

PUBLIC UTILITY DISTRICT NO. 1 *of* CHELAN COUNTY
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April 30, 2012

VIA ELECTRONIC FILING

Honorable Kimberly D. Bose, Secretary
Nathaniel J. Davis, Sr., Deputy Secretary
FEDERAL ENERGY REGULATORY COMMISSION
888 First Street, NE
Washington, DC 20426

Subject: Rocky Reach Hydroelectric Project, FERC No. 2145
Article 401 and Appendix A, Sections 5.7(1) and (2) – Annual Quality Assurance Project Report and QAPP Update

Dear Secretary Bose and Deputy Secretary Davis:

The Federal Energy Regulatory Commission (Commission or FERC) issued the "*Order Modifying and Approving Quality Assurance Project Plan Pursuant to Article 401 and Appendix A*" for the Rocky Reach Hydroelectric Project No. 2145 (Project) on November 3, 2010.[1]

As specified in the Order, the Public Utility District No. 1 of Chelan County (Chelan PUD) is required to file an annual Quality Assurance Project Plan (QAPP) report with the Commission by May 1 of each year for the duration of the license. Chelan PUD is required to file the annual QAPP report to the Washington Department of Ecology (Ecology) by March 1 and provide Ecology a minimum of 30 days to comment on the report. As part of the filing of the annual QAPP report with the Commission, Chelan PUD is required to include documentation of consultation with Ecology and its response to any comments received.

[1] 133 FERC ¶ 62,115

As specified in Paragraph 4 of the Order, Chelan PUD is to conduct water quality monitoring activities at the locations and frequency described below:

Parameter (metric)	**Location(s)**	**Frequency**
Temperature (degrees Celsius)	Rocky Reach forebay and tailrace, Rock Island forebay	Hourly, April-October
Temperature (degrees Celsius)	Juvenile fish bypass, adult fishway	Hourly for one year
Total dissolved gas (TDG) (% saturation)	Rocky Reach forebay and tailrace, Rock Island forebay	Hourly, April-August

Since the Order approving the QAPP was issued November, 2010, Chelan PUD is submitting the first annual QAPP report to include Rocky Reach and Rock Island temperature monitoring (April – October) and the juvenile fish bypass and adult fishway temperature monitoring to the Commission by May 1, 2012. Please refer to Chelan PUD's letter filed with the Commission on May 2, 2011.

TDG monitoring is currently conducted at both the Rocky Reach and Rock Island hydroelectric projects. Therefore, Chelan PUD has collected the required TDG data specified in Paragraph 10 of the Order and has included the annual Gas Abatement Report with this filing (see attachment).

If you have any questions or require additional information, please contact me or Waikele Hampton at (509) 661-4627.

Sincerely,

Michelle Smith
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Enclosure: Final 2011 QAPP Annual Report

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Rocky Reach
2011 Annual Quality Assurance Project Report and QAPP Update

FINAL

ROCKY REACH HYDROELECTRIC PROJECT
FERC Project No. 2145

April 30, 2012

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

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EXECUTIVE SUMMARY

The Public Utility District No. 1 of Chelan County (Chelan PUD) owns and operates the Rocky Reach Hydroelectric Project (Project) on the Columbia River. The Project is operated under the terms and conditions of Federal Energy Regulatory Commission (Commission or FERC) Hydroelectric Project License No. 2145.

The Commission issued the "Order on Offer of Settlement and Issuing New License" (License) and "Order on Rehearing and Clarification" for the Rocky Reach Hydroelectric Project No. 2145 (Project) on February 19, 2009, and May 21, 2009, respectively. In accordance with License Article 401 and Certification Condition Numbers 5.7(1) and 5.7(2) of Appendix A – Section 401 Water Quality Certification of the License, Chelan PUD is required to file a Quality Assurance Project Plan (QAPP) within one year of License issuance and annually thereafter with the Commission.

Section 5.7(8) of the 401 Certification requires an Annual Water Quality Monitoring Report[1] of water quality monitoring results, along with a summary report be submitted to WDOE by March 1 of each year, to track the Project's progress towards meeting remaining in compliance with state water quality standards.

The QAPP was submitted to WDOE on December 21, 2009 and filed with the FERC on February 19, 2010. The QAPP was approved by the FERC on November 3, 2010. The FERC Order Modifying and Approving the QAPP requires the submittal of the Annual Quality Assurance Project Report to the FERC by May 1 of each year. This report also includes the annual update to the QAPP.

The Water Quality Certification sections 5.7(1) and 5.7(2) requires Chelan PUD to monitor total dissolved gas (TDG) and temperature in the Project forebay and tailrace annually; temperature in the upstream fishway and juvenile fish bypass system for one year; a one-time study of pH, dissolved oxygen (DO), and water temperature in shallow water areas of the Rocky Reach reservoir, including areas that contain dense growths of aquatic macrophytes; and a one-time study of Gas Bubble Trauma (GBT).

The following report contains a summary of water quality monitoring conducted in 2011, proposed actions to be implemented in 2012, and annual update to the QAPP.

[1] Per Order Modifying And Approving Quality Assurance Project Plan Pursuant To Article 401 And Appendix A (issued November 03, 2010) the FERC refers to this report as the Annual Quality Assurance Project Report.

SECTION 1: INTRODUCTION

The Rocky Reach Hydroelectric Project (Project), owned and operated by Chelan County Public Utility District (Chelan PUD), is located on the Columbia River in Chelan County, Washington, approximately seven miles upstream of the city of Wenatchee, Washington (Figure 1). The Project utilizes the waters of the Columbia River, whose drainage basin extends over substantial portions of northern Washington, Idaho, Montana and into Canada. The Project reservoir (Lake Entiat) extends 43 miles to Douglas County PUD's Wells Dam. The Project consists primarily of an 8,235-acre reservoir; a 2,847-foot-long by 130-foot-high concrete gravity dam spanning the river, including a powerhouse and spillway; a juvenile fish bypass system, and hatchery facilities.

The 401 Certification requires Chelan PUD to monitor total dissolved gas (TDG) and temperature in the Project forebay and tailrace annually; temperature in the upstream fishway and juvenile fish bypass system (JFBS) for one year; a one-time study of pH, dissolved oxygen (DO), and water temperature in shallow water areas (macrophyte beds) of the Rocky Reach reservoir, including areas that contain dense growths of aquatic macrophytes; and a one-time study of Gas Bubble Trauma (GBT). In addition, the 401 Certification requires Chelan PUD to compile hourly temperature data from the Wells Dam tailrace. The 401 Certification also requires that a Quality Assurance Project Plan (QAPP) for these parameters (does not include Wells Dam tailrace temperature) be submitted for Ecology approval. A QAPP was submitted to Ecology and the final QAPP (Appendix A) was filed with FERC on February 19, 2010 (approved on November 3, 2010). The QAPP provided the basic framework for all the water quality monitoring and reporting required in the Rocky Reach 401 Certification.

Section 5.7(8) of the 401 Certification requires the submittal of an annual report of water quality monitoring results, along with a summary report by March 1 of each year to WDOE. WDOE will use the monitoring results to track the Project's progress toward meeting and remaining in compliance with the state water quality standards. Additionally, the FERC Order Modifying and Approving the QAPP requires the submittal of the annual report to the FERC by May 1 of each year.

Figure 1-1. Location of Rocky Reach Hydroelectric Project on the Columbia River.

SECTION 2: MONITORING PROCEDURES

2.1 Forebay and Tailrace TDG and Temperature

Consistent with the 401 Certification, TDG and temperature were monitored in the Project forebay and tailrace on an hourly basis, April 1 - August 31 and April – October, respectively.

The forebay fixed monitoring station (FMS) is located on the upstream side of the dam (Figure 2), the standpipe affixed to the corner between the powerhouse and spillway, approximately mid-channel. Consistent with the 401 Water Quality Certification (Ecology, April 4, 2006), the tailrace fixed monitoring station is located approximately 0.38 mile downstream of the dam (Figure 2). The standpipe is affixed to the downstream side of a pier nose supporting the juvenile bypass system outfall pipe. This location is east of mid-channel, and is minimally impacted by powerhouse flows when the project is passing water over the spillway (Schneider and Wilhelms, 2005). This location was chosen because it was the most feasible location near the end of the aerated zone, which is the compliance point for the Mid-Columbia TDG TMDL.

Forebay and tailrace TDG and temperature data were collected using instruments that can immediately transmit the data to Chelan PUD headquarters, allowing for real-time data recording. A multi-parameter instrument (Minisonde) developed by Hydrolab, Inc., equipped with TDG and temperature sensors, was lowered down the standpipe at each site and submerged to depth of approximately 15 feet.

TDG and temperature measurements were recorded throughout the monitoring season at 15-minute intervals. These 15-minute intervals were averaged into hourly readings for use in compiling daily and 12-hour averages for TDG; and daily averages, daily highs, and 7-DADMax (seven day average of daily maximum) for temperature. All hourly data were forwarded to Chelan PUD headquarters building and then onto the US Army Corps of Engineers Reservoir Control Center (RCC) and posted at their site on the World Wide Web. Data transmitted to RCC was limited to that data collected between April 1 and September 6 (entire TDG monitoring season). The remainder of the temperature data (September 7 – October 31) is available upon request from Chelan PUD.

2.1.1 Alternative Spillway Operations

In 2011, high flow volumes and high levels of TDG in the Columbia River provided an opportunity for Chelan PUD to implement a test of spillway operations not previously tested under the high-flow conditions. The purpose was to evaluate the effectiveness of alternative operations using gates 2-12, to determine whether TDG levels could be reduced without adverse effects on fish passage. The testing utilized four spill configurations: standard, TDG Spill Pattern, Shallow Arc Spill, and Flattened Spill Pattern.

The standard spill configuration used at Rocky Reach uses gates 2-8 with a minimum discharge per spill bay of about 4 kcfs. The standard spill configuration was designed to create a crown-shaped pattern of turbulent flow below the spillway with decreasing velocities leading toward the fishway entrances. This spill pattern provides favorable guidance conditions for adult migrant salmon and steelhead. The same pattern is used for juvenile fish passage spill. During spill operations, whether for juvenile fish passage, TDG management, or for other purposes, the gates are operated via a computer automated system that follows the spill pattern. Gates 9-12 are used only in high flow conditions when gates 2-8 cannot pass enough water.

The TDG Spill Pattern was intended to mimic the crowned pattern of the standard spill configuration, but utilized all of the available spillgates in an effort to avoid higher flows through individual gates. This spill pattern reduced individual gate openings by 2-3 feet with the intent to result in spill discharge that does not carry entrained air as deep below the tailrace surface as would be the case with the standard pattern. Reducing the depth that entrained air is carried in spill discharge also has the potential to reduce the TDG levels that result from high spill discharges. The other two spill patterns (below) have the same objective, but also deviate more from the crowned discharge pattern that is designed to assist upstream fish passage.

The Shallow Arc Spill configuration was designed to spread spill volumes more evenly across the spillway while retaining some of the crowned discharge pattern.

The Flattened Spill Pattern was intended to more evenly distribute the spill flow across the entire width of the spillway. Basically, the same number of gates are open the same amount but redistributed to promote more surface mixing and less concentration of deep spill at one location.

The study was conducted from early June to the end of July while river flows were high. The testing schedule established that each configuration was to be run for 24 hours at a time (midnight to midnight, until the end of June; and 0700 -0700 until the end of the study). Upon the completion of one scenario, another would begin.

A study plan for 2012 is being prepared to further implement and evaluate the alternative spillway operations used during 2011.

2.2 Fishway and Juvenile Fish Bypass Temperature

As per the QAPP, Chelan PUD will install temperature loggers at two locations in the upstream fishway (exit and near the bottom of the ladder) and two locations (entrance and sampling facility) in the JFBS. Although the 401 Certification and QAPP do not specify a schedule for installation of the temperature loggers, Chelan PUD is expecting to install the loggers in the upstream fishway during winter 2012/2013, and in the juvenile sampling facility during spring 2012. Loggers will be installed, if necessary, in the juvenile fish bypass system entrance after further evaluation of temperature data that is collected using a velocity meter. The velocity meter is equipped with a temperature probe, but at this time Chelan PUD does not know if the level of accuracy meets the QAPP standards. Determining this will be the first step in evaluating the future use of this instrument for collecting JFBS entrance temperature data. If it is determined the level of accuracy does not meet the QAPP standards, Chelan PUD will move forward with the installation of loggers in the JFBS entrance that do meet the QAPP standards.

2.3 Wells Dam Tailrace Temperature

Hourly water temperature from April 7 – September 15 was retrieved from the Columbia River DART page at http://www.cbr.washington.edu/dart/.

2.4 GBT

No GBT study was conducted in 2011. Refer to the schedule of 2012 planned activities in Section 4 of this document.

2.5 Macrophyte Bed DO, pH, and Temperature

No water quality study was conducted in macrophyte beds in 2011. Refer to the schedule of 2012 planned activities in Section 4 of this document.

Figure 2. Location of forebay and tailrace FMSs, and JFBS SC entrance.

2.6 Data Evaluation (QA/QC) (Attainment of Data Quality Objectives)

2.6.1 Representativeness

TDG and temperature data were collected from locations required by the 401 Certification and the Mid-Columbia River and Lake Roosevelt TDG TML. Data was collected hourly, which is at a frequency sufficient to determine trends and if water quality standards are being met.

2.6.2 Comparability

TDG and temperature were monitored using standard units of measurement at fixed locations, and therefore data is comparable to data collected historically by Chelan PUD.

2.6.3 Completeness

TDG

Data collection, QA/QC, and analyses of TDG followed those described in the QAPP. Table 2.1 shows the number of values that were omitted from the dataset due to QA/QC issues compared to the total number of available hours. Overall data loss in the 2011 monitoring season (April 1 – August 31) was 184 hours of the combined 14,688 available hours, which was well within the 90% data completeness decision quality objective as specified in the QAPP.

The causes of the data losses in the Rock Island forebay and tailrace have not yet been determined.

Table 2.1. Overview of total dissolved gas data set during 2011 fish spill season.

Location	Available data collection hours	Number of omitted/ lost hourly readings	Percent data completeness (%)
RRFB	3672	5	99.86
RRTR	3672	7	99.71
RIFB	3672	72	98.04
RITR	3672	100	97.28
Total	14,688	184	98.75

Temperature

Data collection, QA/QC, and analyses of water temperature followed those described in the QAPP. Table 2-2 shows the number of values that were omitted from the dataset due to QA/QC issues compared to the total number of available hours. Overall data loss in the 2011 monitoring season was 269 hours of the combined 10,272 available hours, which was well within the 90% data completeness decision quality objective as specified in the QAPP.

No data was collected in the fishway or at the JFBS.

Table 2-2. Overview of temperature data set during the 2011 monitoring period (April 1 – October 31).

Location	Available data collection hours	Number of omitted/ lost hourly readings	Percent data completeness (%)
FB FMS	5,136	3	99.94
TR FMS	5,136	264	94.86
Total	10,272	269	97.38

2.6.4 Precision

The TDG and temperature monitoring program implemented in 2011 used the same type of equipment to monitor water quality over a small spatial and temporal regime at all sites. Additionally, duplicate sampling occurred during monthly calibrations. See Appendix C for the calibration reports.

2.6.5 Bias

Bias was minimized by following standard protocols for calibration and maintenance.

As discussed in the QAPP, the accuracy/bias of the temperature sensors is ±0.1°C. During 14 instrument maintenance/calibrations, instrument temperature was compared to a standard. Of these 14 comparisons, 10 met the data quality objective of ±0.1°C (Appendix C). The four remaining comparisons (all ±0.2°C) did not meet the measurement data quality objective (MQO) as discussed in the QAPP; however the criteria may be overly strict and may need to be revised. Since completion of the QAPP, Chelan PUD has received input from WDOE (in the form of comments on the Draft Shallow Water/Macrophyte Bed Sampling QAPP) that it is not recommended to use the instrument's manufacturer specification for MQOs because expected instrument error alone can cause a failure of meeting the QA criteria. With this recommendation in mind, Chelan PUD has determined that the data from these instruments appears acceptable for use.

2.6.6 Sensitivity

All of the sensors used for the monitoring program have sensitivities that are better than required to determine compliance with water quality standards.

2.6.7 Calibration and Maintenance

Forebay and Tailrace TDG and Temperature

Section 5.7.3 of the 401 Certification requires Chelan PUD to maintain a TDG monitoring program that is at least as stringent as the QA/QC calibration and monitoring procedures and protocols developed by the USGS monitoring methodology for the Columbia River.

Chelan PUD has developed its QA/QC protocols following established protocols by other resource agencies conducting similar monitoring programs, such as the USGS, U.S. Army Corps of Engineers, and other mid-Columbia River Dam operators, as well as HydroLab Corporation's recommendations. These QA/QC protocols are included in Chelan PUD's approved QAPP (Appendix A).

Chelan PUD entered into a Professional Services Agreement with Columbia Basin Environmental to perform monthly calibrations and equipment maintenance on the forebay and tailrace TDG/temperature instruments. Quality Assurance/Quality Control measures were accomplished through training in

instrument maintenance, operation, and factory prescribed calibration methods. A detailed log was maintained for all work done on the monitoring equipment, including monthly maintenance, calibration, exchange of instruments, and any other pertinent information. Redundant measurements with a mobile instrument to verify the accuracy of the in-situ instruments were conducted during the monthly calibrations. Calibration reports are included as Appendix C.

Fishway and juvenile fish bypass system

At this time, instruments have not been installed in the fishway or JFBS. Therefore, there is no data to report for those locations.

GBT

No studies were conducted during 2011.

DO/pH

No studies were conducted during 2011.

SECTION 3: RESULTS AND DISCUSSION

3.1 TDG

Refer to the 2011 Gas Abatement Annual Report (Appendix B) for further information about TDG.

3.1.1 Alternative Spillway Operations

Chelan PUD is currently analyzing the data gathered during the spill gate testing conducted in 2011. This data will be valuable in the development of a plan to investigate alternative spillway operations (as per Section 5.4(1)(b)(6) of the 401 Certification) in 2012. Data from 2011 and any data collected during the 2012 monitoring season will be included and discussed in the 2012 Annual Quality Assurance Project Report.

3.2 Temperature

3.2.1 Forebay, Tailrace, and Wells Dam tailrace

Temperature data were collected throughout the monitoring season at 15-minute intervals at both Rocky Reach FMS. These 15-minute intervals were averaged into hourly readings for use in compiling daily averages, daily highs, and 7-DADMax temperature. Chelan PUD obtained Wells Dam tailrace hourly temperature data from the Columbia River DART website (http://www.cbr.washington.edu/dart/). The summary values (mean, minimum, and maximum) for all hourly temperature measurements are presented in Table 3-1 below.

Table 3-1. Summary of hourly temperature measurements for each Rocky Reach FMS and the Wells Dam tailrace, 2011.

Location	Data Interval	Mean	Minimum	Maximum
Wells Dam Tailrace	4/17– 9/15	13	4.6	19.6
Rocky Reach Forebay	4/1 – 10/31	13.7	4.5	19.5
Rocky Reach Tailrace	4/1 – 10/31	13.6	4.2	19.1
Note: All temperature is in degrees Celsius.				

Daily maximum temperatures from the three sites were used to determine the 7-DADMax. Figures 3 and 4 present graphical displays of the 1-DMax and 7-DADMax values. In general, water temperatures peaked during the months of July through September.

As per Section 5.5(1)(c) of the 401 Certification, this data will be used to run the CE-QUAL-W2 model in Year 5 of the License to evaluate the Project compliance with numeric temperature criteria.

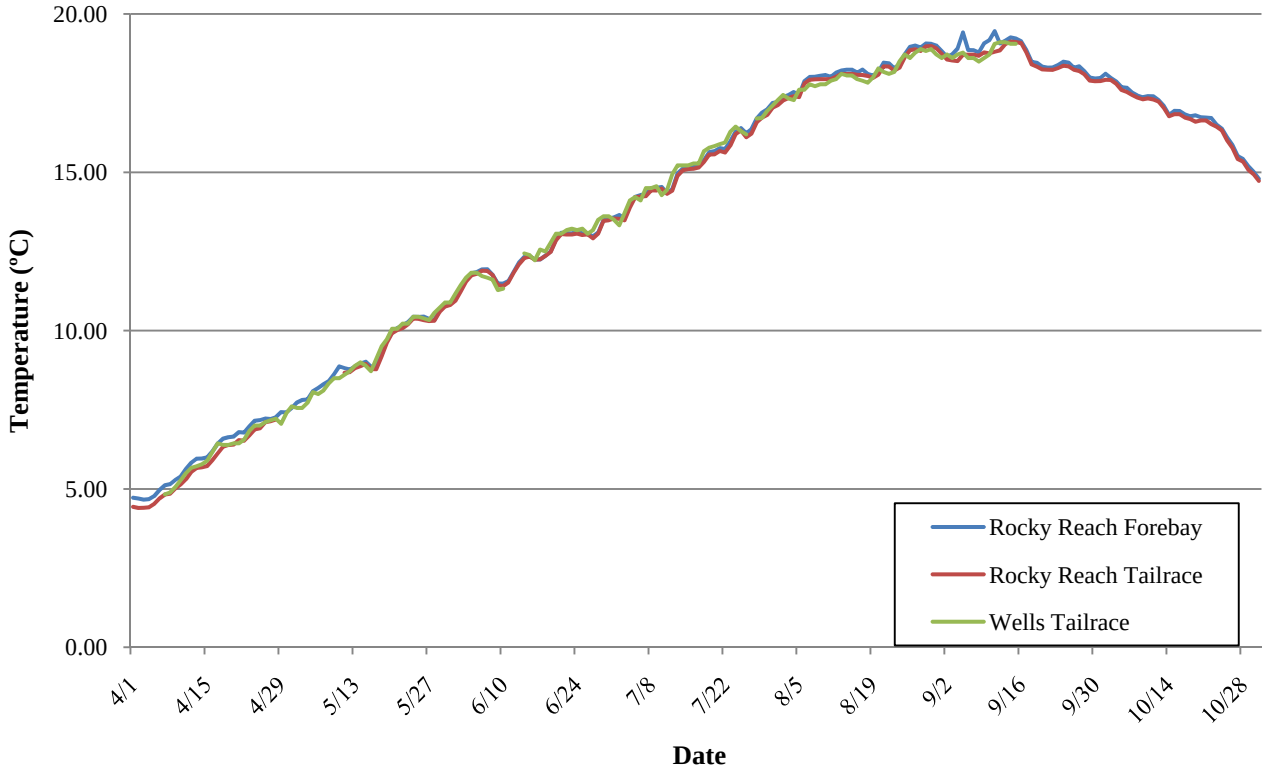

Figure 3-1. Daily maximum water temperature values recorded at each site in 2011.

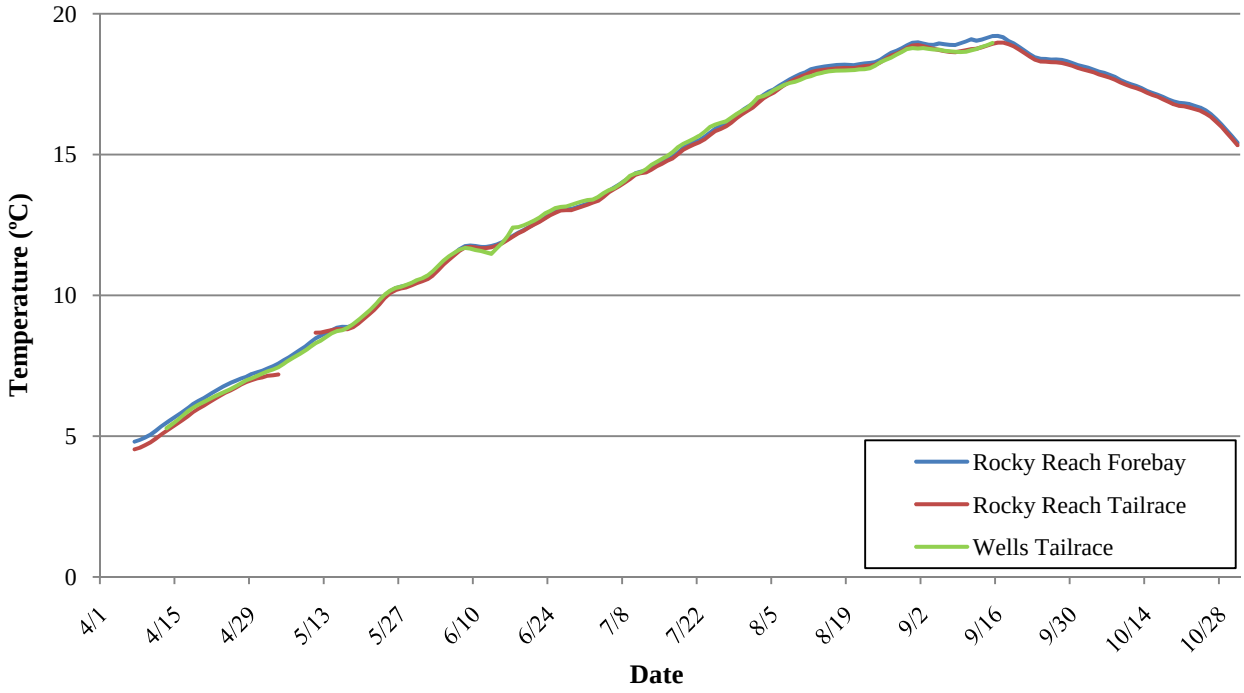

Figure 3-2. Seven day rolling average of daily maximum temperture values recorded at each site in 2011.

Upstream Fishway

At this time, instruments have not been installed in the upstream fishway or in the JFBS. Therefore, there is no data to report for those locations.

3.3 GBT

No studies were conducted in 2011.

3.4 Dissolved Oxygen and pH

No studies were conducted in 2011.

SECTION 4: PROPOSED 2012 ACTION PLAN

4.1 TDG

Chelan PUD plans to continue the TDG monitoring program conducted in 2011.

As per Section 5.4(1)(b)(6) of the 401 Certification, Chelan PUD is developing a plan to further investigate alternative spillway operations using any of gates 2 through 12 to determine whether TDG levels can be reduced without adverse effects on fish passage. A draft of the plan will be complete and ready for WDOE review mid-May 2012, with the goal of having a final plan in place prior to high flows. Implementation of the plan is dependent on high flow conditions and approval of the Habitat Conservation Plan Coordinating Committee (HCP CC). Results of the testing conducted in 2011 and any testing conducted in 2012 will be included and discussed in the 2012 Annual Quality Assurance Project Report.

4.2 Temperature

4.2.1 Forebay and Tailrace

Chelan PUD plans to continue the forebay and tailrace temperature monitoring program conducted in 2011.

4.2.2 Fishway and juvenile fish bypass system

As per the QAPP, Chelan PUD will install temperature loggers at two locations in the upstream fishway (exit and near the bottom of the ladder) and two locations (entrance and sampling facility) in the JFBS. Although the 401 Certification and QAPP do not specify a schedule for installation of the temperature loggers, Chelan PUD is expecting to install the loggers in the upstream fishway during winter 2012/2013 and in the juvenile sampling facility during spring 2012. Loggers will be installed, if necessary, in the juvenile fish bypass system entrance after further evaluation of temperature data that is collected using a velocity meter. The velocity meter is equipped with a temperature probe, but at this time Chelan PUD does not know if the level of accuracy meets the QAPP standards. Determining this will be the first step in evaluating the future use of this instrument for collecting JFBS entrance temperature data. If it is determined the level of accuracy does not meet the QAPP standards, Chelan PUD will move forward with the installation of loggers in the JFBS entrance that do meet the QAPP standards.

4.3 GBT

Chelan PUD plans to develop a study plan for reservoir GBT during the winter of 2012/2013. Dependent on appropriate TDG conditions, implementation would begin spring of 2013, subsequent to review and approval by WDOE.

4.4 Dissolved Oxygen/pH

Chelan PUD recently submitted to WDOE a Draft Shallow Water/Macrophyte Bed Sampling QAPP that provides specific details regarding sampling design, equipment updates, and other information specific to the assessment of water quality in shallow water areas of the Rocky Reach reservoir, including areas with macrophyte beds. Upon WDOE approval, Chelan PUD will submit the Shallow Water/Macrophyte Bed Sampling QAPP to the Commission.

The proposed schedule for implementation of the shallow water/macrophyte bed study is as follows:

1/3/2012	First Draft QAPP to Pat Irle for review
2/10/2012	Pat Irle Initial Comments/Edits to Steve Hays
4/18/2012	Second Draft QAPP/Study Design to Ecology and Rocky Reach Fish Forum (RRFF) for review

5/1/2012	Ecology and RRFF comments/edits to Steve Hays
6/1/2012	Final QAPP/Study Design to Ecology and RRFF
7/1/2012	Ecology Approval of QAPP
7/1/2012	Submittal of QAPP to FERC as an Appendix to the 2010 QAPP
7/1-8/1/2012	Equipment preparation, calibration, data forms and maps
8/6-10/2012	First sample week
8/20-24/2012	Second sample week
9/10-14/2012	Third sample week
9/24-28/2012	Fourth sample week
9/7/2012	August data to Ecology (Pat Irle)
10/5/2012	September data to Ecology (Pat Irle)
11/15/2012	Technical memo with results to Ecology and RRFF
2/1/2013	Draft report to Ecology and RRFF
3/15/2013	Ecology and RRFF comments to Chelan PUD
5/1/2013	Final Report (to be included as an appendix to the 2012 Annual Quality Assurance Project Report) to Ecology, RRFF and filed with the FERC

SECTION 5: PROPOSED CHANGES TO QAPP

As discussed in Section 4.4 above, Chelan PUD is currently working with WDOE to finalize a QAPP for Shallow Water/Macrophyte Bed Sampling. Upon WDOE approval, Chelan PUD will submit the Shallow Water/Macrophyte Bed Sampling QAPP to the Commission.

Additionally, as discussed in section 2.6.5, it may be necessary to revise the data quality objectives discussed in the February 2010 QAPP, based upon input recently received from WDOE on the Draft Shallow Water/Macrophyte Bed Sampling QAPP. Chelan PUD will begin discussions with WDOE regarding possible revisions as soon as possible. If revisions are made, Chelan PUD will submit a revised QAPP to FERC upon WDOE approval.

APPENDIX A: FINAL QUALITY ASSURANCE PROJECT PLAN

The final Quality Assurance Project Plan can be found at the following link:

http://www.chelanpud.org/departments/licensingCompliance/rr_implementation/ResourceDocuments/33937.pdf

APPENDIX B: 2011 ANNUAL GAS ABATEMENT REPORT

The 2011 Annual Gas Abatement Report can be found at the following link:

http://www.chelanpud.org/departments/licensingCompliance/rr_implementation/ResourceDocuments/38065.pdf

APPENDIX C: CALIBRATION REPORTS

Site	InstrID	Date	Time	BP mmHg	Temperature (°C)			TDG Pressure (mmHg)				Deviation from STD TDG %Saturation			
				STD	STD	Probe	Diff	100%	113%	126%	139%	100%	113%	126%	139%
RRDW	38865	03/28/11	11:00	748.8	4.60	4.5	0.1	748	848	948	1048	0.1	0.1	0.1	0.1
RRDW	38865	04/26/11	9:45	744.4	7.40	7.3	0.1	744	844	944	1045	0.1	0.1	0.1	-0.1
RRDW	38865	05/25/11	13:15	739.3	10.60	10.5	0.1	739	839	939	1039	0.0	0.0	0.0	0.0
RRDW	38865	06/30/11	12:05	744.3	14.50	14.3	0.2	744	844	944	1044	0.0	0.0	0.0	0.0
RRDW	38865	07/27/11	14:30	743.5	17.00	16.8	0.2	743	843	943	1043	0.1	0.1	0.1	0.1
RRDW	38865	08/24/11	13:30	741.3	19.00	19.0	0.0	741	840	940	1041	0.0	0.2	0.2	0.0
RRDW	38865	09/28/11	11:50	754.2	17.90	17.7	0.2	752	852	952	1053	0.3	0.3	0.3	0.2
RRH	60048	03/28/11	14:00	747.0	6.20	6.3	-0.1	744	842	942	1041	0.4	0.7	0.7	0.8
RRH	37607	04/25/11	14:20	709.8	11.40	11.4	0.0	710	810	911	1011	0.0	0.0	-0.2	-0.2
RRH	37607	05/25/11	15:35	737.4	10.80	10.7	0.1	737	837	937	1038	0.1	0.1	0.1	-0.1
RRH	37607	06/30/11	11:20	742.5	14.60	14.5	0.1	745	844	944	1044	-0.3	-0.2	-0.2	-0.2
RRH	37607	07/27/11	15:05	741.6	17.80	17.7	0.1	742	842	942	1042	-0.1	-0.1	-0.1	-0.1
RRH	37607	08/24/11	14:05	739.0	19.70	19.5	0.2	739	839	939	1040	0.0	0.0	0.0	-0.1
RRH	37607	09/28/11	12:20	751.8	18.30	18.2	0.1	750	850	950	1051	0.2	0.2	0.2	0.1

APPENDIX D: DAILY MAXIMUM TEMPERATURE & 7-DAY ROLLING AVERAGE OF THE DAILY MAXIMUM TEMPERATURES

	Daily Maximum Temperatures				7-Day Rolling Average of Daily Maximum Temperatures		
Date	**Wells Tailrace**	**Rocky Reach Forebay**	**Rocky Reach Tailrace**		**Wells Tailrace**	**Rocky Reach Forebay**	**Rocky Reach Tailrace**
4/1		4.72	4.44				
4/2		4.70	4.40				
4/3		4.66	4.41				
4/4		4.68	4.42				
4/5		4.78	4.53				
4/6		4.97	4.70				
4/7	4.83	5.12	4.82			4.80	4.53
4/8	4.89	5.15	4.85			4.87	4.59
4/9	5.06	5.29	5.01			4.95	4.68
4/10	5.28	5.40	5.14			5.05	4.78
4/11	5.5	5.63	5.31			5.19	4.91
4/12	5.67	5.83	5.54			5.34	5.05
4/13	5.72	5.96	5.67		5.28	5.48	5.19
4/14	5.78	5.96	5.68		5.41	5.60	5.31
4/15	5.89	5.99	5.72		5.56	5.72	5.44
4/16	6.17	6.19	5.91		5.72	5.85	5.57
4/17	6.44	6.43	6.12		5.88	6.00	5.71
4/18	6.39	6.59	6.33		6.01	6.14	5.85
4/19	6.39	6.63	6.39		6.11	6.25	5.97
4/20	6.44	6.65	6.40		6.21	6.35	6.08
4/21	6.44	6.79	6.54		6.31	6.47	6.20
4/22	6.56	6.78	6.52		6.40	6.58	6.32
4/23	6.83	6.98	6.69		6.50	6.69	6.43
4/24	7	7.16	6.88		6.58	6.80	6.54
4/25	7	7.17	6.92		6.67	6.88	6.62
4/26	7.11	7.22	7.11		6.77	6.96	6.72
4/27	7.17	7.21	7.14		6.87	7.04	6.83
4/28	7.22	7.26	7.19		6.98	7.11	6.92
4/29	7.06	7.43			7.06	7.20	6.99
4/30	7.39	7.42			7.14	7.27	7.05
5/1	7.61	7.55			7.22	7.32	7.09
5/2	7.56	7.73			7.30	7.40	7.15
5/3	7.56	7.81			7.37	7.49	7.16
5/4	7.72	7.83			7.45	7.58	7.19
5/5	8.06	8.09			7.57	7.69	
5/6	8	8.19			7.70	7.80	
5/7	8.11	8.31			7.80	7.93	
5/8	8.33	8.40			7.91	8.05	
5/9	8.5	8.63			8.04	8.18	
5/10	8.5	8.87			8.17	8.33	
5/11	8.61	8.82	8.67		8.30	8.47	8.67
5/12	8.72	8.77	8.69		8.40	8.57	8.68
5/13	8.89	8.87	8.81		8.52	8.67	8.72
5/14	9	8.96	8.88		8.65	8.76	8.76

	Daily Maximum Temperatures				7-Day Rolling Average of Daily Maximum Temperatures		
Date	**Wells Tailrace**	**Rocky Reach Forebay**	**Rocky Reach Tailrace**		**Wells Tailrace**	**Rocky Reach Forebay**	**Rocky Reach Tailrace**
5/15	8.89	9.02	8.95		8.73	8.85	8.80
5/16	8.72	8.86	8.79		8.76	8.88	8.80
5/17	9.11	8.85	8.78		8.85	8.88	8.80
5/18	9.5	9.24	9.18		8.98	8.94	8.87
5/19	9.72	9.67	9.61		9.12	9.07	9.00
5/20	10.06	9.98	9.92		9.29	9.23	9.16
5/21	10.06	10.09	10.02		9.44	9.39	9.32
5/22	10.22	10.16	10.08		9.63	9.55	9.48
5/23	10.22	10.27	10.20		9.84	9.75	9.68
5/24	10.44	10.44	10.38		10.03	9.98	9.91
5/25	10.44	10.43	10.37		10.17	10.15	10.08
5/26	10.39	10.45	10.33		10.26	10.26	10.19
5/27	10.33	10.37	10.30		10.30	10.32	10.24
5/28	10.56	10.33	10.31		10.37	10.35	10.28
5/29	10.72	10.65	10.59		10.44	10.42	10.36
5/30	10.89	10.83	10.76		10.54	10.50	10.43
5/31	10.89	10.84	10.81		10.60	10.56	10.50
6/1	11.17	11.00	10.94		10.71	10.64	10.58
6/2	11.44	11.30	11.24		10.86	10.76	10.71
6/3	11.67	11.61	11.55		11.05	10.94	10.89
6/4	11.83	11.81	11.74		11.23	11.15	11.09
6/5	11.83	11.85	11.79		11.39	11.32	11.26
6/6	11.72	11.94	11.89		11.51	11.48	11.42
6/7	11.67	11.94	11.88		11.62	11.63	11.58
6/8	11.61	11.76	11.76		11.68	11.74	11.69
6/9	11.28	11.49	11.43		11.66	11.77	11.72
6/10	11.33	11.48	11.41		11.61	11.75	11.70
6/11		11.57	11.53		11.57	11.72	11.67
6/12		11.86	11.83		11.52	11.72	11.68
6/13		12.15	12.09		11.47	11.75	11.70
6/14	12.44	12.33	12.29		11.67	11.81	11.76
6/15	12.39	12.36	12.34		11.86	11.89	11.85
6/16	12.22	12.25	12.24		12.10	12.00	11.96
6/17	12.56	12.25	12.25		12.40	12.11	12.08
6/18	12.5	12.37	12.36		12.42	12.22	12.20
6/19	12.78	12.50	12.48		12.48	12.31	12.29
6/20	13.06	12.88	12.85		12.56	12.42	12.40
6/21	13.06	13.09	13.05		12.65	12.53	12.51
6/22	13.17	13.08	13.03		12.76	12.63	12.61
6/23	13.22	13.07	13.03		12.91	12.75	12.72
6/24	13.17	13.13	13.06		12.99	12.87	12.84
6/25	13.22	13.07	13.02		13.10	12.97	12.93
6/26	13.06	13.07	13.04		13.14	13.06	13.01
6/27	13.17	12.97	12.92		13.15	13.07	13.02

	Daily Maximum Temperatures				7-Day Rolling Average of Daily Maximum Temperatures		
Date	Wells Tailrace	Rocky Reach Forebay	Rocky Reach Tailrace		Wells Tailrace	Rocky Reach Forebay	Rocky Reach Tailrace
6/28	13.5	13.09	13.07		13.22	13.07	13.03
6/29	13.61	13.49	13.46		13.28	13.13	13.09
6/30	13.61	13.53	13.49		13.33	13.19	13.15
7/1	13.5	13.58	13.54		13.38	13.26	13.22
7/2	13.33	13.65	13.53		13.40	13.34	13.29
7/3	13.72	13.55	13.48		13.49	13.41	13.36
7/4	14.11	13.95	13.88		13.63	13.55	13.49
7/5	14.22	14.23	14.21		13.73	13.71	13.66
7/6	14.11	14.28	14.23		13.80	13.82	13.77
7/7	14.5	14.31	14.25		13.93	13.94	13.88
7/8	14.5	14.50	14.43		14.07	14.07	14.00
7/9	14.56	14.51	14.42		14.25	14.19	14.13
7/10	14.28	14.54	14.49		14.33	14.33	14.27
7/11	14.44	14.35	14.32		14.37	14.39	14.34
7/12	14.94	14.47	14.42		14.48	14.42	14.37
7/13	15.22	14.97	14.89		14.63	14.52	14.46
7/14	15.22	15.12	15.07		14.74	14.64	14.58
7/15	15.22	15.16	15.10		14.84	14.73	14.67
7/16	15.28	15.16	15.11		14.94	14.82	14.77
7/17	15.28	15.24	15.15		15.09	14.92	14.87
7/18	15.67	15.39	15.33		15.26	15.07	15.01
7/19	15.78	15.64	15.56		15.38	15.24	15.17
7/20	15.83	15.67	15.57		15.47	15.34	15.27
7/21	15.89	15.76	15.68		15.56	15.43	15.36
7/22	15.94	15.74	15.62		15.67	15.51	15.43
7/23	16.28	15.98	15.85		15.81	15.63	15.54
7/24	16.44	16.28	16.21		15.98	15.78	15.69
7/25	16.3	16.39	16.32		16.07	15.92	15.83
7/26	16.2	16.23	16.11		16.13	16.01	15.91
7/27		16.36	16.22		16.18	16.11	16.00
7/28	16.7	16.70	16.58		16.31	16.24	16.13
7/29	16.72	16.89	16.73		16.44	16.41	16.29
7/30	16.94	16.99	16.82		16.55	16.55	16.43
7/31	17.11	17.19	17.05		16.66	16.68	16.55
8/1	17.28	17.22	17.12		16.83	16.80	16.66
8/2	17.44	17.38	17.27		17.03	16.96	16.83
8/3	17.33	17.44	17.35		17.07	17.11	16.99
8/4	17.28	17.53	17.41		17.16	17.23	17.11
8/5	17.61	17.45	17.38		17.28	17.31	17.20
8/6	17.61	17.88	17.81		17.38	17.44	17.34
8/7	17.78	18.01	17.92		17.48	17.56	17.46
8/8	17.72	18.02	17.94		17.54	17.67	17.58
8/9	17.78	18.05	17.94		17.59	17.77	17.68
8/10	17.78	18.07	17.94		17.65	17.86	17.76

	Daily Maximum Temperatures				7-Day Rolling Average of Daily Maximum Temperatures		
Date	Wells Tailrace	Rocky Reach Forebay	Rocky Reach Tailrace		Wells Tailrace	Rocky Reach Forebay	Rocky Reach Tailrace
8/11	17.89	18.02	17.94		17.74	17.93	17.84
8/12	17.94	18.15	18.02		17.79	18.03	17.93
8/13	18.11	18.22	18.11		17.86	18.08	17.97
8/14	18.06	18.24	18.10		17.90	18.11	18.00
8/15	18.06	18.24	18.11		17.95	18.14	18.02
8/16	17.94	18.15	18.08		17.97	18.16	18.04
8/17	17.89	18.24	18.07		17.98	18.18	18.06
8/18	17.83	18.11	18.05		17.98	18.19	18.08
8/19	18	18.06	17.99		17.98	18.18	18.07
8/20	18.28	18.17	18.08		18.01	18.17	18.07
8/21	18.17	18.46	18.35		18.02	18.20	18.10
8/22	18.11	18.44	18.34		18.03	18.23	18.14
8/23	18.17	18.28	18.21		18.06	18.25	18.16
8/24	18.5	18.42	18.30		18.15	18.28	18.19
8/25	18.72	18.72	18.63		18.28	18.37	18.27
8/26	18.61	18.96	18.86		18.37	18.50	18.40
8/27	18.78	19.00	18.89		18.44	18.61	18.51
8/28	18.89	18.94	18.83		18.54	18.68	18.58
8/29	18.83	19.07	18.98		18.64	18.77	18.67
8/30	18.89	19.06	18.99		18.75	18.88	18.78
8/31	18.72	19.00	18.91		18.78	18.97	18.87
9/1	18.61	18.83	18.75		18.76	18.98	18.89
9/2	18.72	18.65	18.56		18.78	18.94	18.84
9/3	18.61	18.73	18.53		18.75	18.90	18.79
9/4	18.72	18.91	18.52		18.73	18.89	18.75
9/5	18.78	19.42	18.71		18.72	18.94	18.71
9/6	18.61	18.86	18.72		18.68	18.91	18.67
9/7	18.61	18.85	18.71		18.67	18.89	18.64
9/8	18.5	18.78	18.68		18.65	18.89	18.63
9/9	18.61	19.08	18.79		18.63	18.95	18.67
9/10	18.72	19.18	18.75		18.65	19.01	18.70
9/11	19.06	19.46	18.80		18.70	19.09	18.74
9/12	19.11	19.07	18.85		18.75	19.04	18.76
9/13	19.11	19.15	19.05		18.82	19.08	18.81
9/14	19.06	19.26	19.13		18.88	19.14	18.87
9/15	19.06	19.23	19.11		18.96	19.20	18.93
9/16		19.14	19.08			19.21	18.97
9/17		18.86	18.78			19.17	18.97
9/18		18.49	18.41			19.03	18.92
9/19		18.46	18.33			18.94	18.84
9/20		18.34	18.25			18.82	18.73
9/21		18.30	18.24			18.69	18.60
9/22		18.31	18.23			18.56	18.48
9/23		18.39	18.29			18.45	18.36

	Daily Maximum Temperatures				7-Day Rolling Average of Daily Maximum Temperatures		
Date	**Wells Tailrace**	**Rocky Reach Forebay**	**Rocky Reach Tailrace**		**Wells Tailrace**	**Rocky Reach Forebay**	**Rocky Reach Tailrace**
9/24		18.49	18.37			18.40	18.30
9/25		18.46	18.35			18.39	18.29
9/26		18.30	18.24			18.37	18.28
9/27		18.35	18.20			18.37	18.27
9/28		18.19	18.10			18.36	18.25
9/29		18.00	17.90			18.31	18.21
9/30		17.96	17.87			18.25	18.15
10/1		17.98	17.88			18.18	18.08
10/2		18.12	17.92			18.13	18.02
10/3		17.99	17.92			18.08	17.97
10/4		17.87	17.80			18.01	17.91
10/5		17.69	17.60			17.94	17.84
10/6		17.67	17.54			17.90	17.79
10/7		17.52	17.44			17.83	17.73
10/8		17.43	17.36			17.75	17.65
10/9		17.37	17.31			17.65	17.57
10/10		17.41	17.34			17.56	17.48
10/11		17.40	17.30			17.50	17.41
10/12		17.28	17.23			17.44	17.36
10/13		17.10	17.03			17.36	17.29
10/14		16.82	16.77			17.26	17.19
10/15		16.94	16.84			17.19	17.12
10/16		16.94	16.84			17.13	17.05
10/17		16.83	16.73			17.04	16.96
10/18		16.77	16.68			16.95	16.87
10/19		16.80	16.60			16.89	16.78
10/20		16.74	16.64			16.83	16.73
10/21		16.73	16.64			16.82	16.71
10/22		16.71	16.52			16.79	16.66
10/23		16.51	16.44			16.73	16.61
10/24		16.38	16.32			16.66	16.55
10/25		16.10	16.00			16.57	16.45
10/26		15.86	15.77			16.43	16.33
10/27		15.51	15.42			16.26	16.16
10/28		15.42	15.34			16.07	15.98
10/29		15.20	15.08			15.85	15.77
10/30		15.02	14.94			15.64	15.56
10/31		14.80	14.73			15.42	15.33

APPENDIX E: CONSULTATION RECORD

From: Frantz, Waikele M.
Sent: Thursday, March 01, 2012 6:55 PM
To: Pat Irle
Cc: Charlie McKinney
Subject: 2011 Water Quality Report

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

To: Patricia Irle, Washington State Department of Ecology
Charlie McKinney, Washington State Department of Ecology

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

Re: Rocky Reach Hydroelectric Project No. 2145
License Article 401 – Water Quality Annual Report

Ms. Irle and Mr. McKinney:

As per Section 5.7(8) of the 401 Water Quality Certification for Rocky Reach, Chelan PUD hereby submits the 2011 Water Quality Annual Report for your review.

Please review and submit your comments on or before 5:00 p.m., April 12, 2012 to me via email at waikele.frantz@chelanpud.org or via fax to (509) 661-8203.

Pursuant to the FERC Order Modifying and Approving Quality Assurance Project Plan, Chelan PUD will file the Final Water Quality Report with FERC by May 1, 2012.

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

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

Thank you,
Waikele Frantz
509-661-4627

APPENDIX F: WDOE COMMENTS TO DRAFT AND CHELAN PUD RESPONSE

Section (as numbered in the DRAFT report)	**Washington Department of Ecology Comment**	**Chelan PUD Response**
2.2	It is stated that "Loggers will be installed in the [JFBS] entrance after further evaluation of temperature data that is collected using a velocity meter…" Does this mean that the velocity meter also has a temperature probe on it? What is the level of accuracy of the temperature probe? What kind of evaluation of the data do you propose? (Would it meet your current QAPP standards?)	Yes, the velocity meter also has a temperature probe on it. At this time, Chelan PUD is evaluating the level of accuracy of this instrument. If it is determined the instrument accuracy is not suitable for collecting JFBS entrance temperature data and does not meet the QAPP standards, Chelan PUD will move forward with the installation of loggers that do meet the QAPP standards. Section 2.2 has been revised to clarify.
2.6	It was good to see Data Completeness discussed. Could you discuss the degree of attainment with each of the other QAPP objectives (e.g., how successful was the sampling at attaining the decision quality and measurement quality objectives) for both TDG and temperature.	Section 2.6 has been revised to address this comment. In light of WDOE's comments on the Draft Shallow Water/Macrophyte Bed Sampling QAPP, Chelan PUD believes a revision to the QAPP data objectives for TDG and Temperature may be necessary. Chelan PUD will work with WDOE to resolve this issue.
3.2	The water quality standard for temperature is the 7-day average of the maximum daily temperature. Therefore, it would also be helpful to provide the 7-DADMax temperature for each point. Average monthly temperatures aren't nearly as useful.	Section has been revised to address comment.
4.2	This section will need to be re-evaluated based on using maximum daily temperatures; providing the 7DADMax temperatures would be even better.	Section 3.2 has been revised to address comment. *Section 4: Discussion* has been removed from the report, as it did not include any information that was not addressed elsewhere in the report.
6.	The QAPP may need to be modified, or a QAPP appended, to address DO, temperature and pH monitoring in the macrophyte beds this summer.	As noted in Section 5.4 of the DRAFT (Section 4.4 of FINAL), Chelan PUD is working with WDOE to finalize a QAPP for Shallow Water/Macrophyte bed sampling. Section 5 of the report has been revised to include a discussion of the QAPP for Shallow Water/Macrophyte bed sampling.
Appendix D	Water quality standards are based on the average of the *daily maximum* temperature; therefore it is more valuable to provide a table of the maximum temperatures for each day at each location. The complete standard is the 7-day average of the maximum daily temperature. It would be even more helpful to include the 7-DADMax temperature for each point.	Appendix D has been revised to include Daily Maximum Temperatures and 7-Day Rolling Average of Daily Maximum Temperatures. Average daily temperatures have been removed from the appendix.