From:	Hays, Steve
To:	Peterschmidt, Mark F. (ECY); "Jim Pacheco"; "Korth, Jeffrey "; "Graham Simon"; "travis.maitland@dfw.wa.gov"; "Kari Grover Wier"; "Alex Martinez (ramartinez@fs.fed.us)"; "rvacirca@fs.fed.us"; "Ashley_Rawhouser@nps.gov"; "Hugh_Anthony@nps.gov"; "Steve Lewis (Stephen_Lewis@fws.gov)"; "Rich Domingue (richard.domingue@noaa.gov)"; "Justin Yeager (Justin.Yeager@noaa.gov)"; "Bill Towey"; "Bob Rose (rosb@yakamafish-nsn.gov)"; "Carl Merkle (carlmerkle@ctuir.com)"; "Phil Archibald (ndmarkey@gmail.com)"; "Nick Elwell"; "tom.ernsberger@parks.wa.gov"; ""Cooney, Mike"; "nona.snell@rco.wa.gov"; "wai@mansonparks.com"; "Richard Uhlhorn (richard@richarduhlhorn.com)"; "Thomas O"Keefe (okeefe@amwhitewater.org)"
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Subject:	For Review - Draft Lake Chelan Annual Flow and Water Temperature Report 2015
Date:	Tuesday, May 10, 2016 3:09:41 PM
Attachments:	2015 Annual Flow and Temperature Report - Draft.docx 2015 Annual Flow and Temperature Report - Draft.pdf

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P U B L I C U T I L I T Y D I S T R I C T N O . 1 o f C H E L A N C O U N T Y

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To: Chelan River Fishery Forum

Washington Department of Ecology

Washington Department of Fish and Wildlife

United States Forest Service

National Park Service

United States Fish and Wildlife Service

National Marine Fisheries Service

CCT (Colville)

YN (Yakama)

CTUIR (Umatilla tribe)

City of Chelan

Lake Chelan Sportsman Association

United States Geological Survey

Washington State Parks and Recreation Commission

Washington State Recreation and Conservation Office

Manson Parks and Recreation Department

Lake Chelan Recreation Association

American Whitewater

From: Steven Hays, Fish & Wildlife Senior Advisor

Public Utility District No. 1 of Chelan County (Chelan PUD)

steve.hays@chelanpud.org

(509)661-4181

Re: Lake Chelan Hydroelectric Project No. 637 (Project)

License Articles 405a and 408; Appendix D 401 Water Quality Certification Condition V.C.i)

Draft Lake Chelan Annual Flow and Water Temperature Report 2015

Dear Chelan River Fishery Forum and Other Parties:

In accordance with Articles 405 and 408 of the Lake Chelan Hydroelectric Project License, Chelan PUD invites comments on the Draft Lake Chelan Annual Flow and Water Temperature Report 2015 (attached).

Please submit your comment letters on or before 3:00 p.m., June 9, 2016 to Steve Hays via email at steve.hays@chelanpud.org. I have provided the report in both MSWORD and PDF formats for your convenience. Please feel free to use the review features in MSWORD to make your suggested edits. However, in order to facilitate documentation of your comments and Chelan PUD's responses to comments regarding significant substantive issues, please provide those comments and any supportive rationales or data in a separate

document so that it can be incorporated into the record of consultation.

Pursuant to License Article 405, Chelan PUD will file the Final Lake Chelan Annual Flow and Water Temperature Report with FERC and post it to the Lake Chelan License Implementation web page.

All comments received will be appended to the Final Lake Chelan Annual Flow and Water Temperature Report 2015 with a notation regarding how each comment or recommendation was incorporated in the report, or, if not incorporated, the reasons why the comment was not incorporated.

If you have any questions, please do not hesitate to contact me at (509-661-4181).

Steven Hays

Fish and Wildlife Senior Advisor

steve.hays@chelanpud.org

(509) 661-4181

LAKE CHELAN ANNUAL FLOW AND WATER TEMPERATURE REPORT 2015

LICENSE ARTICLES 405 & 408

Draft

LAKE CHELAN HYDROELECTRIC PROJECT
FERC Project No. 637

May 10, 2016

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

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EXECUTIVE SUMMARY

Chelan PUD received a new license (License) from the Federal Energy Regulatory Commission (FERC) on November 6, 2006, authorizing Chelan PUD to operate the Lake Chelan dam and powerhouse for a period of 50 years. The License conditions require that Chelan PUD provide minimum flows to the Chelan River and monitor those flows and water temperatures at various locations. The License required the construction of a Low Level Outlet at Chelan Dam, a Reach 4 Habitat Channel and spawning areas in the tailrace, and operations to protect aquatic life through flow ramping rates and powerhouse operations. The License also requires that Chelan PUD file an Annual Flow and Temperature Report with the FERC documenting compliance with these License requirements.

Flow releases were provided throughout the year from the Low Level Outlet for minimum flows of at least 80 cfs in Reaches 1-3. The runoff forecast for 2015 was 64 percent of average, which is classified as a "dry year" for setting minimum flows during the annual runoff cycle. The 2015 minimum flow releases to Reaches 1-3 were at least 80 cfs from May 15 – July 15. Additional flow was provided from the Pump Station to the Reach 4 Habitat Channel for salmon and steelhead spawning during their respective spawning periods and, to provide relief from high water temperatures, one pump was operated from June 3 – September. There were no minimum flow deviations in 2015.

Flows were released from the spillway, as needed for lake level control, from June 29 – July 2 and July 7 – July 10. These flow releases were managed to meet lake level target elevations and to avoid high spill levels that could damage the Reach 4 Habitat Channel. Daily average spillway flow releases for lake level control peaked at 1,321 cfs on June 29, with the highest hourly flows of 2,008 also on June 29. Flow releases from the Low Level Outlet were also managed to provide whitewater boating flows on September 19-20. Flows were ramped back down to minimum flows following the event, with ramping concluded on September 21.

There were 246 salmon redds with eggs incubating in the tailrace from spawning that occurred in 2014. Powerhouse operations for Chinook redd protection, based on results from the previous year's tests, were implemented and monitored to determine if adequate oxygen levels were maintained in Chinook salmon redds. During this study, the tests were designed to maintain minimum generation flows of over 800 cfs. During dive operations to install oxygen probes and sample redds for egg-fry survival measurements, the period of time with no powerhouse flow was limited to a maximum of three hours. After these studies concluded on March 26, the powerhouse operated with one turbine at full capacity until April 1. There was a maintenance outage of both units for three hours on April 1, then both units were operated at full capacity until April 17, by which time emergence of Chinook salmon had concluded.

The powerhouse was operated at full capacity, except for some periods for maintenance, from April 17 – April 30. During the first two weeks of May, one turbine was operated but with several periods with no generation including four days from May 10 – May 13. Steelhead spawning surveys were conducted from March – May, with three redds counted in the habitat channel, but no steelhead spawning was observed in the tailrace in 2015.

During the Chinook spawning period, powerhouse daily average flows were maintained above 2,000 cfs from October 15 –November 30, with the exception of some periods of a few hours with one turbine operating and a 4 hour outage of both turbines on November 19. A total count of 448 Chinook redds were estimated to have been deposited in the Chelan River, including the Reach 4 Habitat Channel and pool (125), tailrace (217), and downstream in the Chelan/Columbia River confluence and Columbia River (106). There were also 19 sockeye redds counted in 2015.

Water temperatures were monitored at seven locations in the Chelan River and tailrace. Water temperatures neither increased nor decreased during transit through the Reach 4 Habitat Channel. The maximum daily average water temperatures measured from upstream to downstream locations were 24.7 °C at the Low Level Outlet, 25.0 °C at the top of Reach 1, 24.7 °C at the end of Reach 1, 24.8 °C at the end of Reach 3, 24.8 °C at the bottom of Reach 4, and 25.3 °C in the tailrace. The highest hourly temperatures recorded at these locations were 25.1 °C, 25.4 °C, 27.6 °C, 27.3 °C, 26.6 °C and 26.6 °C, respectively. The highest 7-DADMax temperatures recorded were 24.6 °C at the top of Reach 1, 26.1 °C and 26.0 °C at the ends of Reaches 1 and 3, and 25.6 °C at the bottom of Reach 4.

Water quality assessments for dissolved oxygen and pH were made in Reach 4 from May 6 – December 31. Water quality standards were met for these parameters during these monitoring periods. Total dissolved gas percent saturation was measured for spillway flows up to 2,000 cfs. The highest TDG measurement of 103.1 percent was below the maximum criterion of 110 percent.

SECTION 1: INTRODUCTION

The Lake Chelan Hydroelectric Project (Project) is owned and operated by the Public Utility District No. 1 of Chelan County (Chelan PUD). The Federal Energy Regulatory Commission (FERC) license for operation of this project, issued on November 6, 2006, authorizes Chelan PUD to operate the Lake Chelan dam and powerhouse for a period of 50 years. As part of the normal operation of the Project, Chelan PUD withdraws water from Lake Chelan for power generation and discharges that water through the powerhouse into an excavated tailrace, which leads to the confluence of the Chelan River and the Columbia River. Flows released from the Chelan Dam follow the natural channel of the Chelan River, joining with the powerhouse tailrace flows and discharging to the Columbia River. As a requirement of the new License, minimum flows were established for the Chelan River and that flow was initiated on October 14, 2009.

Chelan PUD filed an Operations Compliance Monitoring Plan (OCMP), as required in License Article 405, which describes how Chelan PUD operates to meet: (1) the instream flows, ramping rates, and tailrace flows as set forth in Article 7 of the Lake Chelan Settlement Agreement and Chapter 7 of the Comprehensive Plan attached to the Settlement Agreement; (2) and the lake levels as set forth in Article 8 of the Settlement Agreement and Chapter 8 of the Comprehensive Plan. The OCMP includes the specifics of flow measurement techniques, electronic flow data posting, quarterly and annual reporting requirements, and an implementation schedule.

Chelan PUD filed a Threatened and Endangered Species Protection Plan (TESPP), as required in License Article 408, which describes: (1) how Chelan PUD implemented provisions for timely development of a system to release water at the Lake Chelan Dam or pump water from the project powerhouse tailrace to the Chelan River, and subsequent operation of that system to continuously maintain flows equal to or greater than the flows required for Chelan River Reach 4; and (2) methods and schedules for monitoring of flows in the project tailrace and in Reach 4 of the Chelan River and annual reporting of the monitoring results, as set forth in Article 7 of the Lake Chelan Settlement Agreement and Chapter 7 of the Comprehensive Plan attached to the Settlement Agreement, and (3) methods for timely determination of the need to take actions to improve water quality characteristics adversely affecting anadromous fish, and identification and implementation of appropriate actions.

The OCMP and TESPP were submitted to the FERC on May 4, 2007 and the FERC issued an order approving the TESPP on November 28, 2007 and an order modifying and approving the OCMP on November 30, 2007. Both the OCMP and TESPP require the recording and reporting of flows in the Chelan River, to evaluate meeting minimum flow requirements, protection of fish habitat and protection of salmon and steelhead eggs incubating in the tailrace. The TESPP also includes annual reporting of water temperature monitoring required in the Lake Chelan Settlement Agreement. The order approving the OCMP requires that Chelan PUD shall file an Annual Flow Report with the FERC by February 28 of each year. Due to weather and snow conditions that frequently prevented retrieval of temperature loggers in January and February, the FERC granted a request from Chelan PUD to change the filing date of these annual reports to April 30. Due to high flow conditions necessary to accomplish construction activities, temperature loggers could not be retrieved until the end of March in 2016. Chelan PUD

requested, and FERC granted a request to extend the filing date of the 2015 annual report until June 15, 2016. This Annual Flow and Temperature Report meets the flow and temperature reporting requirements of License Articles 405 and 408 for 2015.

Chelan PUD manages the level of Lake Chelan and flow releases through the powerhouse and into the Chelan River channel at the dam for power generation and other purposes. License Article 405 requires management of lake levels with priority given to maintaining minimum flows in the Chelan River (initiated in 2009) and reducing high spillway flows into the Chelan River to protect fish habitat. This report includes two sections that correspond to the flow reporting requirements of the FERC order: Section 2, Chelan River Instream Flows and Section 3, Powerhouse Tailrace Security Flows. Section 4 of this report contains the water temperature monitoring that was conducted in 2014. In addition, the FERC order requires that Chelan PUD conduct general water quality assessments in years 6 (2012) and 8 (2014) sufficient to demonstrate that the Chelan River meets water quality standards for dissolved oxygen, total dissolved gas, turbidity and pH. After 2014, additional data was collected to document water quality assessments that further address this requirement. Section 5 of this report discusses information collected in 2015.

SECTION 2: CHELAN RIVER INSTREAM FLOWS

2.1 Chelan River Instream Flows

Flow releases were provided throughout the year from the Low Level Outlet for minimum flows of at least 80 cfs in Reaches 1-3 (Figure 2-1). The runoff forecast for 2015 was 64 percent of average, which is classified as a "dry year" for setting minimum flows during the annual runoff cycle. The 2015 minimum flow releases to Reaches 1-3 were at least 80 cfs from May 15 – July 15. Additional flow was provided from the Pump Station to the Reach 4 Habitat Channel for salmon and steelhead spawning during their respective spawning periods and, to provide relief from high water temperatures, one pump was operated from June 3 – September 3 (Figure 2-2). There were no minimum flow deviations in 2015.

Flows were released from the spillway, as needed for lake level control, from June 29 – July 2 and July 7 – July 10. These flow releases were managed to meet lake level target elevations and to avoid high spill levels that could damage the Reach 4 Habitat Channel. Daily average spillway flow releases for lake level control peaked at 1,321 cfs on June 29, with the highest hourly flows of 2,008 also on June 29. Flow releases from the Low Level Outlet were also managed to provide whitewater boating flows on September 19-20. Flows were ramped back down to minimum flows following the event, with ramping concluded on September 21.

Spawning flows were provided for steelhead trout from March 15 – May 14 and for Chinook salmon from October 15-November 30. The Chelan River Fisheries Forum approved testing an alternative spawning flow using four instead of five pumps for both the steelhead and Chinook spawning periods. The spawning flows were provided through the combination of the Low Level Outlet flows and Pump Station flows, maintaining flow levels of at least 272 cfs during the spring steelhead spawning period. The flow effects of shutting off the pumps were buffered by increasing the flow from the Low Level Outlet to 194 cfs at the time the Pump Station shut down began. During the Chinook spawning period, the flow ranged from 282 cfs – 295 cfs. At the end of the Chinook spawning period, flows from the Pump Station were ramped down one pump at a time to avoid fish stranding. Steelhead spawning surveys were conducted from March through May, with three steelhead redds confirmed and several other possible redds seen in 2015. Chinook fry were observed rearing in the Reach 4 Habitat Channel from mid April through May. Chinook spawning began on October 4 and was completed prior to November 29. There were a total of 448 redds counted in the Chelan River Reach 4, the tailrace and Columbia River at the confluence. There were 125 redds in the Reach 4 Habitat Channel and upstream pool, 217 in the tailrace and 106 in the Columbia River in Chelan River currents below the confluence. There were also 19 sockeye redds counted in the pool above the habitat channel.

A tabulation of average daily flows from the Low Level Outlet, Pump Station, combined flows into Reaches 1-3 and Reach 4, powerhouse discharge, spill discharge and hourly lake levels and powerhouse tailwater levels are presented in Appendix A. Hourly data reported quarterly is available Chelan PUD's web page under Licensing and Compliance, Lake Chelan License Implementation, Resource Documents.

Figure 2-1. Flow Releases to Reaches 1-3 of the Chelan River, 2015.

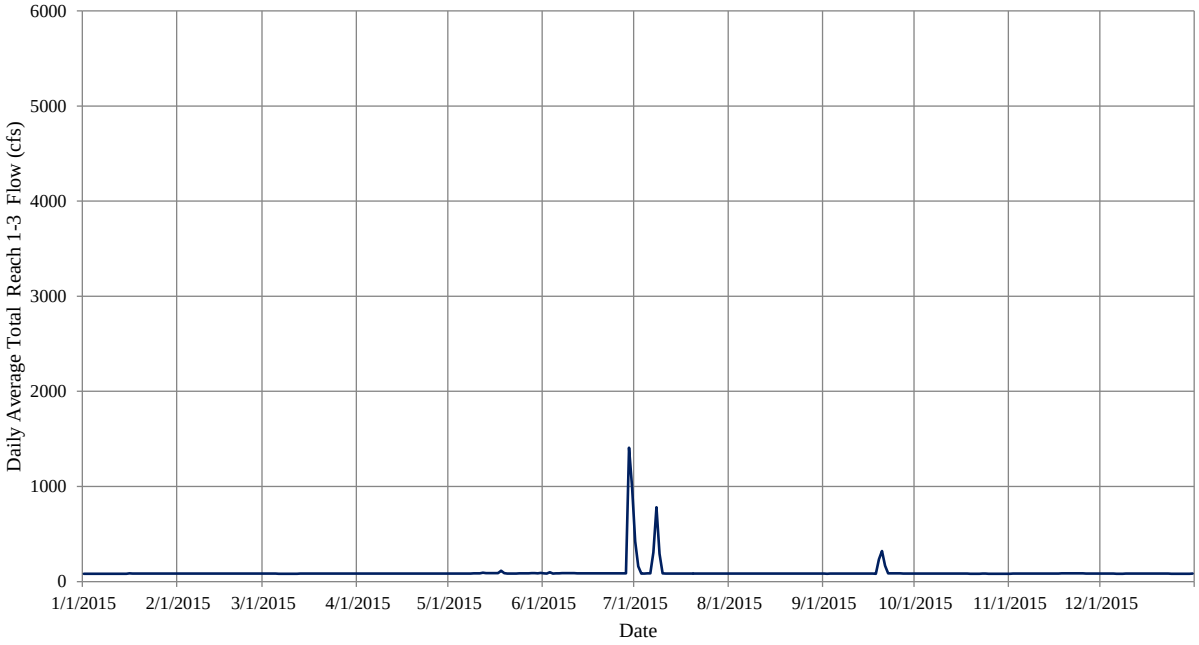
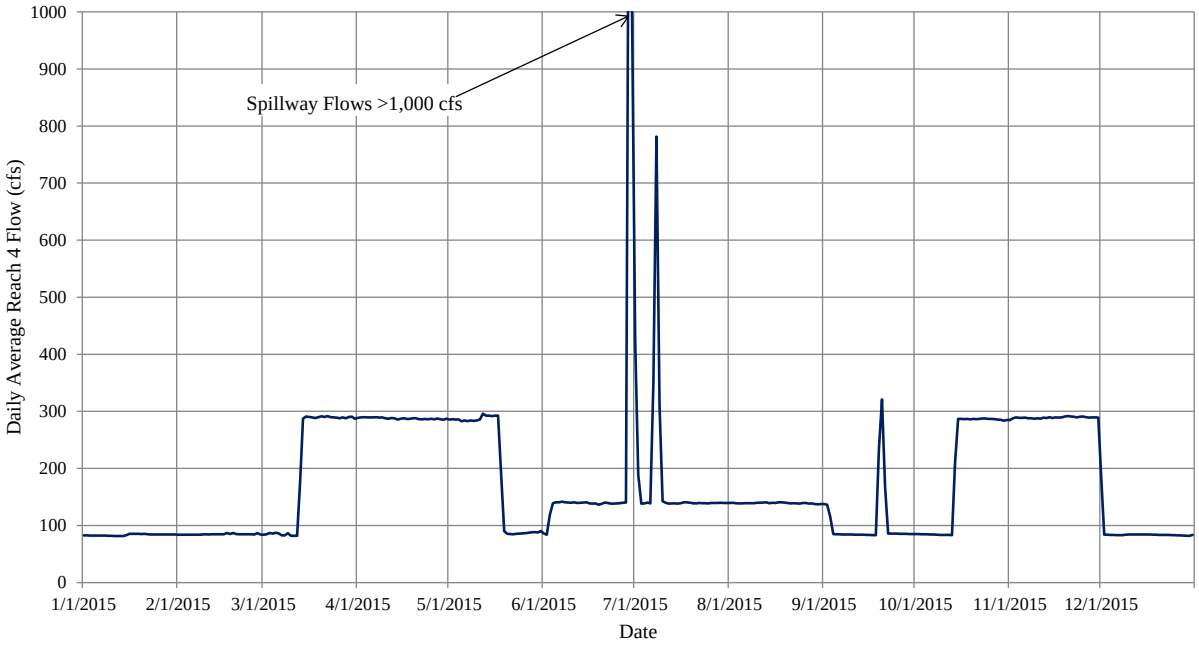


Figure 2-2. Flow Releases to Chelan River Reach 4, 2015.



2.2 Chelan River Ramping Rates

The Lake Chelan Settlement Agreement requires that ramping rates are to be established for the Chelan River to protect aquatic organisms from rapid fluctuations in water levels. The ramping rates for decreases in water levels were initially set at approximately two inches per hour during

the period when juvenile salmon and steelhead fry may be present. The OCMP states that the two inches per hour ramping rates will remain in effect until biological evaluations have determined the actual ramping rates necessary to prevent stranding of fish in the Chelan River. The locations in the Chelan River where water level changes will be measured to determine operating criteria for compliance with ramping rates will be determined in consultation with the Chelan River Fishery Forum.

The year 2015 was the sixth full year of minimum flow operations for the Chelan River since completion of the Low Level Outlet, Reach 4 Habitat Channel, and Pump Station. Biological evaluations of fish populations with snorkel surveys in the Chelan River Reaches 1-3 and Reach 4 began in 2012. Results of those surveys have been provided to the Chelan River Fisheries Forum and were included in the 2015 Biological Objectives Status Report. Observations during the snorkel surveys, steelhead spawning surveys (weekly March 15-June 1), summer observations during temperature logger replacement (monthly July, August, September) and fall during Chinook spawning surveys (weekly October – November) have only observed Chinook salmon fry in the Reach 4 Habitat Channel during the months of April, May and June. No Chinook or steelhead fry have been observed prior to mid April and after July. However, ramping rate operations for juvenile fish were followed throughout the year since refinement of ramping rates has not yet concluded.

Chelan PUD continued to implement operating criteria for compliance with the two inches per hour ramping rates that were refined in 2011 and further developed in 2014 and 2015 to improve instructions on the timing of flow changes. These improved instructions are shown in Table 2-1.

Table 2-1. Final Ramping Criteria (2015).

Chelan River Maximum Allowable Spill Reduction Ramping Rates		
Chelan Hydro License Compliance		
Revised 12/14/2015		
Whenever making a change in total spill, enter the table below at the "Total Current Spill" on the left, read "Maximum Allowable Spill Reduction Ramping Rate" on the right. **NOTE – if spill is reduced to a lower bandwidth, the ramp rate will change at the point (i.e. spill starts at 1100 cfs and you want to change to 900 cfs, it would be 200 cfs for 30 minutes (until 1000 cfs is reached), then 50 cfs/hr for 2 hours until 900 cfs is reached).		
Only reduce spill during daylight hours (to aid fish movement from potential entrapment areas).		
Total Current Spill = Spill Gates + Low Level Outlet cfs	Maximum Allowable Spill Reduction Ramping Rate	
	Fry are Present Along Riverbank Mar 15 to Sep 15 cfs/hr	No Fry Are Present Along Riverbank Sep 16 to Mar 14 cfs/hr
1000 < Total Current Spill	250	250
500 < Total Current Spill <= 1000	100	100
400 < Total Current Spill <= 500	50	50
220 < Total Current Spill <= 400	25	30
80 < Total Current Spill <= 220	20	20

SECTION 3: POWERHOUSE TAILRACE SECURITY FLOWS

3.1 Powerhouse Operations

There were 246 salmon redds with eggs incubating in the tailrace from spawning that occurred in 2014. Powerhouse operations for Chinook redd protection, based on results from the previous year's tests, were implemented and monitored to determine if adequate oxygen levels were maintained in Chinook salmon redds. During this study, the tests were designed to maintain minimum generation flows of over 800 cfs. During dive operations to install oxygen probes and sample redds for egg-fry survival measurements, the period of time with no powerhouse flow was limited to a maximum of three hours. After these studies concluded on March 26, the powerhouse operated with one turbine at full capacity until April 1. There was a maintenance outage of both units for three hours on April 1, then both units were operated at full capacity until April 17, by which time emergence of Chinook salmon had concluded.

The powerhouse was operated at full capacity, except for some periods for maintenance, from April 17 – April 30. During the first two weeks of May, one turbine was operated but with several periods with no generation including four days from May 10 – May 13. Steelhead spawning surveys were conducted from March – May, with three redds counted in the habitat channel, but no steelhead spawning was observed in the tailrace in 2015.

During the Chinook spawning period, powerhouse daily average flows were maintained above 2,000 cfs from October 15 –November 30, with the exception of some periods of a few hours with one turbine operating and a 4 hour outage of both turbines on November 19. A total count of 448 Chinook redds were estimated to have been deposited in the Chelan River, including the Reach 4 Habitat Channel and pool (125), tailrace (217), and downstream in the Chelan/Columbia River confluence and Columbia River (106). There were also 19 sockeye redds counted in 2015.

Powerhouse flows were above 2,000 cfs from December 1 – 31, except for a few hours on three days. The daily average powerhouse flows are shown in Figure 3-1.

Water surface elevations in the tailrace can fluctuate by several feet over the course of a day due to changes in Columbia River flows that affect the backwater curve of the Rocky Reach reservoir. The water level fluctuations in the tailrace are reduced when the Chelan Powerhouse is operating. In past years, temporary dewatering of a few Chinook redds in shallow areas had been observed when the powerhouse was not operating and Columbia River flows were low. During tailrace spawning habitat construction in 2008 these areas were graded to prevent dewatering, and this area was again excavated and graded in summer of 2014 to remove river gravels that had accumulated since 2008. The water levels in the tailrace remained above 707.5 feet most of the time and never dropped below 707.0 feet from January 1 – May 31 and October 15 – December 31. The daily average tailwater levels measured at the powerhouse are shown in Figure 3-2.

Figure 3-1. Chelan Powerhouse Daily Average Flows, 2015.

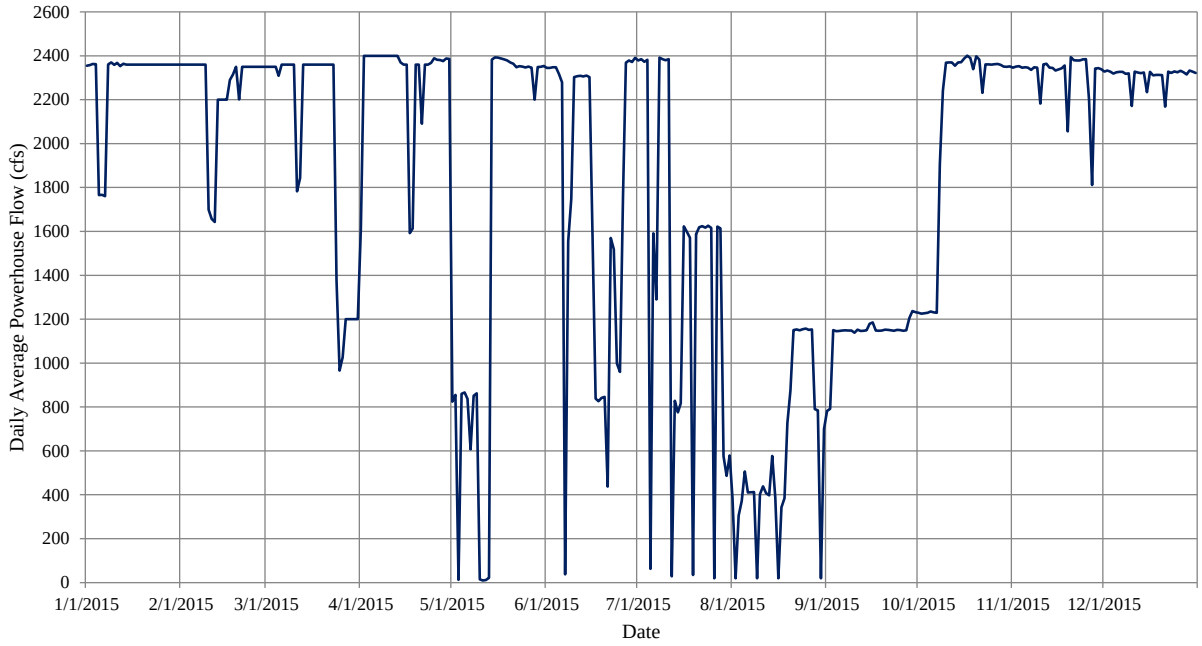
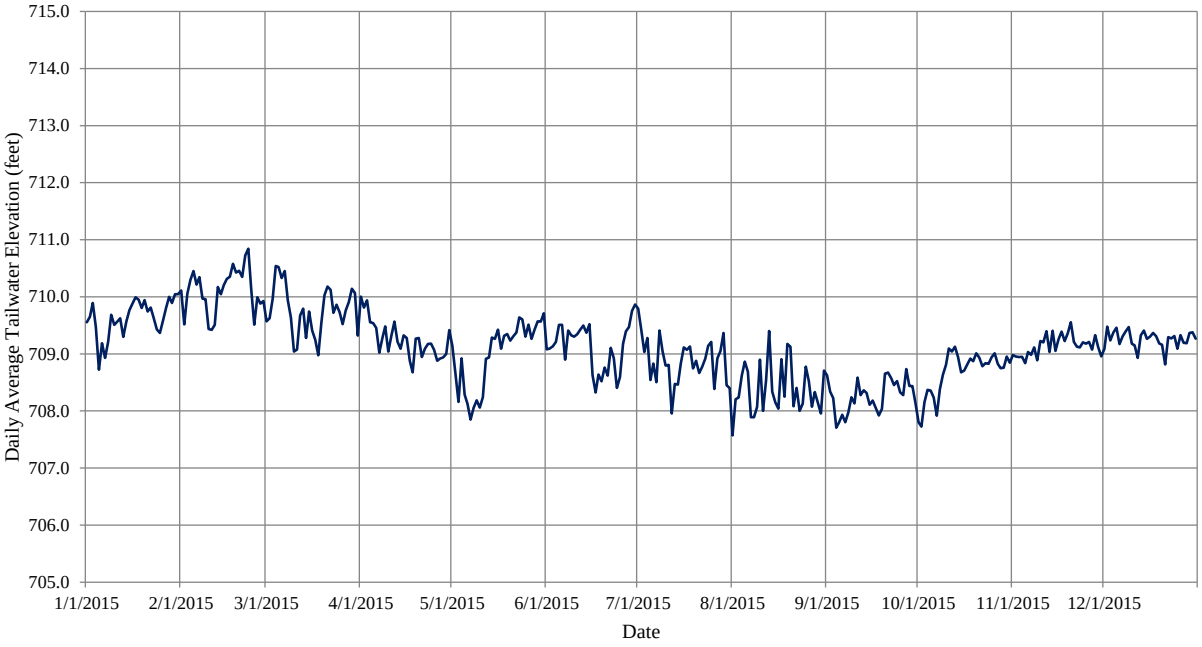


Figure 3-2. Chelan Powerhouse Daily Average Tailwater Elevations, 2015.



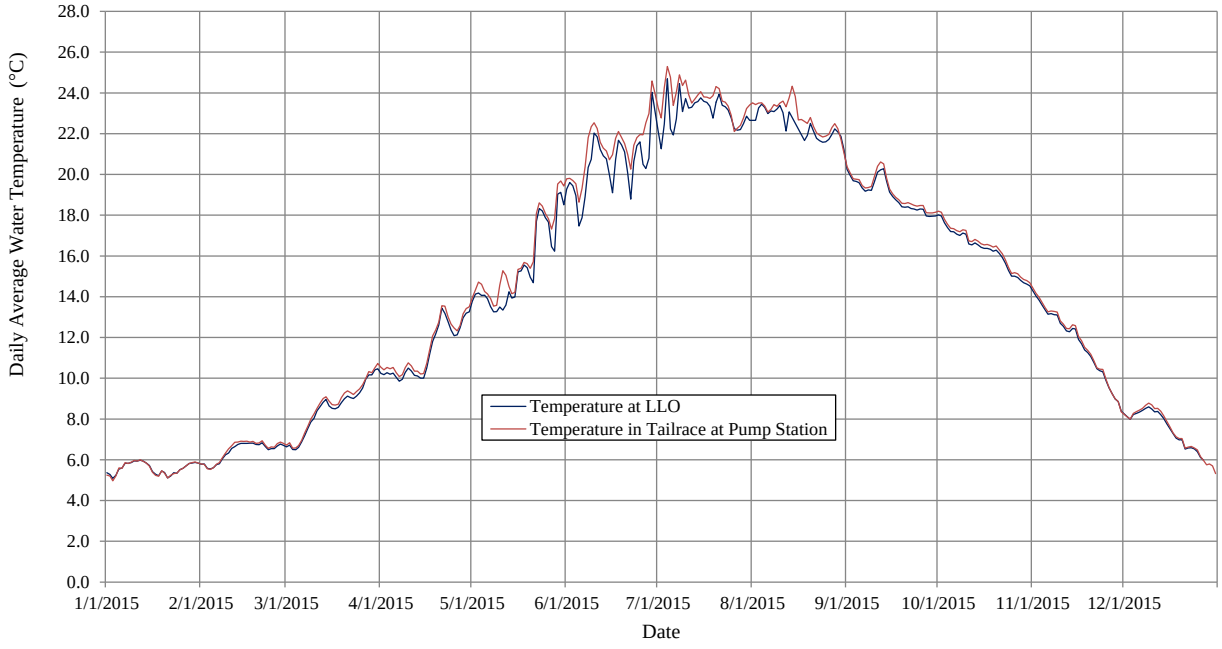
SECTION 4: WATER TEMPERATURE MONITORING

4.1 Water Temperatures Released to Chelan River and Tailrace

Automated water temperature monitoring equipment is installed at two locations, within the pipe that draws water from the base of the Chelan Dam and discharges to the Chelan River through the Low Level Outlet and in the Chelan Powerhouse Tailrace from a sensor mounted on the Pump Station intake screens. These monitoring locations measure water temperatures that reflect the coolest water available for the Chelan River (Low Level Outlet temperature) and the average of water temperatures arriving at the face of Chelan Dam as drawn through the powerhouse intakes (Chelan Powerhouse Tailrace). Water temperatures measured in the tailrace also represent the temperature of water that is being discharged to the Reach 4 Habitat Channel when the Pump Station is in operation.

Water temperatures from these sources (Figure 4-1) generally show little stratification in water temperatures at the face of Chelan Dam. The maximum daily average water temperature measured in the Low Level Outlet pipe was 24.7 °C. Hourly water temperatures peaked at 25.1 °C on July 4. Tailrace maximum daily average temperature was 25.3 °C, while hourly temperatures peaked at 25.8 °C on July 4.

Figure 4-1. Low Level Outlet and Tailrace Daily Average Water Temperatures.



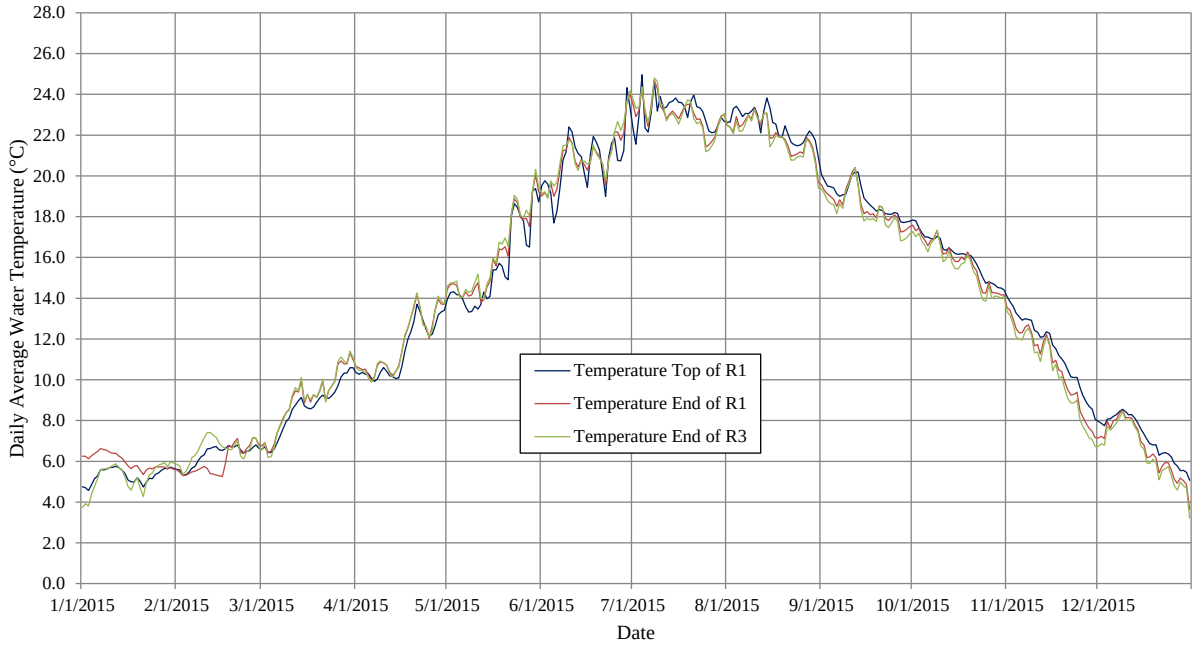
4.2 Water Temperatures in Chelan River Reaches 1-3.

Water temperatures are monitored at three locations with temperature recording data loggers (Onset HOBO Water Temp Pro v2) that are set to record the water temperature at hourly intervals. These locations are at the top of Reach 1, which measures the temperature of water

entering the Chelan River from the Low Level Outlet and the spillway. The location of this temperature logger is set below the mixing zone for these sources of water. The second location is at the end of Reach 1, which is the reach of the Chelan River that has the lowest gradient and least profile shading, thus the greatest potential for water temperature heating during the spring and summer. The third location is at the end of Reach 3, where the Chelan River exits the series of cascades and falls that are the upstream barrier to anadromous fish. The temperature loggers at each location are exchanged several times during the year to retrieve the data. These data are reported quarterly during most of the year, with monthly reporting for July, August and September. These data reports are available on Chelan PUD's web page under Licensing and Compliance, Lake Chelan License Implementation, Resource Documents.

The water temperatures recorded at the monitored Reaches in 2015 demonstrated small differences in daily average water temperature between Reaches (Figure 4-2). However, the daily maximum water temperature increased above the temperature at the Low Level Outlet during summer and decreased during the fall. This is not unexpected because the water exiting Lake Chelan is affected by the heat sink effect of the lake's large volume. Water in Lake Chelan is still warming from March – August, but then retains this heat through the late summer and fall, thus water exiting the lake is cooler than sustainable at equilibrium with ambient solar and air temperature conditions through the summer, then tends to be warmer than sustainable through fall and early winter. The maximum daily average water temperatures recorded in 2015 were 25.0 °C at the top of Reach 1, 24.7 °C at the end of Reach 1, and 24.8 °C at the end of Reach 3. The highest hourly temperatures recorded were 25.4 °C, 27.6 °C, and 27.3 °C, respectively for the top of Reach 1, end of Reach 1 and end of Reach 3. The highest temperature recorded was at the end of Reach 1 on July 4.

Figure 4-2. Chelan River Reaches 1-3 Daily Average Water Temperatures.

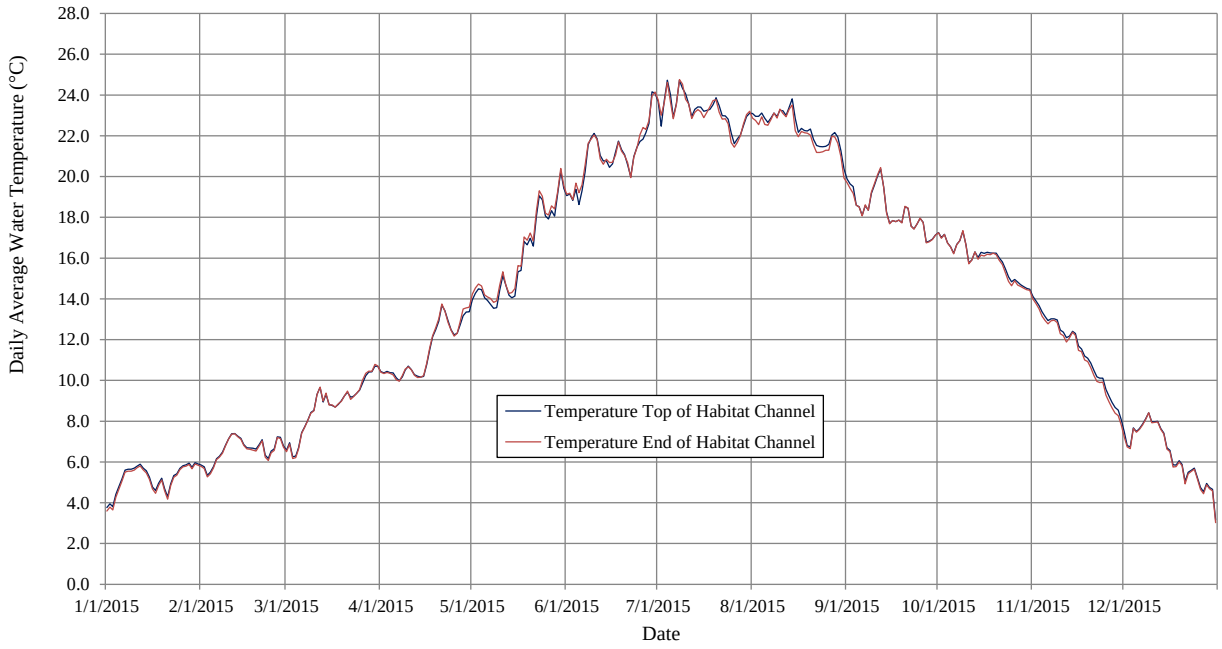


4.3 Water Temperatures in Chelan River Reach 4 Habitat Channel.

Water temperatures are monitored at hourly intervals at two locations (Onset HOBO Water Temp Pro v2), at the upper and lower end of the habitat channel. The upper location records either the water temperature exiting from the pool below the end of Reach 3 or the mixed flows from that source and the Pump Station canal outlet, when the pumps are in operation. The monitoring location at the end of the habitat channel is at the point where habitat channel flows enter into the tailrace, just upstream from where mixing of these flows is expected.

The daily average water temperature data from these locations did not show any evidence of heating as water passed through the habitat channel (Figure 4-3). Cooler tailrace water from operation of one pump from the Pump Station from June 3 – September 3 resulted in lower maximum hourly temperatures than water entering from Reach 3. The maximum daily average temperatures recorded were 24.7 °C at the top and 24.8 °C at the end of the habitat channel. The maximum hourly temperatures were 26.0 °C and 26.6 °C at the upper and lower ends of the habitat channel. These peak temperatures were recorded on July 9 and July 4, respectively.

Figure 4-3. Reach 4 Habitat Channel Daily Average Water Temperatures.



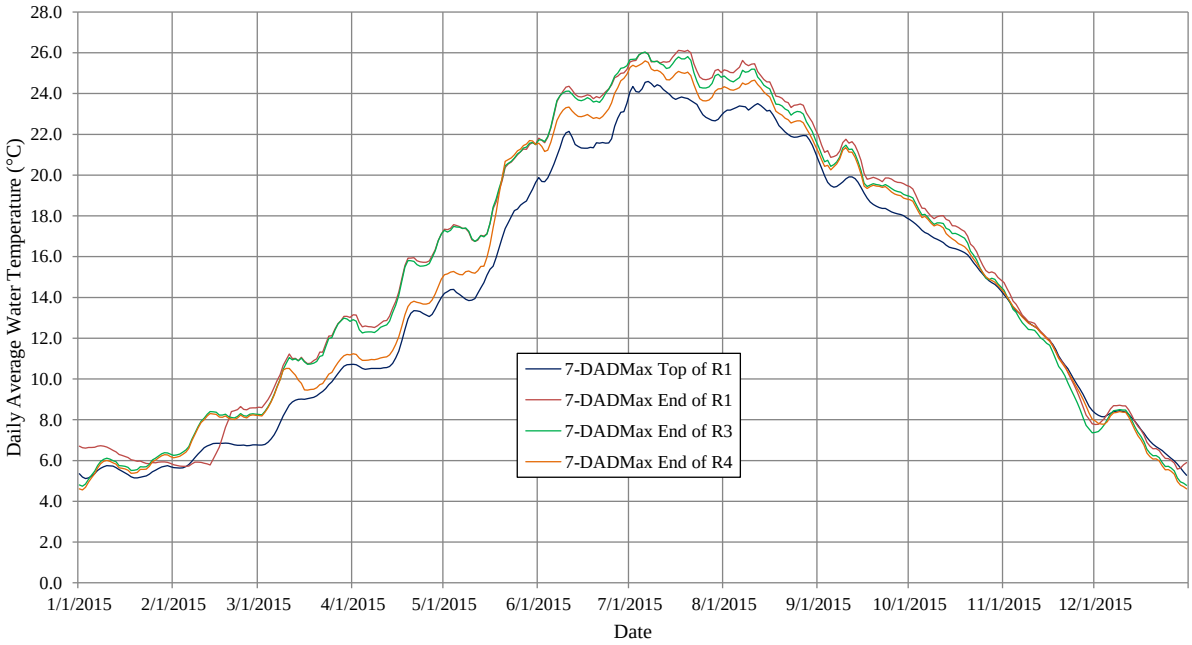
4.4 Chelan River 7-DADMax Water Temperatures Top Reach 1 to Bottom Reach 4.

Washington State water quality standards for temperature establish criteria based on the 7-DADMax (seven day average of daily maximum temperature). The 7-DADMax criterion for the Chelan River is currently 17.5 °C (see Section 5, Table 5-1), with an allowable human effect of 0.3 °C above natural conditions. Natural conditions have not been defined for the Chelan River due to its current status of a river in the initial stages of restoration. However, the temperature of water exiting Lake Chelan is the initial water temperature at the beginning of the Chelan River. This water is either provided exclusively from the Low Level Outlet, which draws the coolest water available at the face of the Chelan Dam, or is from a mix of water from the

spillway and the Low Level Outlet. As water flows through the Chelan River, it either heats or cools, depending on the time of year, since water exiting Lake Chelan is thermally buffered from daily and seasonal environmental influences. The 7-DADMax from the fall through early spring may be warmer at the upper Chelan River (top of Reach 1) than at the lower end where it merges with the tailrace (end of Reach 4). As solar radiation and warmer air temperatures increase from spring through summer, the 7-DADMax will increase as water flows down the Chelan River. The 7-DADMax may be nearly identical at different locations, indicating that the water temperature had reached equilibrium with the external sources of heat gain or loss prior to reaching the downstream monitoring locations.

The 7-DADMax water temperatures from four locations, top of Reach 1, end of Reach 1, end of Reach 3 and end of the Reach 4 Habitat Channel are shown in Figure 4-4. During the periods when flows in Reach 4 are increased for Chinook and steelhead spawning, the water temperatures measured at the end of the Reach 4 Habitat Channel reflects the mix of water from the tailrace and water exiting Reach 3. The difference in temperature is pronounced during the spring when steelhead spawning flows are provided by the pumping station (March 15 – May 15). Prior to and after the spring pumping period, the 7-DADMax at the end of Reach 3 and at the end of the Reach 4 Habitat Channel are nearly identical (Figure 4-4). However, cooler tailrace water provided from June 3 – September 3 effectively lowered the 7-DADMax by a small amount. The 7-DADMax at the top of Reach 1 exceeded the 17.5 °C criterion on May 22, with exceedances extending through October 3, reaching a peak of 24.6 °C on July 6 and July 7. The 7-DADMax at the end of Reach 4 exceeded the criterion from May 18, with exceedances continuing through October 10. The highest 7-DADMax reached 25.6 °C on July 6. The highest 7-DADMax at the ends of Reach 1 and Reach 3 were 26.1 °C and 26.0 °C, respectively.

Figure 4-4. The 7-DADMax Water Temperatures for Reaches 1 – 4.



SECTION 5: WATER QUALITY ASSESSMENT

General water quality assessment data was collected from May – December in 2015 to provide additional continuous monitoring. The requirement for general water quality assessment is that Chelan PUD conduct general water quality assessments in years 6 (2012) and 8 (2014) sufficient to demonstrate that the Chelan River meets water quality standards for dissolved oxygen, total dissolved gas, turbidity and pH. The 401 Certification specifies that this information is to be collected in Reach 4 for dissolved oxygen, turbidity and pH, whereas the total dissolved gas measurements are to be made in Reach 1 below the spillway of the Chelan Dam. Water quality criteria currently applicable to the Chelan River, which has a designated aquatic life use of salmonid spawning, rearing and migration, are shown in Table 5-1.

Table 5-1. Water Quality Criteria for Salmonid Spawning, Rearing and Migration.

	Water Temperature	Dissolved Oxygen	pH	Turbidity	Total Dissolved Gas
Criteria	7-DADMax <=17.5 °C	1 Day Min. 8.0 mg/l	6.5-8.5 Units	-	110 % Saturation
Allowable Human Effect	0.3 °C above natural conditions	0.2 mg/l	< 0.5 Units	5 NTU when Background <= 50 NTU	None

5.1 Assessment of Dissolved Oxygen, pH and Turbidity in Reach 4 Habitat Channel.

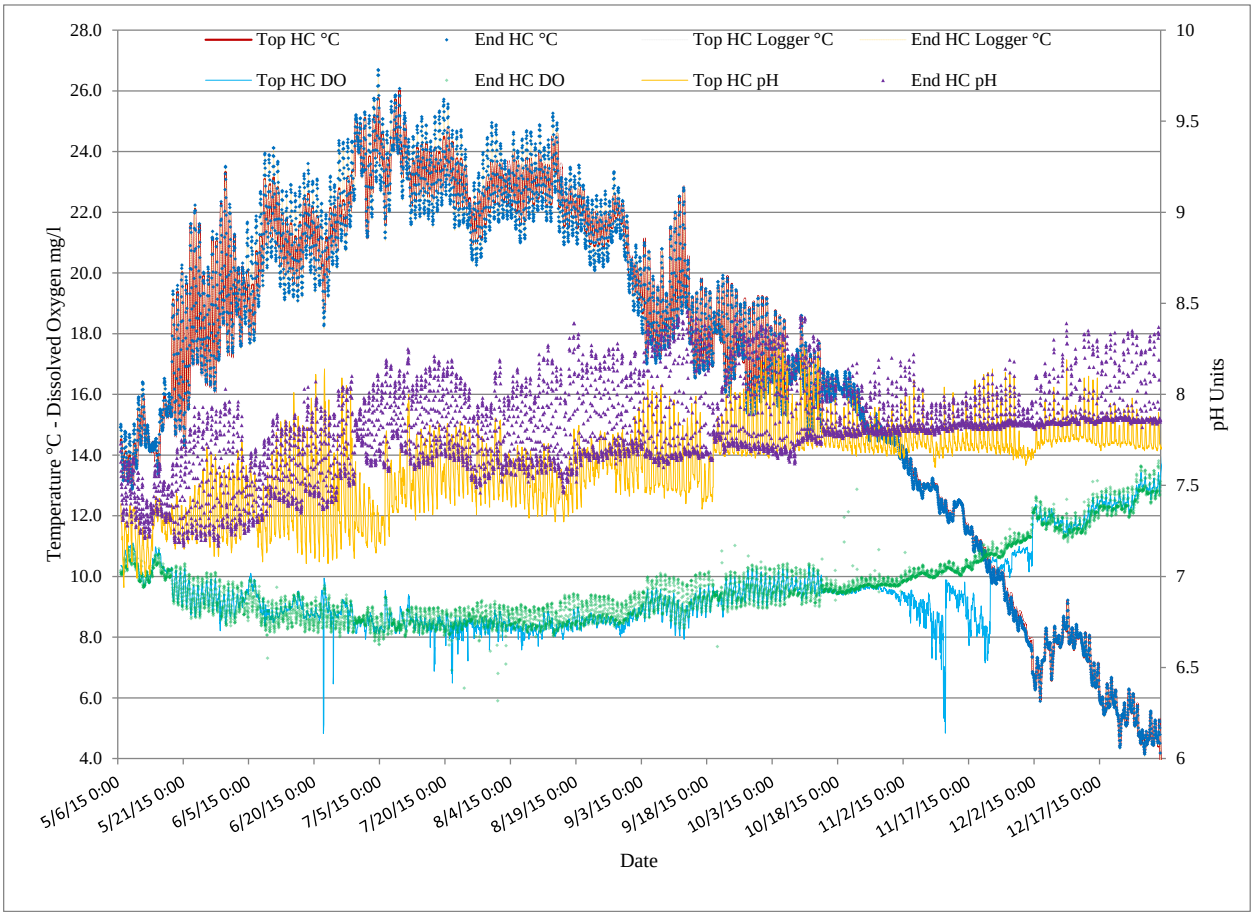
Measurements of water temperature, dissolved oxygen and pH were obtained from two locations in the Reach 4 Habitat Channel from May 6 to December 31, 2015. Measurements were obtained using Hydrolab MS5 Minisondes that were programmed to record data every hour. One Minisonde was attached to the same anchor post that is used for the temperature recording data logger at the upper end of the Habitat Channel. The other Minisonde was attached to the anchor post that is used for the temperature logger at the downstream end of the habitat channel.

The dissolved oxygen and pH data collected were within the criteria specified for the current designated uses for the Chelan River (Table 5-1).The temperature, dissolved oxygen and pH data collected with the Minisondes are shown in Figure 5-1. The hourly temperature data regularly collected from the upper and lower end of the Reach 4 Habitat Channel are also shown in these figures, demonstrating the close agreement between these four independent measurements of water temperature. As discussed in Sections 4.3-4.4, water temperatures exceeded the 7-DADMax 17.5 °C from May 18 – October 10. Daily swings in temperature were attenuated until May 15 and from October 15 – November 30 while the spawning flows were provided from the pumping station. The dissolved oxygen levels in Figure 5-1 demonstrate that despite water temperatures exceeding 17.5 °C the dissolved oxygen level still met the water quality criterion of 8.0 mg/l. Sporadic low dissolved oxygen readings recorded by the Minisonde at the upper end of the habitat channel in June and November appear to be from a malfunctioning sensor because the

low dissolved oxygen readings were inconsistent with water temperature conditions and the information from the other Minisonde. The pH readings from the Minisonde at the lower end of the habitat channel trended higher than pH recorded at the upper end of the habitat channel, however all measurements were within the water quality criteria. The pH from both Minisondes appeared to be drifting into higher values after four to five months of deployment, possibly due to depletion of the electrolyte in the reference sensor. Future long deployments should be limited to less than four months between replenishment of pH electrolyte and recalibration.

The water clarity in the Chelan River is very high throughout the year, except during high spill levels. A single turbidity measurement was taken on October 12, 2013, and the turbidity was 0.04 NTU. Except during high spill events, the water clarity is very high throughout the year. There is no background turbidity against which to compare the turbidity in the Reach 4 Habitat Channel since there is no construction activity and there are no active erosion sites within the Habitat Channel. Chelan PUD intends to conduct long-term continuous monitoring of turbidity in 2016.

Figure 5-1. May – December 2015, Water Quality Data in Reach 4 Habitat Channel.



5.2 Assessment of Total Dissolved Gas in Reach 1 Below Chelan Dam Spillway.

A secure and representative method for placing an instrument for measuring TDG was installed in 2014 and monitoring occurred in 2015, but due to the low runoff in 2015 there were only two spill events. Several hours of spill at about 2,000 cfs occurred on June 29, yet the highest TDG level measured during this spill was 103.1 percent. The spillway at Chelan Dam does not have a stilling basin where entrained air could be carried to depth, thus there is no physical process that would cause TDG to exceed the 110 percent criterion. Additional TDG measurements are planned for 2016.

SECTION 6: SUMMARY

Flow releases were provided throughout the year from the Low Level Outlet for minimum flows of at least 80 cfs in Reaches 1-3. The runoff forecast for 2015 was 64 percent of average, which is classified as a "dry year" for setting minimum flows during the annual runoff cycle. The 2015 minimum flow releases to Reaches 1-3 were at least 80 cfs from May 15 – July 15. Additional flow was provided from the Pump Station to the Reach 4 Habitat Channel for salmon and steelhead spawning during their respective spawning periods and, to provide relief from high water temperatures, one pump was operated from June 3 – September. There were no minimum flow deviations in 2015.

Flows were released from the spillway, as needed for lake level control, from June 29 – July 2 and July 7 – July 10. These flow releases were managed to meet lake level target elevations and to avoid high spill levels that could damage the Reach 4 Habitat Channel. Daily average spillway flow releases for lake level control peaked at 1,321 cfs on June 29, with the highest hourly flows of 2,008 also on June 29. Flow releases from the Low Level Outlet were also managed to provide whitewater boating flows on September 19-20. Flows were ramped back down to minimum flows following the event, with ramping concluded on September 21.

There were 246 salmon redds with eggs incubating in the tailrace from spawning that occurred in 2014. Powerhouse operations for Chinook redd protection, based on results from the previous year's tests, were implemented and monitored to determine if adequate oxygen levels were maintained in Chinook salmon redds. During this study, the tests were designed to maintain minimum generation flows of over 800 cfs. During dive operations to install oxygen probes and sample redds for egg-fry survival measurements, the period of time with no powerhouse flow was limited to a maximum of three hours. After these studies concluded on March 26, the powerhouse operated with one turbine at full capacity until April 1. There was a maintenance outage of both units for three hours on April 1, then both units were operated at full capacity until April 17, by which time emergence of Chinook salmon had concluded.

The powerhouse was operated at full capacity, except for some periods for maintenance, from April 17 – April 30. During the first two weeks of May, one turbine was operated but with several periods with no generation including four days from May 10 – May 13. Steelhead spawning surveys were conducted from March – May, with three redds counted in the habitat channel, but no steelhead spawning was observed in the tailrace in 2015.

During the Chinook spawning period, powerhouse daily average flows were maintained above 2,000 cfs from October 15 –November 30, with the exception of some periods of a few hours with one turbine operating and a 4 hour outage of both turbines on November 19. A total count of 448 Chinook redds were estimated to have been deposited in the Chelan River, including the Reach 4 Habitat Channel and pool (125), tailrace (217), and downstream in the Chelan/Columbia River confluence and Columbia River (106). There were also 19 sockeye redds counted in 2015.

Water temperatures were monitored at seven locations in the Chelan River and tailrace. Water temperatures neither increased nor decreased during transit through the Reach 4 Habitat Channel.

The maximum daily average water temperatures measured from upstream to downstream locations were 24.7 °C at the Low Level Outlet, 25.0 °C at the top of Reach 1, 24.7 °C at the end of Reach 1, 24.8 °C at the end of Reach 3, 24.8 °C at the bottom of Reach 4, and 25.3 °C in the tailrace. The highest hourly temperatures recorded at these locations were 25.1 °C, 25.4 °C, 27.6 °C, 27.3 °C, 26.6 °C and 26.6 °C, respectively. The highest 7-DADMax temperatures recorded were 24.6 °C at the top of Reach 1, 26.1 °C and 26.0 °C at the ends of Reaches 1 and 3, and 25.6 °C at the bottom of Reach 4.

Water quality assessments for dissolved oxygen and pH were made in Reach 4 from May 6 – December 31. Water quality standards were met for these parameters during these monitoring periods. Total dissolved gas percent saturation was measured for spillway flows up to 2,000 cfs. The highest TDG measurement of 103.1 percent was below the maximum criterion of 110 percent.

APPENDIX A: DAILY AVERAGE LAKE CHELAN ELEVATIONS, POWERHOUSE FLOWS, TAILWATER ELEVATIONS AND CHELAN RIVER FLOWS FROM SPILL, LOW LEVEL OUTLET AND PUMPING STATION

Date	Lake Chelan Elevation (ft)	Powerhouse Tailrace Flow (cfs)	Powerhouse Tailwater Elevation (ft)	Low Level Outlet Flow (cfs)	Spill Flow (cfs)	Chelan River Flow Reaches 1-3 (cfs)	Pump Station Flow (cfs)	Chelan River Flow Reach 4 (cfs)
1/1/2015	1093.2	2355	709.6	83	0	83	0	83
1/2/2015	1093.1	2358	709.7	83	0	83	0	83
1/3/2015	1093.0	2363	709.9	82	0	82	0	82
1/4/2015	1093.0	2362	709.5	82	0	82	0	82
1/5/2015	1093.0	1766	708.7	82	0	82	0	82
1/6/2015	1093.0	1766	709.2	82	0	82	0	82
1/7/2015	1093.0	1760	708.9	82	0	82	0	82
1/8/2015	1093.0	2361	709.2	82	0	82	0	82
1/9/2015	1093.0	2370	709.7	82	0	82	0	82
1/10/2015	1092.9	2359	709.5	82	0	82	0	82
1/11/2015	1092.9	2368	709.6	82	0	82	0	82
1/12/2015	1092.8	2353	709.6	82	0	82	0	82
1/13/2015	1092.8	2363	709.3	81	0	81	0	81
1/14/2015	1092.7	2360	709.6	81	0	81	0	81
1/15/2015	1092.6	2360	709.8	83	0	83	0	83
1/16/2015	1092.6	2360	709.9	86	0	86	0	86
1/17/2015	1092.5	2360	710.0	85	0	85	0	85
1/18/2015	1092.5	2360	709.9	85	0	85	0	85
1/19/2015	1092.5	2360	709.8	85	0	85	0	85
1/20/2015	1092.4	2360	709.9	85	0	85	0	85
1/21/2015	1092.3	2360	709.7	85	0	85	1	85
1/22/2015	1092.2	2360	709.8	85	0	85	0	85
1/23/2015	1092.2	2360	709.6	84	0	84	0	84
1/24/2015	1092.1	2360	709.4	84	0	84	0	84
1/25/2015	1092.1	2360	709.4	84	0	84	0	84
1/26/2015	1092.1	2360	709.6	84	0	84	0	84
1/27/2015	1092.1	2360	709.8	84	0	84	0	84
1/28/2015	1092.1	2360	710.0	84	0	84	0	84
1/29/2015	1092.1	2360	709.9	84	0	84	0	84
1/30/2015	1092.1	2360	710.0	84	0	84	0	84
1/31/2015	1092.1	2360	710.0	84	0	84	0	84
2/1/2015	1092.0	2360	710.1	84	0	84	0	84
2/2/2015	1092.0	2360	709.5	84	0	84	0	84
2/3/2015	1092.0	2360	710.1	84	0	84	0	84
2/4/2015	1091.9	2360	710.3	84	0	84	0	84
2/5/2015	1091.9	2360	710.5	84	0	84	0	84
2/6/2015	1092.0	2360	710.2	84	0	84	0	84
2/7/2015	1092.0	2360	710.3	84	0	84	0	84
2/8/2015	1092.0	2360	710.0	84	0	84	0	84
2/9/2015	1092.1	2360	710.0	84	0	84	0	84
2/10/2015	1092.2	1699	709.4	85	0	85	0	85
2/11/2015	1092.3	1657	709.4	84	0	84	0	84
2/12/2015	1092.4	1643	709.5	84	0	84	0	84
2/13/2015	1092.4	2200	710.2	84	0	84	0	84
2/14/2015	1092.5	2200	710.0	85	0	85	0	85
2/15/2015	1092.5	2200	710.2	85	0	85	0	85
2/16/2015	1092.6	2200	710.3	85	0	85	0	85
2/17/2015	1092.6	2290	710.4	85	0	85	2	87

Date	Lake Chelan Elevation (ft)	Powerhouse Tailrace Flow (cfs)	Powerhouse Tailwater Elevation (ft)	Low Level Outlet Flow (cfs)	Spill Flow (cfs)	Chelan River Flow Reaches 1-3 (cfs)	Pump Station Flow (cfs)	Chelan River Flow Reach 4 (cfs)
2/18/2015	1092.6	2315	710.6	85	0	85	0	85
2/19/2015	1092.6	2350	710.4	85	0	85	2	87
2/20/2015	1092.6	2202	710.5	85	0	85	0	85
2/21/2015	1092.6	2350	710.3	85	0	85	0	85
2/22/2015	1092.6	2350	710.7	85	0	85	0	85
2/23/2015	1092.5	2350	710.8	85	0	85	0	85
2/24/2015	1092.5	2350	710.1	85	0	85	0	85
2/25/2015	1092.5	2350	709.5	85	0	85	0	85
2/26/2015	1092.4	2350	710.0	84	0	84	0	84
2/27/2015	1092.4	2350	709.9	84	0	84	2	86
2/28/2015	1092.3	2350	709.9	84	0	84	0	84
3/1/2015	1092.3	2350	709.6	84	0	84	0	84
3/2/2015	1092.2	2350	709.6	84	0	84	1	85
3/3/2015	1092.2	2350	710.0	84	0	84	3	87
3/4/2015	1092.1	2350	710.5	83	0	83	2	86
3/5/2015	1092.0	2309	710.5	83	0	83	4	87
3/6/2015	1092.0	2360	710.3	83	0	83	3	86
3/7/2015	1091.9	2360	710.5	83	0	83	0	83
3/8/2015	1091.8	2360	709.9	83	0	83	0	83
3/9/2015	1091.8	2360	709.6	82	0	82	4	86
3/10/2015	1091.7	2360	709.0	82	0	82	0	82
3/11/2015	1091.6	1783	709.1	82	0	82	0	82
3/12/2015	1091.6	1843	709.7	82	0	82	0	82
3/13/2015	1091.6	2360	709.8	85	0	85	94	179
3/14/2015	1091.6	2360	709.3	84	0	84	203	288
3/15/2015	1091.7	2360	709.7	85	0	85	206	291
3/16/2015	1091.8	2360	709.4	85	0	85	206	290
3/17/2015	1091.8	2360	709.2	85	0	85	204	289
3/18/2015	1091.9	2360	709.0	85	0	85	203	288
3/19/2015	1091.9	2360	709.5	85	0	85	205	290
3/20/2015	1091.9	2360	710.0	85	0	85	206	291
3/21/2015	1091.9	2360	710.2	85	0	85	205	290
3/22/2015	1091.9	2360	710.1	85	0	85	207	292
3/23/2015	1091.9	2360	709.7	85	0	85	205	290
3/24/2015	1092.0	1377	709.9	85	0	85	205	289
3/25/2015	1092.0	966	709.7	84	0	84	205	289
3/26/2015	1092.1	1027	709.5	84	0	84	204	288
3/27/2015	1092.2	1200	709.8	84	0	84	205	289
3/28/2015	1092.3	1200	709.9	84	0	84	204	288
3/29/2015	1092.4	1200	710.1	85	0	85	205	290
3/30/2015	1092.5	1200	710.1	85	0	85	206	290
3/31/2015	1092.6	1200	709.3	85	0	85	202	287
4/1/2015	1092.7	1613	710.0	85	0	85	204	289
4/2/2015	1092.8	2400	709.8	85	0	85	205	289
4/3/2015	1092.8	2400	709.9	85	0	85	205	290
4/4/2015	1092.8	2400	709.6	85	0	85	205	289
4/5/2015	1092.8	2400	709.5	85	0	85	205	290
4/6/2015	1092.8	2400	709.5	85	0	85	204	289

Date	Lake Chelan Elevation (ft)	Powerhouse Tailrace Flow (cfs)	Powerhouse Tailwater Elevation (ft)	Low Level Outlet Flow (cfs)	Spill Flow (cfs)	Chelan River Flow Reaches 1-3 (cfs)	Pump Station Flow (cfs)	Chelan River Flow Reach 4 (cfs)
4/7/2015	1092.7	2400	709.0	85	0	85	204	290
4/8/2015	1092.7	2400	709.3	85	0	85	204	289
4/9/2015	1092.7	2400	709.5	85	0	85	204	290
4/10/2015	1092.6	2400	709.0	85	0	85	203	288
4/11/2015	1092.6	2400	709.3	85	0	85	202	287
4/12/2015	1092.6	2400	709.6	85	0	85	204	288
4/13/2015	1092.5	2400	709.2	84	0	84	204	288
4/14/2015	1092.5	2370	709.1	83	0	83	202	285
4/15/2015	1092.4	2360	709.3	84	0	84	203	287
4/16/2015	1092.3	2360	709.3	85	0	85	203	288
4/17/2015	1092.3	1593	708.9	85	0	85	202	287
4/18/2015	1092.3	1613	708.7	85	0	85	202	287
4/19/2015	1092.3	2360	709.3	85	0	85	203	288
4/20/2015	1092.2	2360	709.3	85	0	85	203	288
4/21/2015	1092.3	2091	708.9	85	0	85	202	287
4/22/2015	1092.3	2360	709.1	85	0	85	201	286
4/23/2015	1092.3	2360	709.2	84	0	84	203	287
4/24/2015	1092.3	2368	709.2	84	0	84	202	286
4/25/2015	1092.3	2389	709.1	84	0	84	203	287
4/26/2015	1092.3	2382	708.9	84	0	84	202	286
4/27/2015	1092.3	2381	708.9	84	0	84	203	288
4/28/2015	1092.3	2376	708.9	84	0	84	202	286
4/29/2015	1092.3	2388	709.0	84	0	84	201	285
4/30/2015	1092.3	2385	709.4	84	0	84	203	287
5/1/2015	1092.3	824	709.1	84	0	84	202	286
5/2/2015	1092.4	855	708.7	84	0	84	202	286
5/3/2015	1092.6	13	708.2	85	0	85	201	286
5/4/2015	1092.7	860	708.9	85	0	85	201	286
5/5/2015	1092.8	866	708.3	85	0	85	198	283
5/6/2015	1093.0	838	708.1	85	0	85	199	284
5/7/2015	1093.1	607	707.8	85	0	85	198	283
5/8/2015	1093.2	851	708.1	85	0	85	199	284
5/9/2015	1093.3	863	708.2	86	0	86	198	283
5/10/2015	1093.4	15	708.1	87	0	87	197	284
5/11/2015	1093.6	10	708.2	88	0	88	198	286
5/12/2015	1093.9	12	708.9	88	6	94	202	296
5/13/2015	1094.1	21	708.9	89	0	89	204	293
5/14/2015	1094.3	2383	709.3	88	0	88	204	292
5/15/2015	1094.4	2393	709.3	89	0	89	203	292
5/16/2015	1094.5	2391	709.4	89	0	89	203	292
5/17/2015	1094.6	2388	709.1	89	0	89	204	292
5/18/2015	1094.8	2384	709.3	113	0	113	76	190
5/19/2015	1094.9	2378	709.3	90	0	90	0	90
5/20/2015	1095.1	2370	709.2	85	0	85	0	85
5/21/2015	1095.4	2363	709.3	85	0	85	0	85
5/22/2015	1095.7	2348	709.4	85	0	85	0	85
5/23/2015	1095.9	2353	709.6	85	0	85	0	85
5/24/2015	1096.2	2350	709.6	86	0	86	0	86

Date	Lake Chelan Elevation (ft)	Powerhouse Tailrace Flow (cfs)	Powerhouse Tailwater Elevation (ft)	Low Level Outlet Flow (cfs)	Spill Flow (cfs)	Chelan River Flow Reaches 1-3 (cfs)	Pump Station Flow (cfs)	Chelan River Flow Reach 4 (cfs)
5/25/2015	1096.4	2347	709.3	86	0	86	0	86
5/26/2015	1096.5	2351	709.5	86	0	86	0	86
5/27/2015	1096.6	2346	709.3	87	0	87	0	87
5/28/2015	1096.9	2200	709.4	88	0	88	0	88
5/29/2015	1097.1	2349	709.6	88	0	88	0	88
5/30/2015	1097.3	2350	709.6	88	0	88	0	88
5/31/2015	1097.6	2354	709.7	91	0	91	0	91
6/1/2015	1097.7	2345	709.1	86	0	86	0	86
6/2/2015	1097.9	2345	709.1	84	0	84	0	84
6/3/2015	1098.1	2348	709.1	98	0	98	21	119
6/4/2015	1098.2	2348	709.2	85	0	85	54	139
6/5/2015	1098.2	2317	709.5	86	0	86	55	141
6/6/2015	1098.3	2279	709.5	87	0	87	54	141
6/7/2015	1098.6	37	708.9	89	0	89	53	142
6/8/2015	1098.8	1554	709.4	88	0	88	52	141
6/9/2015	1099.0	1748	709.3	89	0	89	51	140
6/10/2015	1099.2	2303	709.3	88	0	88	52	140
6/11/2015	1099.3	2307	709.3	88	0	88	52	140
6/12/2015	1099.3	2309	709.4	87	0	87	52	139
6/13/2015	1099.3	2306	709.5	86	0	86	54	140
6/14/2015	1099.3	2310	709.4	86	0	86	55	140
6/15/2015	1099.3	2303	709.5	86	0	86	55	141
6/16/2015	1099.3	1575	708.6	86	0	86	53	139
6/17/2015	1099.4	838	708.3	86	0	86	52	138
6/18/2015	1099.5	826	708.6	86	0	86	53	139
6/19/2015	1099.6	842	708.5	86	0	86	50	136
6/20/2015	1099.6	847	708.8	86	0	86	52	138
6/21/2015	1099.7	438	708.6	87	0	87	53	140
6/22/2015	1099.7	1570	709.1	87	0	87	52	139
6/23/2015	1099.7	1518	708.9	87	0	87	51	138
6/24/2015	1099.8	998	708.4	87	0	87	52	138
6/25/2015	1099.8	960	708.6	87	0	87	52	139
6/26/2015	1099.8	1768	709.2	87	0	87	53	139
6/27/2015	1099.8	2369	709.4	87	0	87	53	140
6/28/2015	1099.9	2379	709.5	87	0	87	53	140
6/29/2015	1099.9	2372	709.8	86	1321	1407	18	1425
6/30/2015	1099.8	2391	709.9	86	903	989	0	989
7/1/2015	1099.8	2378	709.8	86	338	423	0	423
7/2/2015	1099.8	2385	709.4	86	74	160	29	189
7/3/2015	1099.8	2373	709.0	85	0	85	53	138
7/4/2015	1099.7	2382	709.3	85	0	85	54	139
7/5/2015	1099.7	63	708.5	86	0	86	55	140
7/6/2015	1099.8	1591	708.8	86	0	86	53	139
7/7/2015	1099.8	1290	708.5	86	221	307	44	351
7/8/2015	1099.8	2391	709.4	85	697	781	0	781
7/9/2015	1099.7	2385	709.1	85	206	290	20	311
7/10/2015	1099.6	2380	708.8	85	3	88	55	143
7/11/2015	1099.6	2385	708.8	85	0	85	55	140

Date	Lake Chelan Elevation (ft)	Powerhouse Tailrace Flow (cfs)	Powerhouse Tailwater Elevation (ft)	Low Level Outlet Flow (cfs)	Spill Flow (cfs)	Chelan River Flow Reaches 1-3 (cfs)	Pump Station Flow (cfs)	Chelan River Flow Reach 4 (cfs)
7/12/2015	1099.6	28	708.0	85	0	85	53	138
7/13/2015	1099.6	829	708.5	85	0	85	54	139
7/14/2015	1099.6	775	708.5	85	0	85	54	139
7/15/2015	1099.7	816	708.8	85	0	85	54	138
7/16/2015	1099.6	1623	709.1	85	0	85	54	139
7/17/2015	1099.6	1598	709.1	85	0	85	56	141
7/18/2015	1099.5	1571	709.1	85	0	85	56	141
7/19/2015	1099.5	35	708.7	85	0	85	55	140
7/20/2015	1099.5	1587	708.9	85	0	85	54	139
7/21/2015	1099.5	1619	708.7	85	0	85	54	139
7/22/2015	1099.4	1624	708.8	85	0	85	55	139
7/23/2015	1099.4	1617	708.9	85	0	85	54	139
7/24/2015	1099.3	1626	709.1	85	0	85	54	139
7/25/2015	1099.2	1616	709.2	85	0	85	54	139
7/26/2015	1099.2	20	708.4	85	0	85	54	139
7/27/2015	1099.2	1622	708.9	85	0	85	55	139
7/28/2015	1099.1	1614	709.1	84	0	84	55	139
7/29/2015	1099.1	576	709.4	84	0	84	56	140
7/30/2015	1099.1	487	708.5	85	0	85	55	140
7/31/2015	1099.1	579	708.4	85	0	85	55	139
8/1/2015	1099.1	384	707.6	85	0	85	55	139
8/2/2015	1099.1	20	708.2	85	0	85	55	140
8/3/2015	1099.1	306	708.2	85	0	85	54	139
8/4/2015	1099.2	372	708.6	85	0	85	54	139
8/5/2015	1099.2	506	708.9	85	0	85	54	139
8/6/2015	1099.1	410	708.7	84	0	84	55	139
8/7/2015	1099.1	411	707.9	85	0	85	54	139
8/8/2015	1099.1	413	707.9	85	0	85	55	139
8/9/2015	1099.1	20	708.1	85	0	85	54	139
8/10/2015	1099.2	403	708.9	84	0	84	56	140
8/11/2015	1099.2	438	708.0	85	0	85	55	140
8/12/2015	1099.2	407	708.5	85	0	85	55	140
8/13/2015	1099.2	398	709.4	85	0	85	56	141
8/14/2015	1099.2	577	708.3	85	0	85	54	139
8/15/2015	1099.3	386	708.1	85	0	85	55	140
8/16/2015	1099.3	20	708.0	85	0	85	54	139
8/17/2015	1099.3	343	708.9	85	0	85	56	141
8/18/2015	1099.3	385	708.3	85	0	85	56	141
8/19/2015	1099.3	726	709.2	85	0	85	55	140
8/20/2015	1099.3	875	709.1	85	0	85	55	139
8/21/2015	1099.3	1150	708.1	84	0	84	54	139
8/22/2015	1099.2	1154	708.4	84	0	84	55	139
8/23/2015	1099.1	1150	708.0	84	0	84	55	139
8/24/2015	1099.1	1154	708.1	84	0	84	55	138
8/25/2015	1099.0	1157	708.8	84	0	84	56	140
8/26/2015	1099.0	1151	708.5	84	0	84	56	140
8/27/2015	1098.9	1153	708.1	84	0	84	55	138
8/28/2015	1098.9	790	708.3	84	0	84	55	139

Date	Lake Chelan Elevation (ft)	Powerhouse Tailrace Flow (cfs)	Powerhouse Tailwater Elevation (ft)	Low Level Outlet Flow (cfs)	Spill Flow (cfs)	Chelan River Flow Reaches 1-3 (cfs)	Pump Station Flow (cfs)	Chelan River Flow Reach 4 (cfs)
8/29/2015	1098.9	784	708.1	83	0	83	54	138
8/30/2015	1098.9	20	708.0	84	0	84	53	137
8/31/2015	1099.0	700	708.7	84	0	84	54	138
9/1/2015	1099.0	783	708.6	84	0	84	54	138
9/2/2015	1099.0	792	708.3	83	0	83	54	136
9/3/2015	1099.0	1150	708.2	83	0	83	32	115
9/4/2015	1098.9	1145	707.7	85	0	85	0	85
9/5/2015	1098.9	1146	707.8	85	0	85	0	85
9/6/2015	1098.8	1148	707.9	84	0	84	0	84
9/7/2015	1098.7	1149	707.8	84	0	84	0	84
9/8/2015	1098.7	1148	708.0	84	0	84	0	84
9/9/2015	1098.6	1148	708.2	84	0	84	0	84
9/10/2015	1098.6	1138	708.1	84	0	84	0	84
9/11/2015	1098.5	1152	708.6	84	0	84	0	84
9/12/2015	1098.5	1147	708.3	84	0	84	0	84
9/13/2015	1098.5	1148	708.4	84	0	84	0	84
9/14/2015	1098.4	1150	708.3	84	0	84	0	84
9/15/2015	1098.3	1180	708.1	84	0	84	0	84
9/16/2015	1098.3	1185	708.2	83	0	83	0	83
9/17/2015	1098.2	1148	708.1	83	0	83	0	83
9/18/2015	1098.1	1148	707.9	83	0	83	0	83
9/19/2015	1098.1	1148	708.0	234	0	234	0	234
9/20/2015	1098.0	1152	708.7	321	0	321	0	321
9/21/2015	1098.0	1151	708.7	168	0	168	0	168
9/22/2015	1098.0	1150	708.6	86	0	86	0	86
9/23/2015	1097.9	1148	708.5	86	0	86	0	86
9/24/2015	1097.9	1151	708.5	86	0	86	0	86
9/25/2015	1097.8	1150	708.3	86	0	86	0	86
9/26/2015	1097.9	1148	708.3	86	0	86	0	86
9/27/2015	1097.8	1150	708.7	85	0	85	0	85
9/28/2015	1097.6	1205	708.4	85	0	85	0	85
9/29/2015	1097.6	1237	708.4	85	0	85	0	85
9/30/2015	1097.5	1232	708.1	85	0	85	0	85
10/1/2015	1097.5	1230	707.8	85	0	85	0	85
10/2/2015	1097.4	1225	707.7	85	0	85	0	85
10/3/2015	1097.4	1227	708.2	85	0	85	0	85
10/4/2015	1097.3	1229	708.4	84	0	84	0	84
10/5/2015	1097.2	1235	708.4	84	0	84	0	84
10/6/2015	1097.2	1231	708.2	84	0	84	0	84
10/7/2015	1097.1	1229	707.9	84	0	84	0	84
10/8/2015	1097.0	1905	708.4	84	0	84	0	84
10/9/2015	1097.0	2242	708.6	84	0	84	0	84
10/10/2015	1096.9	2369	708.8	83	0	83	0	83
10/11/2015	1096.8	2370	709.1	84	0	84	0	84
10/12/2015	1096.7	2370	709.0	83	0	83	0	83
10/13/2015	1096.6	2355	709.1	83	0	83	0	83
10/14/2015	1096.6	2370	708.9	84	0	84	126	210
10/15/2015	1096.4	2371	708.7	84	0	84	203	287

Date	Lake Chelan Elevation (ft)	Powerhouse Tailrace Flow (cfs)	Powerhouse Tailwater Elevation (ft)	Low Level Outlet Flow (cfs)	Spill Flow (cfs)	Chelan River Flow Reaches 1-3 (cfs)	Pump Station Flow (cfs)	Chelan River Flow Reach 4 (cfs)
10/16/2015	1096.3	2388	708.7	84	0	84	203	287
10/17/2015	1096.2	2401	708.8	83	0	83	203	287
10/18/2015	1096.1	2390	708.9	83	0	83	204	287
10/19/2015	1096.0	2339	708.9	83	0	83	203	286
10/20/2015	1095.9	2398	709.0	83	0	83	204	287
10/21/2015	1095.8	2383	708.9	83	0	83	204	286
10/22/2015	1095.6	2231	708.8	83	0	83	204	287
10/23/2015	1095.5	2361	708.8	84	0	84	204	288
10/24/2015	1095.4	2361	708.8	83	0	83	204	287
10/25/2015	1095.2	2360	708.9	83	0	83	204	287
10/26/2015	1095.1	2362	709.0	83	0	83	204	287
10/27/2015	1095.0	2363	708.8	82	0	82	204	287
10/28/2015	1094.9	2359	708.8	82	0	82	204	286
10/29/2015	1094.8	2350	708.8	82	0	82	204	285
10/30/2015	1094.7	2350	709.0	81	0	81	202	284
10/31/2015	1094.8	2352	708.8	82	0	82	203	285
11/1/2015	1095.0	2345	709.0	82	0	82	203	285
11/2/2015	1095.0	2350	709.0	84	0	84	204	288
11/3/2015	1095.0	2353	708.9	85	0	85	204	289
11/4/2015	1094.9	2346	708.9	85	0	85	204	289
11/5/2015	1094.8	2348	708.8	85	0	85	204	289
11/6/2015	1094.7	2345	709.0	85	0	85	204	289
11/7/2015	1094.6	2336	709.0	84	0	84	203	288
11/8/2015	1094.5	2348	709.1	84	0	84	204	288
11/9/2015	1094.5	2345	708.9	84	0	84	203	287
11/10/2015	1094.4	2183	709.2	84	0	84	204	288
11/11/2015	1094.3	2360	709.2	85	0	85	203	287
11/12/2015	1094.2	2363	709.4	84	0	84	205	289
11/13/2015	1094.1	2346	709.0	84	0	84	204	288
11/14/2015	1094.3	2345	709.4	84	0	84	205	290
11/15/2015	1094.4	2333	709.1	85	0	85	203	288
11/16/2015	1094.4	2338	709.3	85	0	85	205	289
11/17/2015	1094.5	2343	709.4	85	0	85	204	289
11/18/2015	1094.7	2356	709.2	86	0	86	204	290
11/19/2015	1094.8	2055	709.4	86	0	86	205	291
11/20/2015	1094.8	2394	709.6	86	0	86	206	292
11/21/2015	1094.7	2380	709.2	86	0	86	205	291
11/22/2015	1094.7	2379	709.1	86	0	86	205	291
11/23/2015	1094.6	2379	709.1	85	0	85	204	289
11/24/2015	1094.6	2384	709.2	86	0	86	205	291
11/25/2015	1094.5	2385	709.2	86	0	86	205	291
11/26/2015	1094.4	2202	709.2	85	0	85	205	290
11/27/2015	1094.4	1812	709.1	85	0	85	204	289
11/28/2015	1094.3	2342	709.3	85	0	85	205	290
11/29/2015	1094.2	2344	709.1	85	0	85	205	290
11/30/2015	1094.1	2339	709.0	84	0	84	205	289
12/1/2015	1094.0	2328	709.1	84	0	84	94	178
12/2/2015	1093.9	2333	709.5	84	0	84	0	84

Date	Lake Chelan Elevation (ft)	Powerhouse Tailrace Flow (cfs)	Powerhouse Tailwater Elevation (ft)	Low Level Outlet Flow (cfs)	Spill Flow (cfs)	Chelan River Flow Reaches 1-3 (cfs)	Pump Station Flow (cfs)	Chelan River Flow Reach 4 (cfs)
12/3/2015	1093.9	2328	709.2	84	0	84	0	84
12/4/2015	1093.8	2319	709.4	84	0	84	0	84
12/5/2015	1093.7	2325	709.5	83	0	83	0	83
12/6/2015	1093.7	2327	709.2	83	0	83	0	83
12/7/2015	1093.7	2327	709.3	83	0	83	0	83
12/8/2015	1093.7	2318	709.4	83	0	83	0	83
12/9/2015	1093.9	2320	709.5	84	0	84	0	84
12/10/2015	1094.0	2172	709.2	84	0	84	0	84
12/11/2015	1094.1	2328	709.1	84	0	84	0	84
12/12/2015	1094.1	2324	708.9	84	0	84	0	84
12/13/2015	1094.1	2321	709.3	84	0	84	0	84
12/14/2015	1094.1	2324	709.4	84	0	84	0	84
12/15/2015	1094.0	2235	709.3	84	0	84	0	84
12/16/2015	1094.0	2327	709.3	84	0	84	0	84
12/17/2015	1094.0	2311	709.4	84	0	84	0	84
12/18/2015	1093.9	2313	709.3	84	0	84	0	84
12/19/2015	1093.9	2313	709.2	84	0	84	0	84
12/20/2015	1093.8	2312	709.2	84	0	84	0	84
12/21/2015	1093.8	2168	708.8	84	0	84	0	84
12/22/2015	1093.7	2328	709.3	84	0	84	0	84
12/23/2015	1093.7	2322	709.3	83	0	83	0	83
12/24/2015	1093.6	2329	709.3	83	0	83	0	83
12/25/2015	1093.5	2325	709.1	83	0	83	0	83
12/26/2015	1093.4	2332	709.3	83	0	83	0	83
12/27/2015	1093.3	2325	709.2	83	0	83	0	83
12/28/2015	1093.3	2315	709.2	82	0	82	0	82
12/29/2015	1093.2	2333	709.4	82	0	82	0	82
12/30/2015	1093.1	2328	709.4	82	0	82	0	82
12/31/2015	1093.0	2322	709.3	83	0	83	0	83

APPENDIX B: DAILY AVERAGE WATER TEMPERATURES

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
1/1/2015	5.4	4.7	6.3	3.7	3.8	3.6	5.2	5.3
1/2/2015	5.3	4.7	6.2	3.9	4.0	3.8	5.2	5.3
1/3/2015	5.1	4.6	6.1	3.8	3.8	3.6	5.0	5.1
1/4/2015	5.2	4.9	6.3	4.4	4.4	4.3	5.2	5.3
1/5/2015	5.5	5.2	6.4	4.8	4.8	4.7	5.6	5.8
1/6/2015	5.6	5.3	6.5	5.2	5.2	5.1	5.6	5.7
1/7/2015	5.8	5.6	6.6	5.6	5.6	5.5	5.9	6.0
1/8/2015	5.8	5.6	6.6	5.6	5.6	5.5	5.8	5.9
1/9/2015	5.9	5.6	6.5	5.6	5.6	5.6	5.9	5.9
1/10/2015	5.9	5.7	6.5	5.7	5.7	5.6	6.0	6.0
1/11/2015	5.9	5.7	6.4	5.8	5.8	5.7	5.9	6.0
1/12/2015	6.0	5.8	6.4	5.9	5.9	5.8	6.0	6.0
1/13/2015	5.9	5.7	6.3	5.7	5.7	5.6	5.9	6.0
1/14/2015	5.8	5.6	6.2	5.6	5.6	5.5	5.8	5.9
1/15/2015	5.7	5.4	6.0	5.2	5.3	5.1	5.7	5.7
1/16/2015	5.4	5.1	5.8	4.8	4.8	4.7	5.4	5.4
1/17/2015	5.3	5.0	5.6	4.6	4.6	4.5	5.2	5.3
1/18/2015	5.2	5.0	5.8	5.0	5.0	4.9	5.2	5.3
1/19/2015	5.5	5.2	5.8	5.2	5.2	5.1	5.5	5.5
1/20/2015	5.4	5.0	5.6	4.7	4.7	4.6	5.3	5.4
1/21/2015	5.1	4.7	5.4	4.3	4.3	4.2	5.1	5.2
1/22/2015	5.2	5.0	5.6	4.9	4.9	4.8	5.2	5.3
1/23/2015	5.4	5.2	5.7	5.3	5.3	5.2	5.3	5.4
1/24/2015	5.3	5.1	5.6	5.4	5.4	5.4	5.3	5.4
1/25/2015	5.5	5.4	5.7	5.7	5.7	5.6	5.5	5.6
1/26/2015	5.6	5.4	5.7	5.8	5.8	5.8	5.6	5.6
1/27/2015	5.7	5.6	5.7	5.9	5.9	5.8	5.7	5.7
1/28/2015	5.8	5.6	5.7	5.9	5.9	5.9	5.8	5.8
1/29/2015	5.8	5.6	5.6	5.7	5.7	5.7	5.9	5.9
1/30/2015	5.9	5.7	5.7	6.0	6.0	5.9	5.9	5.9
1/31/2015	5.8	5.7	5.6	5.9	5.9	5.8	5.8	5.9
2/1/2015	5.8	5.6	5.6	5.9	5.8	5.8	5.8	5.8
2/2/2015	5.8	5.6	5.5	5.8	5.8	5.7	5.8	5.8
2/3/2015	5.6	5.3	5.3	5.4	5.3	5.3	5.6	5.6
2/4/2015	5.5	5.3	5.3	5.5	5.5	5.4	5.5	5.6
2/5/2015	5.6	5.5	5.4	5.8	5.8	5.7	5.6	5.7
2/6/2015	5.8	5.7	5.5	6.2	6.2	6.1	5.8	5.8
2/7/2015	5.8	5.7	5.5	6.3	6.3	6.2	5.9	5.9
2/8/2015	6.1	6.0	5.6	6.5	6.5	6.4	6.1	6.1
2/9/2015	6.2	6.2	5.7	6.8	6.8	6.8	6.3	6.3
2/10/2015	6.3	6.3	5.8	7.2	7.1	7.1	6.5	6.5
2/11/2015	6.6	6.6	5.6	7.4	7.4	7.4	6.7	6.7
2/12/2015	6.6	6.6	5.4	7.4	7.4	7.4	6.9	6.8
2/13/2015	6.8	6.7	5.4	7.3	7.3	7.2	6.9	6.8
2/14/2015	6.8	6.7	5.3	7.2	7.2	7.1	6.9	6.9
2/15/2015	6.8	6.6	5.3	6.9	6.9	6.8	6.9	6.9
2/16/2015	6.8	6.5	5.3	6.7	6.7	6.6	6.9	6.9
2/17/2015	6.8	6.6	5.9	6.7	6.7	6.6	6.9	6.9

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
2/18/2015	6.8	6.8	6.8	6.6	6.7	6.6	6.9	6.9
2/19/2015	6.7	6.7	6.7	6.6	6.6	6.5	6.8	6.8
2/20/2015	6.7	6.7	6.9	6.8	6.8	6.8	6.8	6.8
2/21/2015	6.8	6.8	7.1	7.0	7.1	7.0	6.9	6.9
2/22/2015	6.7	6.6	6.4	6.3	6.3	6.2	6.7	6.7
2/23/2015	6.5	6.4	6.4	6.1	6.2	6.1	6.6	6.6
2/24/2015	6.5	6.5	6.6	6.5	6.5	6.5	6.6	6.6
2/25/2015	6.5	6.5	6.8	6.6	6.6	6.6	6.6	6.6
2/26/2015	6.7	6.7	7.2	7.2	7.2	7.2	6.8	6.8
2/27/2015	6.8	6.8	7.1	7.1	7.2	7.1	6.9	6.9
2/28/2015	6.7	6.6	6.8	6.7	6.8	6.7	6.8	6.8
3/1/2015	6.6	6.6	6.8	6.5	6.6	6.5	6.7	6.7
3/2/2015	6.7	6.7	6.9	6.9	6.9	6.9	6.8	6.8
3/3/2015	6.5	6.4	6.4	6.2	6.3	6.2	6.6	6.6
3/4/2015	6.5	6.4	6.5	6.2	6.3	6.2	6.6	6.6
3/5/2015	6.6	6.6	6.8	6.7	6.7	6.6	6.7	6.7
3/6/2015	6.9	6.9	7.4	7.4	7.4	7.4	7.0	7.0
3/7/2015	7.2	7.2	7.7	7.7	7.7	7.7	7.3	7.3
3/8/2015	7.5	7.6	8.1	8.0	8.1	8.0	7.6	7.7
3/9/2015	7.9	7.9	8.4	8.4	8.4	8.4	8.0	8.0
3/10/2015	8.0	8.1	8.6	8.5	8.5	8.5	8.2	8.2
3/11/2015	8.4	8.6	9.2	9.3	9.3	9.3	8.5	8.6
3/12/2015	8.6	8.8	9.5	9.6	9.7	9.7	8.8	8.8
3/13/2015	8.8	9.0	9.4	9.5	8.9	9.0	9.0	9.0
3/14/2015	9.0	9.1	9.9	10.1	9.3	9.4	9.1	9.1
3/15/2015	8.6	8.7	8.9	9.0	8.8	8.8	8.9	8.8
3/16/2015	8.5	8.6	9.3	9.3	8.8	8.8	8.7	8.7
3/17/2015	8.5	8.6	8.9	9.0	8.7	8.7	8.7	8.6
3/18/2015	8.6	8.7	9.3	9.3	8.8	8.9	8.7	8.7
3/19/2015	8.8	8.9	9.1	9.1	9.0	9.0	9.1	9.0
3/20/2015	9.0	9.1	9.4	9.5	9.2	9.2	9.3	9.2
3/21/2015	9.1	9.3	9.9	10.0	9.4	9.5	9.4	9.3
3/22/2015	9.0	9.1	9.0	8.9	9.2	9.1	9.3	9.2
3/23/2015	9.0	9.1	9.5	9.5	9.2	9.2	9.2	9.1
3/24/2015	9.1	9.2	9.7	9.7	9.4	9.4	9.3	9.3
3/25/2015	9.3	9.4	9.9	10.0	9.5	9.6	9.5	9.4
3/26/2015	9.5	9.7	10.8	10.9	9.9	10.0	9.7	9.7
3/27/2015	9.9	10.1	10.9	11.1	10.2	10.4	10.0	10.1
3/28/2015	10.2	10.3	10.8	10.9	10.4	10.5	10.3	10.3
3/29/2015	10.2	10.3	10.8	10.8	10.4	10.4	10.3	10.3
3/30/2015	10.4	10.6	11.3	11.4	10.7	10.8	10.5	10.6
3/31/2015	10.5	10.6	11.0	11.1	10.7	10.7	10.7	10.6
4/1/2015	10.2	10.3	10.6	10.6	10.4	10.4	10.5	10.4
4/2/2015	10.2	10.3	10.6	10.5	10.4	10.3	10.4	10.3
4/3/2015	10.3	10.4	10.5	10.5	10.4	10.4	10.5	10.4
4/4/2015	10.2	10.3	10.5	10.4	10.4	10.3	10.5	10.4
4/5/2015	10.3	10.3	10.3	10.1	10.4	10.3	10.5	10.4
4/6/2015	10.0	10.1	9.9	9.9	10.1	10.0	10.3	10.2

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
4/7/2015	9.9	9.9	10.1	10.1	10.0	10.0	10.1	10.0
4/8/2015	9.9	10.0	10.7	10.8	10.2	10.2	10.2	10.1
4/9/2015	10.3	10.4	10.9	10.9	10.5	10.5	10.5	10.4
4/10/2015	10.5	10.6	10.8	10.8	10.7	10.7	10.8	10.7
4/11/2015	10.4	10.4	10.7	10.7	10.5	10.5	10.6	10.5
4/12/2015	10.1	10.2	10.4	10.3	10.3	10.2	10.4	10.3
4/13/2015	10.1	10.2	10.2	10.1	10.2	10.1	10.3	10.2
4/14/2015	10.0	10.1	10.4	10.4	10.2	10.2	10.2	10.1
4/15/2015	10.0	10.1	10.7	10.6	10.2	10.2	10.2	10.1
4/16/2015	10.5	10.6	11.4	11.3	10.8	10.8	10.7	10.7
4/17/2015	11.2	11.4	12.1	12.2	11.5	11.6	11.4	11.3
4/18/2015	11.8	12.0	12.5	12.6	12.1	12.2	12.1	12.0
4/19/2015	12.2	12.4	13.1	13.1	12.5	12.6	12.4	12.4
4/20/2015	12.6	12.8	13.5	13.6	12.9	13.0	12.8	12.8
4/21/2015	13.4	13.7	14.2	14.3	13.7	13.8	13.6	13.5
4/22/2015	13.2	13.3	13.5	13.6	13.4	13.4	13.5	13.3
4/23/2015	12.8	12.9	12.8	12.7	12.9	12.8	13.0	12.9
4/24/2015	12.4	12.5	12.6	12.6	12.5	12.5	12.7	12.5
4/25/2015	12.1	12.1	12.0	12.1	12.2	12.2	12.5	12.2
4/26/2015	12.1	12.2	12.6	12.5	12.3	12.3	12.3	12.3
4/27/2015	12.5	12.6	13.4	13.4	12.7	12.9	12.6	12.6
4/28/2015	13.0	13.2	13.9	14.1	13.2	13.5	13.2	13.1
4/29/2015	13.2	13.3	13.7	13.9	13.3	13.6	13.4	13.3
4/30/2015	13.3	13.4	13.7	13.7	13.4	13.6	13.5	13.4
5/1/2015	13.8	14.0	14.5	14.6	14.0	14.2	14.0	13.8
5/2/2015	14.1	14.3	14.7	14.8	14.3	14.5	14.3	14.1
5/3/2015	14.2	14.3	14.7	14.8	14.5	14.7	14.7	14.6
5/4/2015	14.1	14.2	14.6	14.8	14.5	14.6	14.6	14.3
5/5/2015	14.1	14.2	14.2	14.1	14.1	14.2	14.3	14.0
5/6/2015	13.9	14.0	14.0	14.1	13.9	14.1	14.1	13.8
5/7/2015	13.5	13.6	14.3	14.4	13.7	14.0	13.9	13.6
5/8/2015	13.3	13.3	14.1	14.3	13.5	13.8	13.5	13.4
5/9/2015	13.3	13.4	14.2	14.3	13.6	13.9	13.6	13.5
5/10/2015	13.5	13.6	14.5	14.8	14.4	14.7	14.6	14.5
5/11/2015	13.3	13.5	14.8	15.2	15.1	15.3	15.3	15.2
5/12/2015	13.6	13.7	13.8	14.0	14.7	14.7	15.1	14.8
5/13/2015	14.2	14.3	13.9	14.0	14.2	14.3	14.5	14.2
5/14/2015	13.9	14.0	14.6	14.7	14.1	14.3	14.2	14.0
5/15/2015	14.0	14.1	14.8	15.0	14.1	14.5	14.2	14.1
5/16/2015	15.2	15.4	15.9	16.0	15.3	15.6	15.3	15.3
5/17/2015	15.3	15.4	15.6	15.7	15.4	15.6	15.4	15.4
5/18/2015	15.6	15.7	16.4	16.8	16.8	17.0	15.7	15.7
5/19/2015	15.4	15.6	16.4	16.6	16.6	16.9	15.6	15.6
5/20/2015	15.0	15.1	16.5	17.0	17.0	17.2	15.4	15.3
5/21/2015	14.7	14.9	16.1	16.6	16.6	16.8	15.7	15.7
5/22/2015	17.7	18.0	18.1	18.1	18.0	18.3	18.1	18.1
5/23/2015	18.3	18.6	18.9	19.0	19.1	19.3	18.6	18.5
5/24/2015	18.2	18.5	18.7	18.9	18.9	19.0	18.4	18.4

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
5/25/2015	17.9	18.0	18.0	18.1	18.1	18.2	18.1	18.0
5/26/2015	17.7	17.8	17.9	18.0	17.9	18.1	17.8	17.7
5/27/2015	16.5	16.6	17.9	18.3	18.3	18.6	17.3	17.3
5/28/2015	16.2	16.5	17.5	18.0	18.1	18.4	17.8	17.8
5/29/2015	19.0	19.3	19.2	19.2	19.2	19.3	19.5	19.5
5/30/2015	19.1	19.4	20.1	20.3	20.3	20.4	19.7	19.6
5/31/2015	18.5	18.7	19.2	19.5	19.4	19.6	19.4	19.4
6/1/2015	19.3	19.5	19.0	19.1	19.1	19.1	19.8	19.8
6/2/2015	19.6	19.8	19.2	19.2	19.1	19.2	19.8	19.8
6/3/2015	19.4	19.6	19.0	18.9	18.8	18.9	19.7	19.6
6/4/2015	19.0	19.2	19.6	19.8	19.4	19.7	19.5	19.4
6/5/2015	17.5	17.7	19.0	19.5	18.6	19.2	18.6	18.5
6/6/2015	17.9	18.2	19.3	19.7	19.3	19.6	19.3	19.3
6/7/2015	18.9	19.4	20.3	20.6	20.2	20.6	20.4	20.5
6/8/2015	20.3	20.8	21.3	21.5	21.6	21.6	21.8	21.7
6/9/2015	20.7	21.2	21.3	21.5	21.9	21.9	22.3	22.2
6/10/2015	22.0	22.4	21.9	21.8	22.1	22.0	22.5	22.4
6/11/2015	21.8	22.2	21.6	21.6	21.9	21.8	22.3	22.1
6/12/2015	21.2	21.4	20.7	20.6	21.0	20.9	21.6	21.4
6/13/2015	20.9	21.1	20.4	20.3	20.8	20.6	21.3	21.1
6/14/2015	20.8	21.0	20.8	20.7	20.8	20.9	21.2	21.0
6/15/2015	20.0	20.1	20.6	20.7	20.5	20.7	20.7	20.5
6/16/2015	19.1	19.4	20.3	20.6	20.6	20.7	21.0	20.7
6/17/2015	20.7	21.1	20.7	20.7	21.2	21.1	21.8	21.5
6/18/2015	21.7	21.9	21.4	21.5	21.7	21.7	22.1	21.8
6/19/2015	21.5	21.7	21.2	21.1	21.3	21.2	21.8	21.5
6/20/2015	21.1	21.3	21.0	20.8	21.1	21.0	21.5	21.3
6/21/2015	20.1	20.2	20.5	20.6	20.6	20.7	21.0	20.6
6/22/2015	18.8	19.0	19.5	19.8	20.0	20.0	20.3	20.2
6/23/2015	20.7	20.9	20.8	20.7	21.0	20.9	21.4	21.3
6/24/2015	21.4	21.6	21.3	21.3	21.4	21.4	21.8	21.5
6/25/2015	21.6	21.9	22.1	22.2	21.7	22.1	22.0	21.7
6/26/2015	20.5	20.8	22.2	22.7	21.8	22.4	21.9	21.7
6/27/2015	20.3	20.7	21.7	22.2	22.1	22.3	22.5	22.2
6/28/2015	20.8	21.3	22.1	22.6	22.6	22.7	23.0	22.7
6/29/2015	24.0	24.3	23.6	23.6	24.2	24.0	24.6	24.3
6/30/2015	23.1	23.4	24.0	24.2	24.1	24.1	24.0	23.7
7/1/2015	22.1	22.3	23.5	23.8	23.7	23.8	23.3	23.0
7/2/2015	21.3	21.6	22.9	23.3	22.5	23.0	22.8	22.5
7/3/2015	22.5	22.9	23.2	23.4	23.7	23.6	24.3	24.0
7/4/2015	24.7	25.0	24.4	24.4	24.7	24.6	25.3	25.0
7/5/2015	22.2	22.4	23.0	23.2	24.0	23.7	24.8	24.5
7/6/2015	21.9	22.1	22.4	22.6	22.9	22.8	23.4	23.1
7/7/2015	22.7	23.1	23.5	23.3	23.6	23.5	24.0	23.8
7/8/2015	24.5	24.7	24.7	24.8	24.7	24.8	24.9	24.6
7/9/2015	23.1	23.2	24.3	24.6	24.3	24.5	24.4	24.0
7/10/2015	23.7	23.9	23.4	23.5	24.1	23.8	24.6	24.4
7/11/2015	23.3	23.3	23.2	23.5	23.6	23.6	23.9	23.7

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
7/12/2015	23.3	23.4	22.8	22.7	22.9	22.8	23.5	23.4
7/13/2015	23.5	23.6	23.0	23.0	23.3	23.1	23.7	23.5
7/14/2015	23.6	23.7	23.2	23.1	23.4	23.3	23.9	23.7
7/15/2015	23.8	23.8	23.0	22.9	23.4	23.2	24.1	23.8
7/16/2015	23.6	23.6	22.8	22.5	23.2	22.9	23.8	23.6
7/17/2015	23.5	23.6	23.1	22.9	23.2	23.1	23.8	23.6
7/18/2015	23.3	23.4	23.4	23.3	23.3	23.4	23.7	23.5
7/19/2015	22.8	22.9	23.5	23.7	23.5	23.7	23.9	23.9
7/20/2015	23.5	23.7	23.5	23.6	23.9	23.8	24.3	24.0
7/21/2015	23.9	24.0	23.1	22.8	23.5	23.2	24.2	23.9
7/22/2015	23.4	23.4	22.8	22.6	23.0	22.8	23.6	23.3
7/23/2015	23.3	23.3	22.8	22.6	23.0	22.8	23.5	23.3
7/24/2015	23.2	23.2	22.4	22.3	22.8	22.6	23.4	23.1
7/25/2015	22.8	22.7	21.4	21.2	22.1	21.7	22.9	22.7
7/26/2015	22.2	22.2	21.5	21.3	21.6	21.4	22.1	22.0
7/27/2015	22.2	22.1	21.7	21.5	21.8	21.7	22.3	22.1
7/28/2015	22.2	22.2	21.9	21.8	22.0	22.0	22.4	22.3
7/29/2015	22.5	22.5	22.6	22.4	22.5	22.6	22.8	22.7
7/30/2015	22.9	22.9	23.0	22.9	22.9	23.0	23.2	23.1
7/31/2015	22.7	22.7	23.0	23.1	23.1	23.2	23.4	23.2
8/1/2015	22.6	22.6	22.5	22.5	23.1	22.9	23.5	23.3
8/2/2015	22.7	22.6	22.4	22.4	23.0	22.7	23.4	23.4
8/3/2015	23.3	23.3	22.1	22.1	23.0	22.6	23.5	23.3
8/4/2015	23.4	23.4	22.9	22.7	23.1	22.9	23.5	23.3
8/5/2015	23.3	23.2	22.4	22.2	22.9	22.6	23.3	23.2
8/6/2015	23.0	22.9	22.5	22.2	22.6	22.5	23.1	22.9
8/7/2015	23.1	23.1	22.8	22.6	22.9	22.8	23.2	22.8
8/8/2015	23.1	23.1	23.0	23.0	23.1	23.1	23.4	23.2
8/9/2015	23.2	23.2	22.8	22.7	22.9	22.9	23.3	23.2
8/10/2015	23.4	23.4	23.3	23.2	23.3	23.3	23.5	23.3
8/11/2015	23.0	23.0	22.8	22.8	23.2	23.1	23.6	23.3
8/12/2015	22.1	22.1	22.5	22.6	23.0	22.9	23.3	23.2
8/13/2015	23.1	23.2	23.1	23.0	23.4	23.3	23.8	23.6
8/14/2015	NA	23.8	23.0	23.1	23.8	23.5	24.3	24.1
8/15/2015	NA	23.3	21.9	21.4	22.8	22.2	23.8	23.5
8/16/2015	NA	22.6	21.9	21.6	22.2	22.0	22.7	22.6
8/17/2015	NA	22.5	22.1	22.0	22.4	22.2	22.7	22.6
8/18/2015	21.7	22.0	21.9	21.9	22.3	22.1	22.6	22.5
8/19/2015	21.9	21.9	21.9	21.9	22.2	22.1	22.5	22.4
8/20/2015	22.5	22.5	21.8	21.7	22.3	22.0	22.8	22.6
8/21/2015	22.1	22.0	21.5	21.2	21.8	21.6	22.4	22.2
8/22/2015	21.8	21.6	21.0	20.8	21.5	21.2	22.0	21.9
8/23/2015	21.7	21.5	21.0	20.8	21.5	21.2	21.9	21.8
8/24/2015	21.6	21.5	21.1	20.9	21.5	21.2	21.8	21.7
8/25/2015	21.6	21.5	21.2	21.0	21.5	21.3	21.9	21.7
8/26/2015	21.7	21.6	21.1	20.9	21.6	21.3	22.0	21.8
8/27/2015	22.0	21.9	21.9	21.8	22.0	22.0	22.3	22.2
8/28/2015	22.2	22.2	21.7	21.6	22.2	21.9	22.5	22.3

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
8/29/2015	22.1	22.0	21.4	21.3	21.9	21.6	22.2	22.1
8/30/2015	21.9	21.7	20.8	20.6	21.3	21.0	21.7	21.6
8/31/2015	21.2	20.9	19.7	19.4	20.4	19.9	21.1	20.9
9/1/2015	20.2	20.1	19.6	19.4	19.9	19.7	20.4	20.2
9/2/2015	20.0	19.8	19.3	19.1	19.6	19.4	20.1	20.0
9/3/2015	19.7	19.5	19.1	18.8	19.5	19.2	19.8	19.7
9/4/2015	19.7	19.5	19.0	18.6	18.6	18.6	19.8	19.7
9/5/2015	19.6	19.4	18.8	18.6	18.5	18.5	19.7	19.6
9/6/2015	19.3	19.1	18.5	18.2	18.1	18.1	19.5	19.4
9/7/2015	19.2	19.0	18.8	18.6	18.6	18.6	19.3	19.2
9/8/2015	19.2	19.1	18.6	18.4	18.3	18.3	19.4	19.3
9/9/2015	19.2	19.1	19.3	19.2	19.2	19.2	19.4	19.3
9/10/2015	19.7	19.6	19.7	19.6	19.6	19.7	19.9	19.8
9/11/2015	20.1	20.1	20.2	20.1	20.0	20.1	20.4	20.3
9/12/2015	20.2	20.2	20.4	20.4	20.4	20.4	20.6	20.5
9/13/2015	20.3	20.2	19.6	19.5	19.5	19.5	20.5	20.4
9/14/2015	19.7	19.5	18.6	18.3	18.3	18.2	19.8	19.7
9/15/2015	19.1	18.9	18.1	17.8	17.7	17.7	19.3	19.1
9/16/2015	18.9	18.7	18.2	17.9	17.8	17.8	19.0	19.0
9/17/2015	18.8	18.6	18.1	17.8	17.8	17.8	18.9	18.8
9/18/2015	18.6	18.4	18.1	17.9	17.9	17.9	18.8	18.6
9/19/2015	18.4	18.3	17.9	17.8	17.7	17.7	18.6	18.4
9/20/2015	18.4	18.3	18.5	18.5	18.5	18.5	18.6	18.4
9/21/2015	18.4	18.3	18.5	18.5	18.4	18.5	18.6	18.4
9/22/2015	18.3	18.1	17.9	17.6	17.6	17.6	18.6	18.3
9/23/2015	18.3	18.1	17.8	17.5	17.4	17.4	18.5	18.3
9/24/2015	18.3	18.1	18.0	17.7	17.7	17.7	18.4	18.2
9/25/2015	18.3	18.2	18.1	18.0	18.0	18.0	18.5	18.3
9/26/2015	18.3	18.2	18.0	17.8	17.8	17.7	18.5	18.3
9/27/2015	18.0	17.7	17.3	16.8	16.8	16.8	18.1	17.9
9/28/2015	17.9	17.7	17.3	16.9	16.8	16.8	18.1	17.9
9/29/2015	18.0	17.7	17.4	17.0	16.9	16.9	18.1	18.0
9/30/2015	18.0	17.8	17.5	17.2	17.1	17.1	18.1	18.0
10/1/2015	18.0	17.8	17.6	17.3	17.3	17.2	18.2	18.0
10/2/2015	18.0	17.8	17.3	17.0	17.0	17.0	18.1	18.0
10/3/2015	17.6	17.5	17.4	17.2	17.2	17.2	17.8	17.6
10/4/2015	17.4	17.2	17.0	16.8	16.8	16.7	17.6	17.4
10/5/2015	17.2	17.0	16.8	16.6	16.6	16.5	17.4	17.2
10/6/2015	17.2	17.0	16.6	16.3	16.2	16.2	17.3	17.2
10/7/2015	17.1	16.9	16.8	16.7	16.7	16.7	17.2	17.1
10/8/2015	17.0	16.9	17.0	16.9	16.9	16.9	17.2	17.0
10/9/2015	17.1	17.0	17.3	17.3	17.3	17.3	17.3	17.2
10/10/2015	17.1	16.9	16.7	16.7	16.7	16.6	17.3	17.1
10/11/2015	16.6	16.4	16.2	15.8	15.8	15.7	16.7	16.6
10/12/2015	16.5	16.3	16.2	15.9	15.9	15.9	16.7	16.5
10/13/2015	16.6	16.5	16.5	16.3	16.3	16.3	16.8	16.7
10/14/2015	16.5	16.3	16.0	15.7	16.0	15.9	16.7	16.6
10/15/2015	16.4	16.2	15.8	15.5	16.3	16.2	16.6	16.5

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
10/16/2015	16.4	16.2	15.8	15.4	16.2	16.1	16.5	16.4
10/17/2015	16.4	16.2	16.0	15.7	16.3	16.2	16.6	16.4
10/18/2015	16.3	16.2	15.9	15.8	16.3	16.2	16.5	16.4
10/19/2015	16.2	16.1	16.3	16.2	16.2	16.2	16.4	16.3
10/20/2015	16.3	16.1	16.0	15.8	16.2	16.2	16.5	16.3
10/21/2015	16.1	15.9	15.6	15.3	16.0	15.9	16.3	16.1
10/22/2015	15.9	15.7	15.4	15.1	15.8	15.7	16.1	15.9
10/23/2015	15.6	15.4	14.8	14.4	15.5	15.3	15.8	15.6
10/24/2015	15.3	15.0	14.3	13.9	15.1	14.9	15.4	15.3
10/25/2015	15.0	14.7	14.3	13.9	14.8	14.6	15.1	15.0
10/26/2015	15.0	14.8	14.8	14.6	15.0	14.9	15.2	15.0
10/27/2015	14.9	14.7	14.3	14.0	14.8	14.7	15.1	15.0
10/28/2015	14.8	14.7	14.3	14.1	14.7	14.6	15.0	14.8
10/29/2015	14.7	14.5	14.2	14.1	14.6	14.5	14.9	14.7
10/30/2015	14.6	14.5	14.2	14.0	14.5	14.4	14.8	14.6
10/31/2015	14.5	14.4	14.2	14.1	14.5	14.4	14.7	14.5
11/1/2015	14.3	14.1	13.5	13.3	14.1	14.0	14.4	14.2
11/2/2015	14.0	13.8	13.4	13.1	13.9	13.8	14.2	14.0
11/3/2015	13.8	13.6	13.0	12.7	13.7	13.5	14.0	13.8
11/4/2015	13.6	13.3	12.5	12.1	13.4	13.1	13.7	13.6
11/5/2015	13.4	13.1	12.3	12.0	13.1	12.9	13.5	13.3
11/6/2015	13.1	12.9	12.3	12.0	12.9	12.8	13.3	13.1
11/7/2015	13.2	13.0	12.6	12.4	13.0	12.9	13.3	13.1
11/8/2015	13.1	13.0	12.7	12.5	13.0	13.0	13.3	13.1
11/9/2015	13.1	12.9	12.3	12.2	13.0	12.8	13.3	13.1
11/10/2015	12.7	12.4	11.7	11.3	12.5	12.3	12.8	12.7
11/11/2015	12.6	12.3	11.7	11.4	12.4	12.2	12.7	12.5
11/12/2015	12.3	12.1	11.3	10.9	12.1	11.9	12.4	12.3
11/13/2015	12.3	12.1	11.9	11.6	12.2	12.1	12.4	12.3
11/14/2015	12.4	12.4	12.2	12.1	12.4	12.4	12.6	12.5
11/15/2015	12.4	12.3	11.8	11.7	12.3	12.2	12.6	12.4
11/16/2015	11.9	11.7	10.8	10.4	11.7	11.5	12.1	11.9
11/17/2015	11.7	11.5	11.0	10.8	11.5	11.4	11.8	11.7
11/18/2015	11.4	11.2	10.5	10.1	11.2	11.0	11.5	11.4
11/19/2015	11.3	11.0	10.4	10.2	11.1	10.9	11.4	11.3
11/20/2015	11.1	10.8	9.9	9.6	10.9	10.6	11.2	11.1
11/21/2015	10.8	10.5	9.5	9.1	10.5	10.3	10.9	10.8
11/22/2015	10.5	10.1	9.3	8.9	10.2	9.9	10.5	10.4
11/23/2015	10.4	10.1	9.3	8.9	10.1	9.9	10.4	10.4
11/24/2015	10.3	10.1	9.4	9.0	10.1	9.9	10.4	10.3
11/25/2015	9.9	9.6	8.5	8.0	9.6	9.3	10.0	9.9
11/26/2015	9.5	9.2	8.2	7.7	9.2	9.0	9.6	9.5
11/27/2015	9.3	8.9	7.9	7.4	8.9	8.7	9.2	9.2
11/28/2015	9.0	8.7	7.6	7.2	8.7	8.4	9.0	8.9
11/29/2015	8.9	8.6	7.5	7.1	8.5	8.3	8.9	8.8
11/30/2015	8.4	8.1	7.2	6.7	8.1	7.8	8.3	8.3
12/1/2015	8.2	8.0	7.1	6.7	7.5	7.2	8.2	8.2
12/2/2015	8.1	7.9	7.2	6.9	6.8	6.7	8.1	8.0

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
12/3/2015	8.0	7.7	7.1	6.8	6.7	6.7	8.0	7.9
12/4/2015	8.2	8.1	8.0	7.7	7.7	7.6	8.3	8.2
12/5/2015	8.3	8.1	7.6	7.5	7.5	7.5	8.4	8.3
12/6/2015	8.3	8.2	8.0	7.7	7.6	7.6	8.4	8.3
12/7/2015	8.4	8.3	8.1	7.9	7.9	7.8	8.5	8.4
12/8/2015	8.5	8.5	8.4	8.2	8.1	8.1	8.7	8.6
12/9/2015	8.6	8.6	8.5	8.4	8.4	8.4	8.8	8.7
12/10/2015	8.5	8.4	8.1	8.0	8.0	7.9	8.7	8.6
12/11/2015	8.3	8.3	8.1	8.0	8.0	7.9	8.5	8.4
12/12/2015	8.4	8.3	8.1	8.0	8.0	8.0	8.5	8.4
12/13/2015	8.2	8.1	7.8	7.7	7.6	7.6	8.4	8.2
12/14/2015	8.0	7.9	7.6	7.5	7.4	7.4	8.1	8.0
12/15/2015	7.8	7.6	7.0	6.7	6.7	6.6	7.9	7.8
12/16/2015	7.5	7.3	6.8	6.6	6.6	6.5	7.6	7.5
12/17/2015	7.3	7.1	6.2	5.9	5.9	5.8	7.3	7.3
12/18/2015	7.1	6.9	6.2	5.9	5.9	5.8	7.1	7.1
12/19/2015	7.0	6.8	6.4	6.1	6.1	6.0	7.0	7.0
12/20/2015	7.0	6.8	6.2	5.9	5.9	5.8	7.0	7.0
12/21/2015	6.5	6.3	5.4	5.1	5.0	4.9	6.6	6.5
12/22/2015	6.6	6.4	5.8	5.5	5.5	5.4	6.6	6.6
12/23/2015	6.6	6.4	5.9	5.6	5.6	5.5	6.7	6.6
12/24/2015	6.5	6.4	5.9	5.7	5.7	5.6	6.6	6.5
12/25/2015	6.4	6.2	5.6	5.3	5.2	5.2	6.5	6.4
12/26/2015	6.1	5.9	5.1	4.8	4.8	4.7	6.2	6.1
12/27/2015	6.0	5.8	4.9	4.6	4.5	4.4	6.0	5.9
12/28/2015	5.7	5.5	5.2	5.0	4.9	4.9	5.8	5.7
12/29/2015	5.7	5.6	5.1	4.8	4.8	4.7	5.8	5.7
12/30/2015	5.7	5.5	4.9	4.7	4.7	4.6	5.7	5.7
12/31/2015	5.4	5.1	3.6	3.2	3.2	3.0	5.3	5.3

APPENDIX C: CONSULTATION RECORD

On May 10, 2016, Chelan PUD provided a draft of the 2015 Annual Flow Report to the USGS and members of the CRFF and LCRF in accordance with the requirements of the FERC Order Modifying and Approving Operations Compliance and Monitoring Plan, Article 405, under Ordering Paragraph (B):

> "The licensee shall allow the resource agencies, Tribes and non-governmental organizations specified under Article 405, 30 days to provide comments and/or recommendations on their report before filing with the FERC. The filing shall include comments and/or recommendations from the consulted entities and the licensee's response to any comments. If the licensee does not adopt a recommendation, the report shall include the licensee's reasons, based on project-specific information."

The following individuals were sent draft copies for a 30 day review period.

NAME	***AGENCY***	***Comments***
Peterschmidt, Mark	Washington State Department of Ecology	-
Pacheco, Jim	Washington State Department of Ecology	-
Korth, Jeffrey	Washington State Department of Fish and Wildlife	-
Simon, Graham	Washington State Department of Fish and Wildlife	-
Maitland, Travis	Washington State Department of Fish and Wildlife	-
Grover Wier, Kari	United States Department of Agriculture – Forest Service	-
Martinez, Alex	United States Department of Agriculture – Forest Service	-
Vacirca, Richard	United States Department of Agriculture – Forest Service	-
Rawhouser, Ashley	National Park Service	-
Anthony, Hugh	National Park Service	-
Lewis, Steve	United States Fish and Wildlife Service	-
Yeager, Justin	National Marine Fisheries Services	-
Domingue, Richard	National Marine Fisheries Services	
Towey, Bill	Confederated Tribes of the Colville Reservation	-
Rose, Bob	Yakama Indian Nation	-
Merkle, Carl	Confederated Tribes of the Umatilla Indian Reservation	-
Cooney, Mike	City of Chelan	-
Archibald, Phil	Lake Chelan Sportsman Association	-
Elwell, Nick	United States Geological Survey	-
Ernsberger, Tom	Washington State Parks and Recreation Commission	-
Snell, Nona	Washington State Recreation and Conservation Office	-
Petersen, Wai	Manson Parks and Recreation Department	-
Uhlhorn, Richard	Lake Chelan Recreation Association	-
O'Keefe, Thomas	American Whitewater	-