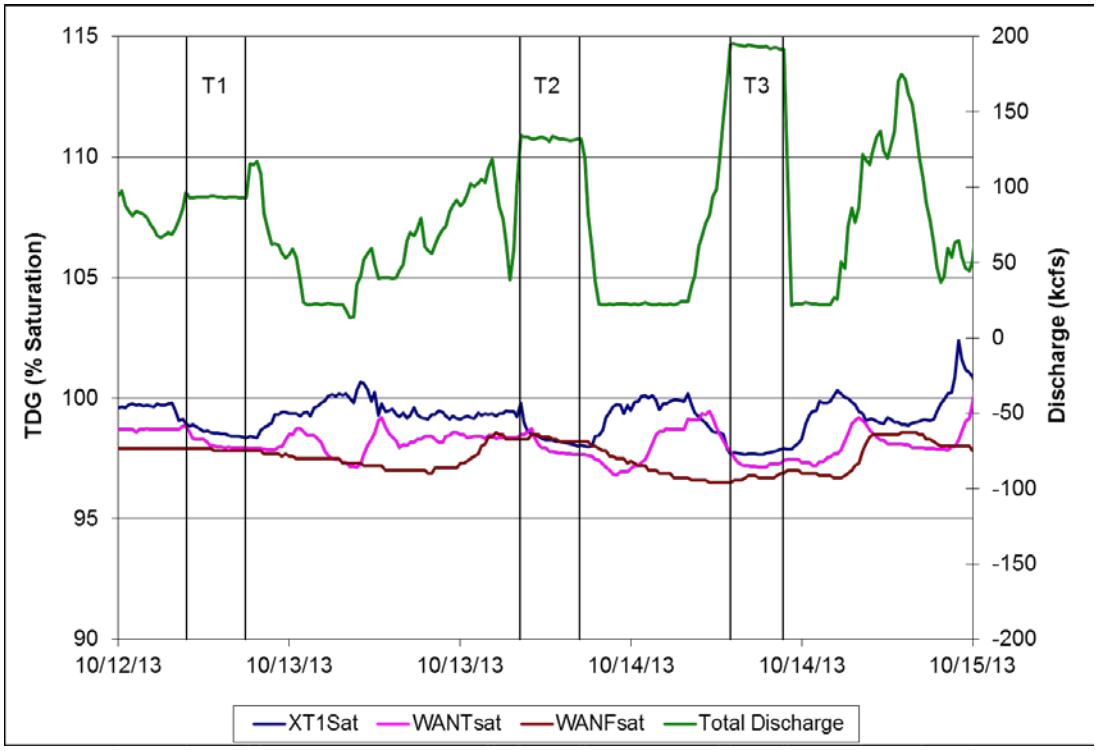

Figure A-5 Mean TDG percent saturation for transect (T1) stations, Wanapum tailrace (WANT) and forebay (WANF) stations with total project discharge.

Figure A-6 is an expansion of Figure A-5 to cover the entire study period and the time of occurrence of each test. A complete listing of descriptive statistics is presented in Table A-4 for each of the 13 tests identified between October 10 and October 24, 2013. The constant project discharges for the 10 incidental tests varied from a mean of 22 kcfs up to 100 kcfs.

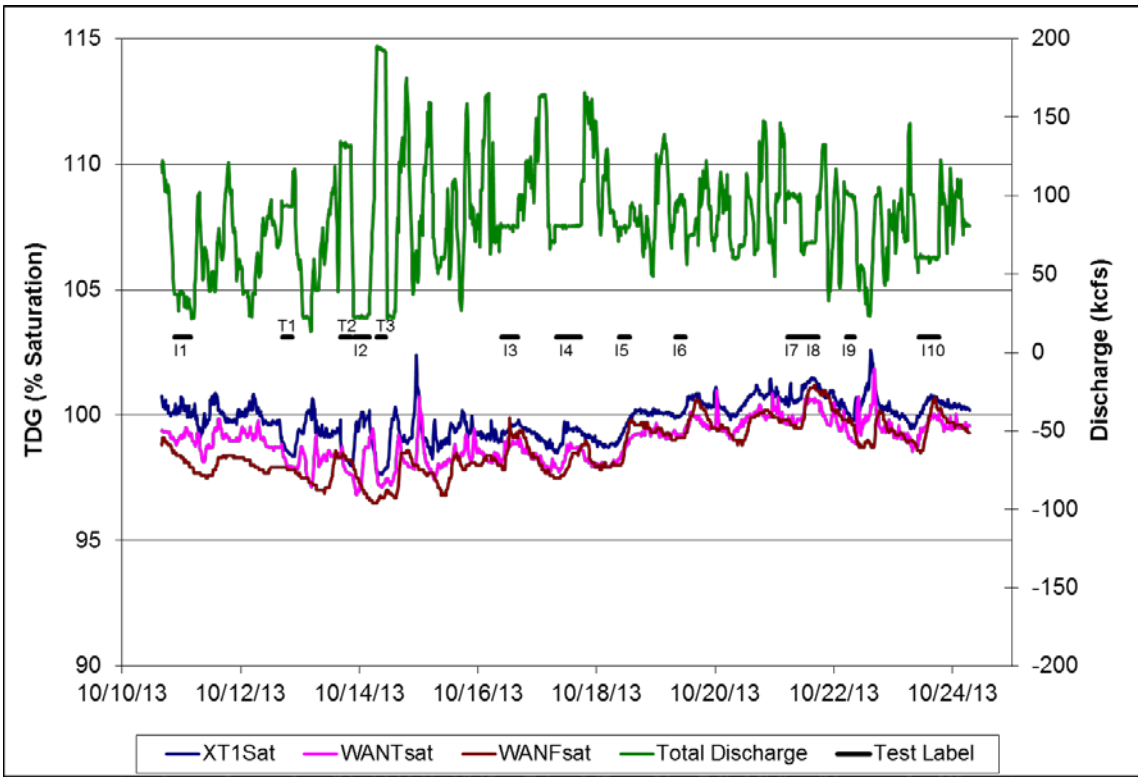

Figure A-6 **Mean TDG percent saturation for transect T1, Wanapum tailrace (WANT) and forebay (WANF) with powerhouse discharge for the complete study period.**

Table A-4 Summary data for each of the tests.

Test	Total Discharge (kcfs)	WANF (%SAT)	T1 (%SAT)	WANT (%SAT)	Delta TDG T1-WANF
T1	93.3	97.8	98.4	97.9	0.6
T2	132.5	98.3	98.1	97.6	-0.2
T3	193.5	96.7	97.8	97.4	1.1
I1	32.2	98.1	100.2	99.2	2.1
I2	22.6	97.2	100.0	98.5	2.8
I3	80.1	98.8	99.5	98.9	0.7
I4	80.5	98.0	99.3	98.6	1.3
I5	79.5	98.7	99.6	99.0	0.9
I6	96.1	99.1	100.1	99.4	1.0
I7	99.7	99.6	100.5	99.8	0.9
I8	70.1	100.9	101.3	100.6	0.4
I9	100.2	99.7	100.0	99.1	0.3
I10	60.3	99.6	100.5	99.4	0.9

Note: Tests T1 – T3 were the targeted test in accordance with the study plan (Keeler 2012); test I1 – I10 were incidental tests (during which the sluiceway was spilling between 1.5 – 2.3 kcfs).

It is important to note that the ice/trash sluiceway was not operational during the three targeted test periods (T1 – T3), but spill did occur (between 1.5 - 2.3 kcfs) during all other periods of the TDG evaluation, including the incidental test periods (I1 – I10). This sluiceway is operated to provide adult fall back for migrating salmonids and because of the record fall run of adult Chinook salmon in 2013, Grant PUD was not able to close the sluiceway for the entire study period. Additionally during these incidental test periods it is important to note that Wanapum Dam was operated as a nine unit project. A unit was taken offline in order to perform the generator replacement project.

Spikes in TDG occurred on a few occasions at the extreme stations of P5 (far left-bank side) and P1 (far right-bank side) with the highest levels associated with the extreme left-bank station P5 and somewhat at the next station, P4. This apparent gradient went away during periods of no sluiceway operation, indicating minor TDG increases in the left-bank flow downstream from sluiceway operation. Additionally, during incidental tests 1 and 2 the sluiceway flow made up approximately 6% and 9% of the total project flow, respectively. This could be a possible explanation as to the slightly higher TDG deltas seen during incidental tests 1, 2, and 4 in Table A-4.

All of the average test TDG data for the WANF, WANT, and transect T1 is presented in Figure A-7. Values to the left of the black line were collected during the targeted test periods have the sluiceway off and with all ten advanced turbines operating, while the data on the right was collected during the incidental periods were the sluiceway was in operation and the project operated with only nine advanced turbine units. The mean difference between WANF and T1 transect TDG for the targeted tests (T1 – T3) was -0.02 %SAT, while the mean difference for the incidental tests (I1 – I10) was 0.9 %SAT. The mean difference between WANF and WANT during the targeted tests was -0.2 %SAT, while the mean difference between WANF and WANT for the incidental tests periods was 0.3 %SAT.

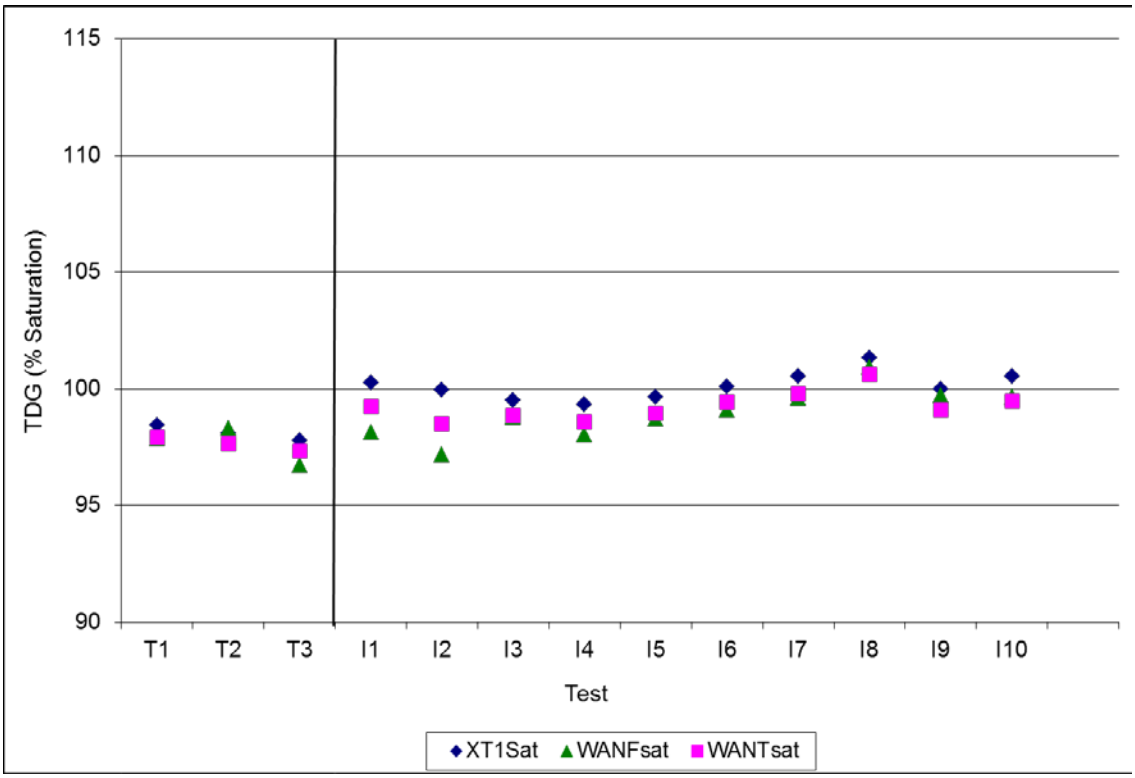

Figure A-7 Average TDG levels recorded at the T1 transect, tailrace (WANT) and forebay (WANF) fixed-site monitoring stations associated with each test condition.

4.0 Total Dissolved Gas Data

Time histories for both TDG and water temperature for the data collected during the study is presented in the following sections. The data is divided spatially into the WANF data, WANT data, and T1 transect data.

4.1 Wanapum Dam Forebay TDG

The Wanapum Dam forebay data consisted of two stations at the same location and depth, the existing forebay FSM station (WANF), and an additional instrument (WANFBU) added for the purpose of this testing period. The forebay data was used as the incoming/background TDG for comparison to the downstream TDG during the testing operations. The two instruments produced similar data for both TDG and water temperature. The time history TDG and temperature data is

depicted in Figure A-8. Total dissolved gas varied from 96 %SAT up to 101 %SAT during the entire study period. The TDG time histories were characterized by daily cycles of approximately 2 %SAT. These cycles are likely associated with daily solar warming cycles which were approximately 1°C. The TDG pressure changes associated with 1 degree increase in water based on Charles' Law is approximately 15 mmHg or about a 2 %SAT increase at standard pressure and temperature.

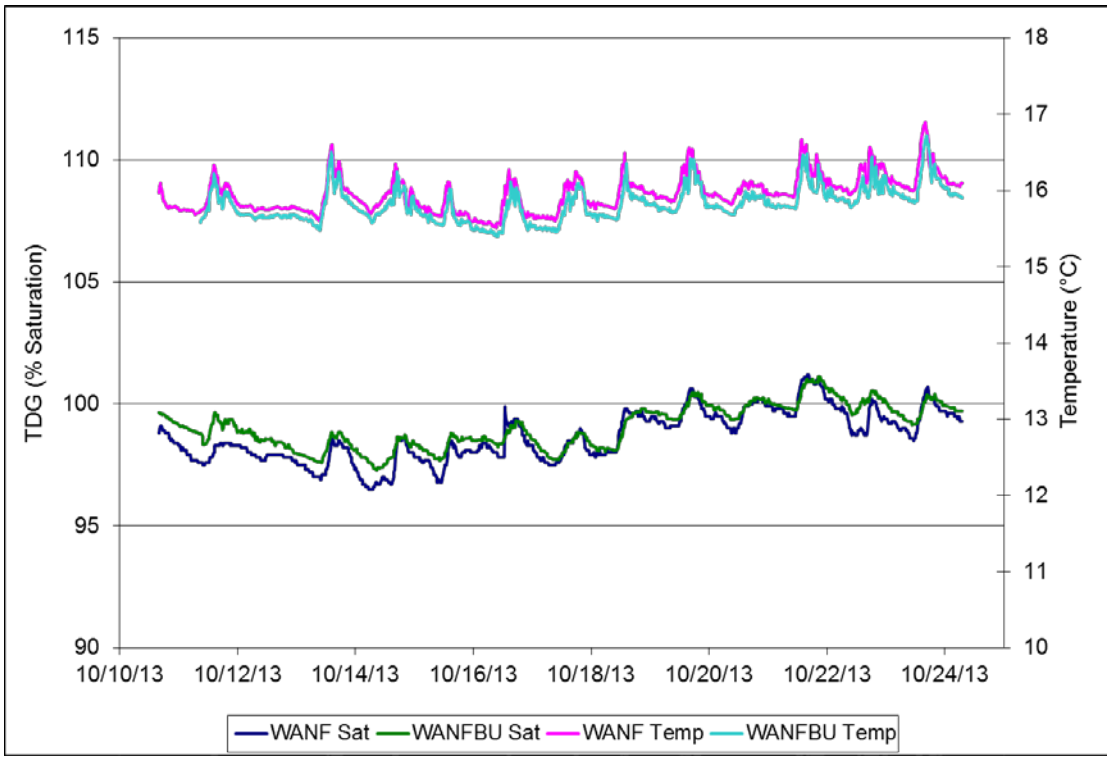

Figure A-8 Wanapum Dam forebay TDG and water temperature during the 2013 study period.

The forebay backup instrument averaged 0.4 % +/- 0.37 % higher than the existing FSM station during its period of operation. The forebay TDG %SAT was collected on the additional instrument added for the purpose of this study. Temperatures ranged from 15.4 to 16.9 °C during the field study. The average temperature difference was 0.1 °C +/-0.08 °C for the two instruments. Note the daily variability for TDG in the forebay measures indicating the influence of fluctuating upstream release gas exchange as well as diel thermal effects from solar warming of at least the surface waters at the depth of the instruments.

4.2 Wanapum Dam Tailwater Total Dissolved Gas

As with the forebay station there was a an additional tailrace monitor added for the purpose of this study (WANTBU). Figure A-9 depicts both the TDG %SAT and water temperature logged by the tailwater instruments. The TDG %SAT values varied from 97 %SAT to 102.3 %SAT during the field testing. The TDG fluctuations were somewhat variable responding to project operational changes, upstream conditions, and the daily solar influence on water temperature.

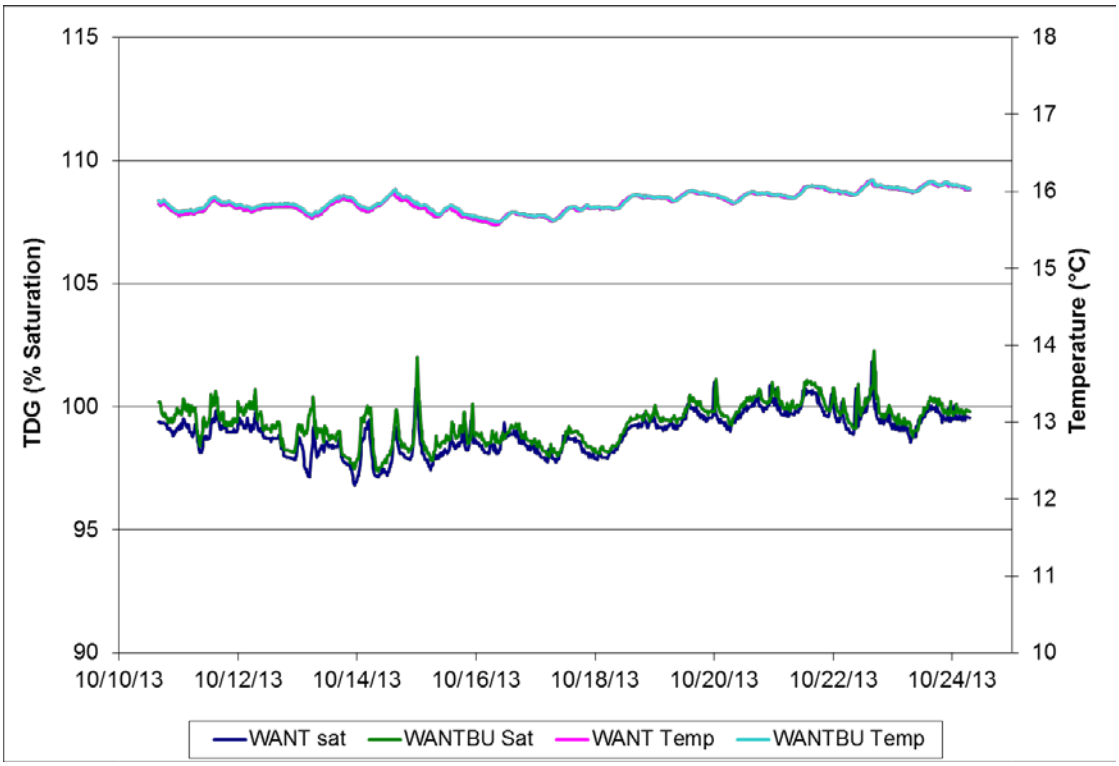

Figure A-9 Wanapum Dam tailwater TDG during the 2013 study period.

The tailwater backup instrument averaged 0.4 % +/- 0.2 % more than the existing FSM station during its period of operation. The average temperature difference was 0.02 °C +/-0.02°C for the two instruments. The tailrace TDG %SAT was collected on the additional instrument added for the purpose of this study.

4.3 Transect T1 TDG

Data collected at the downstream transect, T1, for the complete study period is presented in Figure A-10, and includes the seven-instrument time histories with two of the stations, P2 and P4 each having replicate instruments located near river bottom. Stations P1, P3, and P5 were represented by one instrument near the bottom in each case. Similar to the tailwater station the TDG %SAT at T1 fluctuated from 97 %SAT up to 105 %SAT during the testing period. Spikes in TDG occurred on a few occasions at the extreme stations P5 and P1 with the highest levels normally associated with the left bank station P5 and somewhat at the next station, P4. This apparent gradient went away during periods of no sluiceway operation, indicating minor TDG increases in the left bank flow downstream from sluiceway operation. The difference in TDG for the T1 cross section during the period of sluiceway operation was approximately 3 %SAT.

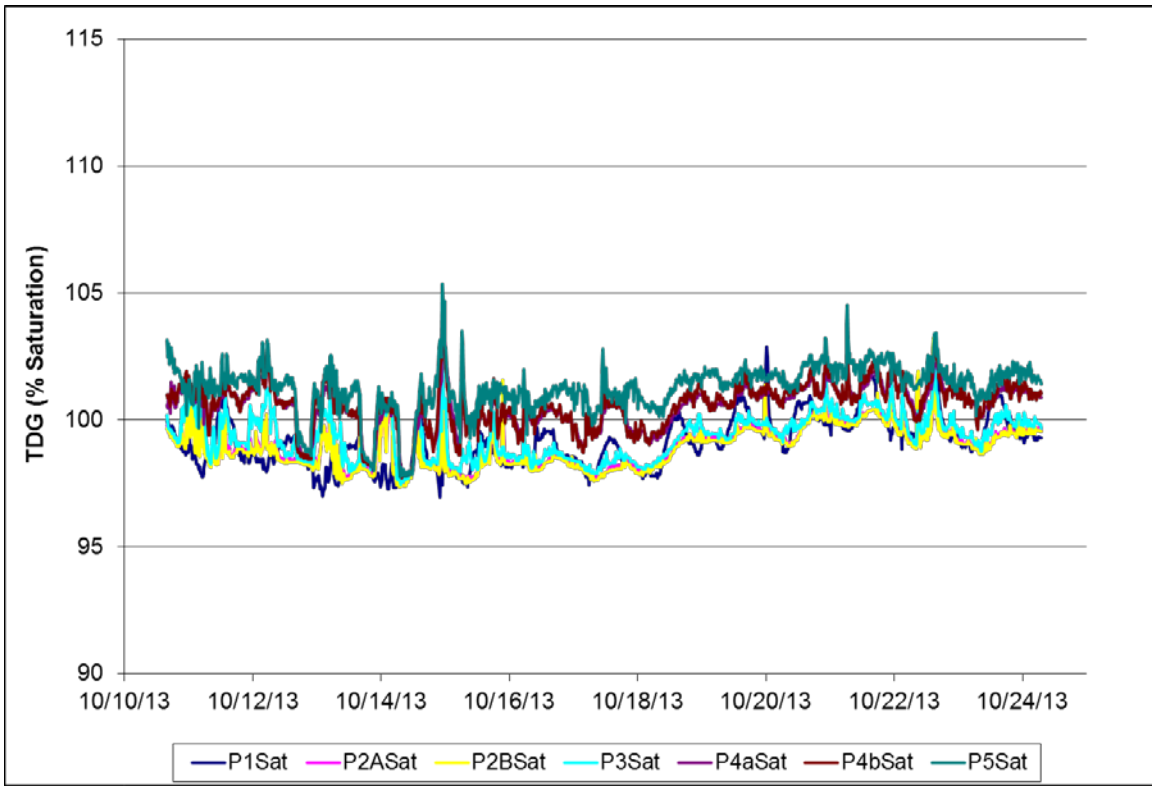

Figure A-10 TDG %SAT for all the sampling stations on transect T1 during the 2013 study period.

The range in TDG %SAT across all instruments on transect T1 during just powerhouse operations was seldom more than 0.3 %SAT indicating minimal to no gradient in TDG %SAT across the river when there were only powerhouse operations, which was the case during the three targeted test operations. Figure A-11 depicts the T1 data over a shorter time period, October 12-15 2013 allowing a more detailed observation of the time histories for all instruments.

Figure A-12 depicts the transect T1 average TDG %SAT time histories as well as that for the downstream FSM station, WANT. In general the TDG %SAT values were similar in pattern with the differences averaging 0.89 %SAT at the same time intervals.

The T1 temperature data for the study period is presented in Figure A-13. In general the lateral thermal gradient and the daily solar warming were both as indicated by the instruments less than 0.5 °C.

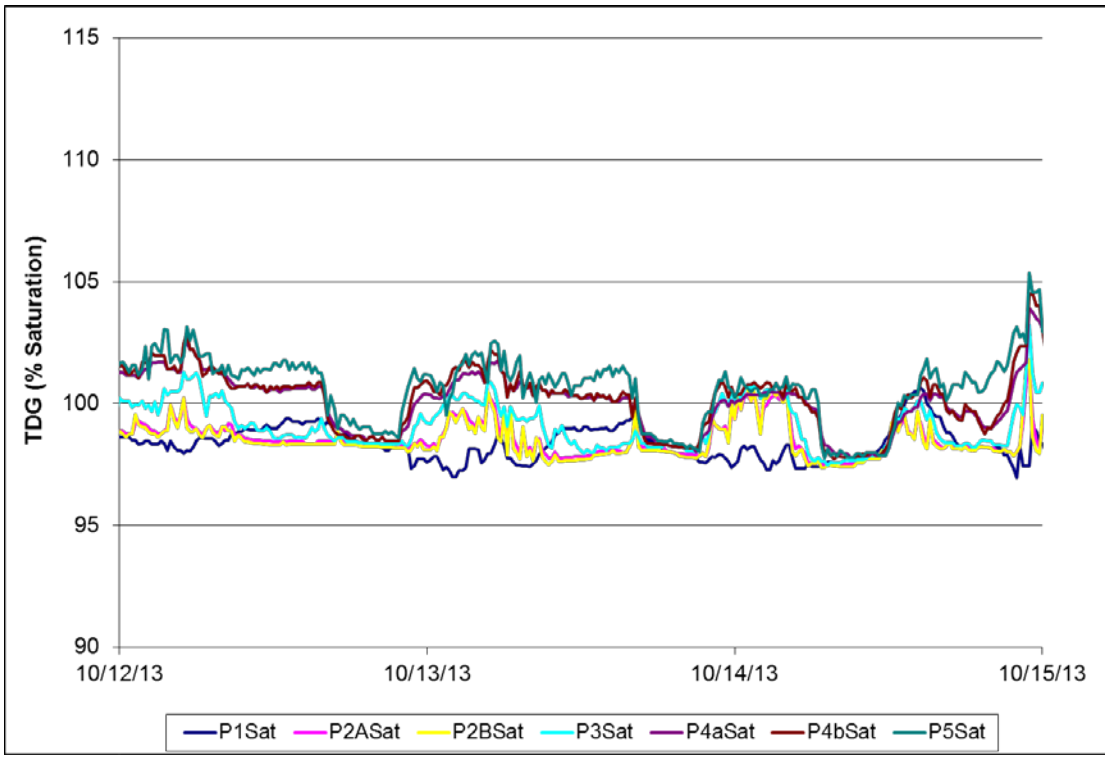

Figure A-11 TDG %SAT for all the sampling stations on transect T1 from October 12 to October 15, 2013.

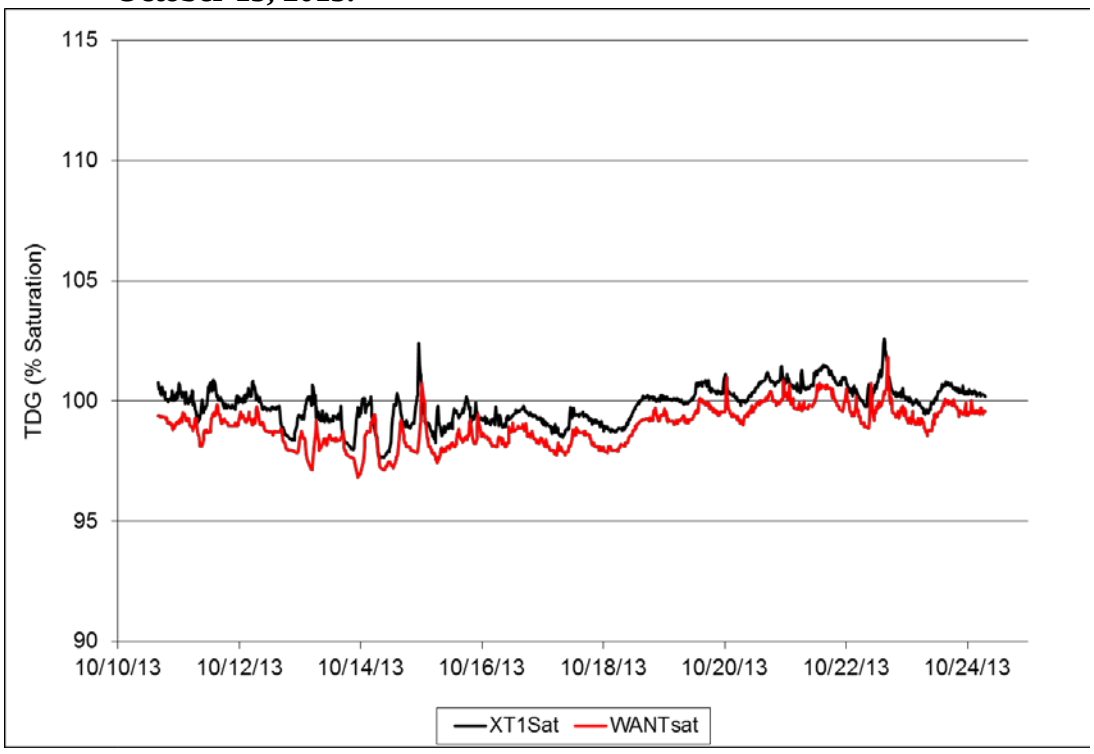

Figure A-12 Transect T1 average TDG %SAT and the Wanapum Dam tailrace FSM station, WANT.

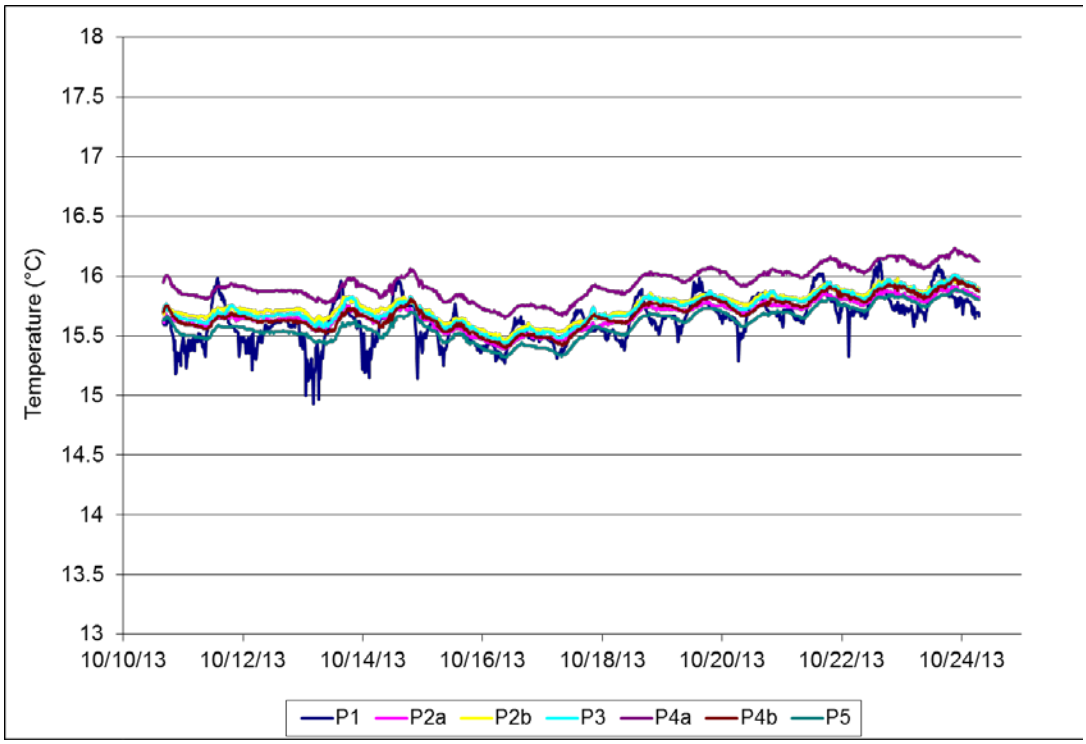

Figure A-13 Transect T1 water temperature data during the study period.

4.4 Comparison of T1 transect vs. WANT TDG values

A limited comparison of the tailwater TDG 15-minute interval time history data at the Wanapum Dam tailrace FSM station (WANT) to the transect T1 results were presented in Section 3.3.3. Figure A-14 shows that the time series data indicated the two data sets to be very similar with the differences typically less than 1%SAT for the same time intervals. This analysis can be extended by using comparable results coming from similar or the same waters by building in a lag for selecting the T1 data, which allows for the additional time of travel to the WANT station. The time of travel from T1 to WANT may vary considerably but in general a 1-hour lag fits with available flow data and from the previous plots. Figure A-14 compares the two downstream locations applying a 1-hour lag in the T1 TDG data. Even though the difference is small the resulting average difference between T1 (1-hr lag) and WANT from the detailed time history data during the field testing operation is 0.63 %SAT, with a standard deviation of +/- 0.21 %SAT. This would indicate that the two stations would be good indicators of each other, as the difference between the two during the period of study was within the precision the equipment and normal field sampling error.

The linear regression of the T1 (1 hr lagged data) vs. WANT shown in Figure A-15 has nearly a one to one relationship with an R^2 of 0.80. This supports the good agreement between the two downstream stations even though they are separated by 3.2 river miles.

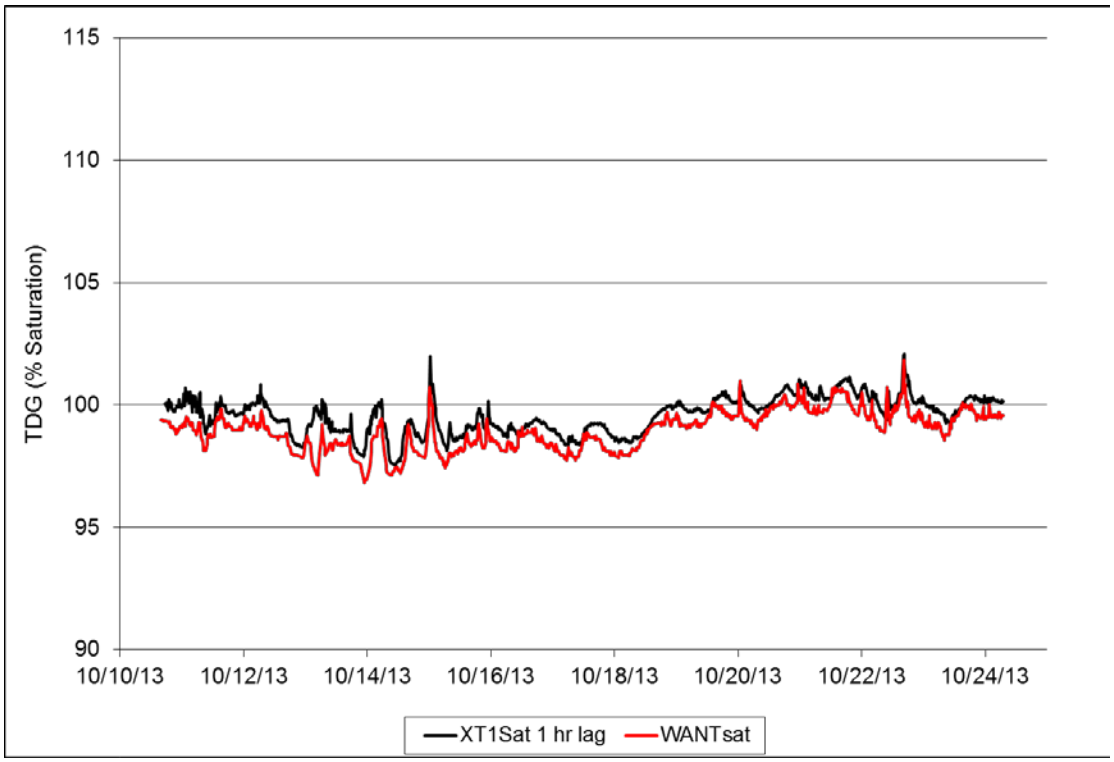

Figure A-14 Comparison of transect T1 (1-hr lag) and Wanapum Dam tailrace (WANT) TDG levels recorded during the field study.

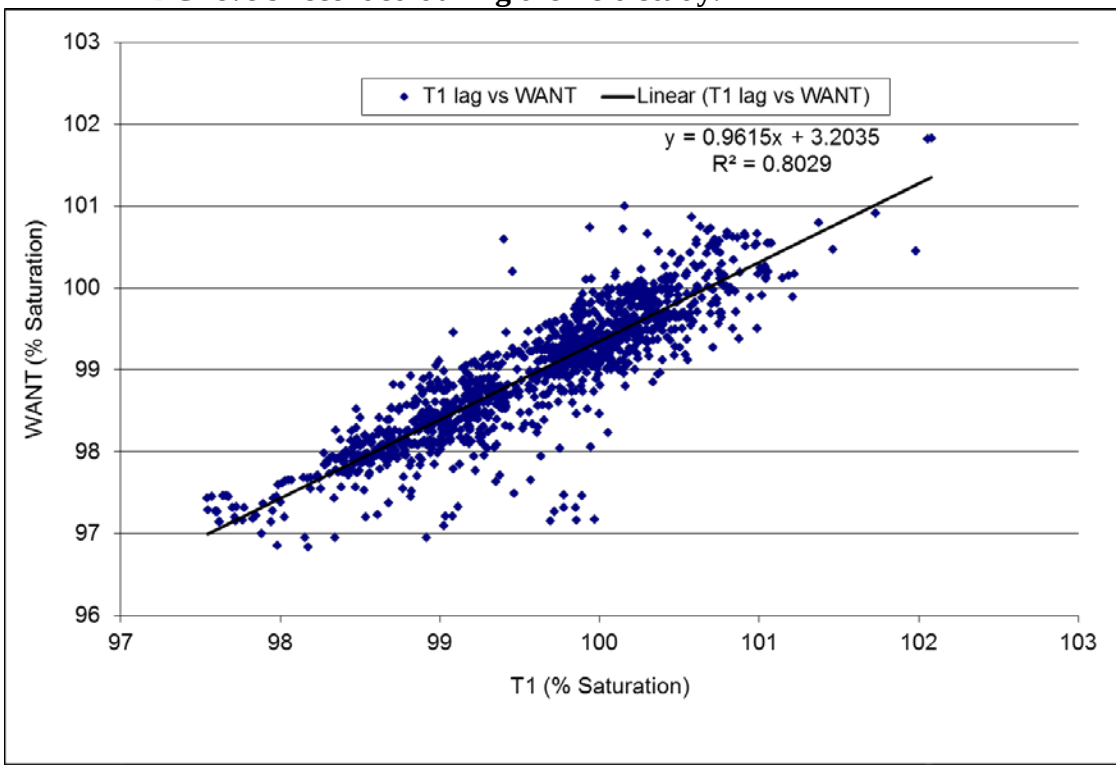

Figure A-15 Comparison of transect T1 (1-hr lag) vs. Wanapum Dam tailrace (WANT) TDG levels recorded during the study period.

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Carroll J. H., Schneider, M., and Lemons, J. 2001. Wanapum Phase III Total Dissolved Gas Spillway Performance Test July 14-16, 1999. Memorandum Report to Public Utility District No. 2 of Grant County. 2001.

Hendrick, R., Carroll, J. H., Hay, D., and Jeske, D. 2008. Study Plan for Evaluating Total Dissolved Gas Exchange Related to Operation of the Wanapum Dam Future Unit Fish Bypass. May 2008. Prepared for Public Utility District No. 2 of Grant County (Grant PUD). May 12, 2008.

Schneider, M., Carroll, J. H., and Lemons, J. 2001. Wanapum Phase 5 Post-Deflector Total Dissolved Gas Full Spillway Performance Test April 26–May 3, 2000. Memorandum Report to Public Utility District No. 2 of Grant County. 2001.

CALENDAR YEAR 2013

ACTIVITIES UNDER PRIEST RAPIDS HYDROELECTRIC PROJECT LICENSE (FERC NO. 2114)

Public Utility District No. 2 of Grant County, Washington

February 2014

Executive Summary

Public Utility District No. 2 of Grant County, Washington (Grant PUD) owns and operates two hydroelectric dams on the Columbia River; Wanapum and Priest Rapids, known altogether as the Priest Rapids Project (Project), and is operated under the terms and conditions of the Federal Energy Regulatory Commission (FERC) Hydroelectric Project License No. P-2114 issued by FERC on April 17, 2008.

Grant PUD operates the Project through the coordinated operation of the seven-dam system and other Columbia Basin entities with current operational agreements with the fishery agencies and other operators to provide protection and improvement for a range of fisheries and other resources within and downstream of the Project. These agreements include the Hanford Reach Fall Chinook Protection Program Agreement, the Hourly Coordination Agreement, and the Priest Rapids Project Salmon and Steelhead Settlement Agreement (SSSA). The Project is also subject to the requirements of the FERC license and related laws and regulations, as well as to the requirements (incorporated by reference in the license) of the Biological Opinion (BiOp) of the Priest Rapids Project issued by the National Marine Fisheries Service (NMFS) for its effects on anadromous salmon, the Clean Water Act Section 401 Water Quality Certification (WQC) issued by the Washington State Department of Ecology (WDOE), and the BiOp for the Priest Rapids Project issued by the United States Fish and Wildlife (USFWS) regarding the effect of the Project on bull trout.

This report is intended to fulfill the annual reporting requirement for the following License Articles:

- 401(a)(1) - Downstream Passage Alternatives Action Plan, including:
    - NMFS BiOp: 1.2 (Wanapum) and 1.11 (Priest Rapids)
    - NMFS and USFWS Fishway Prescriptions: 8 (Wanapum) and 14 (Priest Rapids);
- 401(a)(2) - Progress and Implementation (P&I) Plan, including:
    - 401(a)(3) - Habitat Plan[1];
    - 401(a)(6) Avian Predation Control Program[1]
    - 401(a)(7) – Northern Pikeminnow Removal Program[1]
    - NMFS BiOp: 1.33
    - NMFS and USFWS Fishway Prescription: 24
- 401(a)(4) - Artificial Propagation, Hatchery and Genetic Management, and Monitoring and Evaluation (for all species)
- 401(a)(8) - Priest Rapids Dam Alternative Spill Measures Evaluation; and
- 404 - Fishery Operations Plan Report.

These license articles require that annual plans and reports be filed with FERC to document compliance with the requirements of the Project License and to propose plans for the coming year.

[1] In FERC's approval of the following individual management plans, FERC directed Grant PUD to provide an annual account of the respective implementation activities in the annual P&I Plan

On May 1, 2012, Grant PUD filed a request with FERC to combine these individual reports into one comprehensive report and change the filing deadline to April 15 annually. The combination of the reports and revised filing date would ease coordination with the natural resource agencies and result in a more efficient review and approval process. FERC issued an Order on June 15, 2012 approving Grant PUD's request.

This report provides a description of the activities related to the implementation of protection, enhancement and mitigation measures required within the FERC License and issued orders, BiOp (NMFS & USFWS), and SSSA for the Priest Rapids Project completed during the calendar year January 1, through December 31, 2012. Information incorporated into this report is based upon activities occurring within the Priest Rapids Coordinating Committee (PRCC) and related subcommittees (Hatchery and Habitat) associated with achieving performance standards for:

- juvenile salmonids, juvenile and adult salmonids passage measures;
- predator control programs;
- No-Net-Impact and habitat funds, and
- hatchery supplementation and monitoring and evaluation.

Specific details on the suite of activities covered by this report can be found in Sections 2 through 5 below.

The activities and plans covered in this report occurred in consultation with the PRCC and its hatchery and habitat subcommittees and the Priest Rapids Fish Forum (PRFF). The PRCC and its hatchery and habitat subcommittees are made up of representatives from NMFS, USFWS, Washington Department of Fish and Wildlife (WDFW), Yakama Nation (YN), Confederated Tribes of the Umatilla Reservation (CTUIR), the Colville Confederated Tribes (CCT) and Grant PUD.

Table of Contents

List of Figures

List of Tables

List of Appendices

List of Acronyms

APP	Artificial Propagation Plan
BiOp	2008 National Marine Fisheries Service Biological Opinion for the Priest Rapids Project
BY	brood year
CFS	cubic-feet per second
CORPS	U.S. Army Corps of Engineers
CWT	coded-wire tag
DPS	Distinct Population Segment
DVR	digital video recorder
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
FERC	Federal Regulatory Energy Commission
FPC	Fish Passage Center
FPE	fish passage efficiency
FSM	Fixed Site Monitoring Station
HCP	Habitat Conservation Plan
HGMP	Hatchery and Genetic Management Plan
GAP	Gas Abatement Plan
GIG	Gravity Intake Gate
kcfs	thousand cubic feet per second
LWSNFH	Little White Salmon National Fish Hatchery
M&E	Monitoring and Evaluation
NMFS	National Marine Fisheries Service
NNI	No Net Impact
O&M	Operations and Maintenance
OLAFT	Priest Rapids Dam Off-ladder Adult Fish Trap
ONA	Okanagan Nation Alliance
PIT-tag	passive integrated transponder tag
PRCC	Priest Rapids Coordinating Committee
PRFB	Priest Rapids Fish Bypass
PRFF	Priest Rapids Fish Forum
Project	Priest Rapids Project

PTAGIS	PIT-tag Information System
PUD	Public Utility District
RM	river mile
SAP	Standards Action Plan
SSSA	Priest Rapids Project Salmon and Steelhead Settlement Agreement
SOA	Statement of Agreement
T&C	Term and Condition
TDG	total dissolved gas
UCR	Upper Columbia River
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
VFC	video fish count
WFUB	Wanapum Fish Bypass
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington Department of Ecology
Wildlife Services	USDA Wildlife Services

1.0 Introduction

Public Utility District No. 2 of Grant County, Washington (Grant PUD) owns and operates two hydroelectric dams on the Columbia River; Wanapum and Priest Rapids, known altogether as the Priest Rapids Project (Project), and is operated under the terms and conditions of the Federal Energy Regulatory Commission (FERC) Hydroelectric Project License No. P-2114 issued by FERC on April 17, 2008.

Grant PUD operates the Project through the coordinated operation of the seven-dam system and other Columbia Basin entities with current operational agreements with the fishery agencies and other operators to provide protection and improvement for a range of fisheries and other resources within and downstream of the Project. These agreements include the Hanford Reach Fall Chinook Protection Program Agreement (HRFCPPA), the Hourly Coordination Agreement, and the Priest Rapids Project Salmon and Steelhead Settlement Agreement (SSSA). The Project is also subject to the requirements of the FERC license and related laws and regulations, as well as to the requirements (incorporated by reference in the license) of the Biological Opinion (BiOp) of the Priest Rapids Project issued by the National Marine Fisheries Service (NMFS) for its effects on anadromous salmon, the Clean Water Act Section 401 Water Quality Certification (WQC) issued by the Washington State Department of Ecology (WDOE), and the BiOp for the Priest Rapids Project issued by the United States Fish and Wildlife (USFWS) regarding the effect of the Project on bull trout.

This report is intended to fulfill the annual reporting requirement for the following License Articles:

- 401(a)(1) - Downstream Passage Alternatives Action Plan, including:
    - NMFS BiOp: 1.2 (Wanapum) and 1.11 (Priest Rapids)
    - NMFS and USFWS Fishway Prescriptions: 8 (Wanapum) and 14 (Priest Rapids);
- 401(a)(2) - Progress and Implementation (P&I) Plan, including
    - 401(a)(3) - Habitat Plan[2];
    - 401(a)(6) Avian Predation Control Program[1]
    - 401(a)(7) – Northern Pikeminnow Removal Program[1]
    - NMFS BiOp: 1.33
    - NMFS and USFWS Fishway Prescription: 24
- 401(a)(4) - Artificial Propagation, Hatchery and Genetic Management, and Monitoring and Evaluation (for all species)
- 401(a)(8) - Priest Rapids Dam Alternative Spill Measures Evaluation; and
- 404 - Fishery Operations Plan Report.

[2] In FERC's approval of the following individual management plans, FERC directed Grant PUD to provide an annual account of the respective implementation activities in the annual P&I Plan

These license articles require that annual plans and reports be filed with FERC to document compliance with the requirements of the Project license and to propose plans for the coming year.

On May 1, 2012, Grant PUD filed a request with FERC to combine these individual reports into one comprehensive report and change the filing deadline to April 15 annually. The combination of the reports and revised filing date would ease coordination with the natural resource agencies and result in a more efficient review and approval process. FERC issued an Order on June 15, 2012 approving Grant PUD's request.

The activities and plans covered in this report occurred in consultation with the Priest Rapids Coordinating Committee (PRCC) and its hatchery and habitat subcommittees and the Priest Rapids Fish Forum (PRFF). The PRCC and its hatchery and habitat subcommittees are made up of representatives from NMFS, USFWS, Washington Department of Fish and Wildlife (WDFW), Yakama Nation (YN), Confederated Tribes of the Umatilla Reservation (CTUIR), the Colville Confederated Tribes (CCT) and Grant PUD.

1.1 Purpose of Report

This report provides a description of the activities related to the implementation of protection, enhancement and mitigation measures required within the FERC License and issued orders, BiOps (NMFS & USFWS), and SSSA for the Project completed during the calendar year January 1, through December 31, 2013. Information incorporated into this report is based upon activities occurring within the PRCC and related subcommittees (Hatchery and Habitat) associated with achieving performance standards for:

- juvenile salmonids, juvenile and adult salmonids passage measures;
- predator control programs;
- No-Net-Impact and habitat funds, and
- hatchery supplementation and monitoring and evaluation.

Specific details on the suite of activities covered by this report can be found in Sections 2 through 5 below.

1.2 Roles and Responsibilities of the Priest Rapids Coordinating Committee

As defined in the SSSA, the PRCC has the role and responsibility to coordinate the implementation of the adaptive management programs contained in the SSSA. Specific roles and responsibilities (but not limited to) identified within the SSSA include the following;

- Approve or modify annual Progress & Implementation (P&I) Plans; approve or modify the Performance Evaluation Program; review Performance Evaluation Reports;
- Advocate decisions of the Committee in all relevant regulatory forums;
- Establish such subcommittees as it deems useful;
- Coordinate adaptive management programs contained in the SSSA including Hatchery and Habitat subcommittees (Section 5.1);
- Make decisions (except for the implementation of the anadromous fish activities set forth in Appendix A of the SSSA) related to the implementation of SSSA (Section 5.4);

- Serve as a forum to coordinate the implementation of the SSSA and to consider issues that arise (Section 5.5.1);
- Assesses new information as it becomes available through the implementation of this Agreement or otherwise (Section 5.5.2);
- May from time to time recommend to FERC amendments to the new license to reflect the best available scientific information on means and measures to achieve the applicable performance standards for the Project (Section 5.5.2);
- Coordinate as appropriate the design and implementation of research and monitoring programs consistent with SSSA (Section 5.5.3);
- Coordinate activities listed above, the sharing of data and information, and the conduct of other activities under the SSSA with related activities associated with other hydropower operations on the Columbia River in order to promote efficiencies and the use of best available scientific information and analysis in the implementation of the SSSA, including, but not limited to, participation in studies relating to the assessment of project related juvenile and adult delayed mortality (Section 5.5.3);
- Seek to resolve disputes at the subcommittee level (Section 6.3); and
- Conduct other business as may be appropriate for the efficient and effective implementation of these measures.

1.2.1 Priest Rapids Coordinating Policy Committee

The PRCC Policy Committee was convened twice during 2013. The result of these meeting was the development of a statement of agreement (SOA 2013-01) as it related to Grant PUD's mitigation requirements associated with the White River spring Chinook program. Through censuses, the PRCC Policy Committee agreed that implementing the spring Chinook smolt supplementation program on the White River was not feasible at this time due to the technical, scientific and political challenges. The PRCC Policy Committee also agreed that in order for Grant PUD to meet its Wenatchee spring Chinook salmon mitigation for the period from Brood Year (BY) 2013 through BY 2026, the following would occur:

- Grant PUD will complete the White River Captive Brood Program with the last release in 2016 and the last monitoring of captive brood fish in the natural environment in 2019. Grant PUD will not be responsible for any artificial propagation activities in the White River through BY 2026;
- Grant PUD will continue to implement the Monitoring and Evaluation (M&E) plan for the White River (2020-2026), which was developed by the PRCC HSC and reviewed and approved by FERC on February 7th, 2012 and is currently being updated by the PRCC HSC. Finalization of this update is anticipated in spring 2013. Grant PUD agrees that the PRCC HSC would be responsible for adapting the M&E program to new information. Grant PUD may need to seek FERC approval per license Article 401(b) prior to implementation. Additional data collection beyond that collected as part of the Grant PUD-funded hatchery M&E plan is not the obligation of Grant PUD but may be funded via other sources such as the PRCC's Habitat and No Net Impact accounts, Salmon Recovery Funding (SRF) Board, and/or Bonneville Power Administration;

- Grant PUD will build the Nason Creek Acclimation Facility to accommodate up to 275,000 smolts;
- Grant PUD Wenatchee spring Chinook mitigation requirements will be met via a combined total of 223,670 spring Chinook between the Nason Creek Program and the White River Captive Brood Program through 2016. For example, the current target for Nason Creek is 150,000 smolts, while the target for White River is 75,000 smolts. In the near-term, it is expected that the White River Program will produce in excess of 75,000 smolts while Nason Creek may experience shortfalls as that program develops. During this timeframe, up to 75,000 White River smolts will be credited to Grant PUD's overall Wenatchee spring Chinook production requirement of 223,670;
- Grant PUD will meet its Wenatchee spring Chinook mitigation post 2016 (2017-2026) via the Nason Creek Program. In the event shortfalls in meeting production at Nason Creek are identified, Grant PUD will, in consultation with the PRCC HSC, develop strategies to address these shortfalls through hatchery production or other alternatives as agreed to by the PRCC HSC;
- The disposition of White River and non-Nason Creek natural origin adults encountered during broodstock collections at Tumwater and/or other locations will be the responsibility of the Joint Fisheries Parties that are signatories to the Section 10 permit for the Nason Creek spring Chinook program;
- By 2026, the PRCC HSC will assess the need to restart a White River spring Chinook hatchery supplementation program by assembling all relevant technical information and overseeing an independent scientific review. The independent scientific review will consist of a panel of subject matter experts selected by the PRCC HSC who will address specific critical questions developed by the PRCC HSC. The expert panel will address the critical questions but will not have decision-making authority over the future of the White River spring Chinook program. Prior to initiating the independent scientific review, the PRCC will review and approve the framework and structure of the review. Once the framework and structure of the scientific review is approved by the PRCC, the review should be complete within one year.
- Implementation of this agreement is contingent upon NMFS issuance of an Endangered Species Act (ESA Section 10 permit for the Nason Creek spring Chinook program prior to 2013 broodstock collection.

1.2.2 Priest Rapids Coordinating Committee

Grant PUD continued to support the PRCC (per Term &Condition (T&C) 1.35). Over the course of 2013, the PRCC held a total of 12 meetings (Table 1). Meeting agendas and minutes can be viewed at PRCC Meeting Minutes. Four SOA's were approved by the PRCC during 2013 and are listed in Table 2. SOA 2013-04 provided guidance on ownership of real property purchased via No Net Impact (NNI) and/or Habitat funds. This SOA established that equipment purchased through the course of a project and/or evaluation with a purchase value of $300 would be returned to Grant PUD within 15 days of project completion, Grant PUD would track, determine fair market value, surplus if committee agreed and all funds resulting from surplus would be deposited back into the appropriate NNI or Habitat Fund. SOA 2013-07 approved by the PRCC Hatchery subcommittee and PRCC (on June 26, 2013) converted Grant PUD's 1 million

hatchery fry requirement from Priest Rapids hatchery to 273, 961 sub-yearling smolts for annual releases in the Columbia River. The PRCC also agreed that this fully met the 1 million hatchery fry requirement under the Priest Rapids Salmon and Steelhead Settlement Agreement for the duration of Grant PUD's license. SOA 2013-08 provided NNI funds to Grant PUD to purchase an electrofishing boat for northern pikeminnow removal. Under the SOA, Grant PUD agreed to provide all labor necessary to operate the vessel and fully fund all operation and maintenance costs associated with the electrofishing boat, motor and trailer. The fourth and final SOA approved by the PRCC in 2013 (SOA 2013-09), provide guidance on how survival estimates for covered species would be calculated over the next several years for yearling Chinook, juvenile steelhead and sockeye. This SOA also indicated that after survival standards were achieved for each species, each 5 year check-in would be a standalone estimate used to recalculate the NNI Fund as necessary. SOAs were approved by PRCC consensus and can be viewed at PRCC SOAs. PRCC Hatchery Subcommittee 2013 meeting schedule and approved statement of agreements are found in Section 5.1 and the PRCC Habitat Subcommittee activities can be found in Section 6.0.

Table 1 Priest Rapids Coordinating Committee 2013 meeting dates.

PRCC	January 23, 2013
PRCC	February 27, 2013
PRCC	March 27, 2013
PRCC	April 24, 2013
PRCC	May 22, 2013
PRCC	June 26, 2013
PRCC	July 24, 2013
PRCC	August 27, 2013
PRCC	September 25, 2013
PRCC	October 30, 2013
PRCC	November 20, 2013
PRCC	December 11, 2013

Table 2 Statement of Agreements approved by the Priest Rapids Coordinating Committee.

Years	Title of Statement of Agreement	Date Approved
2013-04	Guidance on Ownership of Real or Personal Property Purchased via NNI and/or Habitat Funds.	4/12/2013
2013-07	Priest Rapids Hatchery Fall Chinook Fry-to-Smolt Conversion	6/26/2013
2013-08	Funding Request for the Purchase of an Electrofishing Boat	6/26/2013
2013-09	Calculation of Survival Estimates for Covered Species	11/26/2013

1.3 Adaptive Management

The protection, mitigation, and enhancement (PME) measures contained in the SSSA and BiOp are implemented according to the principals of adaptive management. In the SSSA, adaptive management is an active systematic process for continually improving management policies and practices by sequential learning from the outcomes of operational programs. Adaptive management employs management programs that are designed to experimentally compare selective policies or practices by evaluating alternative hypotheses about the system being managed. The sequence of adaptive management steps include: (1) problem assessment, (2) project design, (3) implementation, (4) monitoring, (5) evaluation, and (6) adjustment of future decisions. Adaptive management is not considered complete until the planned management actions have been implemented, measured and evaluated and the resulting new knowledge has been fed back into the decision-making process to aid in future planning and management. The fundamental objective of adaptive management with respect to the Project is to achieve the passage performance standards by 2013.

The Grant PUD and the PRCC have been utilizing this approach over several decades and included such approach in the issued 2004 & 2008 NMFS BiOps, SSSA, WQC, the FERC License and Orders. Key examples of application of the approach include implementation of juvenile salmonid behavior and survival evaluations, calculation of NNI Funds, predator control programs, planning, designing, prototype testing, construction and biological testing as it relates to the Wanapum Future Unit Bypass (WFUB), design and current construction of the Priest Rapids Fish Bypass (PRFB), and implementation of the various hatchery and habitat programs. Specific details are provided Sections 2 through 5 below.

1.4 Performance Evaluation Program

The 2008 National Oceanic Atmospheric Administration Fisheries (NOAA Fisheries) BiOp, (T&C 1.33; T&C 1.33) requires Grant PUD to prepare an annual summary report (Performance Evaluation Program) which reflects all activities and progress during the previous calendar year. The purpose of this report is to provide a reliable technical basis to assess the degree to which Grant PUD is improving juvenile and adult passage survivals, habitat productivity improvements, and supplementation for the listed anadromous fishery resources affected by the Project. This annual report is also required to include results of monitoring, modeling, or other analyses that take place in the calendar year to evaluate the degree to which the actions are likely to improve juvenile and adult survivals. In addition, where appropriate, the Performance Evaluation Program is supposed to measure and evaluate individual actions within each

category, assess the contribution of the action to the desired objective, and provide a basis for identifying new options and priorities among those options for further progress in meeting objectives. Grant PUD believes that this report fulfills the requirement of T&C 1.33, as specific programs and updates to those programs are illustrated below in Sections 2 through 5.

Grant PUD is required to coordinate the design of its Performance Evaluation Program with the development of relevant parallel monitoring or evaluation systems by other hydropower operators in the Columbia Basin and the Northwest Power Planning Council (T&C 1.34; 2008 NOAA BiOp). The purpose of this coordination is to promote technical consistency and compatibility among efforts to:

- contribute to a comprehensive evaluation of stock performances throughout the Columbia Basin
- promote the use of the best available science; and
- provide opportunities for the efficient sharing of monitoring activities, data management systems, analytical modeling, and other activities.

Grant PUD regularly and routinely participates in local forums to promote technical consistency and compatibility among efforts to contribute to a comprehensive evaluation of stock performances throughout the Columbia Basin. For example, technical and policy staff from the Public Utility Districts of Chelan, Douglas and Grant Counties (PUDs) meets regularly to discuss potential fish evaluations and resource issues. Grant PUD staff also participates in Chelan and Douglas PUD's respective Habitat Conservation Plan (HCP) Hatchery and HCP Habitat subcommittees to coordinate among the various programs. These meeting have led to the development of several hatchery sharing agreements among the PUDs as well as the development of consistent monitoring and evaluation programs related to hatchery supplementation.

Grant PUD staff also participates in several regional forums to discuss and share ideas on a broad spectrum of fish protection and enhancement issues. These forums include:

- Inland Avian Predation Working Group trying to address Caspian Tern predation on juvenile salmonids migrating through the mid-Columbia River and other areas of the Columbia River);
- Fish Tagging Forum;
- Washington/British Columbia Chapter, Western Regional, and National American Fishery Society conferences (as presenters);
- Hydro-Vision (national conference; presenter);
- Hydro Research Foundation Fellowship Program;
- Priest Rapids Fish Forum, Regional Lamprey and White Sturgeon Technical Workgroups;
- regional Bull Trout Recovery forums;
- Army Corps of Engineers (CORPS) year-end Total Dissolved Gas (TDG) monitoring meeting;

- 100th Meridian Columbia River Basin Team for aquatic invasive species;
- Fall Chinook Work Group;
- Upper Columbia Salmon Recovery Board meetings; and
- Wenatchee Watershed Planning Unit meetings.

2.0 Priest Rapids Project

2.1 Progress in Achieving Performance Standards

Grant PUD is required to make steady progress towards achieving a minimum 91 percent combined adult and juvenile salmonid survival performance standard at the Priest Rapids and Wanapum developments (i.e., each dam). The 91 percent standard includes a 93 percent Project-level (reservoir and dam) juvenile performance standard. NMFS recognized that it is not currently possible to measure the 91 percent combined adult and juvenile survival standard.

Over the last decade, Grant PUD has conducted dam and reservoir smolt survival evaluations, evaluating progress towards meeting a 93 percent juvenile Project passage survival. This standard can be measured at each development individually, or as a composite of survival at the two developments. To evaluate steady progress toward achieving the 93% juvenile salmonid project survival requirement and to strive toward achieving passage performance standards, Grant PUD has included a proposed decision process below (Figure 1). Although the PRCC and Grant PUD have not had detailed discussions on the proposed decision flow chart presented below, it has been the basic approach as Grant PUD strives to maintain and meet performance standards for the Priest Rapids Project. As discussed above and as defined in the SSSA, adaptive management is a key component for continually improving management policies and practices by sequential learning from the outcomes of operational programs, such as evaluation of juvenile salmonid passage survival at the Project.

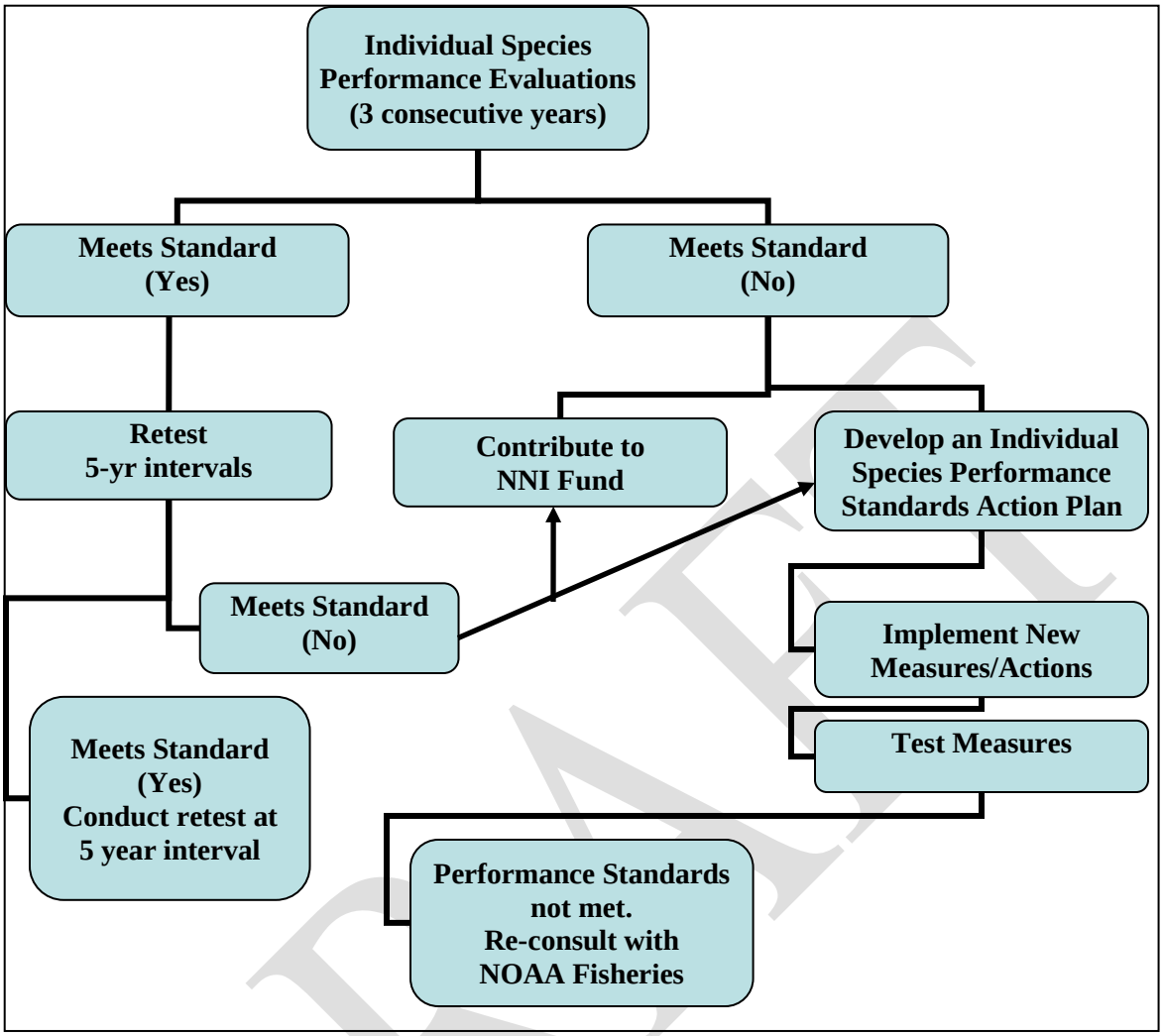

Figure 1 Flow chart showing proposed decision process used to achieve juvenile salmonid project survival requirements for the Priest Rapids Project.

2.1.1 Yearling Chinook

Performance standards for yearling Chinook were met for the Project in 2005. The three year (2003-2005) consecutive arithmetic average of 86.59% exceeded the standard of 86.49% (Anglea et al 2003, Anglea et al 2004, Anglea et al 2005). These results were formally accepted by the PRCC and approved by NMFS on September 28, 2005.

Grant PUD will be conducting a survival evaluation for yearling Chinook during the spring outmigration of 2014 (SOA 2001-06 and SOA 2013-09). Per SOA 2013-09, the survival estimate will be a standalone estimate and will not be combined with previous developed survival estimates.

2.1.2 Juvenile Steelhead

Grant PUD and the PRCC have been overseeing rigorous investigations on the downstream passage behavior and survival of juvenile steelhead through the Project since 2004 (Robichaud et al. 2005, Sullivan et al. 2009, Thompson et al. 2012, Timko et al. 2007, 2008, 2010, and 2011, Wright et al. 2010). The juvenile steelhead performance standards of the BiOp and SSSA were

not met in 2008-2010 (81.05%) where mark-recapture detection histories of acoustic-tagged run-of-river (ROR) smolts in paired release studies were examined through the joint Wanapum-Priest Rapids Project (Skalski et al. 2009, 2010, and 2011). Timko et al. (2011) estimated that the performance standards of steelhead passing through the dams at both Wanapum and Priest Rapids dams were generally being met and exceeded 95% in all three years at Priest Rapids Dam and two out of three years at Wanapum Dam; however, survival through the reservoirs was poor.

Top-spill passage at both Wanapum and Priest Rapids dams were remarkably high during performance standard testing. All metrics for top-spill passage at Wanapum and Priest Rapids dams increased in 2010 from previous years, as the WFUB collected 77.3% (increase of 7.1% over 2009) of migrating steelhead. The prototype top-spill bulkhead bypass at Priest Rapids dam also collected a high proportion of the migrating steelhead (57.4%, increased 6.3% from 2009).

At Wanapum and Priest Rapids dams, fish are selecting limited surface collection flow rather than the predominant powerhouse flows. At Wanapum Dam, the WFUB on average passed 16.5% of the total river flow but entrained nearly 80% of the migrating steelhead and sockeye. Similarly, at Priest Rapids Dam, the prototype top-spill bulkhead passed 25% of the total river flow but entrained over half of the migrating study fish.

Based on recent studies performed, there is direct evidence of impacts on juvenile steelhead survival in the Project by predators, primarily Caspian terns and northern pikeminnow, which is likely a direct result of the species out-migration run-timing, size, health, rear-type, and overall behavior that increases steelhead susceptibility to predation (Sullivan et al. 2009, Timko et al. 2010 and 2011). In fact, steelhead are preferred and more likely to be predated upon by Caspian terns, compared to all other salmonids in the Columbia River basin (Evans et al. 2011, Hostetter 2009) and are being preyed upon in the Project area by a nesting colony on the Columbia Plateau, Goose Island, Potholes Reservoir (Roby et al.2011).

This nesting colony has grown by over 60% since 2007, last surveyed at approximately 600 breeding pairs in 2011. Recent studies have shown that this colony represents a large threat to the out-migration of listed Upper Columbia River (UCR) steelhead as annual consumption of UCR steelhead has averaged 10% (2006-2009, 95% CI 9.1-11.1%), with the highest take measured in 2009 at 15.7% (95% CI 13.6-18.2%) at this colony alone (Evans et al. 2011). Grant PUD is actively investigating the impacts of other migratory, piscivorous birds on juvenile steelhead in the Project. Furthermore, annual variability in river flow influences the level of avian predation in the Project area (Collis et al. 2009, Hostetter 2009). The same is true of piscivorous fishes, in particular northern pikeminnow appear to be of highest concern (Thompson et al. 2012).

Following the proposed decision flow chart proposed in Figure 1 above, Grant PUD and the PRCC developed a juvenile steelhead performance standard action plan (SAP). The SAP is a planning and guidance document intended to assist NMFS, Grant PUD, and the representatives of the PRCC with directing progress toward achieving the juvenile steelhead survival standards through the Wanapum and Priest Rapids developments in the Project. The SAP was developed to address shortfalls in juvenile steelhead performance standards in the Project area, as required under Terms and Conditions 1.2 and 1.11 of the 2008 NMFS BiOp. The SAP is intended to be a living document, modified as appropriate in collaboration with the PRCC and approved by NMFS. Annual modifications to this plan will include updates, information, and implementation schedules for progress toward achieving juvenile steelhead performance standards. The SAP

includes all comprehensive information regarding the measures being taken to achieve juvenile steelhead performance standards for the Project.

The next consecutive 3 year schedule for juvenile steelhead evaluations will occur during 2014-2016 to coincide with completion of the PRFB. Per SOA 2013-09, the PRCC agreed the survival estimate will be developed from the evaluations conducted 2014-2016 will not be combined with previous developed survival estimates (Timko et al. 2007, 2008, 2010, and 2011, Wright et al. 2010).

2.1.3 Juvenile Sockeye

Grant PUD conducted two consecutive years of paired release-recapture evaluations to estimate juvenile sockeye survival through the Wanapum and Priest Rapids projects. The two year arithmetic average performance standard for sockeye smolt passage through the Project was 91.6% (Skalski et al. 2009b; Skalski et al. 2010).

As a result of the high survival observed for juvenile sockeye, the PRCC agreed to defer the third year of juvenile sockeye survival evaluation until 2016.

The PRCC agreed to conduct year three of the juvenile sockeye survival evaluation in 2016, which would also serve as the initial five year check-in study for sockeye. The PRCC and Grant PUD also agreed that for 2012 through 2016, the NNI Fund will be based on the current two year survival average for sockeye and for 2017 (and beyond), the NNI Fund will be based on a new three sockeye survival average, based on 2016 study results, if validated by the PRCC (SOA 2011-06).

2.1.4 Sub-yearling Chinook

The SSSA anticipated that survival evaluations for sub-yearling Chinook (three consecutive years) were to begin in 2009. Based on two pilot sub-yearling acoustic tag survival studies conducted in the Priest Rapids Dam project (one dam and reservoir) in 2008 and 2009, the PRCC and Grant PUD agreed that technology and/or methodology is presently not available to conduct a sub-yearling summer Chinook survival evaluation. Technology issues, such as battery-life issue related to the use of an active tag and variety of life-history strategies illustrated within a population of sub-yearling Chinook continue to be limiting factors.

Survival evaluations for sub-yearling Chinook in the Project are scheduled to occur in 2016 (SOA 2011-06). If no limiting factors (technology or life history) remain, evaluations would occur over a three year consecutive timeframe of 2016-2018. The PRCC will determine the feasibility prior to conducting sub-yearling Chinook (September of 2015). Per SOA 2011-06, the PRCC agreed that if sub-yearling Chinook standards are met based on a 2 year consecutive average, the PRCC may consider deferring the third year of study, with a 5 year check-in occurring in 2023.

2.1.5 Coho

In August 2007, Grant PUD and the PRCC approved through a SOA 2007-5, coho as an established “Covered Species.” This SOA supersedes the criteria for such determination as discussed in the SSSA. As a “Covered Species,” measures for implementing and evaluating the coho protection program were agreed to and are defined below.

- The PRCC and its PRCC hatchery subcommittee HSC agree that through Grant PUD’s early implementation in providing operation and maintenance (O&M) funding prior to a

determination on whether a hatchery program and/or population of coho exists in the Wenatchee, Entiat and Methow basins, development and expansion of existing facilities (either Grant PUD or facilities owned or operated by others) will not be considered. The use of future production facilities developed by Grant PUD will be considered for coho use if consistent with the Yakama Nation's Master Plan.

- The PRCC and its HSC agree that O&M funds provided by Grant PUD for the coho program also includes funding for all M&E programs.
- The PRCC and its HSC agree that an interim juvenile salmonid project survival of 93% (project) and 95% (dam) individual project passage survival will be assumed for each development.
- Juvenile coho survival studies will not be performed at the Project unless there is compelling evidence that demonstrates hydro operations have an impact of greater than 7% mortality on coho.
- The PRCC and its HSC agree that if the coho program does not meet its program/performance goals:
    1). Other impacts to the coho program will be researched before evaluation of Project survival will be considered. This may include such things as harvest, hatchery performance, facilities, use of lower river stock for up-river production, etc.
    2). Existing information for coho behavior and survival at other facilities in the Columbia Basin will be considered.
    3). There is agreement that when and if there is a requirement for survival studies, it is accomplished in the most cost-effective manner.
- The PRCC and its HSC agree there will be no NNI contribution for coho. If there is "compelling" evidence and studies are implemented and passage survival standards are not being met, compensation would be achieved through actual cost-per-pound of overall hatchery production, as negotiated by Yakama Nation and Grant PUD.
- The PRCC and its HSC agree that adult passage evaluations for coho at the Project will not be required. Priority will remain on measurement and hydro operations for co-migrating Permit Species.
- The PRCC and its HSC agree that the performance of coho program will be evaluated in 2017 for consistency with the Endangered Species Act and will need to meet the appropriate standards and goals as established by the committees to ensure protection of the Permit Species. If, as a result of the evaluations and program modifications either (a) the coho population is stable or increasing, or (b) the coho population is declining and other basin species populations are declining, then Grant PUD will continue to provide compensation pursuant to the Agreement entered into between the Yakama Nation and Grant PUD and this SOA. If the coho population is declining and other basin populations are stable or increasing, then the PRCC and its HSC should determine the viability of a coho program and if the program should remain a requirement of the SSSA.
- If the PRCC and its HSC determine that a coho program is no longer viable, Grant PUD will not be required to continue providing compensation pursuant to Section 12.1 (or

another Agreement entered into between the Yakama Nation and Grant PUD) the SSSA or this SOA. Funding would continue through the end of the respective brood-year.

The PRCC and its HSC agree that by adhering to all the actions in this SOA, Grant PUD fully meets its coho mitigation obligation under the SSSA through 2017.

2.1.6 Schedule

Grant PUD and the PRCC developed a performance standard survival evaluation schedule in December of 2011 (SOA 2011-06; Table 3). Under this schedule, it is anticipated that if the PRFB is constructed and operational a project-wide yearling Chinook survival evaluation check-in will occur in 2014, in conjunction with the first year of a 3 year (2014-2016) consecutive juvenile steelhead survival evaluation (also project-wide). A juvenile sockeye evaluation, which would also serve as a 5 year check-in is scheduled to occur in 2016, while the first year of a 3 year consecutive evaluation for sub-yearling Chinook survival evaluations is scheduled in 2016 through 2018. . It is expected that the PRFB will be operational by juvenile salmonid and steelhead outmigration spring 2014.

Table 3 Performance Standards Survival Evaluation Schedule for Covered Species migrating through the Priest Rapids Project 2014 – 2021.

Species	2014[1]	2015	2016	2017	2018	2019	2020	2021
Spring Chinook	X[2]	.	.	.	.	X[3]	.	.
Steelhead	X[4]	X[5]	X[6]	.	.	.	.	X[7]
Sockeye		.	X[8]	.	.	.	.	X[9].
Summer Chinook		.	X[10]			.	.	.

[1] PRCC may need to modify the survival evaluation check-in schedule for spring Chinook and steelhead survival evaluations, if the Priest Rapids Top-spill is **NOT** completed prior to the outmigration in spring of 2014.
[2] 2014 would serve as the 5 year check-in for yearling Chinook and would occur after completion of the Priest Rapids Top-spill.
[3] 2019 would be a 5 year check-in for yearling Chinook if standards are met in 2014.
[4] 2014 would serve as the first year of a 3 year consecutive evaluation for summer steelhead.
[5] 2015 would serve as the second year of a 3 year consecutive evaluation for summer steelhead.
[6] 2016 would serve as the third year of a 3 year consecutive evaluation for summer steelhead.
[7] 2021 would serve as the 5 year check-in for juvenile steelhead if standards are achieved during 2014-2016.
[8] 2016 would serve as the 5 year check-in for sockeye survival.
[9] 2021 would serve as the 5 year check-in for sockeye if survival standards are met in 2016.
[10] During 2016-2018, Grant PUD would conduct three consecutive years of survival evaluations for sub-yearling Chinook (if feasible).

2.2 No Net Impact Fund

Grant PUD and the PRCC recognized that the performance standards for the Project may not be achieved for certain stocks through 2003 Project operations. The purpose of the NNI is to provide Grant PUD and the PRCC with additional financial capacity to undertake measures to improve survivals of juvenile salmonids prior to the time when the Project attains applicable juvenile project survival standards.

The NNI Fund is intended to provide near-term compensation for annual survivals that are less than the survival objectives in the performance standards for the Project for spring Chinook, steelhead, summer Chinook and sockeye. Grant PUD's annual contributions to the fund will be reduced as progress towards meeting performance standards for each is achieved. Once Grant

PUD and the PRCC determine that performance standards have been achieved on a species-by-species basis, the NNI Fund annual contributions for that species will be terminated.

To evaluate steady progress toward meeting performance standards and to adjust the NNI Fund, Grant PUD, in consultation with the PRCC, conduct survival studies. The results of these studies are used to estimate survival rates based on an arithmetic three-year average of the annual estimates. Table 3 includes a planned implementation schedule for conducting these evaluations. The annual contribution made into the NNI account prior to February 15, 2013 was $1,881,316.29.

2.3 Description of Turbine Operating Criteria and Protocols

Project turbines are operated in a protocol referred to as "Fish Mode" and also "Ganging Units" during the juvenile salmonid out-migration season (typically mid- to late-April through mid- to late-August), based on smolt index counts conducted by WDFW at the Rock Island Smolt Monitoring Station in order to maximize turbine passage survival rates of juvenile salmonids. Fish Mode was the result of using Hill Curves, Theoretical Avoidable Losses calculations, turbine discharge rates, head, and fish survival curves (based on 1996 and 2005 balloon-tag evaluations of salmonid smolts through the turbines) to determine the operating range of the turbines and maintain a minimum fish survival rate of 95 percent. For Wanapum Dam, this means an operating range of 11.8 to 15.7 thousand cubic feet per second (kcfs) per turbine, and for Priest Rapids Dam, turbine units are operated between 11.2 to 17.5 kcfs. Upon further investigation of the issue concerning smolt-passage survival through turbines, it was determined that passage survival rates for out-migrating juvenile salmonids are influenced not only by how a turbine is operated (i.e. Fish Mode), but also how the dam's powerhouse, overall, is operated. This determination led to the concept of "ganging" turbine units in conjunction with operating turbines in Fish Mode. Ganging units is defined as concentrating operating turbines into blocks of adjacent units, thus reducing the edge-effect in regard to predation by fish and birds on salmonid smolts as smolts exit a turbine's draft tube (LGL Limited, 2003).

When turbines are required, ganged units are operated first and shutdown last because it has been demonstrated that juvenile salmonids are drawn to passing through turbines closest to the spillway and that their survival is highest when passing through blocks of turbines being operated in Fish Mode.

Turbines furthest from the spillways (Unit 1 at Wanapum and Unit 10 at Priest Rapids) are the first turbines to discontinue operation during daylight hours when the powerhouses are operating at less than full capacity during juvenile and adult fish-migration seasons. The discharge from these turbines may adversely affect adult salmonids' ability to efficiently locate the entrances to the adult fishways adjacent to these turbine discharges.

2.3.1 Turbine Operation and Inspection Schedule

Turbines are operated as needed for producing electricity and do not have an operation season or schedule. Turbines are inspected as necessary based on the number of hours operated and other associated stresses.

2.4 Description of Spillway Operating Criteria and Protocols

The WFUB was designed to operate at five different flow volumes: 20 kcfs, 15 kcfs, 10 kcfs, 5kcfs and 2.5 kcfs. In the past four years, the WFUB has been operated at 20 kcfs during the downstream migration of juvenile salmonids. In 2008, the PRCC established that the bypass

would be operated at 15 kcfs if future tailwater conditions were less than 488.0 ft. in elevation or tailwater discharge is less than 60 kcfs. With a tailwater below 488.0 ft., the outflow from the WFUB at 20 kcfs becomes unstable and starts to undulate. This undulation causes a condition that is believed to be less conducive for migrating juvenile smolts, with a likely increase in total dissolved gas (TDG) that could ultimately also decrease survival. At this described lower tailwater elevation, when the outflow from the WFUB is reduced, this undulating jet of water is returned to a surface-skimming flow, which entrains less air and is presumed better for fish passage survival. Grant PUD will maintain the Wanapum tailwater elevations to stay within the range of 488.0 ft. to 498.0 ft. during the smolt out-migration season during non-extreme river condition periods.

The WFUB was operated continuously during the juvenile salmonid out-migration season in 2013 (typically starting mid-April through mid- to late-August) and is inspected for necessary maintenance annually when it is not in operation.

In the event of inadvertent spill, water is spilled through the tainter gates in a manner agreed upon by the PRCC spill representatives. An example of the typical spill protocols is given in the SSSA. Table 1 of Appendix A. Table 2 in Appendix A is an example of the inadvertent spill operation schedule at Wanapum Dam during 2013.

Non-turbine surface-spill passage route at Priest Rapids Dam during 2013 was through the top-spill bulkhead located at spillbays 5 & 6. This non-turbine surface-spill passage route at Priest Rapids Dam will be utilized until the PRFB is completed, which is currently anticipated to be April 1, 2014.

In the event of inadvertent spill, spill will occur through the tainter gates in accordance with the protocols (Appendix A - Table 3). Table 4 in Appendix A summarizes the spill operation schedule used at Priest Rapids Dam for 2013.

Grant PUD in consultation with the PRCC fish spill representatives, used and will continue to use the smolt index counts from the Rock Island Smolt Monitoring Station to determine when annual spring fish spill at both developments is initiated (before 2.5 percent of the juvenile spring migrants have passed the Project - typically mid- to late-April) and summer fish spill is terminated (when over 95.0 percent of the summer juvenile migrants have passed; typically mid- to late-August). Typically, the end of the spring fish spill overlaps with the beginning of the summer fish spill, providing continuous fish spill from April to August.

2.4.1 Spillway Operation and Inspection Schedule

The spillways are operated on the schedule outlined above during the juvenile salmonid out-migration season, and are operated on an as-needed basis during the remainder of the year. Inspections typically occur during the late summer/early fall low river-flow period, with any necessary maintenance occurring during the low river-flow winter months when the tainter gates are unlikely to be needed.

2.5 Description of Sluiceways Operating Criteria and Protocol

The sluiceway at Wanapum Dam is fully opened to provide an adult salmonid fish fallback route when the WFUB is closed at the end of the juvenile salmonid out-migration season, typically in mid- to late-August. The WFUB serves as the adult salmonid fallback route while it is in operation. The sluiceway remains open until November 15 of each year. The sluiceway at Priest Rapids Dam is un-pinned and then operated as a surface-spill sluiceway following the end of the

salmonid out-migration, typically in mid to late-August, to provide an adult salmonid fallback route, and remains fully open for adult fallback until November 15 of each year.

2.5.1 Sluiceway Operation and Inspection Schedule

The sluiceways are operated on the schedule outlined in the above section. Inspections occur during the non-operation periods.

Construction activity for the PRFB is currently ongoing at Priest Rapids Dam, with an anticipated completion date of April 1, 2014; therefore the operation of the Priest Rapids Sluiceway for adult fallback was not available during 2013. As an alternative fallback route (in 2013), Grant PUD operated a top-spill bulkhead located at spillbay 6. This alternative will remain in place until the PRFB is completed.

2.6 Adult Fishways Operating Criteria, Protocols and Schedule

Fishway ladders are operated with a water depth over weirs of 1.0-1.2 ft. Debris from trash racks and picketed leads is quickly removed from ladder exits when water surface differentials exceed 0.5 ft., or as debris begins building up at the exit from the fish ladder. All submerged orifices and overflow weir crests are cleared of debris prior to the adult fish migration season and are kept free of debris during the fish-passage season. Fishway entrances are operated with a head differential range of 1.0 to 2.0 ft.

Grant PUD operates the fishways within the criteria ranges outlined above, and targeted heads are maintained whenever possible. When targeted heads cannot be maintained, the fishways are operated at maximum capable output to meet entrance and channel flow requirements.

Collection channel transport velocities of 1.5 to 4.0 feet per second (fps) (target 2.0 fps) are maintained through the powerhouse collection channels and through the lower end of the fish ladders. All collection channel orifice gates remain closed during the adult fish-passage season, per agreement with the PRCC.

Fishway inspections are conducted by a project operator at least once per day (walk-through) to ensure that fish facilities are operating within criteria limits. A daily log of the inspections is compared with the computerized printout to assure correct calibration of the fishway control system. At the discretion of NOAA Fisheries or Fish Passage Center (FPC), at least one inspection of the fishways is conducted by one of these agencies each month during the adult fish-passage season (April 15–November 15). Monthly ladder inspections occurred at both hydro projects on April 23, May 14, June 25, July 24, August 23, September 22 and October 23 of 2013. Inspection results are made available to Grant PUD, and problem-area solutions are immediately resolved after the inspection is completed.

Table 4 Criteria for Priest Rapids Dam Powerhouse and Spillway Entrances.

Gate	Targeted Head (ft.)	Gate Depth (ft.)
LSE-2	1.2	Slotted Gate (always open)
LEW-3	1.2	8.5 ± 0.5 ft. (Backup Gate only)
LSE-4	1.5	Slotted Gate (always open)
LEW-6	1.5	8.8 ± 0.5 ft. (Backup Gate only)
RSE-1	1.5	Slotted Gate (always open)
REW-2	1.5	7.5 ± 0.5 ft. (Backup Gate only)

Note:
1. Head represents water level indicator reading immediately above the entrance minus the water level indicator reading in tailwater.
2. Gate depth represents the tailwater reading minus the entrance weir crest reading.
3. The channel surface elevation differential from LSE-4 to LSE-2 should be at or greater than 0.3 ft.
4. The main slotted entrance gates will be used for primary adult passage and the mechanical backup gates will be used only in an emergency.

Verification of electronic water level indicator accuracy will be made via readings from staff gauges during monthly inspections at the discretion of the inspector.

Table 5 Criteria for Wanapum Powerhouse and Spillway Entrances

Gate	Targeted Head (ft.)	Gate Depth (ft.)
SE-2	1.5	Slotted Gate (always open)
SE-1	1.5	(Backup Slotted Gate only)
SE-3	1.2	Slotted Gate (always open)
RSE-2	1.2	Slotted Gate (always open)
REW-1	1.2	(Backup Gate only)

Note:
1. Head represents water level indicator reading immediately above the entrance minus the water level indicator reading in tailwater.
2. The channel surface elevation differential from SE-2 to SE-3 should be at or greater than 0.3 feet.
3. Verification of electronic water level indicator accuracy will be made via readings from staff gauges during monthly inspections at the discretion of the inspector.

Both adult fishways at both developments are typically operated continually from March 1 through November 30 of each year. Exceptions to this protocol are coordinated with NOAA Fisheries, the PRCC and FPC. In the event of a scheduled or emergency fishway maintenance outage, at least one fishway at the development remains in operation at all times.

2.6.1 Left Bank Adult Fishway at Priest Rapids Dam

The left-bank adult fishway at Priest Rapids Dam is composed of a powerhouse collection channel and the connecting east shore ladder. The ladder has two fish entrances, left slotted entrance 4/left entrance weir 5 (LSE4/LEW5 and LEW6-7) but only one (LSE4/LEW5) is kept

open. LEW4 was changed to a slotted entrance in 1998 (now designated as LSE4), allowing LEW6 to be a backup mechanical gate.

LEW5's operation was incorporated and automated to assist with operation of LSE4 and water velocity manipulation in the collection channel. The collection channel consists of three main entrances (LEW1, LSE2, and LEW3) at the channel's west end and 18 leaf gate orifices (OG1-18). LEW2 was changed to a slotted entrance in 1999 and consequently is now designated as LSE2. With PRCC approval, LSE2 was closed in February 2012 (within the winter outage) and the slotted entrance moved to LEW3 and renamed LSE3 (left slotted entrance 3). This action was taken in support of the juvenile bypass construction. Also during February 2012, with PRCC approval, LEW1 was permanently closed.

Only one collection channel main entrance (LSE2) remains open during the adult passage season. All collection channel orifice gates remain closed during the adult passage season. LEW3 serves as a backup mechanical gate to LSE2. The auxiliary water at Priest Rapids Dam is comprised of a combination of gravity flow originating from the Gravity Intake Gate (GIG) and pumped water from five pumps in the tailrace. Both gravity and pumped water enter the attraction water supply pool before being directed into left-bank diffusion chambers (LDC) in the collection channel (LDC1-24), junction pool (LDC25-31), ladder (LDC32-45) and attraction water supply conduit. Butterfly valves control auxiliary water to LDC1-32 and chimneys provide auxiliary water to LDC33-45. At the ladder exit, water to diffusion chamber LDC46 is supplied from the forebay by butterfly valve LV33. Grant PUD operates the diffusion chambers to keep the ladder within required criteria during the fish-passage season.

On October 15, 2010, Grant PUD submitted to FERC a plan for meeting the requirements within license article 403 Tailrace Pumping System for Fishway Water Supply at Priest Rapids Dam. FERC issued an order approving the plan on October 20, 2011. An element of that plan was to install two additional pumps in the existing left bank fish ladder pump house and install an independent gravity supply to the right bank fish ladder attraction water supply system. The additional pumping capacity for the left bank ladder would allow the pump house to supply all three fish ladder entrances at the Project while maintaining 1 foot differentials up to the 5 percent exceedance flow. The plan presented a schedule as follows:

- Spring 2011 - computational fluid dynamics and physical modeling would be conducted as required as well as necessary rock removal in front of the pump house intakes would be completed
- September 2011 - The final engineering design would be completed submitted to the FERC's Division of Dam Safety and Inspections
- March 2012 - Construction of the proposed pump house modifications and right bank supply configurations would commence in March 2012 and be completed by the fish ladder operation season of 2014 (April 1).

During additional engineering review and design for the two additional pumps for the left bank fish ladder; Grant PUD now believes that it will be able to satisfy the requirements of license article 403 by using the installed capacity of the new Right Bank Gravity Supply (RBGS) believes that the installation of the two additional pumps on the left bank pumphouse can be deferred for the following reasons:

- The design capacity for the RBGS is equal to the previously proposed pump capacity (~850 cfs) and flow will be achieved for all three entrances to be operated at minimum criteria up to the 5% exceedence flow (total of 2,480 cubic-feet per second (cfs) through the entrances);
- It will reduce and possibly eliminate the use of the GIG; and
- It will provide a water supply that allows the two fish ladders at Priest Rapids Dam to operate independently of one another.

It is anticipated that the RBGS will be a robust and reliable system based on a throttling plug valve and an energy dissipating manifold in the Right Bank Attraction Water Supply Pool. Additionally, it will be capable of supplementing the pumphouse output during regular fishway operation, thereby resulting in a decreased water demand from the GIG by approximately 850 cfs. The RBGS will also be capable of independent operation of the right bank fish ladder at minimum criteria up to a 3% exceedance flow (895 cfs). The proposed RBGS design to supplement the present pumphouse will also meet the two primary objectives recommended by theNMFS in their letter dated August 18, 2009 (Appendix B in the FERC filing submitted on March 4, 2013).

Based on a review of the original engineering design, ability to meet the NMFS primary objectives and an updated economic analysis; Grant PUD re-initiated discussion with the PRCC in June 2012.

On June 27, 2012, the PRCC members approved Grant PUD's proposal to continue to use the installed "new" capacity of the new right bank gravity supply to satisfy the requirements of license article 403 to provide attraction water at the Priest Rapids Right Bank Ladder and defer installation of the two additional pumps (Appendix B in the FERC filing submitted on March 4, 2013). The PRCC also agreed that if the expected performance of the Right Bank Gravity Supply is not realized, then Grant PUD and the PRCC would reconsider installation of the two additional pumps as originally proposed.

As originally planned and approved by FERC, Grant PUD is continuing to install the RBGS at Priest Rapids Dam, which will provide a new primary water source for the right bank fish ladder. The RBGS will be capable of supplementing the pumphouse output during regular fishway operation, thereby resulting in a decreased water demand from the GIG and will be capable of independent operation of the right bank fish ladder. This will achieve the two primary objectives recommended by NMFS.

2.6.2 Grant PUD submitted a revised management plan for License Article 403 -Tailrace Pumping System for Fishway Water Supply with FERC for review and approval on March 4, 2013. Right Bank Adult Fishway at Priest Rapids Dam

The section of the fishway adjacent to the spillway has three fish entrances (RSE1, REW2 and REW3) but only one, RSE1, is used. REW1 was changed to a slotted entrance (RSE1) in 1999, while REW2 remains as a backup mechanical gate. REW3 faces the spillway and is bulkheaded. Right-bank auxiliary water at Priest Rapids Dam is supplied by the attraction water supply conduit running the length of the spillway. The water supply conduit feeds the right-bank auxiliary water supply pool. The right-bank auxiliary water supply pool can be isolated using the conduit closure gate (CCG) located on the right bank. The two main entrance diffusion chambers

(RDC1 and 2) and diffusion chambers RDC3-5 are all fed by the right-bank auxiliary water supply pool through butterfly valves. The remaining lower ladder diffusion chambers (RDC6-19) are fed from chimneys in the auxiliary water supply pool. Upper diffusion chamber RDC20 is fed by the forebay through butterfly valve RV9. Grant PUD operates the diffusion chambers to keep the ladder within required criteria during the fish passage season.

In September of 2012, Grant PUD awarded a contract to provide a separate water source to the right bank ladder. Construction work began January 2013 and was completed July 2013. The new control system was installed by late 2013 with testing to be completed in early 2014. After completion, the water supply conduit under the spillway will be used as a backup water supply. As originally planned and approved by FERC, Grant PUD installed the RBGS at Priest Rapids Dam, which provides a new primary water source for the right bank fish ladder. The RBGS is capable of supplementing the pumphouse output during regular fishway operation, thereby resulting in a decreased water demand from the GIG and will be capable of independent operation of the right bank fish ladder. This will achieve the two primary objectives recommended by NMFS.

2.6.3 Left Bank Adult Fishway at Wanapum Dam

The left-bank adult fishway at Wanapum Dam is comprised of a powerhouse collection channel and the connecting east-shore ladder. The ladder has two slotted fish entrances (SE1 and SE2) but only one (SE2) is kept open. The collection channel consists of 20 leaf-gate orifices (OG1-20). The SE3 entrance is now located at the OG-20, and it will remain open during the adult-passage season. All collection channel orifice gates remain closed during the adult passage season. The auxiliary water at Wanapum Dam is comprised of a combination of gravity flow originating from the forebay through two inline valves, and pumped water from two turbine-driven pumps drawing water from the tailrace. Both gravity and pumped water empty into the attraction water supply channel before being directed into left-bank diffusion chambers (LDC) in the powerhouse collection channel (LDC27-50), junction pool (LDC24-26), and ladder (LDC2-23). Butterfly valves control auxiliary water to LDC25-50 and chimneys control auxiliary water to LDC2-24. At the ladder exit, butterfly valve LV7 provides forebay gravity water to diffusion chamber LDC1. Grant PUD operates the diffusion chambers to keep the ladder within required fishway criteria during the fish passage period.

2.6.4 Right Bank Adult Fishway at Wanapum Dam

The fishway, adjacent to the spillway, has three fish entrances (REW1, RSE2 and REW3) but only one (RSE2) is used. REW2 was changed to a slotted entrance (RSE2) in 1996, while REW1 remains as a backup mechanical gate. REW3 faces the spillway and is bulkheaded. Right-bank auxiliary water at Wanapum Dam is supplied by the gravity supply conduit through two inline valves fed by the forebay. The lower diffusion chambers (RDC25-32) are fed by individual butterfly valves from the attraction water supply channel. Water is provided to the remaining lower ladder diffusion chambers (RDC2-24) by attraction water supply channel chimney overflow. The upper ladder diffusion chamber RDC1 is fed by the forebay through butterfly valves RV9 and 10. Grant PUD operates the diffusion chambers to keep the ladder within required fishway criteria during the fish passage period.

2.6.5 Fishway Inspections and Dewatering

Dewatering of the fishways for inspection and maintenance is conducted during the periods of minimum fish migration. In order to shorten the ladder shutdown periods, dewatering operations are carefully planned in advance. A schedule for the inspection and maintenance is worked out in cooperation with the PRCC, PRFF, and the FPC. The required frequency of the dewatering for maintenance is determined from Grant PUD's experience gained through yearly inspections.

During all dewatering that may involve fish handling, trained personnel are present to provide technical guidance and assure sound fish handling. Every effort is made to remove fish prior to the system becoming fully dewatered. All adult anadromous species recovered are released upstream of the dam.

2.6.6 Normal Winter Maintenance Period (December 1 – February 28)

The fishways may be dewatered to allow annual maintenance of fish facility equipment, including pumps, diffuser gratings, valves, and orifice and entrance gates as necessary to assure their readiness during the adult fish-migration period.

All fishway dewaterings are recorded and a report is completed by the project biologist or technician. Fish biologists or technicians are present at all dewaterings to assure proper fish handling procedures are followed.

A copy of the proposed winter maintenance is made available to the FPC, NOAA Fisheries, PRCC and PRFF by November 1 each year. Any expected deviation from the normal winter maintenance period is listed. Changes to the normal outage period are coordinated with NOAA Fisheries and FPC.

2.6.7 Scheduled Maintenance

Maintenance which requires dewatering, or that will have a significant effect on fish passage, is done during the winter maintenance period of December 1 through February 28. Maintenance of facilities that does not affect fish passage may be conducted during the rest of the year. Concurrent outages of both fishways are avoided whenever possible to provide an upstream fish passage route at the dams at all times. When facilities are not being maintained during the winter maintenance period, they are operated according to the normal operating criteria, unless otherwise coordinated with NOAA Fisheries, FPC, PRCC, and the PRFF.

2.6.8 Unscheduled Maintenance

Unscheduled maintenance that significantly impacts the operation of a fish-passage facility is coordinated with FPC, NOAA Fisheries, PRCC, and the PRFF. The decision on whether to dewater the ladder and make repairs during the fish passage season or wait until the winter maintenance period is made after consultation with the FPC, NOAA Fisheries, PRCC, and the PRFF. If part of a fish-passage facility malfunctions or is damaged during the fish-passage season and the facility can still be operated within criteria without any detrimental effects on fish passage, repairs are not conducted until the winter maintenance period or until minimal numbers of fish are passing the dam. If part of a facility that may significantly impact fish passage is damaged or malfunctions, it is repaired as soon as possible.

2.7 Total Dissolved Gas Abatement

On January 30, 2009, Grant PUD submitted to FERC and the WDOE a final Gas Abatement Plan (GAP), developed in consultation with the PRCC and WDOE (Hendrick 2009). On July 10, 2009, FERC approved and modified the GAP; the modification required FERC approval of annual updates to the plan. On February 15, 2013, Grant PUD submitted its updated GAP to FERC for approval (Keeler 2013). FERC approval of the GAP for 2013 was received on May 7, 2013. The 2013 update to the original 2009 GAP included details on operational and structural measures that Grant PUD planned to implement over the next five years. These measures are intended to result in compliance with WDOE's water quality standards for TDG at the Project.

In accordance with the GAP, Grant PUD monitored TDG levels in the forebay and tailrace of both Wanapum and Priest Rapids dams during the fish-spill season, as well as used data from the CORPS Pasco TDG monitor as Grant PUD's next downstream forebay TDG compliance point.

Exceedances of TDG standard were minimal during the 2013 fish-spill season, with a total of 43 exceedances of the 115/120 %SAT standard (based on daily average of the 12-highest consecutive hourly readings). There were no exceedances of the 1-hour 125 %SAT standard. The Priest Rapids forebay fixed-site monitoring station (FSM station) accounted for the majority of TDG exceedances (30 of 43 or >69%), all of which can be attributed to river flow in excess of Wanapum Dam's current hydraulic capacity (~163 kcfs). When flows were above Wanapum Dam's hydraulic capacity, involuntary spill was required that contributed to elevated TDG levels, and because of the short distance between Wanapum and Priest Rapids dams (18 river miles (RM)), TDG levels did not have a chance to dissipate below the 115 %SAT by the time they reached the Priest Rapids Dam forebay FSM station. Additionally, of the 30 exceedances recorded at the Priest Rapids Dam forebay FSM station, 23 (77%) corresponded with incoming TDG levels 115 %SAT or above recorded during the same time period at the Wanapum Dam forebay FSM station. Finally, three of the exceedances were attributed to Grant PUD assisting the Grant County Sheriff's Department in the search of human remains in the Wanapum Reservoir (which required Grant PUD to spill above its spill caps in order to maintain desired water elevations).

Grant PUD strives to meet TDG standards, as well achieve juvenile and adult salmonid and steelhead fish passage and survival standards for the Project, all while meeting regional energy loads and demands. Grant PUD attempted to reduce TDG when feasible by implementing operational TDG abatement measures in 2013, including attempting to maximize turbine flows by setting minimum generation requirements (and thus maximizing turbine flows and reducing involuntary spill), participation in regional spill/project operation meetings, implementation of the regional Spill Priority List, and continuing to preemptively spill based on anticipated high flow/low power load time periods. Examples of structural abatement measures include the construction of spillway deflectors at Wanapum Dam (2000), the construction of the WFUB (2008), and the construction of the PRFB (started construction fall of 2011 with expected completion by 2014). Grant PUD believes that by implementing these measures over the next five years (as part of the ten-year compliance schedule that began in 2008) it is implementing the most current reasonable and feasible measures to alleviate for elevated TDG values that occur during the fish-spill season. In accordance with the GAP and Section 6.4.11(c) of the WDOE 401 Water Quality Certification, Grant PUD provided the WDOE and PRCC with a summary report of TDG monitoring efforts during the 2013 fish-spill season (Keeler 2013a). This report can be viewed at: Water Quality Monitoring Data).

2.8 Avian Predation Control at Wanapum and Priest Rapids Dam

Grant PUD is required to implement and fund an avian predation control program at the Priest Rapids Project (T&C 1.9 & 1.19; NMFS 2008). The overall goal is to reduce avian-related mortalities to salmon and steelhead populations affected by the Project. A specific measure identified includes installation and avian arrays/wires across the Wanapum and Priest Rapids powerhouse tailrace area and assure/maintain them in good condition to exclude avian predators. Arrays at both facilities were completed prior to the 2009 smolt out-migration and Grant PUD maintains a cooperative work agreement with the United States Department of Agriculture Wildlife Services (Wildlife Services) to repair, replace and maintain avian wire arrays at both developments. Wildlife Services also collects data to evaluate the avian predator control program.

2.8.1 Avian Predator Control Methods in 2013

Grant PUD has entered into a five year cooperative work agreement with Wildlife Services to conduct bird hazing and other wildlife control duties. Four Wildlife Services crews worked two shifts at Wanapum and Priest Rapids dams during the day beginning on May 1, 2013. Throughout the peak salmonid smolt migration, Wildlife Services personnel hazed birds with pyrotechnics to remove the threat away from the developments seven days a week for approximately 16 hours per day. Piscivorous waterbirds were killed when hazing actions were unsuccessful at deterring foraging birds. Avian control measures were completed on August 2, 2013.

During the 2013 avian control effort, 17,551 birds were hazed, 61% of which were Caspian terns (Hydroprogne caspia) and 941 birds were killed (Table 6). Gut contents of euthanized birds were not examined in 2013. Table 6 shows the overall season results.

Table 6 Total control actions made by Wildlife Services throughout the Priest Rapids Project, mid-Columbia, 2013.

		Hazed		Killed	
Common Name	**Scientific Name**	**Wanapum**	**Priest Rapids**	**Wanapum**	**Priest Rapids**
Caspian tern	*Hydroprogne caspia*	2,796	7,835	0	0
Common merganser	*Mergus merganser*	134	61	12	14
Double-crested cormorant	*Phalacrocorax auritus*	53	57	12	14
Gull, California	*Larus californicus*	1,425	1,220	139	117
Gull, Herring	*Larus argentatus*	94	37	8	2
Gull, Ring-billed	*Larus delawarensis*	1,676	1,194	379	259

2.8.2 Avian Control Efforts Proposed for 2014

As a continuation of the current five year cooperative work agreement with U.S. Department of Agricultural Animal and Plant Health Inspection Wildlife Service (USDS APHIS WS) personnel will continue angling for northern pikeminnow from the Wanapum transformer deck as well as conducting bird hazing efforts in both tailrace and forebay of Wanapum and Priest Rapids dams in 2014.

2.9 Northern Pikeminnow Removal at Wanapum and Priest Rapids Dam

Grant PUD is required to implement and fund a northern pikeminnow removal program at the Project (T&C 1.10 & 1.18; NMFS 2008). The long-term program goal is aimed at reducing juvenile salmon and steelhead mortality associated with predation by northern pikeminnow at the Project and improves juvenile passage survival.

2.9.1 Efforts in 2013

During the 2013, 618,099 northern pikeminnow were removed by the following methods:

- 11,356 in the set line fishery;
- 604,001 in the beach seine fishery; and
- 2,742 in the angling fishery.

The average length of northern pikeminnow removed in the 2013 varied between fisheries. The average length for the set line fishery was 285 mm ± 63 mm (n = 1,421). Northern pikeminnow caught in the beach seine fishery ranged from 12.7 to 406.4 mm (0.5-16") in with an average of about 19.1 mm (0.75"). The average length of northern pikeminnow removed in the angling fishery was 362 mm ± 59 mm (n = 1,662).

2.9.2 Efforts Proposed in 2014

Grant PUD will continue to use set lines, beach seines, angling and electrofishing as proven, cost effective, methods of pikeminnow removal. Two set line boats will be operated in 2014, one in the Wanapum Reservoir and one in the Priest Rapids Reservoir. Grant PUD will also acquire an electrofishing boat in 2014, and should increase sampling efficiency over a wider range of habitat types. Beaching seining will also be utilized in 2014.

2.10 Adult Fish Counting

Grant PUD is required to maintain the video adult fish counting equipment at both developments to provide reliable fish count information and submit annual reports for inclusion in regional databases (T&C 1.2; NMFS 2008). The video fish-counting (VFC) system configuration at each dam has digital video cameras in each fishway streaming data to digital video recorders (DVRs) at each dam. These DVRs are networked and accessed by fish counters via PCs from the fish-counting room at Priest Rapids Dam. Data from the DVRs are played back in fast-forward mode on the PCs, and fish are identified and counted by the fish counters via a separate tallying program. At the end of each day fish counts from Priest Rapids and Wanapum dams are posted to Grant PUD's web page Grant County PUD Fish Counts. The Project fish-counting season runs April 15 through November 15, annually.

There were no major malfunctions or failures experienced within the fish-counting program in 2013. Grant PUD continues to investigate equipment and methods to help remedy periodic slowdown of video playback during heavy use. There were no data-accuracy problems experienced in 2012-2013. The Fish Counters took two quality control tests and all Fish Counters were within acceptable accuracy.

2.10.1 2014 Video Fish Counting Operations

Grant PUD will continue to count fish in 2014 using the same basic methodology as in 2013. In 2014, each dam's fish crowder's backgrounds will be modified to improve removal for cleaning.

The fish counting location will be moved from the present Priest Rapids Dam location to the new office building near Wanapum Dam. Upgrades to the video fish counting computers are anticipated in 2014. Daily fish counts for 2013 and an annual summary can be viewed at Grant County PUD Fish Counts.

2.11 Adult Steelhead Downstream Passage

Grant PUD is required to operate the project sluiceways at both dams continually from the end of summer spill until November 15 to provide a safer passage route for adult steelhead fallbacks (Term &Condition 1.23; NMFS 2008). If in-season monitoring indicates that these time frames could be modified to improve adult downstream fish passage, Grant PUD is required to discuss in-season study results with the PRCC, and upon approval by NMFS, modify the time frame for operating project sluiceways.

During 2013, summer fish-spill ended at on August 22, 2013 at Wanapum Dam and on August 23, 2013 at Priest Rapids Dam. Immediately following the end of summer fish-spill, the sluiceway at Wanapum Dam and Top-Spill Bulkhead in spillbay 6 at Priest Rapids Dam (see 2.5.1 above) were opened and operated 24/7 through November 15, 2013. No in-season discussions with the PRCC or NMFS to modify or improve adult downstream fish passage were necessary during 2013.

3.0 Wanapum Dam

Wanapum Dam consists of a 14,680-acre reservoir and an 8,637-foot-long by 186.5-foot-high dam spanning the Columbia River. The dam consists of left and right embankment sections; left and right concrete gravity dam sections; a left bank and right bank fish passage structure, each with an upstream fish ladder; a gated spillway; an intake section for future generating units; a downstream fish top-spill bypass structure in one of the unused intake sections (unit No. 11); and a powerhouse containing 10 vertical shaft integrated Kaplan turbine/generator sets with a total authorized capacity of 1,038 MW.

3.1 Wanapum Future Unit Fish Bypass

The WFUB was completed in early 2008 and began operation during the start of the annual fish-spill program on April 30, 2008 (Figure 2 & Figure 3). The WFUB was designed to operate at different flow volumes (20, 15, 10, 5 and 2.5 kcfs); however it has not been discussed to extend the operation of the WFUB at flow less than 20 kcfs, except for those periods that the Wanapum tailrace elevation falls below 488 ft. When tailwater drops below an elevation of 488.0', the outflow from the WUFB (at 20 kcfs) becomes unstable and starts to undulate, causing a condition that is believed to be less conducive for migrating juvenile smolts and also possibly producing greater TDG. At this lower tailwater elevation, when the outflow from the WFUB is reduced, this undulating jet (of water) is returned to a surface-skimming flow, which is better for fish passage. Grant PUD, in consultation with the PRCC, agreed to maintain the Wanapum tailwater elevations to stay within the range of 488.0 to 498.0 feet during the salmonid out-migration season during non-extreme river condition periods. During this first year the WFUB was operated at 20 kcfs, and acoustic tag technology was used to evaluate approach, behavioral and survival estimates for juvenile salmonids (yearling Chinook, steelhead, and sockeye) as they approached and passed through the WFUB. Along with survival estimates of salmonid smolts

using the WFUB as a passage route, the passage route efficiency (FPE[3]) of the WFUB was determined. The FPE of a given route used to pass the dam is proportional to the total number of fish detected that passed the dam (i.e., the 2008 FPE of the WFUB was equal to the number of fish that passed at the WFUB in 2008 divided by the total number of fish detected passing the dam in 2008).

Sullivan et al. (2009) reported the FPE for steelhead, yearling Chinook and sockeye through the WFUB were 54.2%, 29.4% and 33.1%, respectively. Survival estimates for the same three salmonid species were derived via a paired-release for steelhead, but only a single-point release for both sockeye and yearling Chinook. These single-point release survival estimates are typically biased low, due to the fact that any tagging and/or handling effects associated with the handled fish have not been removed as they would have been in a paired release. Based on detection histories, the WFUB passage survival estimates were 97.3% for steelhead, 96% for yearling Chinook, and 93% for sockeye. During the 2009 Project survival studies, FPE and passage survival estimates for steelhead and sockeye were determined to have increased; there were no yearling Chinook estimates in 2009. The FPE for steelhead and sockeye through the WFUB were 70.2% and 59.3%, respectively. Survival estimates for steelhead and sockeye were derived through a paired-release model (Skalski et al. 2010). The WFUB passage survival estimates were 99.0% for steelhead and 98.4% for sockeye (Timko et al. 2010).

During the 2010 Project survival studies, FPE and passage survival estimates for steelhead and sockeye were determined. There were no yearling Chinook estimates in 2010. The FPE of steelhead and sockeye through the WFUB were 77.3% and 78.3%, respectively. Survival estimates for steelhead and sockeye were derived via a paired-release model. The WFUB passage survival estimates were 98.9% for steelhead and 97.6% for sockeye (Timko et al. 2011). Table 3 summarizes steelhead FPE and route survival estimates through the WFUB for 2008 through 2010.

In 2011, survival studies were not conducted in the Project; however, juvenile steelhead behavioral studies were conducted with acoustic/passive integrated transponder (PIT) tags. The FPE for steelhead at the WFUB were not measured, yet survival of volitionally passing fish at Wanapum Dam was measured using fixed Juvenile Salmonid Acoustic Tracking System (JSATS) receivers deployed approximately every mile downstream of the dam throughout the Priest Rapids Reservoir. Pooling the recapture histories for the 18 replicate releases resulted in an overall survival probability of 96.6% (SE=0.57%) from release to the Wanapum Dam forebay (Thompson et al. 2012) Survival through Wanapum Dam was estimated at 98.2% (SE=0.46%). During 2014, survival evaluations will be conducted throughout the Priest Rapids Project. Grant PUD will be collecting on yearling Chinook and juvenile steelhead.

The WFUB is operated continuously during the juvenile salmonid out-migration season each year (typically starting mid-April through mid- to late-August) and is inspected for necessary maintenance annually when it is not in operation.

[3] Fish passage efficiency is defined as an estimate of passage for various species utilizing non-turbine passage routes. This estimate is reported as a percentage.

Figure 2 Aerial photograph of Wanapum Dam, mid-Columbia River, WA.

Figure 3 Photograph of Wanapum Dam Fish Bypass facility, looking downstream, mid-Columbia River, WA.

3.2 Wanapum Advanced Hydro Turbines

On October 2, 2003, and supplemented on April 5 and May 28, 2004, Grant PUD filed an application to amend its license for the Project seeking authorization to replace the 10 turbines at the Wanapum development. The Advanced Turbine replacement was proposed to provide increased power and hydraulic capacity, equal or improved survival of juvenile salmon passing through the units, and improved water quality by reducing the amount of spill over the dam during periods of high flows. The decision criteria for proceeding with the replacement of the remaining nine units over the next eight years was based on whether the Advanced Turbine

testing results demonstrated equal or better survival than the existing turbines. Pursuant to FERC's July 23, 2004 Order, Grant PUD installed and tested an Advanced Turbine at Unit 8.

Consistent with the requirements of the BiOp and related FERC Order, a study was designed and conducted to test the hypothesis that survival of Chinook salmon smolts through a new Advanced Turbine would be equal to, or greater than, passage survival through an existing unit. On October 11, 2005, Grant PUD filed a report on the results of biological testing of the first installed Advanced Turbine unit, and in December 2005, FERC authorized continued installation of Advanced Turbines at the Wanapum Development (FERC 2005). Grant PUD completed the Advanced Turbine Upgrades at Wanapum Dam putting the tenth turbine into operation in October, 2013.

Sections 6.4.4(b) and 6.4.9 of the Project's 401 WQC (WDOE 2008), as well as Section II of the individual 401 WQC (WDOE 2004) for the Advanced Turbine installation project, required Grant PUD to conduct a field study to evaluate TDG after the installation of the tenth Advanced Turbine to determine the effect, if any, the Advanced Turbines have on TDG below Wanapum Dam. Article 401(a)(17) of the FERC License (FERC 2008) required FERC approval of the study plan prior to implementation.

The evaluation of TDG related to the operation of all ten of the Advanced Turbines at Wanapum Dam was conducted in accordance with the study plan titled, *Wanapum Dam Advanced Turbine Total Dissolved Gas Evaluation* (Keeler 2012), which was developed in consultation with the WDOE and the PRCC. The study plan was submitted to FERC on September 28, 2012, supplemented on October 2, 2012 and modified and approved by FERC on March 8, 2013.

As stated in the study plan, the primary objective of the evaluation was to assess TDG across the river channel with all ten of the Advanced Turbines operating at varying conditions to determine whether the operation of all ten of the Advanced Turbines significantly affects TDG levels during normal Project operations. To complete this objective, a TDG sensor array arranged in a lateral transecting pattern was placed approximately 2000 feet downstream of Wanapum Dam to monitor changes in TDG levels compared to TDG levels recorded upstream at the Wanapum Dam forebay FSM station and downstream at the Wanapum Dam tailrace FSM station.

In order to quantify TDG production associated with the operation of all ten of the Advanced Turbines, TDG data was collected during the following operational conditions between October 12 and 14, 2013:

1). **Test 1 – Minimum operations** with the turbine gate opening at approximately 60%, under 80 feet of head, which passed an average flow of 9.1 kcfs per turbine unit, equaling an average total powerhouse flow of 93.3 kcfs; and
2). **Test 2 – Average operations** with the turbine gate opening at approximately 77%, under 80 feet of head, which an average flow of 13.1 kcfs per turbine unit, equaling an average total powerhouse flow of 132.5 kcfs; and
3). **Test 3 – Maximum operations** with the turbine gate opening at approximately 95%, under 80 feet of head, which passed an average flow of 19.2 kcfs per turbine unit, equaling an average total powerhouse flow of 193.5 kcfs.

The operational conditions stated above were held steady for at least three consecutive hours to allow conditions to stabilize in the tailrace; depth, temperature, and TDG values were collected at 15-minute intervals (starting at the top of the hour) during the test conditions. The field study

period was extended for ten additional days (to October 24, 2013) in order to record any incidental periods when operational requirements were inadvertently met and the resulting data could possibly be used for further evaluation of the Advanced Turbine operation.

The difference in TDG percent saturation (%SAT) between the Wanapum forebay and the TDG array transect for the targeted test periods (without sluiceway spill) were 0.1 %SAT for Test 1, -0.6 %SAT for Test 2, and 0.4% SAT for Test 3 for an overall mean difference of -0.02%. Given that the sensors used to the collect TDG values for this study have an accuracy ± 0.15 %SAT and sensitivity/resolution of 0.1 %SAT, the differences observed during the targeted tests suggest that the new Advanced Turbines at Wanapum Dam do not materially increase TDG levels during minimum, average, and maximum operating conditions.

During the survival evaluations scheduled for 2014 through 2016, some information will be able to collect to inform the PRCC on the relative survival of yearling Chinook, juvenile steelhead and sockeye salmon through the powerhouse at Wanapum Dam. Previous data (collected in 2008) indicated that the steelhead survival point estimate of passage through the Wanapum powerhouse was 95.2% (all turbines combined and based on the percentage of tags detected downstream that passed through the powerhouse). Survival estimates in 2009 and 2010 for juvenile steelhead indicated were 92.9% 91.4% respectively. Survival estimates for sockeye passing through the powerhouse was 96.2% in 2009 and 92% in 2010.

3.2.1 Description of Turbine Operating Criteria and Fishery Operations

Per Term and Condition 1.8 (NMFS 2008), Grant PUD operates the Wanapum turbines in a protocol referred to as “Fish Mode” and also “Ganging Units” during the juvenile salmonid out-migration season (typically mid- to late-April through mid- to late-August), based on smolt index counts conducted by WDFW at the Rock Island Smolt Monitoring Station in order to maximize turbine passage survival rates of juvenile salmonids. Fish Mode was the result of using Hill Curves, Theoretical Avoidable Losses calculations, turbine discharge rates, head, and fish survival curves (based on 1996 and 2005 balloon-tag evaluations of salmonid smolts through the turbines) to determine the operating range of the turbines and maintain a minimum fish survival rate of 95 percent. For Wanapum Dam, this means an operating range of 11.8 to 15.7 kcfs per turbine, and for Priest Rapids Dam, turbine units are operated between 11.2 to 17.5 kcfs.

Recent investigation of smolt passage survival through turbines determined that passage survival rates for out-migrating juvenile salmonids was influenced not only by turbine operation (i.e. “Fish Mode”), but by powerhouse operation. These determinations led to the concept of “ganging” turbine units in conjunction with operating turbines in fish mode. “Ganging units” is defined as concentrating operating turbines into blocks of adjacent units, thus reducing the “edge-effect” that may increase predation risks to smolts as they exit the turbine draft tube and enter the tailrace. Thompson et al. (2012) results showed that a high concentration of northern pikeminnow, along with some walleye and bass (smallmouth and largemouth), exist in the immediate tailrace of Wanapum Dam and are actively foraging on smolts. Turbines furthest from the spillways (Unit 1 at Wanapum and Unit 10 at Priest Rapids) are the first turbines to discontinue operation during daylight hours when the powerhouses are operating at less than full capacity during juvenile and adult fish-migration seasons. The discharge from these turbines may adversely affect adult salmonids’ ability to efficiently locate the entrances to the adult fishways adjacent to these turbine discharges.

3.3 Wanapum Fish Spill

Fish spill at Wanapum Dam in 2008 - 2010 was passed through the WFUB to test whether this route was a better passage route than tainter gate fish spill at Wanapum Dam. Testing has indicated that the Wanapum tainter gate spill has lower passage survival rates for yearling Chinook and steelhead than other passage routes at the dam (Skalski et al. 2008, Timko et al. 2009). Grant PUD is currently planning on replacing all of the Wanapum Dam spillway Tainter gate seals as part of the Wanapum Dam Interim Spill Regime Evaluation required under Section 6.2(1) of the WQC and Article 11 of the NMFS and USFWS's Section 18 fishway prescriptions, (all of which have been adopted into Article 406 of the FERC license; FERC 2008). Tainter gate seals are believe to be a potential source for juvenile salmonids mortality during spillway passage. Although the Spillway is currently operated during high flow conditions with inadvertent flow, it is a non-turbine passage route alternative in the event the WFUB is not operational. Grant PUD received approval by FERC in February 2012 to begin modifications. During scheduled maintenance outages, the current 2" protruding bolts will be recessed into the seals. At this time, Grant PUD is finalizing the solicitation for contractor bids to begin replacing the seals with the approved design; work is planned to begin during the summer of 2013 and be completed by the fall of 2018 (Table 7).

In consultation with the PRCC fish-spill representatives, smolt index counts from the Rock Island Smolt Monitoring Station are used to determine when annual spring fish spill at both developments is initiated (before 2.5% of the juvenile spring migrants have passed the Project – typically mid- to late-April) and also when summer fish spill is terminated (when over 95% of the summer juvenile migrants have passed; typically mid- to late-August). The end of the spring fish spill typically overlaps with the beginning of summer fish spill, providing continuous fish spill from April to August.

The spillways are operated (if needed) on the schedule outlined above during the juvenile salmonid out-migration season, and are operated on an as-needed basis during the remainder of the year. Inspections typically occur during the late summer/early fall low river-flow period, with any necessary maintenance occurring during the low river-flow winter months when the tainter gates are unlikely to be needed.

3.3.1 Spill

The 2013 fish-spill season began on April 17, 2013 and concluded on August 22, 2013. The fish-spill periods were very closely matched with the juvenile migration timing, and greater than 90 percent of the yearling spring outmigrants passed during the spring fish-spill period between April 17 and June 14. The combined spring and summer fish-spill periods from April 17 – August 22 encompassed greater than 97 percent of the entire 2013 summer outmigration.

Table 7 Anticipated schedule for implementing the Wanapum tainter gate seal modifications.

Task Name	Start Date	End Date
Engineering	May 25, 2010 to Oct.10, 2011	
Review/Design Seal Assembly	May 25, 2010	Aug. 8, 2010
Analyze Gates per seismicity criteria	Dec. 31, 2010	Jun. 29, 2011
Issue/Review Preliminary Engineering Drawings	Jun. 29, 2011	Jul. 27, 2011
Final Design	Jul. 27, 2011	Oct. 10, 2011
FERC process	Jun. 29, 2011 – Jan. 24, 2012	
Construction Permitting (CORPS, WDFW, WDOE, & WDNR)	July 13, 2011 – Dec. 27, 2011	
Contract Prep and Award	Dec. 27, 2012 – Aug. 23, 2013	
Construction	Aug. 23, 2013 – May 3, 2018	
Demobilization	Apr. 3, 2018 – May 3, 2018	

3.4 Wanapum Bulkhead Gatewell Exclusion Screens

License Article 402 required Grant PUD, within six months of issuance date of the license, to file a plan to study the effects of installing gatewell exclusion screens on salmon, steelhead, and lamprey survival during turbine passage. On October 17, 2008, Grant PUD filed a Gatewell Exclusion Screen Study Plan pursuant to license Article 402 under the April 17, 2008 Order Issuing New License[4] for the Project. FERC issued an order approving the Gatewell Exclusion Screen Study Plan on December 18, 2008.

Under the plan, Grant PUD would install, test, and, if tested successfully, install exclusion screens at all bulkhead gatewell slots at both Wanapum and Priest Rapids dams, once approvals and all necessary permitting are acquired. In 2010, Grant PUD monitored and evaluated possible interactions between juvenile salmonids, steelhead and lamprey with the bulkhead exclusion screen (one screen installed at Wanapum Dam and one at Priest Rapids Dam). In addition to the Gatewell Exclusion Screen Evaluation study, the PRCC concurred that a Gatewell Retention Study also be conducted (in 2010) to evaluate if once inside of a gatewell slot, the smolts leave the gatewell slots on their own. This could have possible implications as to whether gatewell exclusion screens are needed at Wanapum Dam.

The results from the Gatewell Retention Study at Wanapum and Priest Rapids dams in 2010, where acoustic-tagged fish were released into wheel gate and bulkhead slots, indicated that median retention times inside of a gatewell slot were 2.9 hours at Priest Rapids Dam and 4.6 hours at Wanapum Dam before sockeye exited the slot, and median retention times were 1.7 days (Wanapum Dam) and 1.9 days (Priest Rapids Dam) before steelhead exited the gatewell slot (Wright et al. 2010). In 2011 a second study was conducted at Wanapum Dam only (O'Connor and Rizor 2012, *Memorandum*). The median retention time for sockeye was 5.5 hours while the steelhead median was 3.1 days prior to leaving the slot. The longer residence times recorded in 2011 were believed to have been an artifact of environmental conditions included increased flow, lower river temperature, and increased TDG compared to the environmental conditions recorded in 2010.

[4] 123 FERC ¶ 61,049 (2008)

Based on the results of the evaluation of exclusion screen interactions with fishes and the retention study, the PRCC members agreed on December 22, 2012 not to require Grant PUD to install gatewell screens at the Project, Statement of Agreement of Not Installing Gatewell Exclusion Screens at Wanapum and Priest Rapids Dams (SOA 2011-09 and 2011-10; PRCC SOAs.

4.0 Priest Rapids Dam

Priest Rapids Dam consists of a 7,725-acre reservoir and a 10,103-foot-long by 179.5-foot-high dam spanning the Columbia River. The dam consists of left and right embankment sections; left and right concrete gravity dam sections; a left and right fish passage structure, each with an upstream fish ladder; a gated spillway section; and a powerhouse containing 10 vertical shaft integrated Kaplan turbine/generator sets with a total authorized capacity of 855 MW.

4.1 Priest Rapids Top-Spill

On April 26, 2011, construction bids for the construction of the PRFB were opened, and ultimately, the construction contract was awarded to Kuney-Goebel Joint Venture for $27.4 million (May 31, 2011), with construction beginning in September of 2011. The most updated final cost for construction of the PRFB $30,477,681.51. Grant PUD is expecting the PRFB will be completed by April 2014.

During the expected two years of construction, the Priest Rapids Top-spill Bulkhead that was utilized for salmonid smolt passage was moved from TG-19 & 20 to TG-5 & 6 and will be utilized for downstream smolt passage in the similar manner as it was used when located at TG-19 & 20. The new location for the top-spill bulkhead was selected after wave analysis was completed at the University of Iowa's IIHR for negative impacts to construction work barges in the Priest Rapids tailrace working on the PRFB during the smolt out-migration season.

Figure 4 Priest Rapids Fish Bypass Construction Activities. Looking Upstream at Gate(s) and Spillway Improvements, December 2013.

Figure 5 **Priest Rapids Fish Bypass, Bay 20 Apron and Ogee Concrete Curing and Preparation Work. December 2013.**

Figure 6 **Priest Rapids Fish Bypass. Pier Tail Structure 23 Being Staged in Bay 22, Prior to Setting on Pier 23 Foundation, December 2013.**

4.2 Primary Juvenile Passage Options/Priest Rapids Fish Spill/Spill Program

During the 2013 smolt out-migration season, the Priest Rapids Top-Spill Operations Configuration spill program used in both 2010 - 2012 was followed with the only exception that spill operations were moved to spill gates 4 – 7 to accommodate the construction of the PRFB. This spill operation consisted of 6.8 kcfs surface spill through the top-spill bulkhead at spill bays 5 and 6, 5 kcfs bottom spill through tainter gates 4 and 7 each; the total "fish spill" amount was approximately 24 kcfs. Fish-spill began on April 18 and ended on August 23, 2013. Juvenile passage in 2014 will be through the newly constructed PRFB. Involuntary spill was passed through the remaining spillway gates at Priest Rapids. Grant PUD, in consultation with NMFS and the PRCC, used near real-time TDG and flow information to adjust/modify spill patterns as necessary.

4.3 Priest Rapids Turbine Operation

In February 2005, a turbine evaluation was conducted at Priest Rapids Dam (Normandeau Associates and Skalski 2005). The objectives of the turbine evaluation were to: 1) estimate direct survival probabilities within ±2.5%, 95% of the time, and 2) evaluate the relationship between turbine discharges (9, 11, 15, and 17 kcfs) and survival and condition of fish entrained at two depths (10' and 30' below the intake ceiling). The resulting data was used to operate the turbine units (and powerhouse) in such a manner that ensures the highest survival rate for juvenile salmonid turbine passage.

This evaluation indicated that high turbine passage survival for entrained yearling Chinook salmon across discharges (9, 11, 15 and 17 kcfs) and depths (10 ft. and 30 ft.) was achieved. Pooled survival probabilities across depths ranged from 95.0% (15 kcfs) to 97.5% (9 kcfs), while pooled survival probabilities across discharges ranged from 96.1% to 96.5% (Normandeau Associates and Skalski 2005). Highest survival (98.8%, SE=0.008) was observed for fish entrained at 30 ft. at 17 kcfs; while the highest survival at 10 ft. occurred at 9 kcfs (97.9%, SE=0.012). The survival estimates at 9 and 11 kcfs were high (97.1% to 97.9%) and ranged from 94.4% to 96.1% for a discharge of 15 kcfs. Survival at the 17 kcfs ranged 95.6% to 98.8% (Normandeau Associates and Skalski 2005). Forty-eight hour survival probabilities estimates were ≥95.6%; only one estimate at 15 kcfs for 10 ft. entrained fish was slightly lower (94.4%).

Term and Condition 1.16 of the BiOp (adapted from Action 18, NMFS 2004), requires Grant PUD to operate the Priest Rapids turbines in non-cavitation mode and run at least two adjacent turbines at any one time. These turbine operations are in place for 95% of the juvenile spring migration (based on index counts at Chelan PUD's Rock Island Dam), and coordinated with the upstream projects. Grant PUD starts monitoring (Rock Island index counts) on or before April 1 of each year and non-cavitation turbine mode operations is initiated before 2.5% of the spring migration has passed. Non-cavitation turbine mode operations are concluded after 97.5% of the spring migration has passed, or on June 15, whichever occurs first.

At this time, Grant PUD expects installation of "in-kind" Kaplan turbines at Priest Rapids Dam. The expected start date for the Priest Rapids Dam turbine installation project is 2016, with a completion date in 2025. Grant PUD will complete the competitive modeling phase of the project in 2014.

4.4 Priest Rapids Bulkhead Gatewell Exclusion Screens

License Article 402 required Grant PUD, within six months of issuance date of the license, to file a plan to study the effects of installing gatewell exclusion screens on salmon, steelhead, and lamprey survival during turbine passage. On October 17, 2008, Grant PUD filed a Gatewell Exclusion Screen Study Plan pursuant to license Article 402 under the April 17, 2008 Order Issuing New License for the Project. FERC issued an order approving the Gatewell Exclusion Screen Study Plan on December 18, 2008.

Under the plan, Grant PUD would install, test, and, if tested successfully, install exclusion screens at all bulkhead gatewell slots at both Wanapum and Priest Rapids dams, once approvals and all necessary permitting are acquired. In 2010, Grant PUD monitored and evaluated possible interactions between juvenile salmonids, steelhead and lamprey with the bulkhead exclusion screen (one screen installed at Wanapum Dam and one at Priest Rapids Dam). In addition to the Gatewell Exclusion Screen Evaluation study, the PRCC concurred that a Gatewell Retention Study also be conducted (in 2010) to evaluate if once inside of a gatewell slot, the smolts leave the gatewell slots on their own. This could have possible implications as to whether gatewell exclusion screens are needed at Wanapum Dam.

The results from the Gatewell Retention Study at Wanapum and Priest Rapids dams in 2010, where acoustic-tagged fish were released into wheel gate and bulkhead slots, indicated that median retention times inside of a gatewell slot were 2.9 hours at Priest Rapids Dam and 4.6 hours at Wanapum Dam before sockeye exited the slot, and median retention times were 1.7 days (Wanapum Dam) and 1.9 days (Priest Rapids Dam) before steelhead exited the gatewell slot (Wright et al. 2010). In 2011 a second study was conducted at Wanapum Dam only (O'Connor and Rizor 2012, Memorandum). The median retention time for sockeye was 5.5 hours while the steelhead median was 3.1 days prior to leaving the slot. The longer residence times recorded in 2011 were believed to have been an artifact of environmental conditions included increased flow, lower river temperature, and increased TDG compared to the environmental conditions recorded in 2010.

Based on the results of the evaluation of exclusion screen interactions with fishes and the retention study, the PRCC members agreed on December 22, 2012 not to require Grant PUD to install gatewell screens at the Project, Statement of Agreement of Not Installing Gatewell Exclusion Screens at Wanapum and Priest Rapids Dams (SOA 2011-09 and 2011-10; PRCC SOAs.

4.5 Priest Rapids Dam Fishway Water Supply

On October 15, 2010, Grant PUD submitted to FERC a plan for meeting the requirements within license article 403 Tailrace Pumping System for Fishway Water Supply at Priest Rapids Dam. FERC issued an order approving the plan on October 20, 2011. An element of that plan was to install two additional pumps in the existing left bank fish ladder pump house and install an independent gravity supply to the right bank fish ladder attraction water supply system. After presentation of additional information to the PRCC by Grant PUD, the PRCC on June 27, 2011 agreed that installation of the two additional pumps of the left bank was not necessary at this time. No modifications are planned to occur to the left bank fish ladder attraction water supply. Modifications to the right bank are occurring as described in section 2.6.1; refer to this section for additional information about this PRCC decision.

4.6 Adult PIT-Tag Detection

Per Term and Condition 1.19 (NMFS 2008), Grant PUD maintained and operated the PIT tag detection system at Priest Rapids Dam. The PIT tag detection system was established in the Priest Rapids Dam fishways in spring 2003.

Priest Rapids Dam has two adult fishways, each with multiple non-overflow weirs in the uppermost sections. The adult PIT-tag detection system at Priest Rapids Dam is designed to detect upstream migrating fish bearing an ISO FDX-B PIT-tag (134.2 kHz). The PIT-tag detection system plans and specification document states the system is designed to be 95% efficient for the detection of Digital Angel's PIT-tag model TX1400ST or "supertag". Each fishway has two detection weirs located within the non-overflow sections (Figure 7. Each detection weir has two completely submerged orifices for fish passage equipped with PIT-tag antennae mounted to the upstream face of each orifice. Each antenna is controlled by a Digital Angel FS1001A Stationary Transceiver (Richmond & Anglea, 2008). Grant PUD expects to upgrade the PIT-tag readers and move the antennas during the 2014 – 2015 winter outage.

In addition to the antennae in the adult fishways, there are three antennae installed at the head of the sorting flume within the Off Ladder Adult Fish Trap (OLAFT). Only fish that have been trapped and pass through the sorting flume are interrogated by this antenna array. The adult fishways' PIT-tag detection system is functional during all times the adult fishways are passable to fish. The OLAFT's PIT-tag detection system is available only when the trap is being operated. All interrogation data collected at Priest Rapids Dam are uploaded to the Pacific States Marine Fisheries Commission's PIT-tag Information System (PTAGIS) web page, http://test.ptagis.org/ptagis/index.jsp. Biomark, Inc. of Boise, ID remotely monitors the detection system for functionality and performs periodic maintenance checks on site. All detection data reported within this report were obtained from the PTAGIS web site.

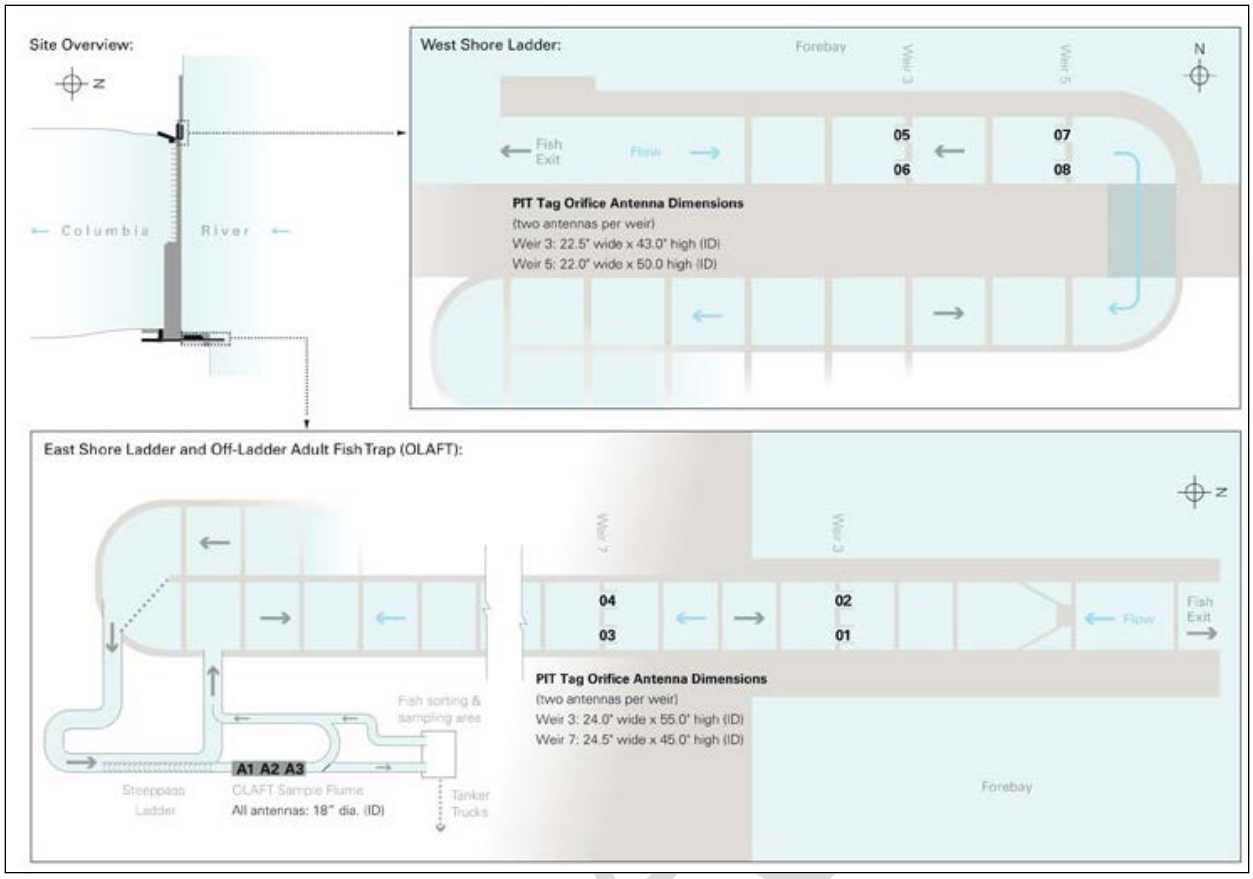

Figure 7 Plan view of upper regions of the fishways at Priest Rapids Dam showing location of PIT-tag detection antennae and associated identification numbers.

4.6.1 2013 PIT-Tag Detection Summary

A total of 21,092 PIT-tag detections were observed at Priest Rapids Dam in 2013. Of these detections, 8,166 were from unique tags within five species of fish. Species of fish carrying PIT tags identified at Priest Rapids Dam in 2013 were Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), steelhead trout (*O. mykiss*), sockeye salmon (*O. nerka*) and northern pikeminnow (*Ptychocheilus oregonensis*). All detections and associated fish species are summarized in Table 8.

Table 8 Summary of PIT-tag Detections at Priest Rapids Dam in 2013.

Species	Number of Observations	Unique Tag Codes
Chinook Salmon	11,040	4,105
Coho salmon	354	118
Steelhead trout	6,931	2,854
Sockeye salmon	2,690	1,062
Bull trout	0	0
Northern pikeminnow	12	3
Unknown/ORPHAN	65	24
Totals	**21,092**	**8,166**

4.7 Adult Fish Trap (Off Ladder Adult Fish Trap/OLAFT)

Under Term and Condition 1.20, Grant PUD is required to maintain in good working order the Priest Rapids Dam OLAFT and ensure that it is operational each year prior to startup for fish collection. Grant PUD is also required to make necessary repairs and modifications as determined necessary.

The WDFW operated the OLAFT at Priest Rapids Dam from early-July through mid-October 2013 to sample steelhead trout for the agency's stock-assessment program and to sample fall Chinook salmon for an age-class study. The WDFW typically operated the trap on Mondays, Wednesdays and Fridays of each week for steelhead trout sampling (July 8 – October 18) and Mondays and Wednesdays (September 1 – October 18) for the fall Chinook salmon age-class study. In addition, WDFW trapped fall Chinook salmon to augment Priest Rapids Hatchery broodstock collection (September 11 – November 15). The Yakama Nation Fisheries operated the trap during late June to mid-July to collect adult sockeye for their Lake Cle Elum and Cooper Lake sockeye salmon reintroduction program. The Yakama Nation typically operated the trap Monday through Friday each week (June 26-July 17). The Yakama Nation also operated the from early to late October to collect coho salmon broodstock in support of their mid-Columbia River coho salmon re-introduction program. The OLAFT was completely dewatered and winterized for the season on November 18, 2013.

There were no significant trap modifications during the winter of 2012 - 2013. Grant PUD improved ceiling lighting and installed a wireless laptop computer system for trap operators. OLAFT Operation Observations.

An operational change was made in November 2011 to have the submerged orifice slide gate (SG-3) open at all times except during trapping operations. The orifice slide gate is part of the OLAFT fish diversion weir and is located on the bottom east side of the weir. This opening is designed to allow lamprey passage without diverting them through the OLAFT facilities. Prior to this time, the slide gate was kept closed by the trap operator. During 2013 the slide gate (SG-2) remained partially open to provide lamprey passage while avoiding non-lamprey access through the side gate. Additional investigations are being considered during subsequent years; the slide gate will be monitored to insure it is open during trapping operations. All other gates, valves, plumbing, electrical components, and laboratory utilities operated as designed. Observed fish passage indicated that adult salmonids continue to successfully find the entrance channel and readily ascended the steeppass fishway (Figure 8). The sorting flume again proved to be sufficient length to allow for the identification and sorting of trapped fish. Fish readily migrated

out of the return channel and back into the main fishway once they had been bypassed or sampled. No significant design improvements to the trapping facilities were made in 2013.

Figure 8 Steeppass fishway section of the off ladder adult fish trap located at Priest Rapids Dam, Columbia River mile 397-1, Washington, USA.

4.7.1 Design Modifications for 2014

There are no major OLAFT modifications planned during the 2014 OLAFT operation season. Grant PUD will continue to make in-season necessary repairs and modifications and needed. A complete report on the 2013 OLAFT activities may be viewed at Grant County PUD supporting documentation.

5.0 Hatchery Mitigation Programs

Grant PUD implements 11 hatchery programs as mitigation for the Project effects on anadromous salmonids and steelhead that pass through the Project area or are affected by Project operations. Under the 2006 SSSA Grant PUD agreed to achieve and maintain "no net impact" from the Project on steelhead; spring, summer and fall Chinook; sockeye; and coho salmon. In part, Grant PUD accomplishes this objective through hatchery propagation. The substantive requirements of the SSSA were incorporated into the WQC conditions, NMFS and USFWS Section 18 prescriptions, and NMFS' 2008 terms and conditions to the incidental take statement

for endangered salmon and steelhead. Grant PUD's FERC license requires implementation as defined in these documents and in the Hatchery and Genetic Management Plans (HGMPs) and Artificial Propagation Plans (APPs) required by License Article 401(a)(4).

5.1 Priest Rapids Coordinating Committee Hatchery Subcommittee

The 2008 NMFS BiOp and SSSA were adopted by FERC and FERC requires Grant PUD to continue to support the Priest Rapids Hatchery Subcommittee (PRCC HSC). This includes provision of sufficient facilitation, administration, and clerical support. This committee is the primary forum for implementing and directing supplementation measures for the Project's anadromous fish program. The PRCC HSC is comprised of NMFS, USFWS, WDFW, Confederated Tribes of the Colville Reservation, Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Reservation, and Grant PUD.

During this reporting period the PRCC HSC met monthly (Table 9) and made considerable progress in making decisions related to the White River spring Chinook program and developing monitoring and evaluation plans for all of Grant PUD's programs. Minutes were taken at all meetings and approved by the PRCC HSC. Significant decisions were formalized in four SOAs during 2013 (Table 10 PRCC SOAs). All SOAs were approved by PRCC HSC consensus. Meeting minutes and statements of agreement for all years can be viewed at Grant PUD's website.

Table 9 Priest Rapids Coordinating Committee Hatchery Subcommittee 2013 meeting schedule.

PRCC Hatchery Subcommittee	January 17, 2013	Meeting
PRCC Hatchery Subcommittee	February 21, 2013	Meeting
PRCC Hatchery Subcommittee	March 21, 2013	Meeting
PRCC Hatchery Subcommittee	April 9, 2013	Meeting
PRCC Hatchery Subcommittee	May 16, 2013	Meeting
PRCC Hatchery Subcommittee	June 19, 2013	Meeting
PRCC Hatchery Subcommittee	July 18, 2013	Meeting
PRCC Hatchery Subcommittee	July 23, 2013	Conference call
PRCC Hatchery Subcommittee	August 22, 2013	Meeting
PRCC Hatchery Subcommittee	September 19, 2013	Meeting
PRCC Hatchery Subcommittee	October 17, 2013	Meeting
PRCC Hatchery Subcommittee	November 21, 2013	Meeting
PRCC Hatchery Subcommittee	December 10, 2013	Conference call
PRCC Hatchery Subcommittee	December 19, 2013	Meeting

Table 10 Statement of Agreements approved by the Priest Rapids Coordinating Committee Hatchery Subcommittee.

Years and SOA #	Title of Statement of Agreement	Date Approved
2013-01	White River Spring Chinook Mitigation	02/08/13
2013-05	Carlton Acclimation Facility Capacity Utilization	04/18/13
2013-06	Monitoring and Evaluation Plan for PUD Hatchery Programs: 2013 Update	04/17/13
2013-07	Priest Rapids Hatchery Fall Chinook Fry-to-Smolt Conversion	06/26/13

5.2 Planning Documents Summary

All hatchery planning documents and associated M&E plans have been approved by the PRCC HSC and by FERC, and all have been submitted to NMFS (Table 11). NMFS issued a 13-year Section 10 take permit for the White River and Nason Creek spring Chinook programs in July 2013. NMFS' action on all other permits for Grant PUD-funded programs is pending. Permits for all remaining programs are anticipated to be issued in 2014.

Table 11 Hatchery planning documents.

Document	Approved by PRCC Hatchery Subcommittee	Submitted to NMFS for approval*	Approved by FERC	NMFS approval/ESA take permit
White River spring Chinook salmon (HGMP)	Aug. 20, 2009	Sept. 15, 2009	Feb. 7, 2012	July 3, 2013
Nason Creek spring Chinook salmon (HGMP)	Aug. 20, 2009	Sept. 15, 2009	Feb. 7, 2012	July 3, 2013
Methow spring Chinook salmon (APP)*	Sept. 16, 2010	June 30, 2009	Dec. 14, 2011	Processing
Okanogan spring Chinook salmon (APP)*	Sept. 23, 2010	Sept. 30, 2009	Dec. 14, 2011	Processing
Wenatchee summer Chinook salmon (HGMP)	Sept. 17, 2009	Sept. 30, 2009	Nov. 15, 2011	Processing
Methow summer Chinook salmon (HGMP)	Sept. 17, 2009	Sept. 30, 2009	Nov. 15, 2011	Processing
Okanogan summer Chinook salmon (APP)*	Dec. 16, 2010	Sept. 30, 2009	Oct. 13, 2011	Processing
Fall Chinook salmon (HGMP & M&E)	Oct. 22, 2009	June 30, 2009	Feb. 7, 2012	Processing
Sockeye salmon (HGMP)	April 22, 2010	Sept. 30, 2009	Nov. 15, 2011	Processing
Coho salmon (APP)*	Oct. 11, 2010	Aug. 31, 2009	Oct. 13, 2011	Processing
Steelhead trout (APP)*	Sept. 23, 2010	Sept. 30, 2009	Dec. 14, 2011	Processing
Monitoring and Evaluation Plan covering all programs	Aug. 20, 2009	June 30, 2009	Approved as part of individual HGMP/APP filings.	N/A

*APPs are explanatory documents that explain the relationship between GPUDs responsibilities within a larger program covered by an HGMP submitted to NMFS by others.

5.3 Facility Development Summary

Substantial progress was made in 2013 on several Grant PUD hatchery program facilities (Table 12).

Table 12 Facility status for planned species.

Program	Facility status
White River spring Chinook salmon	Based on Statement of Agreement 2013-01, approved by the Priest Rapids Coordinating Committee – Policy Committee on Feb. 8, 2013, no long-term acclimation facility will be constructed prior to 2026.
Nason Creek spring Chinook salmon	Construction of the Nason Creek Acclimation Facility began in spring 2013 and is expected to be completed by May 30, 2014. The first spring Chinook production for this program (BY13) is currently on station at Eastbank Hatchery and will be transferred to the Nason Creek Acclimation Facility for overwinter acclimation in fall 2014.
Methow spring Chinook salmon	Methow Fish Hatchery, a Douglas PUD-owned facility, is operated by the Washington Department of Fish and Wildlife. Grant PUD entered into a new long-term interlocal agreement with Douglas PUD in 2nd quarter 2013 for spring Chinook production capacity for adult holding, spawning, incubation, rearing and release. The agreement is good through 2052.
Okanogan spring and summer Chinook salmon	Chief Joseph Hatchery construction, partially funded by Grant PUD, was completed in May 2013. Production at the facility began in summer 2013 with adult holding, spawning, incubation and early rearing. Final acclimation and release will occur at various locations in the Okanogan basin beginning in 2015.
Wenatchee summer Chinook salmon	Feasibility analysis for conversion of the Chelan PUD-owned Dryden Pond to an overwinter acclimation facility is in progress. Grant PUD completed permit-level designs in May 2012. Further design progress is dependent on outcome of the feasibility analysis (anticipated in 2015). Fish are currently spawned, incubated, and early reared at Eastbank Hatchery. Spring acclimation and release into the Wenatchee River occurs at the existing Chelan PUD-owned Dryden Pond. The first smolt release for Grant PUD's portion of this program will occur in spring 2014.
Methow summer Chinook salmon	Construction of the Carlton Overwinter Acclimation Facility began in spring 2013 and is expected to be completed in February 2014. Grant PUD's first summer Chinook production will be brought to the facility from Chelan PUD's Eastbank Hatchery in spring 2014 for overwinter acclimation and release.
Fall Chinook salmon	A major renovation of Priest Rapids Hatchery began in May 2012 and was substantially completed in December 2013. Operation using the new trapping, spawning and incubation components began in September 2013.
Sockeye salmon	Construction on the Penticton Sockeye Hatchery began in July 2013 and is expected to be completed by late summer 2014. The first production at the fry facility will begin with spawning in 2014.
coho salmon	Funding agreement only (10-year agreement with Yakama Nation – expires 2018)
Steelhead trout	Production currently occurs at Wells Hatchery, owned by Douglas PUD. A major renovation of this facility is expected to begin in 2014. Dedicated space for Grant PUD's steelhead production is planned. Acclimation facilities in the Okanogan basin are operational, but Grant PUD is pursuing additional acclimation opportunities and facility upgrades to St. Mary's Pond Acclimation Pond near Omak Creek. Discussions with the Colville Confederated Tribes are underway.

5.4 Number of Fish Released and Dollars Invested Summary

Fish have been produced and released for several of Grant PUD's hatchery programs for multiple years. Significant program investments were made in 2013, including investments in construction of hatchery facilities (Table 13). Expenditures included capital construction, operation and maintenance, and monitoring and evaluation.

Table 13 Approximate number of fish released and estimated dollars invested in support of Grant PUD's hatchery mitigation.

Program	Years that fish were released	Mean number of fish released per year	Number of fish released in 2013	GPUD Program investment ($) in 2013*	GPUD Program investment ($) total*
White River spring Chinook salmon	2004-13	63,601	105,000	$1,512,759	$25,310,694
Nason Creek spring Chinook salmon	2004-05	6,600	0	$5,771,197	$8,387,016
Methow spring Chinook salmon	2007-13	131,374	185,687	$1,328,496	$6,673,040
Okanogan spring Chinook salmon	None	0	0	$79,085	$2,743,239
Wenatchee Summer Chinook salmon	None	0	0	$369,906	$1,543,239
Methow Summer Chinook salmon	None	0	0	$4,016,793	$5,560,658
Okanogan Summer Chinook salmon	None	0	0	$199,869	$7,137,977
Fall Chinook salmon	1985-2013a	5,131,308	5,831,730	$10,608,683	$31,473,646
Sockeye salmon	2005-13	809,195	869,300	$3,066,869	$7,293,822
Coho salmon	2007-13	1,461,095	1,501,324	$249,215	$2,796,183
Steelhead	2005-13	106,612	65,970	$700,215	$4,173,554
Total	**2004-13**	**7,709,785**	**8,559,011**	**$27,903,087**	**$103,093,068**

[a] First fish were released in 1972, but the data from the earlier releases is not as robust as the later dates.

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES. These expenditures do not include Grant PUD staff labor or travel expenditures.

[b] Coho program and related data reporting runs October 1 through September 30, previous year.

5.5 Monitoring and Evaluation Summary

Monitoring and Evaluation activities continued for all hatchery programs currently being implemented by Grant PUD (Table 14). A revised five-year M&E Plan for upper Columbia species was approved by the PRCC HSC in April 2013 (Hillman et al. 2013). A request for proposals to implement the M&E plan in the Wenatchee Basin was also completed during 2013 and contracts to implement the work are being processed for implementation in 2014. Grant PUD has also invested in studies to help improve the performance of hatchery programs. These studies will help inform the optimal size-target and growth of fish reared in the hatchery and also provide additional tools to improve imprinting.

Table 14 Monitoring and Evaluation activities for Grant PUD hatchery programs, partially and fully funded by Grant PUD. The span of years that activities were conducted is in each cell.

Program	Brood Collection	Spawning	Tagging	Release	Juvenile Abundance	Redd Surveys	Carcass Recoveries
White River spring Chinook salmon	97-09	01-13	04-13	02, 04-13	07-13	97-13	97-13
Nason Creek spring Chinook salmon	98-99, 13	02-03, 13	04-05	04-05	07-13	98-99	98-99
Methow spring Chinook salmon	96-99*, 05-13	96-99, 05-13	01-13	02-13	02-13	96-13	96-13
Okanogan spring Chinook salmon	NA	NA	NA	NA	NA	NA	NA
Wenatchee summer Chinook salmon	13	13	13	NA	NA	NA	NA
Methow summer Chinook salmon	13	13	13	NA	NA	NA	NA
Okanogan summer Chinook salmon	13	13	NA	NA	NA	NA	NA
Fall Chinook salmon	98-13	98-13	98-13	98-13	98-13	10-13	10-13
Sockeye salmon	04-12	04-12	04-13	04-13	04-13	04-13	04-13
Coho salmon	05-13	05-13	06-13	06-13	06-13	06-13	06-13
Steelhead trout (Methow)	05-12	05-12	05-12	05-12	05-12	05-12	05-12
Steelhead trout (Okanogan)	06-13	06-13	07-13	07-13	07-13	07-13	07-13

*Part of the captive brood program

5.6 Upper Columbia River Steelhead Supplemental Plan

Grant PUD is required under T&C 1.25 (NMFS 2008) to consult with the PRCC HSC (subject to NMFS approval) to develop an APP to rear 100,000 yearling UCR steelhead for release in the UCR basin. The PRCC HSC has previously agreed that on an annual basis Grant PUD's steelhead compensation responsibilities may be met by funding the Colville Tribes' 20,000 steelhead program in Omak Creek (Okanogan River) and the remaining 80,000 steelhead at the WDFW-operated program at Wells Hatchery owned by Douglas PUD. The PRCC HSC further agreed that as the Omak Creek program develops, it would decide on appropriate adjustments to the apportionment described above. Part of this requirement is to develop a comprehensive monitoring and evaluation program which includes monitoring in the natural environment and investigating the impacts of the hatchery program on the naturally produced steelhead population. This is subject to PRCC HSC approval, and the monitoring and evaluation program may be implemented in conjunction with ongoing or future monitoring and evaluation programs with other entities such as Chelan and Douglas PUDs through cost-sharing agreements.

5.6.1 Program Background

Originally listed as endangered in 1997 the status of UCR steelhead has changed several times; as of August 15, 2011 the upper Columbia distinct population segment (DPS) for steelhead was listed as threatened by NOAA Fisheries. This DPS includes all naturally spawned anadromous steelhead populations below natural and man-made impassable barriers in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border, as well six artificial propagation programs: the Wenatchee River, Wells Hatchery (in the Methow

and Okanogan rivers), Winthrop National Fish Hatchery, Omak Creek, and the Ringold steelhead hatchery programs.

Beginning in 2005, Grant PUD released hatchery steelhead into the Methow basin and co-funded M&E activities as part of its mitigation requirement using facilities at Wells Hatchery. In 2007, Grant PUD released yearling steelhead smolts into the Okanogan basin as part of a reintroduction program operated by the Colville Tribes at Cassimer Bar. Because of poor survival and inadequate hatchery infrastructure, Cassimer Bar was discontinued after the 2011 release and the entire program was moved to Well Hatchery. In order to concentrate M&E efforts into a single basin Grant PUD's steelhead mitigation program has been released wholly into the Okanogan since 2012.

5.6.2 Hatchery Planning Documents

The Wells Hatchery Steelhead HGMP was completed and submitted to NOAA Fisheries in 2011. Currently, NMFS is evaluating the HGMP prior to issuing a new section 10 permit for the Upper Columbia steelhead hatchery programs. An extension to Section 10 permit 1395 was granted by NMFS on September 20, 2013 as the previous permit expired on October 2, 2013. The quantitative objectives for steelhead were approved by the PRCC HSC in January 2009. Grant PUD submitted an APP for both the Wells and Cassimer Bar programs to the PRCC and PRCC HSC on April 17, 2009, and to NMFS on September 30, 2009. The APP was approved by the PRCC HSC on September 23, 2010, submitted to FERC for approval on September 30, 2010, and approved by FERC on December 14, 2011.

An updated HGMP for the Okanogan steelhead program developed by the Colville Confederated Tribes in 2013 was submitted to the PRCC HSC in July and approved by the PRCC HSC in August. It was submitted to NMFS in September and is currently under consideration. A Section 10 permit for the program is expected to be issued by June 2014.

5.6.3 Facilities

Since 2005, Grant PUD has funded releases of yearling steelhead smolts into the upper Columbia basin (Table 15). Grant PUD finalized a new long-term agreement with Douglas PUD in 2013 that will provide new infrastructure at the Wells Hatchery as part of an overall plan to re-design and modernize the facility. Through the agreement, Grant PUD will provide capital for spawning, incubation, and rearing infrastructure for its 100,000 smolt program. Designs for the modernization are expected to be completed in 2014 with construction to follow.

Currently Omak Creek is the only location used for brood collection for the Okanogan program but as it expands, other trapping locations and acclimation sites may be used or developed. A spring-time acclimation raceway on Omak Creek near the St. Mary's Mission is currently used for the locally adapted yearling program.

5.6.4 Operations and Maintenance

Grant and Douglas PUDs developed a new long-term agreement in 2013 for production of Grant PUD's steelhead mitigation program. This agreement covers reimbursement to Douglas PUD for Grant PUD's proportionate use of the Wells Hatchery facility for its steelhead program, including operations and maintenance, monitoring and evaluation, and the capital improvements described in Section 5.6.3.

Grant PUD also continues to fund the Okanogan basin steelhead program managed by the Colville Confederated Tribes. A new two-year agreement between Colville Confederated Tribes and Grant PUD is expected to be signed in early 2014 which will extend the program, including brood collection, transport, acclimation (as needed), and all associated M&E activities through 2016.

In spring 2013, 65,970 BY 2012 steelhead smolts were released into the Okanogan basin as part of Grant PUD's mitigation requirement. Seven consecutive brood years (since 2005) have been released into the Okanogan basin as part of the Colville Confederated Tribes' steelhead program using locally adapted brood. As of November 2013, approximately 26,062 brood year 2013 fish were on-site at the Wells Hatchery as part of Colville Confederated Tribes' steelhead program and 116,984 BY 2013 fish are reserved for Grant PUD from the Wells Hatchery. The fish are scheduled for release in spring 2014. Approximately 15,000 PIT tags and 25,000 coded-wire tags (CWTs) were placed in steelhead parr in October 2013. These fish are rearing at Wells Hatchery and will be released in the spring of 2014.

The mean and total releases for both the Wells and Omak programs between 2005 and 2013 and annual O&M, M&E and capital costs are listed below (Table 15).

Table 15 Steelhead released and annual expenditures as part of the Grant PUD's mitigation requirement.

Calendar Year	Numbers of Fish Released	Annual Expenditures*		
		Capital**	O&M/M&E***	Expenditure Totals
2005	100,000	$542	$285,020	$285,562
2006	101,379	$1,626	$297,680	$299,306
2007	127,819	$2,037	$375,355	$377,392
2008	128,415	$6,269	$425,296	$431,565
2009	95,505	$7,510	$504,510	$512,020
2010	97,393	$7,800	$655,405	$663,205
2011	117,963	$8,376	$320,786	$329,162
2012	84,420	$10,619	$564,508	$575,127
2013	65,970	$114,920	$585,295	$700,215
Mean	106,612			
Totals	**852,894**	**$159,699**	**$4,013,855**	**$4,173,554**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES. Does not include Grant PUD staff labor or travel expenditures.
**These are amortized amounts.
***M&E costs include studies and hatchery evaluations.

5.6.5 Monitoring and Evaluation

As part of program expansion, a request to increase the number of brood collection from 16 to 54 has been made to NMFS with a decision pending. After transport from the collection site to Wells Hatchery the fish are spawned, incubated, and reared prior to transport and released back into select areas of the Okanogan basin. The production goal is for 20,000 or more smolts to be released into Omak Creek in early May. Any excess production above 20,000 fish will be out-

planted into other approved tributaries. Current M&E activities conducted are shown in Table 16 and are consistent with Grant PUD's approved M&E Plan.

Table 16 Monitoring and Evaluation activities for Okanogan basin steelhead, funded by Grant PUD.

Activity	2006	2007	2008	2009	2010	2011	2012	2013
Brood Collection	X	X	X	X	X	X	X	X
Spawning	X	X	X	X	X	X	X	X
Tagging		X	X	X	X	X	X	X
Release		X	X	X	X	X	X	X
Smolt Abundance		X	X	X	X	X	X	X
Carcass/TagRecoveries		X	X	X	X	X	X	X
Redd Surveys		X	X	X	X	X	X	X

5.7 Upper Columbia River Spring Chinook Salmon Supplementation

Upper Columbia River (UCR) Spring Chinook covered under this T&C (1.26; 2008 NMFS) are listed as Endangered (FR Vol. 64, No. 56, March 24, 1999). This Evolutionary Significant Unit (ESU) includes all naturally spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Hatchery propagation of the White River, Nason Creek, Chiwawa River, Twisp River, Methow River, and Chewuch River spring Chinook stocks is included in the ESU.

5.8 White River Spring Chinook Salmon Program

The 2008 NMFS BiOp (T&C 1.27) required Grant PUD to continue to implement the White River spring-run Chinook salmon program. This included the possible development of rearing and acclimation facilities. The program was to be implemented to reach a yearling smolt production level of a total of 150,000 fish. However, in 2012 the smolt production level was recalculated to a total of 74,556. This recalculation and a subsequent statement of agreement suspending the program through 2026 were approved by FERC in November 2013. Details regarding this agreement are found in Section 5.8.1.

5.8.1 Program Background

The White River spawning aggregate is within the UCR spring Chinook salmon ESU. In 1997, a spring Chinook captive broodstock program was initiated for the White River population as an emergency effort to reduce the risk of extinction. Adult escapement has remained low in the White River and the captive-brood program is ongoing. The final egg collection for the first-generation portion of the captive-brood program occurred in 2009. The program was expected to transition to traditional adult-based supplementation once the captive-brood program sunsets in 2016. However, in 2012 resource co-managers determined that an adult-based supplementation program as required is not feasible at this time, due primarily to the inability to collect sufficient broodstock to support a 74,556 smolt program. The PRCC Policy Committee approved a statement of agreement in February 2013 (SOA 2013-01) to cease the captive brood program with the last release of fish in 2016 and last monitoring of captive brood fish in 2019. This agreement also states that Grant PUD will not be responsible for any artificial propagation activities in the White River through broodyear 2026. Grant PUD will continue to monitor and evaluate spring Chinook in the White River during this time period to meet the objectives of

Grant PUD's M&E Plan. It is anticipated Grant PUD's total mitigation of 223,670 Wenatchee basin spring Chinook will be met through increased releases from Grant PUD's Nason Creek program. Any shortfalls that occur in the Nason Creek program through 2026 will be met through other hatchery alternatives as agreed to by the PRCC HSC. An Order approving these program changes was issued by FERC on November 1, 2013 (P-2114-263).

5.8.2 Hatchery Planning Documents

The quantitative objectives for spring Chinook were approved by the PRCC HSC in January 2009. The overall M&E plan, including White River spring Chinook, was submitted to NMFS on June 30, 2009, approved by the PRCC HSC on August 20, 2009 and submitted to FERC on June 28, 2010. A draft HGMP was submitted to the PRCC HSC on April 17, 2009 and to NMFS on June 30, 2009. The PRCC HSC approved the revised plan on August 20, 2009. The PRCC HSC-approved plan was resubmitted to NMFS on September 15, 2009. NMFS requested additional information from Grant PUD on October 22, 2009. An addendum to the HGMP was provided to NMFS in March 2010 and the application was released for public comment by NMFS March 18, 2010, submitted to FERC on June 28, 2010, and approved by FERC on February 7, 2012. A Section 10 ESA take permit was issued for this program by NMFS in July 2013.

5.8.3 Facilities

Because no permanent facilities will be developed for the White River program through 2026 (SOA 2013-01) a short, six-week period of acclimation for juveniles will occur each year until the captive brood program is ceased. Juveniles will be transferred each March from Little White Salmon National Fish Hatchery (LSNFH) to temporary tanks placed on Grant PUD-owned property at mile two of the White River and in net pens in Lake Wenatchee.

5.8.4 Operations and Maintenance

Since 2006, Grant PUD has maintained a contract with the U.S. Department of the Interior for services related to the current captive-broodstock program at Little White Salmon National Fish Hatchery (LWSNFH) near Cook, WA. The captive broodstock are held and spawned at the hatchery and their progeny are early reared there before transport to the White River for spring acclimation and release. Grant PUD also contracts with the WDFW for transportation, final rearing, and release services associated with the White River spring Chinook acclimation program.

5.8.4.1 Broodstock Collection, Rearing, and Spawning

The first- and second-generation components of the White River program are being reared at LWSNFH. Spawning of first-generation adults during 2013 resulted in approximately 125,021 second-generation eggs as of November 30, 2013. A total of 97,713 BY 2012 F2s and 204 captive broodstock (F1s) of BY2009 were on station at LWSNFH as of November 30, 2013. No broodstock have been collected since 2009.

5.8.4.2 Fish Release

White River spring Chinook smolts released during 2013 were from BY 2011 (Table 17). Released fish were adipose-fin present and had a CWT in the base of the adipose-fin tissue. Additionally, approximately 54,500 fish had PIT-tags. A total of 42,000 fish were acclimated in 12 aluminum tanks at Grant PUD's property, located at White River river mile 2, and 105,000 were acclimated in net pens in Lake Wenatchee, at the mouth of the White River. Six-thousand

fish from acclimation tanks were released directly into the White River May 6-8, 2013. Thirty-six-thousand fish were released via trucked transport during the same time frame. All net-pen fish were released via trucked transport May 9-14, 2013. Table 17 shows the numbers of White River spring Chinook salmon released by brood year, acclimation type, and location. Program expenditures to date are reflected in Table 18.

Table 17 Numbers of White River Chinook salmon released by brood year, acclimation type, and location

Brood Year	Release Location	Approximate Number of Fish
2001	Egg basket in White River as fry	1,536
2002	Acclimation tanks in the White River	2,589
2003	Acclimation tanks in the White River	2,096
2004	Acclimation tanks in the White River	1,639
2005	Net pens in Lake Wenatchee	63,779
2006	Direct to White River as subyearlings & yearlings	139,644 and 142,033 respectively
2007	Net pens in Lake Wenatchee & Direct to Lake Wenatchee as yearlings	131,843
2008	Net pens in and at mouth of Lake Wenatchee and in White River	41,603
2009	Acclimation tanks and pens in White River, net pens in Lake and acclimation at River mile 11.5 via side channel and acclimation tanks.	112,596
2010	Acclimation tanks, bridge site	18,850
2011	Acclimation tanks into White and Wenatchee rivers. Net pens into Wenatchee River.	105,000
MEAN (all BY)		63,601
TOTAL		**763,208**

Table 18 Spring Chinook salmon annual expenditures for the White River program as part of Grant PUD mitigation

Calendar Year	Annual Expenditures*		
	Capital**	O&M/M&E***	Totals
1997-2007	$255,010	$14,213,321	$14,468,331
2008	$216,105	$2,342,711	$2,558,816
2009	$268,893	$836,973	$1,106,866
2010	$452,926	$1,403,046	$1,855,972
2011	$1,282,984	$1,115,380	$2,398,364
2012	$281,025	$1,128,561	$1,409,586
2013	$0	$1,512,759	$1,512,759
Totals	**$2,757,943**	**$22,552,751**	**$25,310,694**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES.
**Does not include Grant PUD staff labor or travel expenditures.
** M&E costs include studies and hatchery evaluations.

5.8.5 Monitoring and Evaluation

Since 2007, smolt abundance and emigration from the White River has been monitored using a rotary screw trap. The trap is located downstream of the Sears Creek Bridge. In 2013, the trap was operated from March 1 through late May, and early August through late November.

Preliminary analyses of PIT-tag data suggest survival was low for fish released in the White River and Lake Wenatchee from 2007 through 2013. The PRCC HSC is concerned that precocious male maturation and predation continue to negatively affect survival and emigration as fish migrate through Lake Wenatchee. The final rearing and acclimation strategies described above are designed to address these concerns.

In an effort to reduce precocious maturation, another feeding experiment was conducted in 2013 on BY 2011 juvenile White River spring Chinook salmon at LWSNFH. An approximate 10% reduction in precocious maturation was achieved relative to initial testing conducted in 2011.

Fisheries managers continue to develop an approach for managing spring Chinook in the Wenatchee Basin, which will include the White River program. The concept is to manage the proportion of hatchery and natural-origin fish in the broodstock and on the spawning grounds to limit impacts to the White River spring Chinook spawning aggregate. Information on M&E activities can be found in Table 19.

Table 19 Monitoring and Evaluation Activities for White River spring Chinook, partially or fully funded by Grant PUD.

Activity	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
Brood Collection	X	X	X	X	X	X	X	X	X	X	X	X	X				
Spawning					X	X	X	X	X	X	X	X	X	X	X	X	X
Tagging								X	X	X	X	X	X	X	X	X	X
Release						X		X	X	X	X	X	X	X	X	X	X
Smolt Abundance											X	X	X	X	X	X	X
Carcass Recoveries	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Redd Surveys	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

5.9 Nason Creek Spring Chinook Salmon Program

Under T&C 1.28 (2008 NMFS), Grant PUD continues its work to implement artificial propagation for spring-run Chinook salmon in Nason Creek. This includes the development of rearing and acclimation for production and release in 2015. The facility includes a 10% buffer in production capacity beyond the original required production levels of 250,000.

5.9.1 Program Background

The Nason Creek spawning aggregate is within the UCR spring-run Chinook Salmon ESU. In 1997, a spring Chinook captive-broodstock program was initiated for the Nason Creek population to reduce the risk of extinction. Improvement in adult escapement in Nason Creek has reduced the near-term risk of extinction, so the captive-broodstock program was discontinued. An adult-based supplementation program is being implemented with the intention to increase the abundance of naturally spawning spring Chinook salmon in Nason Creek. The program was to be implemented to reach a yearling smolt production level of a total of 250,000 fish. However, in early 2012 the smolt production level was recalculated to a total of 149,114. This recalculation and a subsequent statement of agreement suspending the White River spring Chinook program through 2026 were approved by FERC in November 2013. Shortfalls in the White River spring Chinook program through 2026 will be achieved through increased smolt releases (totaling 223,670) from the Nason Creek program. Any production shortfalls in the Nason Creek program through 2026 will be made-up through alternative hatchery production as approved by the PRCC HSC.

5.9.2 Hatchery Planning Documents

The PRCC HSC-approved HGMP was submitted to NMFS on September 15, 2009. The HGMP was released by NMFS for public comment on March 18, 2010, and the HGMP was submitted to FERC on June 28, 2010 and approved on February 7, 2012. The HGMP serves as an application for a Section 10 permit under the Endangered Species Act. A Section 10 ESA take permit was issued for this program by NOAA Fisheries in July 2013.

5.9.3 Facilities

The Nason Creek hatchery program employs adult supplementation technologies to rear, acclimate, and release progeny of Nason Creek spring Chinook. Beginning in 2013, immigrating adults were collected from the adult ladder at Tumwater Dam and by tangle-netting in Nason

Creek. Through a long-term hatchery sharing agreement between Chelan PUD and Grant PUD, adult holding, spawning, egg incubation, and initial rearing occurs at the Eastbank Hatchery on the Columbia River near Wenatchee, WA. As subyearlings, juveniles will be transferred from Eastbank Hatchery to the Nason Creek Acclimation Facility for overwinter acclimation. Overwinter acclimation will occur from October through release the following spring. Construction of the Nason Creek Acclimation Facility began in the spring of 2013 and will be completed in the spring of 2014. The resulting progeny will be released from the acclimation facility into Nason Creek at the smolt stage (20 months).

5.9.4 Operation and Maintenance

Approximately 13,200 yearling spring Chinook have been released into Nason Creek as a result of captive broodstock collected in 2002 and 2003 (Table 20). Monitoring and its associated expense were limited because the captive broodstock program was discontinued due to better than expected adult escapement in Nason Creek. However, capital and operations and maintenance expenses continue as the adult-based supplementation program develops (Table 21). Broodstock collection for the adult supplementation program began in 2013. The first releases for the program is expected in 2015.

Table 20 The numbers of Nason Creek spring Chinook salmon released by brood year, acclimation type, and location.

Brood Year	Release Location	Number of Fish
2002	Acclimation tanks in Nason Creek	8,956
2003	Acclimation tanks in Nason Creek	4,244
MEAN		6,600
TOTAL		13,200

Table 21 Spring Chinook salmon annual expenditures for the Nason Creek program as part of Grant PUD's mitigation requirement for the operation of the Priest Rapids Project.

Calendar Year	Annual Expenditures*		
	Capital	O&M/M&E	Totals
2004-2009	$1,023,577	$253,683	$1,277,240
2010	$177,359	$80,989	$258,348
2011	$393,551	$103,962	$497,513
2012	$502,910	$79,808	$582,718
2013	$5,714,051	$57,146	$5,771,197
Totals	**$7,811,428**	**$575,588**	**$8,387,016**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES.
**Breakdown of costs from 2004-2009 unavailable.
***Does not include Grant PUD staff labor or travel expenditures and includes studies.

5.9.5 Monitoring and Evaluation

Grant PUD continued to co-fund juvenile emigrant trapping on Nason Creek (Table 22). Other M&E activities to evaluate the future Nason Creek supplementation program continue to occur, but are not presented in Table 22. These activities include redd surveys, carcass surveys, and reproductive success studies that are currently funded by Chelan PUD and Bonneville Power Administration (BPA).

Table 22 Monitoring and Evaluation Activities for Nason Creek spring Chinook, partially or fully funded by Grant PUD.

Activity	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13
Brood Collection	X	X														X
Spawning					X	X										X
Tagging							X	X								
Release							X	X								
Smolt Abundance										X	X	X	X	X	X	X
Carcass Recoveries	X	X														
Redd Surveys	X	X														
Run Composition /Genetics Evaluations																X

5.10 Methow River Spring Salmon Chinook Program

Methow spring Chinook are included in the UCR spring Chinook salmon ESU. In August 2004, Douglas PUD and Grant PUD entered into a 10-year Interlocal Agreement enabling Grant PUD to utilize excess rearing capacity at the Methow Fish Hatchery owned by Douglas PUD and operated by WDFW. Under this agreement, Grant PUD has the ability to request use of excess rearing capacity for five groups of fish. In September 2004, the Chelan/Douglas PUD HCP and the PRCC HSC agreed upon the framework regarding current and future plans for Douglas PUD to raise mitigation and study fish for Grant PUD.

5.10.1 Program Background

In June 2013, Douglas and Grant PUDs entered into a new long-term agreement for excess capacity at Methow Hatchery for Grant PUD's spring Chinook program. In 2013, the PRCC HSC also approved Grant PUD's annual request as part of Grant PUD mitigation for a request up to 201,000 BY 2012 spring Chinook at Douglas PUD's Methow Hatchery. This action was subsequently approved by the PRCC.

5.10.2 Hatchery Planning Documents

The Methow spring Chinook HGMP is currently under review by NMFS. Quantitative objectives for the program were approved by the PRCC HSC in January 2009. Grant PUD submitted an APP for its Methow spring Chinook program to the PRCC HSC on April 17, 2009 and to NMFS on June 30, 2009. The APP was approved by the PRCC HSC on September 16, 2010, submitted

to FERC on September 30, 2010 and approved by FERC on Dec. 14, 2011. A renewed Section 10 permit for this program is expected by June 2014.

5.10.3 Facilities

The Methow Hatchery has a long history of operation by WDFW and the current facilities are meeting Grant PUD's program needs. There is no current discussion regarding the potential for extensive upgrades at the hatchery.

5.10.4 Operations and Maintenance

Broodstock collection primarily occurs at Wells Dam around the first of May and lasts up to two months. Monthly health examinations including length and weight samples are conducted and growth is monitored regularly.

The number of yearling smolts released in the spring of 2013 from the 2011 brood year was 185,687 fish and represents the seventh consecutive year of fish released on behalf of Grant PUD, with over $6 million dollars being committed to the program to date (Table 23). BY 2012 and 2013 fish are currently being rearing at Methow Hatchery.

Table 23 Spring Chinook salmon smolts released and annual expenditures for the Methow hatchery into the Methow basin as part of Grant PUD's mitigation requirement.

Calendar Year	Numbers of Fish Released	Annual Expenditures*
		O&M**/M&E***
2005	-	$544,874
2006	-	$500,407
2007	152,451	$490,577
2008	150,509	$599,761
2009	109,488	$512,935
2010	187,865	$976,937
2011	210,336	$691,546
2012	186,029	$1,027,507
2013	185,687	$1,328,496
Mean	168,909	
Total	**1,182,365**	**$6,673,040**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES
**Does not include Grant PUD staff labor or travel expenditures.
***Includes studies and hatchery evaluations.

5.10.5 Monitoring and Evaluation

Under its agreement with Douglas PUD, Grant PUD has co-funded the M&E program for Methow spring Chinook since 2005, as well as other hatchery evaluations, and original and contemporary capital expenses. A list of M&E activities can be found in Table 24.

Table 24 Monitoring and Evaluation activities for the Methow spring Chinook salmon hatchery program that is partially or fully funded by Grant PUD.

Activity	2005	2006	2007	2008	2009	2010	2011	2012	2013
Brood Collection	X	X	X	X	X	X	X	X	X
Spawning	X	X	X	X	X	X	X	X	X
Tagging			X	X	X	X	X	X	X
Release			X	X	X	X	X	X	X
Smolt Abundance		X	X	X	X	X	X	X	X
Carcass Recoveries		X	X	X	X	X	X	X	X
Redd Surveys		X	X	X	X	X	X	X	X

5.11 Okanogan Basin Spring Chinook

Hatchery compensation for Okanogan basin spring Chinook is satisfied through an agreement with the PRCC HSC for annual smolt releases of 110,000 into the Okanogan basin each year through the Chief Joseph Hatchery program, operated by the Colville Confederated Tribes and funded by the Bonneville Power Administration and Grant, Douglas and Chelan PUDs.

5.11.1 Program Background

Grant PUD began discussions with the Colville Confederated Tribes in 2006 regarding the proposed Chief Joseph Hatchery. In August of the following year, a Memorandum of Understanding was signed with BPA, Chelan PUD, Grant PUD, and Colville Confederated Tribes to fund the Chief Joseph Hatchery through a cost-share agreement.

In 2010, a tri-party agreement with BPA, Colville Confederated Tribes, and Grant PUD was signed allocating funds for the construction and operation of the Chief Joseph Hatchery. Grant PUD funded 18.3% of the construction costs for the facility, which was completed in 2013. Grant PUD is also committed to funding 18.3% of the operation, maintenance, repair, and replacement of the facility, which is expected to produce 2.9 million spring and summer Chinook annually. Annual costs to date for the spring Chinook portion of Grant PUD's overall production can be found in Table 25.

Table 25 Spring Chinook salmon annual expenditures for the Okanogan program as part of Grant PUD's mitigation requirement.

Calendar Year	Annual Expenditures*		
	Capital	O&M/M&E	Totals
2010	$2,173,494	$0	$2,173,494
2011	$39,518	$0	$39,518
2012	$451,142	$0	$451,142
2013	$0	$79,085	$79,085
Totals	**$2,664,154**	**$79,085**	$2,743,239

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES

**Does not include Grant PUD staff labor or travel expenditures and includes studies and hatchery evaluations.

5.11.2 Hatchery Planning Documents

Grant PUD submitted an APP for the Methow spring Chinook program to the PRCC HSC on April 17, 2009 and to NMFS on September 30, 2009. The APP was approved by the PRCC HSC on September 23, 2010. The HGMP and APP were submitted to FERC on September 30, 2010 and the APP was approved on Dec. 14, 2011.

5.11.3 Facilities

The construction of the Chief Joseph Hatchery, funded under the Northwest Power and Conservation Council's Fish and Wildlife Program (BPA funding) and Grant PUD cost-share, began in June 2010 and was completed in spring 2013. Production of spring and summer Chinook began in July 2013.

A pilot weir on the Okanogan River downstream of Malott, WA was installed and operated during the summer of 2012 and 2013 for the purpose of testing trapping and passage effectiveness, as well as to evaluate the potential for using a similar structure in adult management (both hatchery and natural-origin fish). There were 17 changes implemented to the weir operation in 2013, based on results from the 2012 trapping season. In general, the results to date have been positive and plans for trapping operations in 2014 are in development. Full program reviews between all parties occur annually in March.

5.11.4 Operations and Maintenance

The first spring Chinook broodstock for the Chief Joseph Hatchery was collected in 2013 from Leavenworth stock. Approximately 400 male, female, and jack spring Chinook salmon produced 566,854 eggs as of the end October. Because the facilities were brand new and untested, the first year's brood collection was limited to 60% of total capacity. No fish have been released to date for this program as permits are still pending (anticipated to be issued by June 2014).

5.11.5 Monitoring and Evaluation

As with design, construction, and O&M costs, Grant PUD is committed to funding 18.3% of the M&E costs for the Chief Joseph Hatchery spring Chinook program. As part of the M&E program, the temporary pilot weir on the Okanogan River was installed and operated between August 19 and Sept. 27, 2013. Approximately 3,000 fish were collected and sampled as part of weir operation. In addition to successful weir and trap operation, underwater video, and information on run timing and origin data were collected.

5.12 Fall Chinook Protection Program

As part of Grant PUD's fall Chinook Protection Program required under the SSSA, Grant PUD was required to develop and implement a comprehensive Fall Chinook Protection Program for the fall Chinook populations in the mid-Columbia region affected by the Project. The Program was comprised of the following components: Program Performance Standards, a Passage Program for the Project, the HRFCPPA, and a Fall Chinook APP as described in the SSSA, including facility improvements to the Priest Rapids Hatchery.

5.12.1 Program Background

As part of its overall Fall Chinook Protection Program related to artificial propagation, Grant PUD produces 5 million fall Chinook smolts as mitigation for spawning areas inundated by Project reservoirs. Further, to achieve NNI Grant PUD is also required to provide facilities necessary to produce an additional 1 million fall Chinook sub-yearling smolts. This NNI component of the overall production was recalculated from 1 million to 325,543 sub-yearling smolts by the PRCC HSC in early 2012. Additionally, Grant PUD is required to compensate for the impacts of follow fluctuations within the Hanford Reach to take advantage of the available rearing habitat within its reservoirs by producing an additional 1 million fry. Due to the anticipated low survival of fry released into Project reservoirs, the PRCC HSC agreed in spring 2013 to convert Grant PUD's annual 1 million fry obligation to sub-yearling smolt releases of 273,961 (SOA 2013-07). With these adjustments, Grant PUD's total fall Chinook obligation is currently 5,599,504 sub-yearling smolts releases annually. These mitigation revisions were approved by FERC on November 1, 2013 (P-2114-263).

Grant PUD continues to consult with the PRCC HSC to review the performance of the Fall Chinook Protection Program and determine its continued ability to achieve its performance standards.

5.12.2 Hatchery Planning Documents

The Hanford Reach Fall Chinook salmon HGMP and M&E plan was submitted for review to the PRCC HSC on January 1, 2009 and April 17, 2009. The plan was submitted to FERC on August 27, 2010 and approved on February 7, 2012. An approved plan by NMFS will result in a new Section 10 Permit that will only cover production at Priest Rapids Hatchery and a previous permit issued during 2003 for all non-listed salmonid programs in the upper Columbia River. The new permit is anticipated to be issued by NMFS by June 2014.

5.12.3 Facilities

Grant PUD, in consultation with the PRCC, developed the Priest Rapids Hatchery facilities improvements as outlined in Section 9.6 of the SSSA. Overall design of the renovated facility to produce Grant PUD's mitigation of 5.6 million fall Chinook salmon sub-yearling smolts (plus an additional design capacity for 100,000 smolts) was completed and approved by the PRCC HSC. Construction of the facility, which produces both Grant PUD's current mitigation requirements, and 1.7 million smolts and 3.5 million eyed-eggs for the CORPS, began in spring 2012 and is substantially complete. New components of the facility were operational for all broodstock collection, spawning and incubation activities in the fall of 2013.

5.12.4 Operations and Maintenance

Historical and current information regarding Priest Rapids Hatchery egg take, release and associated expenditures are reflected in Table 26.

Table 26 Priest Rapids Hatchery Egg Take, Release and Costs.

			Annual Expenditures		
Brood Year	Grant Fish Released	Other Fish Released	Capital	O&M**/M&E***	TOTAL
1985				$-	
1986				$-	
1987				$-	
1988	5,404,550	0		$-	
1989	6,431,100	0		$-	
1990	5,239,700	93,800		$-	
1991	5,158,700	1,841,400		$-	
1992	5,451,000	1,683,159		$-	
1993	5,008,476	1,697,360		$-	
1994	5,002,000	1,700,000		$-	
1995	5,000,000	1,700,000		$-	
1996	4,944,700	1,699,400		$-	
1997	5,029,070	1,708,530		$-	
1998	4,841,800	1,663,000		$-	
1999	5,156,000	1,700,000		$461,545	$461,545
2000	5,119,100	1,743,450		$598,792	$598,792
2001	5,041,060	1,737,975		$581,134	$581,134
2002	5,071,640	1,705,965		$664,368	$664,368
2003	5,114,560	1,700,000		$501,156	$501,156
2004	4,899,835	1,700,000		$714,149	$714,149
2005	5,180,752	1,695,538		$732,716	$732,716
2006	5,024,634	1,718,467		$746,409	$746,409
2007	4,548,306	0		$821,250	$821,250
2008	5,067,926	1,720,388	$230,336	$737,252	$967,588
2009	5,064,043	1,712,608	$227,367	$543,893	$771,260
2010	5,081,184	1,717,206	$2,044,281	$724,359	$2,768,640
2011	5,271,247	1,785,701	$9,613,911	$922,045	$10,535,956
2012	5,091,902	1,730,959	$9,690,605	$918,078	$10,608,683
MEAN	5,131,308	1,434,331			
TOTALS	123,151,383	34,423,947	$21,806,500	$9,667,146	$31,473,646

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES
**Does not include Grant PUD staff labor or travel expenditures.
***Includes studies and hatchery evaluations.

5.12.5 Monitoring and Evaluation

Data collection in fulfillment of the Priest Rapids Hatchery M&E Program was initiated in September 2010. Data was collected primarily at the Priest Rapids Hatchery volunteer trap beginning in September, at the hatchery during spawning, and in the Columbia River during and after spawning. Otolith marks were available to help determine hatchery and natural origin of adults. Annual reports that present the current year as well as previous years data have been completed (Hoffarth and Pearsons 2012 a, b, Richards et al. 2013). Data collection associated with the hatchery M&E plan will continue in 2014.

Pilot studies were conducted to evaluate alternative means to achieve desired broodstock and offspring characteristics.

5.12.6 Hanford Reach Fall Chinook Protection Program 2011 and 2012 brood years

As in previous years, implementation of the HRFCPPA was very successful for the 2011-2012 brood year. Protections for fall Chinook salmon from the 2012 BY began on October 15 and continued through June 9, 2013. Based on HRFCPPA criteria and redd counts in the Vernita Bar index area, spawning began October 24 and continued through November 18, 2012. There was a total of 111 redds counted in the index area during the redd survey on November 18 and the distribution of those redds resulted in a Critical Elevation of 65 kcfs. Minimum discharge protections were maintained through the End of Emergence on April 26, 2013. Rearing Period protections began at the start of emergence and continued through June 9, 2013. With the exception of two occasions during the Rearing Period, all constraints were met during for the 2011-2012 12 BY season. One of the exceedances could not have been prevented because of increasing inflows. The second exceedance was intentionally implemented to address changing conditions and reduce the overall effect hydro-operations. Constraints could have been met, but would have required dramatic fluctuations in discharge and significant drafting of multiple reservoirs. An alternative operation was collaboratively developed that did not meet constraints, but provided greater protections for fry rearing in the Hanford Reach. Performance during the 2012 BY (i.e., 97.5% of Rearing Period constraints met) was second only to the perfect compliance that was achieved for the 2011 BY. The cooperation and coordination during the intentional exceedance further demonstrates the continued commitment and strong relationships developed by the signatories to the HRFCPPA.

Fall Chinook salmon stranding and entrapment surveys were completed during each Rearing Period in 2011, 2012, and 2013 as part of the follow-up monitoring plan required by the HRFCPPA (see Article 401(a)(5)). A report of results from 2013 (Hoffarth et al. 2013) was filed with FERC on January 15, 2013.

Protections for fall Chinook salmon from the 2013 BY began on October 15, 2013 and will continue through May or June 2014. Based on redd counts in the Vernita Bar index area, the Initiation of Spawning was determined to be on October 23 for all three elevation zones on Vernita Bar. The End of Spawning was determined to be November 24, 2013. There was a total of 372 redds counted in the index area during the final redd count and the distribution of those redds resulted in a Critical Elevation of 65 kcfs. Minimum discharge protections were maintained through the writing of this report. Protections for BY 2013 will continue into 2014 and will be reported in the 2014-2015 FERC report.

5.13 Summer Chinook

The objective of the Summer Chinook Protection Program is to achieve NNI from the operations of the Project on summer Chinook salmon populations that pass through the Project. Grant PUD's original summer Chinook mitigation obligation was for artificial propagation of 834,000 juvenile salmonids on an annual basis. This number was recalculated to 659,816 by the PRCC HSC in 2012 and approved by FERC on November 1, 2013 (P-2114-263). These fish are divided for release into each of the Wenatchee, Methow, and Okanogan rivers. Details about each of these individual programs can be found below.

5.13.1 Wenatchee Summer Chinook Program Background

Hatchery mitigation for summer Chinook salmon is used to mitigate for unavoidable losses associated with the Project. This mitigation is intended to result in NNI. Grant PUD will began releasing summer Chinook smolts into the Wenatchee River in 2015 under an agreement with Chelan PUD to hold, spawn, incubate and early rear fish at Eastbank Hatchery and to acclimate and release the fish from Chelan's Dryden Pond.

5.13.1.1 Hatchery Planning Documents

Versions of the HGMP were distributed to the PRCC HSC for review and comment on October 2007, June 2008, and April 14, 2009. The revised HGMP was voted on and approved by the PRCC HSC on September 17, 2009, submitted to NMFS on September 30, 2009 and submitted to FERC on January 28, 2011. The HGMP was approved by FERC on November 15, 2011. Grant PUD is waiting for a response from NMFS relative to a Section 10 permit (anticipated for issuance by June 2014).

5.13.1.2 Facilities

The PRCC HSC approved the modification of Eastbank Hatchery to accommodate Grant PUD's summer Chinook mitigation for ultimate release into the Wenatchee and Methow river basins. The modifications include the capacity to hold adults, incubate eggs, and rear fish prior to transfer to an acclimation site. Modifications were completed in 2012.

Fish will be transferred from Eastbank Hatchery to Dryden Acclimation Pond adjacent to the Wenatchee River. Grant PUD developed a basis of design (BOD) for modification of the Dryden Acclimation Pond so that it could be used for overwinter acclimation. The BOD was approved by the HSC on February 27, 2012 and was sent to Chelan PUD for consideration. Chelan PUD does not support modifications of this facility at this time primarily because of concerns related to meeting phosphorous management associated with the Wenatchee River Total Maximum Daily Load requirement administered by WDOE. The WDOE has calculated the maximum allowable phosphorous discharge that would be permitted from the Dryden Pond Facility. Grant PUD has been exploring different cost-effective options, such as development of an ultra-low phosphorous feed and the reduction of fish size, to accommodate the desired number of summer Chinook salmon at Dryden Pond. Grant PUD will acclimate fish during the spring until it is decided whether the Dryden Acclimation Pond will be modified. This approach was approved by the PRCC HSC in 2009 (SOA-2009-09).

Costs associated with development of Wenatchee summer Chinook salmon facilities are included in Table 27.

5.13.1.3 Operations and Maintenance

Under the long-term hatchery sharing agreement between Chelan PUD and Grant PUD, broodstock for the program was collected in 2013. Adults collected were transferred to Eastbank Hatchery where they were held and spawned. Incubation and early rearing also occurred at Eastbank where the fish will be reared until transfer to the Dryden Acclimation Pond in spring 2015 and released into the Wenatchee River.

Table 27 Summer Chinook salmon annual expenditures for the Wenatchee program as part of Grant PUD's mitigation requirement for the operation of the Priest Rapids Project.

Calendar Year	Annual Expenditures*		
	Capital	O&M**/M&E*	Totals
1997-2007	$130,000	NA	$130,000
2008	$32,442	NA	$32,442
2009	$159,422	NA	$159,422
2010	$344,081	NA	$344,081
2011	$58,141	NA	$58,141
2012	$300,269	$148,978	$449,247
2013	$2,185	$367,721	$369,906
Totals	**$1,026,540**	**$516,699**	**$1,543,239**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES
**Does not include Grant PUD staff labor or travel expenditures.
***Includes studies and hatchery evaluations.

5.13.1.4 Monitoring and Evaluation

Grant PUD began contributing to the M&E of the Wenatchee summer Chinook program in 2012. Previously, Chelan PUD had been conducting long-term monitoring of their summer Chinook salmon mitigation program. Progress on an ecological risk assessment and identification of reference streams occurred during 2012 as part of a work effort by the Hatchery Evaluation Technical Team.

5.14 Methow Summer Chinook Program Background

Hatchery mitigation for summer Chinook salmon is used to mitigate for unavoidable losses associated with the Project. This mitigation is intended to result in NNI. The numbers of fish were recalculated in 2012 and this recalculation applies to fish released in 2014. The summer Chinook salmon to be released into the Methow River was recalculated to 200,000. This recalculation was approved by FERC on November 1, 2013 (P-2114-263).

5.14.1.1 Hatchery Planning Documents

Versions of the HGMP were distributed to the PRCC HSC for review and comment on October 2007, June 2008, and April 14, 2009. The revised HGMP was voted on and approved by the PRCC HSC on September 17, 2009, submitted to NMFS on September 30, 2009, and submitted to FERC on January 28, 2011. The HGMP was approved by FERC on November 15, 2011. Grant PUD is waiting for a response from NMFS relative to a Section 10 permit (anticipated by June 2014).

5.14.1.2 Facilities

The PRCC HSC approved the modification of Eastbank Hatchery to accommodate Grant PUD's summer Chinook mitigation for ultimate release into the Wenatchee and Methow river basins. The modifications include the capacity to hold adults, incubate eggs, and rear fish prior to transfer to an acclimation site. Modifications were completed in 2012.

Fish will be transferred from Eastbank Hatchery to the Carlton Acclimation Facility adjacent to the Methow River. The PRCC HSC approved Grant PUD's final design of the Carlton Acclimation Facility and construction began in spring 2013. The facility, which will be completed by February 2014, will be capable of providing overwinter acclimation.

Costs associated with development of Wenatchee summer Chinook salmon facilities are included in Table 28.

5.14.1.3 Operations and Maintenance

Under the long-term hatchery sharing agreement between Chelan PUD and Grant PUD, broodstock for the program was collected in 2013. Adults collected were transferred to Eastbank Hatchery where they were held and spawned. Incubation and early rearing will also occur at Eastbank Hatchery. Fish produced from the 2012 broodstock will be transferred to the new Carlton Acclimation Facility in the spring of 2014 for acclimation and release. Beginning with production from the 2013 brood class, juveniles will be transferred to the Carlton Acclimation Facility as subyearlings in the fall where they will be overwintered and released as yearlings in 2015.

Table 28 Summer Chinook salmon annual expenditures for the Methow program as part of Grant PUD's mitigation requirement for the operation of the Priest Rapids Project.

Calendar Year	Annual Expenditures*		
	Capital	O&M**/M&E***	Totals
1997-2007	$130,000	$-	$130,000
2008	$32,442	$-	$32,442
2009	$159,422	$-	$159,422
2010	$356,065	$-	$356,065
2011	$80,400	$-	$80,400
2012	$660,498	$125,038	$785,536
2013	$3,677,041	$339,75	$4,016,793
Totals	**$5,095,868**	**$464,790**	**$5,560,658**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES
**Does not include Grant PUD staff labor or travel expenditures.
***Includes studies and hatchery evaluations.

5.14.1.4 Monitoring and Evaluation

Grant PUD began contributing to the M&E of the Methow summer Chinook program in 2012 and will continue to fund M&E activities for the duration of the project. Previously, Chelan PUD had been conducting long-term monitoring of their summer Chinook salmon mitigation program.

Progress on an ecological risk assessment and identification of reference streams occurred during 2012 as part of a work effort by the Hatchery Evaluation Technical Team.

5.14.2 Okanogan Summer Chinook Background

Hatchery mitigation for summer Chinook salmon is used to mitigate for unavoidable losses associated with the Project. This mitigation is intended to result in NNI. Grant PUD began discussions with the Colville Confederated Tribes in 2006 regarding a potential cost-share in the proposed Chief Joseph Hatchery. In August of the following year, a Memorandum of Understanding was signed with the BPA, Grant PUD, Chelan PUD, and Colville Confederated Tribes to fund the Chief Joseph Hatchery through a cost-share agreement. In 2010, a tri-party agreement with BPA, Colville Confederated Tribes, and Grant PUD was signed allocating funds for the construction and operation of the Chief Joseph Hatchery. Grant PUD funded 18.3% of the total construction costs (Table 29).

5.14.2.1 Hatchery Planning Documents

Grant PUD submitted an APP for the Methow summer Chinook program to the PRCC Hatchery Subcommittee on April 17, 2009 and to NMFS on September 30, 2009. The APP was approved by the PRCC HSC on September 23, 2010. The HGMP and APP were submitted to FERC on September 30, 2010 and approved by FERC on Oct. 13, 2011.

5.14.2.2 Facilities

Construction of the Chief Joseph Hatchery funded under the Northwest Power and Conservation Council's Fish and Wildlife Program (BPA funding) and Grant PUD cost-share began in early June 2010. The facility was completed in spring 2013 and production of spring and summer Chinook began in July 2013. Acclimation ponds for the integrated yearling summer Chinook program are located at Similkameen (designed for 250,000 fish), Riverside (275,000), and Omak (275,000).

A pilot weir on the Okanogan River downstream of Malott, WA was installed and operated during the summer of 2012 and 2013 for the purpose of testing trapping and passage effectiveness as well as to evaluate the potential for using a similar structure in adult management (both hatchery and natural-origin fish). There were 17 changes implemented to the weir operation in 2013, based on results from the 2012 trapping season. In general, the results to date have been positive and plans for trapping operations in 2014 are being made, with a full report to be provided during the Chief Joseph Hatchery annual program review in March 2014.

Table 29 Summer Chinook salmon annual expenditures for the Okanogan program as part of Grant PUD's mitigation requirement for the operation of the Priest Rapids Project.

Calendar Year	Annual Expenditures*		
	Capital	O&M/M&E**	Totals
2010	$6,026,506	$0	$6,026,506
2011	$109,572	$0	$109,572
2012	$802,030	$0	$802,030
2013	$0	$199,869	$199,869
Totals	**$6,938,108**	**$199,869**	$7,137,977

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES
**Does not include Grant PUD staff labor or travel expenditures and includes studies and hatchery evaluations.

5.14.2.3 Operations and Maintenance

The first summer Chinook broodstock for the Chief Joseph Hatchery was collected in 2013 and included both hatchery and natural-origin summer Chinook. Through October, approximately 1,045,000 green eggs were collected for the first spawn. Since the facilities were brand new and untested, the first year's brood collection was scheduled only to be 60% of total capacity.

Acclimation site locations are currently under evaluation for the summer Chinook APP. Grant PUD's mitigation for this program is 278,000 summer/fall Chinook released into the Okanogan or Columbia rivers.

5.14.2.4 Monitoring and Evaluation

As with design, construction, and O&M costs, Grant PUD is committed to funding 18.3% of the M&E costs for the spring Chinook program resulting from the Chief Joseph Hatchery.

As part of the M&E program, the temporary, pilot weir downstream of the town of Malott, WA on the Okanogan River was installed and operated for the second year in 2013, from August 19 to September 27 and over 3,000 fish were collected and sampled as part of weir operation. In addition to successful weir and trap operation, underwater video, and information on run timing and origin data were collected.

5.15 Sockeye Protection Program

Grant PUD, in consultation with the PRCC, has developed and implemented a comprehensive Sockeye Protection Program for the sockeye populations in the mid-Columbia region affected by the Project. This includes a program to achieve NNI of the operations of the Project on sockeye populations that pass through the Project area and is comprised of the following components: Program Performance Standards; a Passage Program for the Project; 7% compensation provided through an Artificial Propagation Program and 2% compensation provided through the habitat program described (in the SSSA). Grant PUD's overall requirement is to strive to artificially propagate up to 1,143,000 sockeye smolts. As approved by the PRCC HSC in 2010, Grant PUD is meeting NNI through funding of the Okanagan Nation Alliance's Skaha Reintroduction Program and through development of a new hatchery facility in Penticton, B.C., with capacity for an eight million sockeye egg program. This agreement is in effect through 2021.

5.15.1 Program Background

There are two sockeye populations within the upper Columbia River, the Wenatchee and Okanogan river stocks, neither of which are listed under the Endangered Species Act. These populations are healthy enough to allow tribal fisheries in Washington and Canada, with periodic recreational fisheries in Lake Wenatchee, the mainstem Columbia River, and selected tributaries and lakes.

Recognizing that the Okanogan River, which includes nursery/rearing lakes in British Columbia, is the best option for long-term sockeye mitigation opportunity the PRCC HSC approved in 2008 Grant PUD's plan to fund an experimental program to reintroduce sockeye into Skaha Lake in British Columbia. On Oct. 21, 2010, the PRCC HSC approved to extend this sockeye program for an additional five years (SOA-2010-08) and on Nov. 1, 2011, Grant PUD entered into a long-term agreement with the Okanagan Nation Alliance (ONA) to co-fund a new sockeye hatchery, hatchery operations and maintenance costs, and a monitoring and evaluation program.

5.15.2 Hatchery Planning Documents

The HGMP was developed for the sockeye reintroduction program and the quantitative objectives were approved by the PRCC HSC in January 2009. Grant PUD submitted an HGMP to the PRCC HSC on April 17, 2009 and to NMFS on September 30, 2009. The HGMP was submitted to FERC January 28, 2011 and approved by FERC on Nov. 15, 2011.

5.15.3 Facilities

Construction of the Penticton Sockeye Hatchery began in July 2013 and as of December 2013, the steel hatchery building, laboratory, and foundation work is complete and between 35 and 40 percent of the total budget has been expended. Based on the current schedule, the hatchery commissioning should occur in July 2014 with occupation of the facility occurring approximately a month later. The first brood is anticipated to be collected, transported, and spawned in the fall of 2014, with subsequent rearing and release to occur in 2015.

Table 30 Sockeye fry released into Skaha and/or Osoyoos Lakes funded by Grant PUD as part of the ONA 12-year Reintroduction program.

Calendar Year	Numbers of Fish Released	Annual Expenditures*		
		Capital	O&M/M&E**	Totals
2005	1,205,500	**$-**	$377,203	$377,203
2006	913,440	**$-**	$504,115	$504,115
2007	976,140	**$-**	$263,685	$263,685
2008	584,430	**$-**	$340,137	$340,137
2009	1,065,438	**$-**	$738,056	$738,056
2010	581,262	**$-**	$391,184	$391,184
2011	594,000	**$-**	$553,915	$553,915
2012	552,948	$453,737	$604,921	$1,058,658
2013	869,300	$2,397,663	$669,206	$3,066,869
Mean	809,145			
Totals	**6,473,158**	**$2,851,400**	**$4,442,422**	**$7,293,822**

*ALL COSTS ARE ESTIMATES ONLY AND ARE LIKELY TO BE UNDERESTIMATES

**Does not include Grant PUD staff labor or travel expenditures and includes studies and hatchery evaluations.

5.15.4 Operations and Maintenance

Only a limited number of broodstock were collected in 2013 from the Okanagan River, near Oliver, British Columbia, Canada for the purpose of disease screening. Because there was no hatchery capacity available at Shuswap Falls and the Penticton Hatchery was not completed, no broodstock were collected for spawning in 2013. However, there was a considerable amount of work by ONA staff for hatchery design, construction, and on-going M&E activities.

5.15.5 Monitoring and Evaluation

To ensure that sockeye reintroduction does not negatively affect kokanee populations, fishery agencies (including ONA) developed a comprehensive monitoring and evaluation plan, which is partially funded by Grant PUD. However because sockeye have not shown any detrimental effects on Skaha kokanee, the Canadian and US committees have agreed to extend the program for an additional five years beyond the original 2017 termination date. ONA has conducted extensive monitoring of adult sockeye passage at Okanogan Falls Dam. Due to large adult returns and high flow conditions during each of the last three years, sockeye have ascended the previously impassable Okanogan Falls Dam and utilized available habitat.

In addition to monitoring kokanee for the recreational fishery, a suite of other activities are conducted on an annual basis (Table 31) all of which have been approved by committee and contained in Grant PUD's M&E plan.

Table 31 Monitoring and evaluation activities for Okanogan River sockeye salmon; partially funded by Grant PUD.

Activity	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
brood collection	X	X	X	X	X	X	X	X	X	
spawning	X	X	X	X	X	X	X	X	X	
tagging	X	X	X	X	X	X	X	X	X	
release	X	X	X	X	X	X	X	X	X	X
smolt abundance	X	X	X	X	X	X	X	X	X	X
carcass recoveries	X	X	X	X	X	X	X	X	X	X
redd surveys	X	X	X	X	X	X	X	X	X	X

5.16 Coho Protection Program

A coho salmon reintroduction program intended to develop a locally adapted and naturally spawning population from lower Columbia River stock is being implemented by the Yakama Nation. Grant PUD entered into a 10-year funding agreement with the Yakama Nation to assist in development of the program. This $7.4 million agreement is for the period 2008 - 2018.

As a result of the coho program, coho salmon redds and carcasses have been observed in the Wenatchee and Methow rivers. However, the extent to which natural production is occurring has not yet been determined. As more information becomes available and the future of this population has been reviewed and discussed, a decision can be made regarding the long-term management of UCR coho salmon. Grant PUD will work with the PRCC HSC to adaptively manage the coho program to achieve program goals and objectives. Until that time, survival studies for coho through the Project are not proposed.

5.16.1 Hatchery Planning Documents

The HGMP and APP for the UCR coho reintroduction program were submitted to FERC in February 2011 and approved by FERC on October 13, 2011.

5.16.2 Facilities

Funding provided by Grant PUD and other partners involved with the Mid-Columbia coho Restoration Program, is being used by the Yakama Nation to develop and operate facilities to support the program.

5.16.3 Operations and Maintenance

Hatchery supplementation of coho salmon in the Upper Columbia River occurs in two river basins; the Wenatchee and Methow. Adult broodstock for the Wenatchee Basin is collected at Dryden Dam, Tumwater Dam, and the Leavenworth National Fish Hatchery. Adults are transported to the Entiat National Fish Hatchery where they are spawned and their eggs are incubated and hatched prior to release into acclimation ponds the following spring.

Coho salmon broodstock for the Methow Basin is collected primarily at Wells Dam and transported to the Winthrop National Fish Hatchery. However, returns are also collected and spawned at the hatchery. Juvenile coho salmon are held on station until released into acclimation ponds the following spring. The coho reintroduction program and data reporting run on a cycle of October 1 through September 30. Therefore, coho program summary information for the

current year of this report is incomplete. Previous year's data are reported for the coho program (October 1, 20011 – September 30, 2012). Annual smolt releases and costs are presented in Table 32.

Table 32 Total number of coho smolts released as part of the Yakama Nation coho reintroduction program.

Year	Numbers of Fish Released	Annual Expenditures
2007	1,561,768	$0
2008	1,509,093	$43,504
2009	1,424,578	$727,094
2010	1,443,480	$624,459
2011	1,297,974	$665,274
2012	1,529,678	$486,637
2013		$249,215
Mean	1,461,095	
TOTAL	**8,766,571**	**$2,796,183**

*Grant PUD funds the activities associated with approximately 373,296 fish annually. These expenditures do not include Grant PUD staff labor or travel expenditures

5.16.3.1 2013 Broodstock Collection

The Wenatchee River Basin broodstock was comprised of 946 adult coho (377 female, 569 male). Broodstock were collected at Dryden Dam, Tumwater Dam, and Leavenworth National Fish Hatchery.

The Methow River Basin broodstock was comprised of 277 adult coho (327 females, 452 males). Broodstock were collected at Wells Dam, Winthrop National Fish Hatchery, and Methow Hatchery.

5.16.4 Monitoring and Evaluation

As part of the reintroduction program, the Yakama Nation has established an extensive monitoring and evaluation program in both basins where hatchery supplementation is occurring. Regular spawning-ground surveys are conducted in main stems and tributaries, while redds and live fish are enumerated and carcasses are collected for tag recovery and acquiring biological data (Table 33**Error! Reference source not found.**). A smolt trap is operated in the Wenatchee River during the juvenile coho salmon out-migration to provide smolt-abundance estimates. Other M&E activities partially funded by Grant PUD are listed in Table 34.

Table 33 Summary of coho redd surveys in the Wenatchee Basin and Methow Basin, 2013.

River	Redds	Carcasses Recovered
Wenatchee*	125	30
Methow*	48	28

Note:* Includes tributaries.

Table 34 Monitoring and Evaluation Activities for Wenatchee and Methow coho salmon that are partially funded by Grant PUD.

Activity	2005	2006	2007	2008	2009	2010	2011	2012	2013
brood collection	X	X	X	X	X	X	X	X	X
spawning	X	X	X	X	X	X	X	X	X
tagging		X	X	X	X	X	X	X	X
release		X	X	X	X	X	X	X	X
smolt abundance		X	X	X	X	X	X	X	X
carcass recoveries		X	X	X	X	X	X	X	X
redd surveys		X	X	X	X	X	X	X	X

6.0 Priest Rapids Coordinating Committee Habitat Subcommittee

Since January 2005, the PRCC Habitat Subcommittee has met monthly to undertake and oversee the planning and implementation of the necessary program elements to support habitat protection and restoration programs. The committee operates on consensus regarding decisions directly linked to project management. Unresolved disputes may be elevated to the PRCC, which adheres to the 2006 SSSA process for dispute resolution if necessary. Decisions regarding management of anadromous fishery resources in the UCR basin not directly linked to the Project are the purview of the agencies and Tribes. When carrying out activities that may affect local tributary habitat, the PRCC Habitat Subcommittee should seek advice from local entities, including the Upper Columbia Salmon Recovery Board in development of such activities.

The PRCC Habitat Subcommittee is the primary forum for implementing and directing habitat protection and restoration measures for the Project's anadromous fish programs covered under both the Biological Opinion and the SSSA. Under the provisions of these mandates and obligations, three funds were created by Grant PUD (Section 6.2).

FERC requires Grant PUD to continue to support the PRCC Habitat Subcommittee. This includes provision of sufficient facilitation, administration, and clerical support. Minutes are recorded and approved by the PRCC Habitat Subcommittee. A total of 10 meetings, two conference calls, and one field trip to projects in British Columbia were held by the PRCC Habitat Subcommittee members during calendar year 2013 (Table 35). Agendas and meeting minutes are available at Grant PUD's website.

Table 35 Priest Rapids Coordinating Committee Habitat Subcommittee 2013 meetings.

PRCC Habitat	January 10, 2013	Meeting
PRCC Habitat	February 14, 2013	Meeting
PRCC Habitat	March 14, 2013	Meeting
PRCC Habitat	April 11, 2013	Meeting
PRCC Habitat	May 9, 2013	Meeting
PRCC Habitat	June 13, 2013	Meeting
PRCC Habitat	June 17, 2013	Conference Call
PRCC Habitat	July 23, 2013	Conference Call
PRCC Habitat	August 15, 2013	Meeting

PRCC Habitat	September 12, 2013	Meeting
PRCC Habitat	October 10-11, 2013	Field Trip
PRCC Habitat	November 15, 2013	Meeting
PRCC/PRCC Habitat	December 18, 2013	Combined Meeting

Since 2006, 60 total projects have been approved for funding using one of the three funding accounts (601, NNI Fund, 602, Habitat Supplemental Fund, 603, Habitat Conservation Fund). Of those, 34 are completed and 26 are currently active and underway. Eleven new projects were approved in 2013 by the PRCC and/or PRCC Habitat Subcommittee with four from Fund 601, five from Fund 602, and two from Fund 603. The individual projects, separated by funding account, are listed in Table 36.

Table 36 Summary of habitat projects to date, funded in part or wholly approved by the PRCC and/or PRCC Habitat Subcommittee. Projects are grouped by type; No-Net-Impact (601), Habitat Conservation (602) and Habitat (603) funding accounts, by year completed and whether they have been completed or still ongoing.

Grouped Project Titles	Account	Benefits	Year Initiated	Year Completed	Expenditures to Date	Total Approved Cost
Predator Study	601	Predator Removal	2008	2012	$2,428,176	$2,447,907
McIntyre Dam	601	Fish Passage	2008	2013	$1,770,055	$1,770,055
ORRI Phase I	601	Habitat Restoration	2009	2009	$411,000	$411,000
Tall Timber	601	Conservation Easement	2010	2010	$55,000	$55,000
JSAT Steelhead & Pikeminnow Derby	601	Steelhead Study/Predation	2011	2011	$2,008635	$2,012,939
Pikeminnow Derby	601	Predation	2012	2012	$23,669	$25,000
Fish Screen Monitoring, Northern Pikeminnow Bridge 1, GeoChemical Analysis	601	Habitat Improvement/Predator removal/Land Aquisistion/Research	2012	Ongoing	$427,770	$1,571,959
Electrofishing Boat	601	Predation	2013	Ongoing		$125,000
Nason Creek-Godwin & Hardesty	602	Land Acquisition	2007	2007/2008	$650,059	$897,910
Trinidad Creek	602	Land Acquisition	2009	Ongoing	$84,851	$117,000
Vertical Drop Structure 13	602	Spawning Habitat Improvement	2011	Ongoing	$8,742	$65,141
Sugar Dike	602	Land Acquisition	2011	2011	$174,279	$170,366.48
Nason Creek B+ Reconnection, Wenatchee Nutrient Enhancement, Entiat Stormy Reach	602	Habitat Restoration and Assessment/Land Acquisition	2011/2012	Ongoing	$54,495	$991,000

Lower Wenatchee Instream Flow	602	Water Acquisition	2012	2012	$300,000	$300,000
ORRI Phase II, Icicle Creek Boulder Field, Shuttleworth Creek & Tyee Ranch	602	Habitat Restoration Fish Passage Assessment, Water Acquisition and Conservation Easement	2012	Ongoing	$258,902	$1,704,032
Roaring Creek Flow Restoration and Diversion	602	Fish Passage & Instream Flow	2013	Ongoing	$4133	$160,000
Robinson Property Acquisition	602	Land Acquisition	2013	Ongoing	$261,503	$270,065
Tyee Ranch Conservation Easement	602	Attorney/Consulting Fees	2013	2013	$1,000	$1,000
Entiat Stormy Phase II	602	Land Appraisals	2013	Ongoing	$0	$1,700
Entiat Cottonwood Phase II	602	Land/Water Acquisition	2013	Ongoing	$10,000	$10,000
Nason Creek-Godwin	603	Land Acquisition	2007	2007	$3,409	$3,409
Fulton Diversion Dam & Omak Creek	603	Fish Passage/Culvert Replacement	2006	2006	$126,971	$150,971
Skiikumchuck & Kitsap County LiDAR	603	Land Acquisition & Topographic Survey Data	2006	2007	$516,719	$524,000
Upper Columbia Basin LiDAR	603	Topographic Survey	2007	2007	$60,000	$60,000
Wenatchee River Irrigation Diversion & Antoine Creek	603	Water Acquisition & Habitat Restoration	2007	2008	$85,950	$91,970
Mission Creek Barrier Removal, Blackbird Island Phase I & Entiat River Knapp-Wham	603	Fish Passage/Habitat Restoration/Irrigation Diversion	2008	2009	$123,141	$132,935
Blackbird Island Phase II	603	Habitat Restoration	2009	2009	$133,398	$136,500
Bonaparte Creek	603	Livestock Exclusion	2009	2010	$24,078	$27,578
Trinidad Creek	603	Land Acquisition	2010	Ongoing	$84,851	$117,000
Nason Creek LWP	603	Alternative Analysis Design and Report	2010	2011	$45,722	$49,583
White River Nason View Cedar Bend	603	Land Acquisition	2010	2012	$455,600	$454,422
Libby Creek	603	Land Acquisition	2011	2011	$131,537	$206,600
Entiat Stormy Reach Phase II	603	Land Acquisition	2012	2012	$10,000	$10,000
White River Gage	603	O&M Streamflow	2012	Ongoing	$179,980	$227,500

Station, Nason Creek Lower White Pine Ponds, Lower Chewuch Beaver Project & Barkley Irrigation Diversion		Monitoring				
Okanogan River Discharge Monitoring	603	O&M Streamflow Monitoring	2013	Ongoing	$0	$90,952
Icicle/Peshastin Irrigation Flow Analysis	603	Instream Flow Improvement	2013	Ongoing	$9,960	$174,847

6.1 Habitat Plan

As required under the 2004 and 2008 BiOps for the Project, issued by NMFS and the 2006 SSSA, Grant PUD, in consultation with the PRCC Habitat Subcommittee, developed a draft habitat plan for Chinook salmon and steelhead affected by operation of the Project. This plan was developed to shepherd the development and implementation of the protection and restoration programs that promote the rebuilding of self-sustaining and harvestable populations of Chinook salmon and steelhead, and to mitigate for a portion of unavoidable losses resulting from Project operations. This plan was submitted to FERC on June 30, 2009 and received FERC approval on March 5, 2010. As required by Grant PUD's license (Article 401(a)(3)), this plan is now being updated and finalized in consultation with the PRCC Habitat Subcommittee.

The PRCC and PRCC Habitat Subcommittee conducted a combined meeting on December 18, 2013 in order to review at least 20 potential projects that may be presented in 2014 from various sponsors. Although there has been no formal request or approval for these projects, it provided an opportunity for the two different committees to discuss the merits in advance of being formally presented for review. A guidance document was also produced, reviewed, and approved by the PRCC that provides more direction as to the supporting roles to each respective committee.

6.2 Habitat Account

Grant PUD allocates annual funds to a Priest Rapids Habitat Conservation Account in order to finance tributary or mainstem habitat projects to benefit UCR spring Chinook and UCR steelhead (Habitat Fund – BiOp). The SSSA requires additional allocations related to projects identified in the Project Habitat Plan for non-listed species (Habitat Supplemental Fund), and projects to help achieve juvenile survival standards (NNI Fund). Deposits to these accounts occur annually on February 15, concurrent with the filing of this annual FERC report. Expenditures from the NNI Fund occur in consultation with the PRCC, and expenditures of the Habitat Supplemental and Habitat BiOp funds are in consultation with the PRCC Habitat Subcommittee (Table 37). The 2013 deposit for the NNI-601 is $1,881,316; the Habitat Supplemental-602 is $995,421; and Habitat BiOP-603 is $355,587.

Table 37 Priest Rapids Coordinating Committee Habitat account balances and expenditures as of December 31, 2013.

Account	Beginning Balance	Expenditures	Unencumbered Balance

No Net Impact Fund	$6,015,659	$1,238,952	$4,776,707
Habitat Supplemental Fund	$4,159,262	$1,059,658	$3,099,604
Habitat Fund (BiOp)	$702,966	$102,073	$600,893
Total	$10,877,877	$2,400,683	$8,477,204

7.0 Consultation

Grant PUD meets monthly with the PRCC, which includes representatives of NMFS, USFWS, WDFW, Colville Confederated Tribes, and Yakama Nation.

In addition, all reports and documents, such as this one, are distributed to the PRCC 30 days prior to filing with FERC for review and comments. The 2013 Activities under the Priest Rapids Hydroelectric Project License (FERC No.2114) report was distributed on February 3, 2014 to the PRCC for review and comment.

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Appendix A
Priest Rapids Project 2013 Spill Summary

Table 1

2013 WANAPUM DAM SPILL GATE OPERATIONS FOR INADVERTENT SPILL

During Fish Spill **(4-19-2013)**

Total Spill In KCFS	Gate Number												Sluice Gate	Total Opening In Feet
	1	2	3	4	5	6	7	8	9	10	11	12		
2.2						1								1
4.4					1	1								2
6.6					1	1	1							3
8.8				1	1	1	1							4
11.0				1	1	1	1	1						5
13.2				1	1	1	1	1	1					6
15.4				1	1	2	1	1	1					7
17.6				1	2	2	1	1	1					8
19.8				1	2	2	2	1	1					9
22.0				1	2	3	2	1	1					10
24.2				1	2	3	2	2	1					11
26.4				1	2	3	3	2	1					12
28.6			1	1	2	3	3	2	1					13
30.8			1	1	2	3	3	2	1	1				14
33.0			1	1	2	3	3	2	1	1	1			15
35.2			1	2	2	3	3	2	1	1	1			16
37.4			1	2	3	3	3	2	1	1	1			17
39.6			1	2	3	3	3	2	2	1	1			18
41.8			1	2	3	3	3	2	2	1	1	1		19
44.0			1	2	3	3	3	3	2	1	1	1		20
46.2		1	1	2	3	3	3	3	2	1	1	1		21
48.4		1	1	2	3	3	3	3	2	2	1	1		22
50.6		1	1	2	3	3	3	3	2	2	2	1		23

52.8		1	1	2	3	3	3	3	3	2	2	1		24
55.0		1	1	3	3	3	3	3	3	2	2	1		25
57.2		1	2	3	3	3	3	3	3	2	2	1		26
59.4		1	2	3	3	4	3	3	3	2	2	1		27
61.6		1	2	3	3	4	4	3	3	2	2	1		28
63.8		1	2	3	4	4	4	3	3	2	2	1		29
66.0		1	2	3	4	4	4	4	3	2	2	1		30
68.2		1	2	3	4	4	4	4	4	2	2	1		31
70.4		1	2	3	4	4	4	4	4	3	2	1		32
72.6		1	2	3	4	4	4	4	4	3	2	2		33
74.8		2	2	3	4	4	4	4	4	3	2	2		34
77.0		2	3	3	4	4	4	4	4	3	2	2		35
79.2		2	3	4	4	4	4	4	4	3	2	2		36
81.4		2	3	4	4	4	4	4	4	4	2	2		37
83.6		2	4	4	4	4	4	4	4	4	2	2		38
85.8	1	2	4	4	4	4	4	4	4	4	2	2		39
88.0	1	2	4	4	4	4	4	4	4	4	3	2		40
90.2	1	3	4	4	4	4	4	4	4	4	3	2		41
92.4	1	3	4	4	4	4	4	4	4	4	4	2		42
94.6	2	3	4	4	4	4	4	4	4	4	4	2		43
96.8	2	4	4	4	4	4	4	4	4	4	4	2		44
99.0	2	4	4	4	4	5	4	4	4	4	4	2		45
101.2	2	4	4	4	4	5	4	5	4	4	4	2		46
103.4	2	4	4	4	4	5	4	5	4	4	4	3		47
105.6	2	4	4	5	4	5	4	5	4	4	4	3		48
107.8	2	4	4	5	4	5	5	5	4	4	4	3		49
110.0	2	4	4	5	5	5	5	5	4	4	4	3		50
112.2	2	4	4	6	5	5	5	5	4	5	4	3		51
114.4	2	4	4	5	5	5	5	5	5	5	4	3		52

116.6	2	4	5	5	5	5	5	5	5	5	4	3		53
118.8	2	4	5	5	5	5	5	5	5	5	5	3		54
121.0	2	4	5	5	5	6	5	5	5	5	5	3		55
123.2	2	4	5	5	5	6	5	6	5	5	5	3		56
125.4	2	4	5	5	5	6	6	6	5	5	5	3		57
127.6	2	4	5	6	5	6	6	6	5	5	5	3		58
129.8	2	4	5	6	5	6	6	6	5	6	5	3		59
132.0	2	4	5	6	6	6	6	6	5	6	5	3		60
134.2	2	4	5	6	6	6	6	6	6	6	5	3		61
136.4	2	4	6	6	6	6	6	6	6	6	5	3		62
138.6	2	4	6	6	7	6	6	6	6	6	5	3		63
140.8	2	4	6	6	7	6	7	6	6	6	5	3		64
143.0	2	4	6	6	7	6	7	6	7	6	5	3		65
145.2	2	4	6	6	7	7	7	6	7	6	5	3		66
147.4	2	4	6	6	7	7	7	7	7	6	5	3		67
149.6	2	4	6	7	7	7	7	7	7	6	5	3		68
151.8	2	4	6	7	7	8	7	7	7	6	5	3		69
154.0	2	4	6	7	7	8	7	8	7	6	5	3		70
156.2	2	4	6	7	7	8	8	8	7	6	5	3		71
158.4	2	4	6	7	7	8	8	8	8	6	5	3		72
160.6	2	4	6	7	8	8	8	8	8	6	5	3		73
162.8	2	4	6	7	8	8	8	8	8	7	5	3		74
165.0	2	4	6	8	8	8	8	8	8	7	5	3		75
167.2	2	4	7	8	8	8	8	8	8	7	5	3		76
169.4	3	4	7	8	8	8	8	8	8	7	5	3		77
171.6	3	5	7	8	8	8	8	8	8	7	5	3		78
173.8	3	5	7	8	8	8	8	8	8	8	5	3		79
176.0	3	5	7	8	8	8	8	8	8	8	5	4		80
178.2	3	5	7	8	8	8	8	8	8	8	6	4		81

180.4	3	5	8	8	8	8	8	8	8	8	6	4		82
182.6	3	5	8	8	8	9	8	8	8	8	6	4		83
184.8	3	5	8	8	8	9	8	9	8	8	6	4		84
187.0	3	5	8	8	9	9	8	9	8	8	6	4		85
189.2	3	5	8	8	9	9	9	9	8	8	6	4		86
191.4	3	5	8	8	9	9	9	9	9	8	6	4		87
193.6	3	5	8	9	9	9	9	9	9	8	6	4		88
195.8	3	5	8	9	9	9	10	9	9	8	6	4		89
198.0	3	5	8	9	9	10	10	9	9	8	6	4		90

Note:
1. Spill based on reservoir elevation of 570 feet.
2. Spillway with spill deflector (flip-lip) functioning in spillbays 1-12.
3. Spillbay discharge based upon the June 23, 1999 revised spillway discharge table.
4. Deflector performance is assumed lost after 4 feet opening.

Table 2

Inadvertent SPILL PATTERN during PRFB Construction-(during fish-spill) - 4/19/2013

Spread-spill

PRIEST RAPIDS DAM

Total Spill In KCFS	Gate Number 1	2	3	4	Top Spill 5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Sluice Gate
28.0		(fish-spill)		4	open	open	4		(fish-spill)							closed	closed	closed	closed	closed	closed	closed
29.5			1	4	open	open	4									closed	closed	closed	closed	closed	closed	closed
31.0			2	4	open	open	4									closed	closed	closed	closed	closed	closed	closed
32.5			2	4	open	open	4	1								closed	closed	closed	closed	closed	closed	closed
34.0		1	2	4	open	open	4	1								closed	closed	closed	closed	closed	closed	closed
35.5		1	3	4	open	open	4	1								closed	closed	closed	closed	closed	closed	closed
37.0		1	3	4	open	open	4	2								closed	closed	closed	closed	closed	closed	closed
38.5		1	3	4	open	open	4	2	1							closed	closed	closed	closed	closed	closed	closed
40.0		2	3	4	open	open	4	2	1							closed	closed	closed	closed	closed	closed	closed
41.5		2	3	4	open	open	4	2	2							closed	closed	closed	closed	closed	closed	closed
43.0		2	3	4	open	open	4	2	2	1						closed	closed	closed	closed	closed	closed	closed
44.5		2	3	4	open	open	4	3	2	1						closed	closed	closed	closed	closed	closed	closed
46.0		2	3	4	open	open	4	3	2	2						closed	closed	closed	closed	closed	closed	closed
47.5		2	3	4	open	open	4	3	3	2						closed	closed	closed	closed	closed	closed	closed
49.0		2	3	4	open	open	4	3	3	2	1					closed	closed	closed	closed	closed	closed	closed
50.5		2	3	4	open	open	4	3	3	2	1	1				closed	closed	closed	closed	closed	closed	closed
52.0		2	3	4	open	open	4	3	3	2	2	1				closed	closed	closed	closed	closed	closed	closed
53.5		2	3	4	open	open	4	4	3	2	2	1				closed	closed	closed	closed	closed	closed	closed
55.0		2	3	4	open	open	4	4	4	2	2	1				closed	closed	closed	closed	closed	closed	closed
56.5		2	4	4	open	open	4	4	4	2	2	1				closed	closed	closed	closed	closed	closed	closed

58.0		2	4	4	open	open	4	4	4	3	2	1			closed	closed	closed	closed	closed	closed	closed
59.5		2	4	5	open	open	4	4	4	3	2	1			closed	closed	closed	closed	closed	closed	closed
61.0		2	4	5	open	open	5	4	4	3	2	1			closed	closed	closed	closed	closed	closed	closed
62.5		2	4	5	open	open	5	4	4	3	2	2			closed	closed	closed	closed	closed	closed	closed
64.0		2	4	5	open	open	5	4	4	3	3	2			closed	closed	closed	closed	closed	closed	closed
65.5		2	4	5	open	open	5	5	4	3	3	2			closed	closed	closed	closed	closed	closed	closed
67.0		2	4	5	open	open	5	5	4	4	3	2			closed	closed	closed	closed	closed	closed	closed
68.5		2	4	5	open	open	5	5	4	4	3	2	1		closed	closed	closed	closed	closed	closed	closed
70.0		2	4	5	open	open	5	5	4	4	4	2	1		closed	closed	closed	closed	closed	closed	closed
71.5		2	4	5	open	open	5	5	4	4	4	2	2		closed	closed	closed	closed	closed	closed	closed
73.0		2	4	5	open	open	5	5	5	4	4	2	2		closed	closed	closed	closed	closed	closed	closed
74.5		2	4	5	open	open	5	5	5	4	4	2	2		closed	closed	closed	closed	closed	closed	closed
76.0		2	4	5	open	open	5	5	5	4	4	2	2	1	closed	closed	closed	closed	closed	closed	closed
77.5		2	4	5	open	open	5	5	5	4	4	3	2	1	closed	closed	closed	closed	closed	closed	closed
79.0		2	4	5	open	open	5	5	5	4	4	3	3	1	closed	closed	closed	closed	closed	closed	closed
80.5	1	2	4	5	open	open	5	5	5	4	4	3	3	1	closed	closed	closed	closed	closed	closed	closed
82.0	1	2	4	5	open	open	6	5	5	4	4	3	3	1	closed	closed	closed	closed	closed	closed	closed
83.5	1	2	4	6	open	open	6	5	5	4	4	3	3	1	closed	closed	closed	closed	closed	closed	closed
85.0	1	2	4	6	open	open	6	6	5	4	4	3	3	1	closed	closed	closed	closed	closed	closed	closed
86.5	1	2	4	6	open	open	6	6	5	4	4	4	3	1	closed	closed	closed	closed	closed	closed	closed
88.0	1	2	4	6	open	open	6	6	5	5	4	4	3	1	closed	closed	closed	closed	closed	closed	closed
89.5	1	2	4	6	open	open	6	6	6	5	4	4	3	1	closed	closed	closed	closed	closed	closed	closed
91.0	1	2	4	6	open	open	6	6	6	5	5	4	3	1	closed	closed	closed	closed	closed	closed	closed
92.5	1	2	4	6	open	open	6	6	6	5	5	4	3	2	closed	closed	closed	closed	closed	closed	closed
94.0	1	2	4	6	open	open	7	6	6	5	5	4	3	2	closed	closed	closed	closed	closed	closed	closed
95.5	1	2	4	6	open	open	7	7	6	5	5	4	3	2	closed	closed	closed	closed	closed	closed	closed
97.0	1	2	4	7	open	open	7	7	6	5	5	4	3	2	closed	closed	closed	closed	closed	closed	closed
98.5	1	2	4	7	open	open	7	7	6	5	5	4	4	2	closed	closed	closed	closed	closed	closed	closed
100.0	1	2	4	7	open	open	7	7	6	5	5	4	4	2	1	closed	closed	closed	closed	closed	closed	closed

101.5	1	2	4	7	open	open	7	7	6	5	5	4	4	3	1	closed	closed	closed	closed	closed	closed	closed
103.0	2	2	4	7	open	open	7	7	6	5	5	4	4	3	2	closed	closed	closed	closed	closed	closed	closed
104.5	2	3	4	7	open	open	7	7	6	5	5	4	4	3	2	closed	closed	closed	closed	closed	closed	closed
106.0	2	4	4	7	open	open	7	7	6	5	5	4	4	3	2	closed	closed	closed	closed	closed	closed	closed
107.5	2	4	5	7	open	open	7	7	6	5	5	4	4	3	2	closed	closed	closed	closed	closed	closed	closed
109.0	2	4	5	7	open	open	7	7	6	5	5	5	4	3	2	closed	closed	closed	closed	closed	closed	closed
110.5	2	4	5	7	open	open	7	7	7	5	5	5	4	3	2	closed	closed	closed	closed	closed	closed	closed
112.0	2	4	5	7	open	open	7	7	7	6	5	5	4	3	2	closed	closed	closed	closed	closed	closed	closed
113.5	2	4	5	7	open	open	7	7	7	6	6	5	4	3	2	closed	closed	closed	closed	closed	closed	closed
115.0	2	4	5	7	open	open	7	7	7	6	6	5	4	4	2	closed	closed	closed	closed	closed	closed	closed
116.5	2	4	5	7	open	open	7	7	7	6	6	6	4	4	2	closed	closed	closed	closed	closed	closed	closed
118.0	2	4	5	7	open	open	7	7	7	6	6	6	5	4	2	closed	closed	closed	closed	closed	closed	closed
119.5	2	4	5	7	open	open	8	7	7	6	6	6	5	4	2	closed	closed	closed	closed	closed	closed	closed
121.0	2	4	5	7	open	open	8	8	7	6	6	6	5	4	2	closed	closed	closed	closed	closed	closed	closed
122.5	2	4	5	7	open	open	8	8	7	7	6	6	5	4	2	closed	closed	closed	closed	closed	closed	closed
124.0	2	4	5	7	open	open	8	8	7	7	6	6	5	4	3	closed	closed	closed	closed	closed	closed	closed
125.5	2	4	5	7	open	open	8	8	7	7	6	6	6	4	3	closed	closed	closed	closed	closed	closed	closed
127.0	2	4	5	7	open	open	8	8	7	7	6	6	6	5	3	closed	closed	closed	closed	closed	closed	closed
128.5	2	4	6	7	open	open	8	8	7	7	6	6	6	5	3	closed	closed	closed	closed	closed	closed	closed
130.0	2	4	6	8	open	open	8	8	7	7	6	6	6	5	3	closed	closed	closed	closed	closed	closed	closed
131.5	2	4	6	8	open	open	8	8	7	7	7	6	6	5	3	closed	closed	closed	closed	closed	closed	closed
133.0	2	4	6	8	open	open	8	8	7	7	7	7	6	5	3	closed	closed	closed	closed	closed	closed	closed
134.5	2	4	6	8	open	open	8	8	8	7	7	7	6	5	3	closed	closed	closed	closed	closed	closed	closed
136.0	3	4	6	8	open	open	8	8	8	7	7	7	6	5	3	closed	closed	closed	closed	closed	closed	closed
137.5	3	5	6	8	open	open	8	8	8	7	7	7	6	5	3	closed	closed	closed	closed	closed	closed	closed
139.0	3	5	7	8	open	open	8	8	8	7	7	7	6	5	3	closed	closed	closed	closed	closed	closed	closed
140.5	3	5	7	8	open	open	8	8	8	8	7	7	6	5	3	closed	closed	closed	closed	closed	closed	closed
142.0	3	5	7	8	open	open	9	8	8	8	7	7	6	5	3	closed	closed	closed	closed	closed	closed	closed
143.5	3	5	7	8	open	open	9	9	8	8	7	7	6	5	3	closed	closed	closed	closed	closed	closed	closed

145.0	3	5	7	9	open	open	9	9	8	8	7	7	6	5	3	closed	closed	closed	closed	closed	closed	closed
146.5	3	5	7	9	open	open	9	9	8	8	8	7	6	5	3	closed	closed	closed	closed	closed	closed	closed
148.0	3	5	8	9	open	open	9	9	8	8	8	7	6	5	3	closed	closed	closed	closed	closed	closed	closed
149.5	3	5	8	9	open	open	9	9	8	8	8	7	7	5	3	closed	closed	closed	closed	closed	closed	closed
151.0	3	5	8	9	open	open	9	9	8	8	8	7	7	5	4	closed	closed	closed	closed	closed	closed	closed
152.5	3	5	8	9	open	open	9	9	8	8	8	7	7	6	4	closed	closed	closed	closed	closed	closed	closed
154.0	3	5	8	9	open	open	9	9	9	8	8	7	7	6	4	closed	closed	closed	closed	closed	closed	closed
155.5	3	5	8	9	open	open	9	9	9	9	8	7	7	6	4	closed	closed	closed	closed	closed	closed	closed
157.0	3	5	8	9	open	open	9	9	9	9	8	8	7	6	4	closed	closed	closed	closed	closed	closed	closed
158.5	3	5	8	9	open	open	10	9	9	9	8	8	7	6	4	closed	closed	closed	closed	closed	closed	closed
160.0	3	5	8	9	open	open	10	10	9	9	8	8	7	6	4	closed	closed	closed	closed	closed	closed	closed
161.5	3	5	8	9	open	open	10	10	9	9	9	8	7	6	4	closed	closed	closed	closed	closed	closed	closed

Note: Spill based on reservoir elevation of 486 feet.