AVISTA

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April 14, 2015

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, DC 20426

Subject: **Spokane River Hydroelectric Project, FERC Project No. 2545**
Submittal of the 2014 Long Lake Hydroelectric Development Temperature Monitoring Report

Dear Secretary Bose:

In accordance with the Federal Energy Regulatory Commission's (FERC) September 17, 2009 Order Modifying and Approving Water Quality Monitoring and Quality Assurance Project Plan Pursuant to Article 401 (A)(12), Avista completed a 2014 Long Lake Hydroelectric Development Temperature Monitoring Report (Annual Report). The Annual Report was completed in accordance with the Long Lake Dam Reservoir and Tailrace Temperature Water Quality Attainment Plan.

Avista submitted the Annual Report to the Washington Department of Ecology (Ecology) and to the Spokane Tribe (Tribe) on February 27, 2015. Ecology's approval letter, along with the Tribe's comment letter and our responses are included in Appendix A of the Annual Report. In accordance with the Ecology approved Annual Report, Avista will not be monitoring water quality, including temperature, during the high flow season in 2015 and 2016, and will discontinue monitoring at the Long Lake Forebay (LLFB) station during the low-flow season. These are further explained in Section 6.0 of the Annual Report.

With this, Avista is filing the 2014 Long Lake Hydroelectric Development Temperature Monitoring Report with FERC. Please feel free to call me at (509) 495-4998 or Meghan Lunney, in my absence, at (509) 495-4643 if you have any questions or wish to discuss this filing.

Sincerely,

Speed Fitzhugh

Elvin "Speed" Fitzhugh
Spokane River License Manager

Enclosure

cc: Heather Campbell, FERC-DHAC
T.J. LoVullo, FERC-DHAC
Patrick McGuire, Ecology
Brian Crossley, Spokane Tribe
Meghan Lunney, Avista

AVISTA CORPORATION

2014
LONG LAKE HED
TEMPERATURE MONITORING REPORT

WASHINGTON 401 CERTIFICATION, SECTION 5.5

Spokane River Hydroelectric Project
FERC Project No. 2545

Prepared By:
Golder Associates Inc.
Redmond, WA

April 14, 2015

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List of Acronyms and Abbreviations

°C	degrees Celsius
°C/m	degrees Celsius per meter
Avista	Avista Corporation
Certification	section 401 water quality certification
DNR	Washington State Department of Natural Resources
DO	dissolved oxygen
Ecology	Washington State Department of Ecology
DO WQAP	Dissolved Oxygen Water Quality Attainment Plan
FERC	Federal Energy Regulatory Commission
Golder	Golder Associates Inc.
HED	hydroelectric development
LLFB	Long Lake Forebay monitoring station
LLTR	Long Lake HED tailwater monitoring station
m	meter(s)
mg/L	milligram(s) per liter
MS5	Hydrolab® MS5 Multiprobe®
QAPP	Quality Assurance Project Plan
RM	River mile
Spokane Tribe	Spokane Tribe of Indians
TDG	total dissolved gas
Temperature WQAP	Long Lake Dam Reservoir and Tailrace Temperature Water Quality Attainment Plan
TP	Total Phosphorous
USFWS	United States Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington State Department of Fish and Wildlife
WRIA	Water Resource Inventory Area
WQM QAPP	Water Quality Monitoring and Quality Assurance Project Plan

1.0 INTRODUCTION

On June 18, 2009, the Federal Energy Regulatory Commission (FERC) issued a new license for the Spokane River Project (Project), FERC Project No. 2545 (FERC 2009a), which incorporated the Washington Department of Ecology (Ecology) Section 401 Water Quality Certification (Certification; Ecology 2009). In accordance with Section 5.10 and 5.5 of the Certification, Avista Corporation (Avista) developed the Water Quality Monitoring and Quality Assurance Project Plan (WQM QAPP; Avista 2009) and the Long Lake Dam Reservoir and Tailrace Temperature Water Quality Attainment Plan (Temperature WQAP; Avista 2011) in consultation with Ecology and the Spokane Tribe of Indians (Spokane Tribe). Avista filed the Ecology-approved WQM QAPP with FERC on August 13, 2009 and FERC approved it with modification on September 17, 2009 (FERC 2009b). Avista filed the Ecology-approved Temperature WQAP with FERC on January 26, 2011. On May 10, 2011, FERC (2011) issued an order approving and amending the 2009 WQM QAPP, pursuant to Article 401(A)(12) of the license.

As part of the Temperature WQAP, Avista is required to provide an annual summary report of the available temperature water quality monitoring results to Ecology by March 1 on an annual basis. Previous reports summarized Long Lake Hydroelectric Development (HED) temperature data collected in 2010 and 2011 (Golder 2012), in 2012 (Golder 2013), and in 2013 (Golder 2014). This report summarizes temperature monitoring conducted for Long Lake HED during the 2014 calendar year.

2.0 MONITORING ACTIVITIES

2.1 Objectives

The overall objectives of the Temperature WQAP Monitoring Report are to:

- Document monitoring periods
- Summarize temperature monitoring results
- Document compliance with the applicable water quality standards
- Describe any proposed changes to the Temperature WQAP and WQM QAPP

In addition to the above objectives we have included information pertaining to the Spokane Tribe's water quality standards in regards to waters downstream of the Project.

2.2 Monitoring Locations and Periods

Water temperature data that are included in annual summary reports are from a number of water quality monitoring programs as described in the Temperature WQAP (Avista 2011). This report presents temperatures obtained as a component of monitoring programs focused on Spokane River water quality (Ecology 2015a, 2015b), Lake Spokane water quality (Tetra Tech 2015), and Long Lake HED tailwater dissolved oxygen (Golder 2015). Additional temperature data related to studies outside the scope of the Temperature WQAP are available upon request.

2.2.1 Lake Spokane

Temperature monitoring was conducted at two river stations upstream of Lake Spokane (inflow stations), six stations within Lake Spokane, and one station in the forebay just above Long Lake Dam (Table 2-1 and Figure 2-1). These monitoring efforts are described in more detail below.

2.2.1.1 Inflow Stations

Ecology has monitored temperature along with other water quality parameters in the Spokane River and Little Spokane River a short distance upstream of its confluence with Lake Spokane. This was done under Ecology's River and Stream Water Quality Ambient Monitoring Program, which monitors by water year.[1] Ecology's sampling effort at these two stations was conducted in accordance with the Stream Ambient Monitoring QAPP (Ecology 2003). Preliminary data for the Spokane River at Nine Mile Bridge station (54A090) and Little Spokane River near Mouth station (55B070) located on the Little Spokane River at River Mile (RM) 1.1 were downloaded on January 30, 2015.

2.2.1.2 Within Lake Spokane

In 2014, Avista monitored temperature and other water quality through implementation of the Lake Spokane nutrient monitoring program, which it had collaboratively implemented with Ecology in 2010, 2011, and solely implemented starting in 2012. This program included one sampling event in May and October, and two sampling events per month, in June through September, in order to provide baseline data. All sampling was completed in accordance with the Ecology-approved QAPP for Lake Spokane Nutrient Monitoring.[2] Sampling was conducted at the six Lake Spokane monitoring stations described in Table 2-1 and from upstream to downstream are:

- LL5, at approximately RM 54.20
- LL4, at approximately RM 51.47
- LL3, at approximately RM 46.42
- LL2, at approximately RM 42.06
- LL1, at approximately RM 37.62
- LL0, at approximately RM 32.66

[1] The term "water year" is commonly used in hydrology to describe a 12-month discharge year, or flow year, and accounts for precipitation that falls as snow in late autumn and winter and doesn't drain until the following spring or summer's snowmelt. The water year is defined as the 12-month period from October 1 to September 30 of the following year.

[2] The current QAPP (Ecology 2010) as supplemented by its addendum (Lunney and Plotnikoff 2012), which was approved by Ecology on July 16, 2012 (Ross 2012).

2.2.1.3 Long Lake HED Forebay

Avista monitored temperature at the Long Lake Forebay (LLFB) near elevation 1,499 feet, which is the centerline for the powerhouse intake that extends from an elevation of 1,491 to 1,507 feet. All monitoring, including quality control protocols, was conducted in accordance with Avista's Detailed Dissolved Oxygen (DO) Phase II Feasibility and Implementation Plan (Avista 2010).[3] Under this program, water temperature, total dissolved gas (TDG), and DO concentrations were monitored with Hydrolab® MS5 Multiprobe® (MS5) instruments.

2.2.2 Long Lake Dam Tailrace

Both Avista and Ecology have monitored Spokane River temperatures below Long Lake HED in the past, although no temperature data were available from Ecology at its 54A070 station on February 9, 2015 (Ecology 2015c). Avista's monitoring programs are described in more detail below.

2.2.2.1 Avista Monitoring

Specific to the Long Lake Dam tailrace waters, Avista monitored temperature at a station 0.6 mile downstream of the Long Lake Dam (LLTR). This was conducted in accordance with the same monitoring protocols followed for the LLFB monitoring efforts.

2.3 Temperature Numeric Criteria

The Washington state numeric temperature criterion that applies to Lake Spokane and the Long Lake HED tailrace (WAC 173-201A-602, WRIA 54 Notes 1, 2, and 3) limits 1-day maximum temperature to no more than 20.0 degrees Celsius (°C) due to human activities.[4]

The numeric temperature criteria for the Spokane Tribe, whose reservation is located downstream of the Project, are applicable from the upstream Spokane Indian Reservation boundary (approximately RM 32.7) to the mouth of the Spokane River (RM 0). For reference, the upstream boundary of the Spokane Indian Reservation is located approximately 1.2 miles downstream of Long Lake Dam and approximately 0.6 miles downstream of the Avista and Ecology monitoring stations located below the dam. The Spokane River temperature criteria are the Class A 7-day average daily maximum temperature (7-DADM) criteria. The 7-DADM is calculated as the arithmetic average of seven consecutive measures of daily maximum temperatures, with the 7-DADM for any individual day calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days before and the three days after that date. The maximum allowable limit (7-DADM) for the Spokane River varies throughout the year as described below (Spokane Tribe 2003).

[3] Avista obtained FERC approval of the Detailed Dissolved Oxygen Phase II Feasibility and Implementation Plan in December 2010 (FERC 2010).

[4] In addition, water temperature shall not be increased by greater than 0.3°C when natural conditions exceed 20.0°C.

- 18.5°C between June 1 and August 31
- 13.5°C between September 1 and September 30
- 11°C between October 1 and March 31
- 13.5°C between April 1 and May 31

3.0 RESULTS

Results of the temperature monitoring in 2014 are discussed by monitoring location, along with a comparison to the applicable Washington State water quality criteria.

In addition, the discussion in Section 5.0, presents a comparison of the temperature results for the monitoring location below Long Lake Dam with the corresponding Spokane Tribe water quality criteria.

3.1.1 Lake Spokane

Lake Spokane water temperature was monitored at nine locations: Ecology's Spokane River at Nine Mile Bridge station (54A090), Ecology's Little Spokane River station (55B070), and Avista's LL5, LL4, LL3, LL2, LL1, LL0, and LLFB stations.

3.1.1.1 Inflow Stations

Ecology's Spokane River at Nine Mile Bridge station (54A090) was monitored monthly from January through November, although temperature was not reported for October. Reported water temperatures for this timeframe ranged from 3.7°C in February and March to 19.0°C in July (Table 3-1). All monitored water temperatures were less than the 20.0°C Washington State criterion.

Ecology's Little Spokane River station, 55B070, was monitored monthly from January through November. Water temperatures during this timeframe ranged from 4.5°C in February to 17.0°C in July (Table 3-2). All monitored water temperatures were less than the 20.0°C Washington State criterion.

3.1.1.2 Within Lake Spokane

Vertical profiles of water temperatures were monitored at the six Lake Spokane sampling stations in 2014. The frequency of monitoring in 2014 was once in May; twice in the months of June, July, August, and September; and once in October. Results for each of the six lake stations are described below in order from upstream to downstream.

LL5

LL5 water temperature measurements were conducted near the surface, at 0.5 meter (m), and at 1-m intervals from 1 to 5 m below the water surface. With the exception of two monitoring events (August 6 and August 21), thermal stratification did not occur at this station, as indicated by the vertical profiles in which temperature varied less than 1.0°C throughout the entire water column (Table 3-3). The results of the two dates showing thermal stratification indicate the thermocline was at 1.5 m on August 6 and

August 21 (Table 3-3).[5] Four LL5 temperature measurements were greater than the 20.0°C Washington State criterion; these values reached up to 24.1°C, and occurred down to 1 m on August 6 and August 21 (Table 3-3).

LL4

LL4 temperature measurements were taken at 0.5 m and at 1-m intervals from 1 m to 8 m below the water surface. The maximum temperature change rate was greater than 1.0 °C/m for the vertical temperature profiles in July through September (Table 3-4), but had virtually no stratification in May and June, and minimal residual stratification in October. These results indicate the thermocline was between 2.5 m and 5.5 m and was at its deepest level in early August and early September. Nineteen of the temperature measurements were greater than the 20.0°C Washington State criterion. These values reached up to 25.0°C, occurred down to 3 m on July 9 and July 24, down to 5 m on August 6, and down to 4 m on August 21 (Table 3-4).

LL3

LL3 temperature measurements were taken at 0.5 m, at 1-m intervals from 1 m to 10 m, and at 12, 15, 18 and 19 m below the water surface. Vertical temperature profiles for June 25 through September 10 had temperature change rates greater than 1.0 °C/m, and all remaining periods had temperature change rates less than 1.0 °C/m (Table 3-5). The thermocline depth ranged from 2.5 m in late June to 11.0 m in early September. Thirty-eight of the temperature measurements were greater than the 20.0°C Washington State criterion; these values reached up to 24.8°C, occurred down to 0.5 m on June 25, 4 m on July 9 and September 10, 9 m on July 24, 8 m on August 6, and 7 m on August 21 (Table 3-5).

LL2

LL2 temperature measurements were taken at 0.5 m, 1-m intervals from 1 m to 10 m, 3-m intervals from 12 m to 24 m, and at 25 m below the water surface. Vertical temperature profiles had maximum temperature change rates greater than 1.0 °C/m between June 24 and August 20 (Table 3-6). The thermocline was at a depth of 1.5 m on June 24 and became deeper throughout the summer reaching 5.5 m in early August. Thirty-six temperature measurements were greater than the 20.0°C Washington State criterion; these values reached up to 24.8°C occurred at a depths down to 1 m on June 24 and September 9, down to 5 m on July 8, down to 8 m on July 23 and August 5, and down to 7 m on August 20 (Table 3-6).

[5] Thermocline depths are presented as the mid-point between depths of temperature measurements with the greatest change in temperature per meter.

LL1

LL1 temperature measurements were taken at 0.5 m, 1-m intervals from 1 m to 10 m, 3-m intervals from 12 m to 33 m below the water surface. Vertical temperature profiles had temperature change rates greater than 1.0 °C/m for mid-May through early September (Table 3-7). The thermocline was at a depth of 2.5 m on May 14, ranged from 3.5 m to 5.5 m into early July, and extended to depths of 6.5 m to 7.5 m through early September. Thirty-five temperature measurements were greater than the 20.0°C Washington State criterion; these measurements reached up to 25.1°C, occurred down to 5 m on July 8, down to 9 m on July 23, down to 7 m on August 5 and August 20, and down to 2 m on September 9 (Table 3-7).

LL0

LL0 temperature measurements were taken at 0.5 m, 1-m intervals from 1 m to 10 m, and at 3-m intervals from 12 m to 45 m, and within 1 m of the bottom. Only five of the LL0 vertical temperature profiles had maximum temperature change rates greater than 1.0 °C/m indicating thermal stratification was less persistent at LL0 than at LL1 and LL2. Thirty-four temperature measurements were greater than the 20.0°C Washington State criterion; these values reached up to 24.2°C, occurred at 0.5 m on June 24, down to 5 m on July 8, down to 9 m on July 23, down to 8 m on August 5, and down to 7 m on August 20 (Table 3-8).

Lake Station Temperature Profile Comparisons

Comparison of the 2014 temperature profiles for the six sampling stations during late June, July, August, and September are displayed in Figures 3-1 through 3-4, respectively. The maximum temperature reached 20.6°C in late June, 23.7°C in late July, 24.3°C in late August, and 19.4°C in late September. In late June, very similar thermal stratification occurred at the four down-reservoir stations (LL3 through LL0) all of which had near-surface temperature of 20.0°C or greater (Figure 3-1). By late July, temperatures exceeding 20.0°C occurred down to a depth of 8 to 9 m at these four stations and in the upper 3 m at LL4, while temperature in the reservoir's riverine zone (LL5) was approximately 17°C (Figure 3-2). In late August, all stations recorded temperatures exceeding 20.0°C near the surface (Figure 3-3). By late September the surface temperature had cooled by approximately 4°C to 5°C and was less than 20.0°C at all stations (Figure 3-4). In addition, cooling had occurred throughout the rest of the reservoir's upper 20 m of the water column.

3.1.1.3 Long Lake HED Forebay

LLFB, Avista's Long Lake Dam Forebay station, is located between the HED's Unit 3 and 4 intakes. LLFB temperature data were collected in 15-minute intervals from July 1 through October 31 as part of the Detailed DO Phase II Feasibility and Implementation Plan (Figure 3-5). Daily maximum water temperatures for LLFB data ranged from 13.2°C on October 31 to 23.7°C on August 8 (Table 3-9).

Temperature measurements greater than the 20.0°C Washington State criterion occurred on 11 days, which occurred between July 20 and September 1 (Table 3-9). Water temperature variability at station LLFB is likely primarily due to the complex dynamics of hydraulics in the forebay intake area.

3.1.2 Long Lake Dam Tailrace

Long Lake Dam tailrace water temperature was monitored at Avista's Long Lake Dam Tailrace station, LLTR. LLTR temperature data were collected in 15-minute intervals from July 1 through October 31 as part of the Detailed DO Phase II Feasibility and Implementation Plan (Figure 3-6). Daily maximum water temperatures ranged from 13.1°C on October 31 to 21.0°C on July 23 (Table 3-10). Temperatures of greater than the 20.0°C Washington State criterion occurred on 11 days, which were between July 14 and August 13.

Data for Ecology's Spokane River at Long Lake station (54A070) during 2014 was unavailable online as of February 9, 2015.

4.0 SCHEDULE

Avista has prepared, obtained approval for, and implemented the Temperature WQAP and WQM QAPP along with other plans that have the potential to alter Lake Spokane temperatures, nutrients, and DO. Avista will continue to coordinate implementation of measures to improve water quality with the ultimate goal of enhancing cold water fish habitat. The list below summarizes plans that are currently being implemented along with Avista's planned actions towards this goal.

- **WQM QAPP** - Prepared WQM QAPP (Avista 2009) in consultation with Ecology and the Spokane Tribe. Approval of this plan was obtained from Ecology on August 13, 2009 and from FERC with modifications on September 17, 2009 (FERC 2009b).
- **Temperature WQAP** - Prepared the Temperature WQAP (Avista 2011) in consultation with Ecology and the Spokane Tribe. Approval of this plan was obtained from Ecology on January 25, 2011 and from FERC (2011) on May 10, 2011 in an order approving and amending the 2009 WQM QAPP, pursuant to Article 401(A)(12). Avista will continue to provide annual reports summarizing water temperature data for the Long Lake HED in accordance to the approved Temperature WQAP and WQ QAPP and WQM QAPP.
- **Lake Spokane DO WQAP** – Avista prepared the Lake Spokane DO WQAP (Avista and Golder 2012), which discussed nine feasible potential measures to improve DO conditions. Upon receiving FERC approval (December 19, 2012), Avista began implementing the DO WQAP and has submitted Annual Reports for the work completed in 2013 and 2014 (Avista 2014, 2015, respectively). In accordance with the FERC-approved schedule for implementation of the DO WQAP, Avista will continue to conduct baseline monitoring in 2015 and 2016. Avista will then work with Ecology to define future monitoring goals for the lake.

The Annual Reports provide a summary of the baseline monitoring, implementation activities, effectiveness of the implementation activities, and proposed actions of the upcoming year. These implementation activities are summarized as follows and with the exception of the native tree plantings on Avista's shoreline property and the potential carp population reduction program, goals for these potential reasonable and feasible measures are primarily related to improving DO in the lake..

- **Cold Water Fish Habitat Evaluation** – As a continuation of our 2013 efforts, Avista continued to evaluate cold water fish habitat in Lake Spokane. Preliminary analysis indicate that rainbow trout are not severely limited by DO and are most likely inhabiting cooler water in metalimnion and upper portions of the hypolimnion. Also, the habitat volumes for temperature and DO together, as well as separately, indicate that temperature was the most limiting factor restricting habitat more than DO for this species at all the lake station sites.
- **Native Tree Plantings on Avista Shoreline Property** - Avista and the Stevens County Conservation District planted 300 trees consisting of native cottonwoods and willows along Lake Spokane's northern shoreline on Avista-owned property in April 2013. Once mature, the trees will help reduce water temperature and improve habitat along the lake shoreline. One of the areas planted consists of a very steep sandy slope. The trees in this location are also expected to reduce any natural sloughing of sediment, which may contain total phosphorous (TP), into the river along with enhance shoreline habitat.
- **Hangman Creek Basin Shoreline Stabilization and Agricultural Practices** - Avista continues to track plans and progress addressing erosion control in the Hangman Creek Basin by participating in meetings, including the Spokane Conservation District's Hangman Creek Bi-State Watershed Project and Ecology's Spokane River and Lake Spokane DO TMDL Advisory Committee meetings.

  In addition, Avista and the Coeur d'Alene Tribe have acquired approximately 500 acres of farmland with straightened creek beds on upper Hangman Creek through implementation of one of Avista's Spokane River License Wetland Mitigation requirements. Site-specific wetland management plans are updated annually for these properties and include establishing long-term, self-sustaining native emergent, scrub-shrub and/or forested wetlands, riparian habitat and associated uplands, through preservation, restoration and enhancement activities. Since 2013, approximately 3,700 native tree and shrub species have been planted on this approximate 500 acre wetland complex.
- **Wetland Restoration/Enhancement** - Avista acquired a 109-acre parcel on the Little Spokane River, the Sacheen Springs property, to fulfill its 42.51 acre wetland mitigation requirement identified in Section 5.3.G of the Certification. This property contains over one-half mile of frontage along the West Branch of the Little Spokane River that contains a highly valuable wetland complex with approximately 59 acres of emergent, scrub-shrub and forested wetlands and approximately 50 acres of adjacent upland forested buffer. Several seeps, springs, perennial and annual creeks are also found on the property. The property was purchased "in fee" and Avista will pursue a conservation easement in order to protect the property in perpetuity. Avista is in the process of developing a detailed site-specific wetland management plan for the property. Avista completed a detailed site-specific wetland management plan and began implementing it upon its approval by Ecology and FERC in 2014.

- **Land Protection** - Avista has identified approximately 215 acres of land that is currently used for grazing under lease from the Washington State Department of Natural Resources (DNR). This land is located within the south half of Section 16 in Township 27 North, Rand 40 E.W. M. in Stevens County. Avista will continue pursuing a lease for the 215 acres of land from DNR with the intent of placing the land in conservation use.

  In addition, Avista owns more than 1,000 acres of land, of which 350 acres are located within 200 feet of the Lake Spokane shoreline at the downstream end of the reservoir. During 2014 Avista continued to protect these lands, which also serve as a buffer adjacent to other undeveloped Avista land.

- **Bulkhead Removal** - During 2012, Avista partnered with Ecology, the Spokane County Conservation District, and the Stevens County Conservation District through an Ecology grant to identify two to five homeowners and encourage them to convert their bulkheads to more naturalized shorelines. Progress to date includes the removal of an approximate 90-foot-long bulkhead located at the Staggs parcel in Spokane County and replacement of the bulkhead with a more naturalized shoreline[6].

  During 2014, Avista continued to work with the Stevens County Conservation District to plan and permit a design for an additional bulkhead removal project on an Avista-owned shoreline parcel located in TumTum. The project would consist of replacing an approximate 90-foot-long bulkhead with native rocks and vegetation to provide a more naturalized shoreline. Avista anticipates this project will take place during winter 2015/2016, after all permits have been obtained and when the lake is drawn down.

- **Carp Population Reduction Program** – During 2013 and 2014, a Lake Spokane Carp Population Abundance and Distribution Study consisting of a Phase I and Phase II component was completed. The purpose of this study was to better understand carp population abundance, distribution, and seasonal habitat use in order to investigate whether removal of carp would improve water quality in Lake Spokane. Additionally, the study helped define a carp population reduction program that may benefit Lake Spokane water quality.

  Results of the Phase I and II components are presented in the DO WQAP 2014 Annual Summary Report (Avista 2015). Based upon the results, the 2014 Annual Report includes a recommendation to implement a pilot study utilizing a combination of mechanical methods (including spring electrofishing, passive netting, and winter seining), to identify which is the most effective method to remove carp from Lake Spokane. Should Ecology agree with this recommendation, Avista will work with Ecology and the Washington Department of Fish and Wildlife (WDFW) on the pilot study and will obtain all required permits prior to its implementation.

- **Long Lake HED Turbine Aeration and Tailrace DO Monitoring** – Avista will continue to refine implementation of turbine aeration that was initiated in 2010, based on real-time water quality measurements that are monitored 0.6 miles downstream of Long Lake Dam from July 1 through October 30. Avista also will continue to coordinate results with the DO TMDL efforts, and evaluate the need for additional DO enhancement measures in accordance with the FERC-approved schedule (FERC 2010).

6 A time-lapse video produced by the Staggs features the bulkhead removal project is available for viewing at the following website: http://www.youtube.com/watch?v=luT0RZShJoY.

- **Long Lake Dam TDG Abatement and Monitoring** – Avista will conduct Phase V through VII TDG abatement measures. In 2015, this will include awarding construction contract and obtaining permits for the preferred alternative for Long Lake HED TDG abatement. Construction of the structural modifications is expected to occur in 2016 through 2017. Following construction, the performance of the structural modifications will be tested and a spillgate protocol will be defined in 2018 through 2019. In 2018 through 2019, Avista will conduct monitoring to confirm effectiveness of the constructed structural modifications and spillgate operations and prepare annual monitoring reports.

5.0 DISCUSSION

5.1 Lake Spokane

Temperature profile monitoring conducted during 2014 indicated that the 20.0°C Washington State criterion was exceeded within Lake Spokane during June, July, August, and September. The maximum temperature recorded at the lake sites was 25.1°C in August, 24.7°C in July, 20.6°C in June, 20.2°C in September, and 16.0°C in October. Exceedances of 20.0°C occurred at all six lake stations in August; five stations in July; and three stations June and September. Exceedances of 20.0°C within the lake occurred to depths of 9 m in July, 8 m in August, 4 m in September, and 2 m in June. At the Long Lake forebay station, temperatures recorded reached a maximum of 23.7°C and exceeded the criterion during 6 days in July, 4 days in August, and 1 day in September. Measurements at both the Spokane River at Nine Mile Bridge station and Little Spokane River station did not exceed the 20.0°C criterion.

The exceedances reported for Lake Spokane during 2014 are indicative of the natural stratification process typical of eastern Washington and northern Idaho lakes during the summer season. Avista however is continuing to pursue reasonable and feasible mitigation measures in accordance with its Ecology-approved Temperature WQAP and Lake Spokane DO WQAP that may have positive localized effects on temperature within the lake.

5.2 Long Lake Dam Tailrace

During 2014, temperature measurements at the Avista monitoring station, LLTR, located downstream of the Long Lake Dam exceeded the 20.0°C Washington State criterion on 11 days in July and August (Table 3-10). The maximum of these temperatures was 21.0°C.

Monitoring results indicate the Spokane Tribe's 7-DADM criteria established for tribal waters were exceeded July 6 through October 31 (Table 5-1, Figure 5-1). It is important to note the LLTR monitoring station from which 2014 temperature data was collected is located approximately 0.6 miles upstream from the reservation boundary, where the Tribe's criteria is applicable.

As part of a non-License Agreement, Avista provides the Spokane Tribe with funds to complete water quality improvements to help address temperature exceedances along with other water quality improvement needs downstream of the Project. To date, the Spokane Tribe has planted trees and completed stream stabilization efforts in the Chamokane Creek watershed to reduce surface water temperatures. Avista and the Spokane Tribe will continue working together in the future to improve water quality within the reservation. These projects relate to DO, TDG, and temperature within the reservation.

6.0 PROPOSED CHANGES TO THE TEMPERATURE WQAP AND WQM QAPP

Consistent with 2014 activities, Avista will not be monitoring water quality at LLTR, LLGEN, or LLFB during the high-flow season (typically March/April through June) throughout the Long Lake Dam spillway modification project for TDG abatement, which is expected to occur in 2015 through 2017. Since Avista plans to deploy an instrument at LLTR to monitor water quality in the low-flow season for the Long Lake HED Tailrace DO monitoring season, the absence of temperature data from the high-flow season is not expected to impact collection of critical temperature data.

Additionally, Avista is proposing to discontinue monitoring at the LLFB station during the summer critical season. The complex dynamics of hydraulics near the forebay intake cause substantial temperature variability near the dam over short periods and result in measurements that are much less consistent and reliable compared with those at LL0. This change is consistent with Avista's Five-Year Long Lake HED Tailrace DO Monitoring Report.

7.0 REFERENCES

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TABLES

Table 2-1: Long Lake HED Temperature Monitoring Stations and Periods

Monitoring Station	Location	NAD83 Decimal Degrees		2014 Monitoring Year	
		Latitude	Longitude	Start	End
54A090	Spokane River at Nine mile Bridge approximately 0.2 miles downstream of Nine Mile Dam, at river mile (RM) 58	47.7767	117.5448	1/7/2014	11/4/2014
55B070	On the Little Spokane River approximately 1.5 miles upstream from its confluence with Lake Spokane, at RM 1.1	47.7829	117.5305	1/7/2014	11/4/2014
LL5	Long Lake sampling site 5, at RM 54.20	47.7985	117.5692	5/15/2014	10/15/2014
LL4	Long Lake sampling site 4, at RM 51.47	47.8137	117.6106	5/15/2014	10/15/2014
LL3	Long Lake sampling site 3, at RM 46.42	47.8641	117.6668	5/15/2014	10/15/2014
LL2	Long Lake sampling site 2, at RM 42.06	47.8636	117.7014	5/14/2014	10/14/2014
LL1	Long Lake sampling site 1, at RM 37.62	47.8305	117.7612	5/14/2014	10/14/2014
LL0	Long Lake sampling site 0, at RM 32.66	47.8339	117.8349	5/14/2014	10/14/2014
LLFB	Long Lake Forebay between Unit 3 and 4 intakes.	47.8367	117.8397	7/1/2014	10/31/2014
LLTR	On left downstream bank, at water pump house approximately 0.6 mile downstream from Long Lake Dam.	47.8375	117.8503	7/1/2014	10/31/2014
54A070	Approximately 0.6 mile downstream of Long Lake Dam, at the Highway 231 Bridge and RM 33.3.	47.8391	117.8525	Not Available	

Table 3-1: Spokane River at Nine Mile Bridge (54A090) Temperature Monitored in 2014

Date	Maximum Daily Water Temperature (°C)
1/7/2014	4.8
2/4/2014	3.7
3/4/2014	3.7
4/8/2014	7.4
5/6/2014	8.7
6/3/2014	16.7
7/8/2014	19.0
8/5/2014	17.5
9/9/2014	15.3
10/7/2014	NR
11/4/2014	10.5

Notes:

On January 30, 2015, downloaded data from Ecology's website:
http://www.ecy.wa.gov/apps/watersheds/riv/station.asp?theyear=&tab=final_data
&scrolly=323&wria=54&sta=54A090

The 20.0°C criterion was not exceeded at this monitoring location in 2014.

NR= Not reported, although other water quality data was reported for this date.

Table 3-2: Little Spokane River Upstream of Lake Spokane (55B070) Temperature Monitored in 2014

Date	Maximum Daily Water Temperature (°C)
1/7/2014	5.4
2/4/2014	4.5
3/4/2014	6.3
4/8/2014	12.3
5/6/2014	11.8
6/3/2014	16.6
7/8/2014	17.0
8/5/2014	16.0
9/9/2014	12.8
10/7/2014	11.7
11/4/2014	9.5

Notes:

On January 30, 2015, downloaded data from Ecology's website:
http://www.ecy.wa.gov/apps/watersheds/riv/station.asp?theyear=&tab=final_data&scrolly=0&wria=55&sta=55B070

The 20.0°C criterion was not exceeded at this monitoring location in 2014.

Table 3-3: LL5 Temperature Vertical Profiles in 2014

Depth (meters)	Water Temperature (°C)									
	5/15/2014	6/11/2014	6/25/2014	7/9/2014	7/24/2014	8/6/2014	8/21/2014	9/10/2014	9/24/2014	10/15/2014
0.5	11.9	16.3	16.4	19.8	17.3	**24.1**	**23.3**	15.2	14.9	12.5
1.0	11.9	16.2	16.4	19.7	17.3	**24.1**	**23.2**	15.2	15.0	12.5
2.0	11.9	16.2	16.3	19.7	17.3	18.6	17.3	15.2	14.9	12.5
3.0	11.9	16.3	16.2	19.7	17.2	17.8	16.4	15.1	14.8	12.5
4.0	11.9	16.3	16.2	19.7	17.2	17.8	16.3	15.0	14.8	12.5
5.0	11.9	16.2	16.2	19.6	17.2	17.8	16.3	14.9	14.8	12.5
Max Change (°C/m)[1]	0.0	0.1	0.2	0.1	0.0	**5.5**	**5.9**	0.1	0.1	0.0
Depth of Max Change (m) [2, 3]	N/A	0.75	0.75	0.75	N/A	1.50	1.50	0.75	1.50	N/A

Notes:

Data provided by TetraTech on January 2. 2015; does not include results from field duplicates.

Shaded and bold values indicate an exceedance of the 20.0°C criterion.

1. The change in °C per meter of depth was calculated for each pair of adjacent measurement intervals in the table. This value represents the maximum value of the calculated change in °C per one meter of depth for each pair of adjacent measurement intervals. Bold values are >1.0°C per meter depth.

2. Depth of Max Change (m) = the shallowest depth where the greatest temperature gradient occurs.

3. N/A = not applicable (dates with 0.0°C max change)

Table 3-4: LL4 Temperature Vertical Profiles in 2014

Depth (meters)	Water Temperature (°C)									
	5/15/2014	6/11/2014	6/25/2014	7/9/2014	7/24/2014	8/6/2014	8/21/2014	9/10/2014	9/24/2014	10/15/2014
0.5	12.1	16.7	17.2	**23.5**	**22.4**	**25.0**	**23.6**	19.6	18.9	14.3
1.0	12.0	16.6	17.0	**23.5**	**22.4**	**24.9**	**23.6**	19.6	18.9	14.3
2.0	12.0	16.5	16.8	**23.0**	**22.3**	**24.8**	**23.5**	19.6	18.9	13.7
3.0	12.0	16.4	16.8	**20.6**	**21.4**	**24.2**	**23.4**	19.6	18.4	12.8
4.0	12.0	16.4	16.8	19.9	18.6	**23.6**	**22.3**	19.4	17.2	12.7
5.0	11.9	16.3	16.7	19.6	18.1	**21.6**	18.8	18.9	15.0	12.6
6.0	12.0	16.2	16.7	19.6	18.0	17.8	16.7	15.2	14.9	12.6
7.0	11.9	16.2	16.7	19.6	18.0	17.7	16.6	15.2	14.8	12.6
8.0	11.9	16.2	16.7	19.5	17.9	17.7	16.5	15.2	14.8	12.6
Max Change (°C/m)[1]	0.1	0.1	0.5	**2.4**	**2.8**	**3.9**	**3.6**	**3.7**	**2.2**	0.9
Depth of Max Change (m)[2]	0.75	1.50	0.75	2.50	3.50	5.50	4.50	5.50	4.50	2.50

Notes:

Data provided by TetraTech on January 2. 2015; does not include results from field duplicates.

Shaded and bold values indicate an exceedance of the 20.0°C criterion.

1. The change in °C per meter of depth was calculated for each pair of adjacent measurement intervals in the table. This value represents the maximum value of the calculated change in °C per one meter of depth for each pair of adjacent measurement intervals.

2. Depth of Max Change (m) = the shallowest depth where the greatest temperature gradient occurs.

Table 3-5: LL3 Temperature Vertical Profiles in 2014

Depth (meters)	Water Temperature (°C)									
	5/15/2014	**6/11/2014**	**6/25/2014**	**7/9/2014**	**7/24/2014**	**8/6/2014**	**8/21/2014**	**9/10/2014**	**9/24/2014**	**10/15/2014**
0.5	12.5	19.1	**20.1**	**24.7**	**22.7**	**24.8**	**24.1**	**20.1**	19.1	15.8
1.0	12.4	19.1	20.0	**24.6**	**22.7**	**24.8**	**24.1**	**20.1**	19.1	15.8
2.0	12.4	18.8	19.8	**23.5**	**22.7**	**24.8**	**24.1**	**20.1**	19.1	15.8
3.0	12.4	18.3	18.6	**22.9**	**22.7**	**24.7**	**24.1**	**20.1**	19.1	15.8
4.0	12.4	18.2	18.0	**21.1**	**22.7**	**24.2**	**24.1**	**20.1**	18.8	15.8
5.0	12.4	17.9	17.9	20.0	**22.7**	**23.3**	**22.6**	19.9	18.4	15.8
6.0	12.4	17.7	17.3	19.7	**22.6**	**21.9**	**21.4**	19.5	18.1	15.8
7.0	12.4	17.5	17.2	19.7	**22.7**	**21.4**	**20.1**	19.1	17.8	15.7
8.0	12.4	17.5	17.2	19.6	**21.8**	**20.3**	19.4	19.2	17.6	15.2
9.0	12.4	17.5	17.2	19.5	**20.2**	19.7	18.8	18.8	17.5	14.9
10.0	12.4	17.4	17.0	19.4	19.5	19.5	18.5	18.3	17.4	14.2
12.0	12.4	17.3	16.8	18.4	19.6	18.5	18.0	16.0	15.5	13.6
15.0	12.4	17.3	16.3	17.1	19.1	18.2	17.3	15.7	15.2	13.3
18.0	12.4	17.1	15.9	16.6	18.6	18.0	16.8	15.7	15.2	13.2
19.0	12.4	17.1	15.8	16.5	18.4	18.0	16.9	15.7	15.2	13.2
Max Change (°C/m)[1]	0.1	0.5	**1.3**	**1.8**	**1.6**	**1.4**	**1.4**	**1.1**	0.9	0.7
Depth of Max Change (m)[2]	0.75	2.50	2.50	3.50	8.50	5.50	4.50	11.00	11.00	9.50

Notes:

Data provided by TetraTech on January 2. 2015; does not include results from field duplicates.
Shaded and bold values indicate an exceedance of the 20.0°C criterion.
1. The change in °C per meter of depth was calculated for each pair of adjacent measurement intervals in the table. This value represents the maximum value of the calculated change in °C per one meter of depth for each pair of adjacent measurement intervals.
2. Depth of Max Change (m) = the shallowest depth where the greatest temperature gradient occurs.

Table 3-6: LL2 Temperature Vertical Profiles in 2014

Depth (meters)	Water Temperature (°C)									
	5/14/2014	6/11/2014	6/24/2014	7/8/2014	7/23/2014	8/5/2014	8/20/2014	9/9/2014	9/23/2014	10/14/2014
0.5	12.4	19.4	**20.6**	**24.4**	**23.7**	**24.8**	**24.3**	**20.2**	19.0	16.0
1.0	12.0	19.1	**20.6**	**24.1**	**23.6**	**24.7**	**24.3**	**20.1**	18.9	16.0
2.0	11.8	19.0	19.4	**23.6**	**23.6**	**24.5**	**24.3**	20.0	18.8	16.0
3.0	11.7	18.7	18.4	**22.9**	**23.5**	**24.3**	**24.2**	20.0	18.8	16.0
4.0	11.6	18.6	17.7	**20.9**	**23.3**	**24.3**	**23.9**	19.9	18.8	16.0
5.0	11.5	17.9	17.4	**20.5**	**21.8**	**23.3**	**22.5**	19.9	18.6	16.0
6.0	11.5	17.6	17.2	19.7	**20.8**	**22.0**	**21.4**	19.8	18.5	15.9
7.0	11.4	17.4	17.1	19.1	**20.4**	**21.0**	**20.6**	19.8	18.2	15.7
8.0	11.4	17.0	16.9	18.8	**20.3**	**20.3**	19.7	19.8	17.7	15.3
9.0	11.3	17.0	16.8	18.6	19.9	19.6	19.2	18.9	17.2	14.8
10.0	11.3	16.9	16.6	18.3	19.7	19.2	18.9	18.4	17.0	14.8
12.0	11.2	16.7	16.0	18.0	19.5	18.7	18.5	18.0	16.6	14.6
15.0	11.2	16.4	15.9	17.3	19.2	18.3	17.9	17.3	15.7	14.2
18.0	11.0	16.3	15.7	16.8	18.6	18.2	17.6	16.6	15.3	14.1
21.0	10.9	15.9	15.4	16.5	17.5	17.8	16.8	15.5	15.1	14.1
24.0	10.8	15.2	15.0	16.0	16.8	17.1	16.7	15.2	15.1	14.0
25.0	10.8	15.0	14.8	15.8	16.6	16.9	16.7	15.2	15.1	14.0
Max Change (°C/m)[1]	0.8	0.7	**1.2**	**2.1**	**1.5**	**1.3**	**1.5**	0.9	0.5	0.5
Depth of Max Change (m)[2]	0.75	4.50	1.50	3.50	4.50	5.50	4.50	8.50	7.50	8.5

Notes:

Data provided by TetraTech on January 2. 2015; does not include results from field duplicates.

Shaded and bold values indicate an exceedance of the 20.0°C criterion.

1. The change in °C per meter of depth was calculated for each pair of adjacent measurement intervals in the table. This value represents the maximum value of the calculated change in °C per one meter of depth for each pair of adjacent measurement intervals.

2. Depth of Max Change (m) = the shallowest depth where the greatest temperature gradient occurs.

3. nr = not reported

Golder Associates

Table 3-7: LL1 Temperature Vertical Profiles in 2014

Depth (meters)	Water Temperature (°C)									
	5/14/2014	6/11/2014	6/24/2014	7/8/2014	7/23/2014	8/5/2014	8/20/2014	9/9/2014	9/23/2014	10/14/2014
0.5	14.1	19.6	20.0	**23.5**	**23.3**	**25.1**	**24.1**	**20.1**	19.2	15.9
1.0	13.9	19.5	20.0	**23.4**	**23.3**	**24.9**	**24.0**	**20.1**	19.2	15.9
2.0	12.9	19.3	19.8	**23.2**	**23.0**	**24.5**	**24.0**	**20.1**	19.2	15.9
3.0	11.8	19.3	19.5	**22.6**	**22.8**	**24.3**	**23.9**	20.0	19.1	15.9
4.0	11.6	19.2	18.4	**22.1**	**22.7**	**23.8**	**23.9**	19.9	18.8	15.9
5.0	11.3	19.0	18.0	**20.2**	**22.6**	**22.6**	**23.8**	19.9	18.6	15.9
6.0	11.2	17.5	17.3	19.5	**22.4**	**21.7**	**22.4**	19.9	18.4	15.9
7.0	11.1	17.4	17.0	19.0	**22.4**	**21.4**	**20.5**	19.8	17.9	15.9
8.0	11.0	17.2	16.6	18.9	**21.2**	20.0	19.7	18.2	17.6	15.9
9.0	11.0	16.9	16.3	18.4	**20.1**	19.4	19.3	17.9	17.3	15.8
10.0	11.0	16.8	16.2	18.2	20.0	19.1	18.9	17.7	16.9	15.8
12.0	10.9	16.6	16.0	18.1	19.5	18.8	18.4	17.3	16.4	15.8
15.0	10.9	16.4	15.8	17.5	18.9	18.5	18.0	17.1	16.0	15.1
18.0	10.8	16.2	15.6	17.1	18.0	18.0	17.6	16.8	15.5	14.8
21.0	10.7	16.1	15.4	16.8	16.9	17.5	17.4	16.5	15.2	14.4
24.0	10.7	15.9	15.1	16.3	16.4	17.1	17.2	16.2	14.9	14.2
27.0	10.7	15.4	14.9	15.8	16.0	16.5	16.9	15.7	14.8	14.2
30.0	10.6	14.9	14.7	15.5	15.7	15.9	16.5	15.2	14.6	13.9
33.0	10.5	14.5	14.6	15.2	15.5	15.4	15.5	15.1	14.6	13.8
Max Change (°C/m)[1]	**1.1**	**1.5**	**1.1**	**1.9**	**1.2**	**1.3**	**1.9**	**1.6**	0.5	0.2
Depth of Max Change (m)[2]	2.50	5.50	3.50	4.50	7.50	7.50	6.50	7.50	6.50	13.50

Notes:

Data provided by TetraTech on January 2. 2015; does not include results from field duplicates.

Shaded and bold values indicate an exceedance of the 20.0°C criterion.

1. The change in °C per meter of depth was calculated for each pair of adjacent measurement intervals in the table. This value represents the maximum value of the calculated change in °C per one meter of depth for each pair of adjacent measurement intervals.

2. Depth of Max Change (m) = the shallowest depth where the greatest temperature gradient occurs.

Table 3-8: LL0 Temperature Vertical Profiles in 2014

Depth (meters)	Water Temperature (°C)									
	5/14/2014	6/10/2014	6/24/2014	7/8/2014	7/23/2014	8/5/2014	8/20/2014	9/9/2014	9/23/2014	10/14/2014
0.5	13.4	18.1	**20.4**	**22.3**	**22.9**	**24.2**	**24.0**	19.8	19.4	15.9
1.0	12.5	17.9	19.6	**22.1**	**22.9**	**24.2**	**24.0**	19.8	19.3	15.9
2.0	11.6	17.4	19.1	**21.9**	**22.8**	**24.1**	**24.0**	19.8	19.0	15.9
3.0	11.2	17.3	18.4	**21.6**	**22.7**	**24.1**	**24.0**	19.7	18.9	15.9
4.0	11.0	17.2	18.0	**20.9**	**22.7**	**23.0**	**23.9**	19.7	18.8	15.9
5.0	10.9	17.1	17.7	**20.1**	**22.7**	**22.2**	**23.8**	19.7	18.4	15.9
6.0	10.9	17.1	17.2	19.5	**22.7**	**21.3**	**22.2**	19.2	18.2	15.9
7.0	10.9	17.1	16.8	19.1	**22.5**	**20.5**	**20.5**	18.7	18.0	15.9
8.0	10.8	17.1	16.6	18.8	**22.3**	**20.1**	19.4	18.3	17.7	15.9
9.0	10.8	17.1	16.4	18.6	**22.0**	19.6	18.8	17.9	17.2	15.9
10.0	10.8	17.0	16.3	18.4	20.0	19.3	18.5	17.7	16.9	15.9
12.0	10.8	16.7	16.1	18.0	19.6	18.8	18.2	17.5	16.6	15.8
15.0	10.8	16.5	15.8	17.3	18.8	18.3	17.9	17.1	16.1	15.5
18.0	10.7	16.4	15.6	16.9	17.8	17.8	17.7	16.8	15.7	15.2
21.0	10.7	16.2	15.4	16.5	17.1	17.2	17.5	16.5	15.3	14.5
24.0	10.7	15.5	15.2	16.1	16.6	16.9	17.3	15.9	15.0	14.1
27.0	10.7	15.3	15.1	15.7	16.0	16.3	16.7	16.0	14.7	13.9
30.0	10.7	15.0	15.0	15.5	15.6	15.6	15.7	15.9	14.6	13.8
33.0	10.7	14.9	14.9	15.2	15.1	15.2	15.3	15.6	14.5	13.7
36.0	10.4	14.8	14.8	15.0	15.0	14.9	14.8	15.0	14.5	13.6
39.0	10.4	14.6	14.8	14.8	14.7	14.6	14.5	14.5	14.5	13.6
42.0	10.4	14.5	14.8	14.7	14.6	14.5	14.4	14.4	14.5	13.6
45.0	10.1	14.4	14.7	14.6	14.5	14.4	14.4	14.3	14.5	13.6
46.0			14.7	14.6	14.5					
46.5						14.4	14.3			
47.0		14.4				14.4	14.3	14.2	14.5	13.6
48.0	10.0									
Max Change (°C/m)[1]	**1.8**	0.5	**1.6**	0.8	**2.1**	**1.1**	**1.7**	0.5	0.5	0.2
Depth of Max Change (m)[2]	0.75	1.50	0.75	4.50	9.50	3.50	6.50	5.50	8.50	19.50

Notes:

Data provided by TetraTech on January 2. 2015; does not include results from field duplicates.

Shaded and bold values indicate an exceedance of the 20.0°C criterion.

1. The change in °C per meter of depth was calculated for each pair of adjacent measurement intervals in the table. This value represents the maximum value of the calculated change in °C per one meter of depth for each pair of adjacent measurement intervals. Bold values are >1.0°C per meter depth.

2. Depth of Max Change (m) = the shallowest depth where the greatest temperature gradient occurs.

Table 3-9: LLFB Daily Maximum Temperature in 2014

Day	Maximum Daily Water Temperature (°C)					
	June	July	August	September	October	November
1	Not Monitored	17.4	19.1	**20.7**	17.1	Not Monitored
2		17.3	19.6	18.2	16.1	
3		17.3	19.6	19.0	16.6	
4		18.2	19.1	20.0	16.8	
5		18.2	19.1	19.9	16.7	
6		18.1	18.8	19.6	16.1	
7		18.4	19.3	18.9	15.7	
8		18.5	**23.7**	19.2	16.1	
9		19.2	19.2	19.0	16.1	
10		19.3	18.8	19.2	15.8	
11		18.9	18.8	19.6	15.5	
12		18.9	**20.5**	19.2	15.9	
13		19.2	18.8	19.0	16.0	
14		19.0	18.5	18.6	16.0	
15		19.4	18.5	18.1	15.8	
16		19.2	18.4	17.3	15.1	
17		19.2	18.6	17.1	15.1	
18		19.5	18.8	17.2	15.0	
19		19.7	19.4	17.0	15.0	
20		**20.2**	18.9	17.3	14.9	
21		**21.8**	19.1	17.2	14.4	
22		**21.9**	19.4	16.9	14.5	
23		**20.2**	19.5	17.2	14.5	
24		19.3	18.2	16.8	14.4	
25		**20.1**	19.2	16.8	14.2	
26		**20.5**	18.7	17.1	14.1	
27		19.7	19.5	18.0	13.9	
28		19.4	18.8	18.3	13.5	
29		18.8	19.2	18.3	13.4	
30		19.3	**21.0**	16.4	13.3	
31		18.9	**20.3**	--	13.2	

Notes:
-- = not applicable
Shaded and bold values indicate an exceedance of the 20.0°C criterion.
Data collected as part of Avista's Washington Detailed DO Phase II Feasibility and Implementation Plan.

Table 3-10: LLTR Daily Maximum Temperature in 2014

Day	June	July	August	September	October	November
1	Not Monitored	17.9	19.5	18.7	16.6	Not Monitored
2		18.0	19.9	18.6	16.4	
3		18.0	**20.3**	18.2	16.3	
4		18.3	**20.1**	18.7	16.3	
5		18.6	20.0	18.6	16.2	
6		18.4	19.9	18.5	16.1	
7		18.5	19.8	18.2	15.9	
8		18.7	19.8	18.1	15.8	
9		19.8	20.0	17.9	15.9	
10		19.2	19.9	18.0	15.6	
11		19.4	19.8	18.5	15.7	
12		19.5	**20.5**	18.6	15.4	
13		19.4	**20.3**	18.0	15.5	
14		**20.2**	19.7	18.0	15.6	
15		19.9	19.7	17.4	15.3	
16		19.9	19.7	17.2	14.8	
17		20.0	19.5	17.4	14.8	
18		**20.5**	19.7	17.4	14.8	
19		20.0	19.8	17.0	14.8	
20		19.7	19.8	17.2	14.7	
21		**20.1**	19.8	17.4	14.5	
22		**20.6**	19.8	17.2	14.2	
23		**21.0**	19.7	17.1	14.3	
24		19.5	19.2	17.2	14.0	
25		19.8	19.2	16.8	14.0	
26		**20.5**	19.2	16.7	13.9	
27		20.0	19.3	16.9	13.5	
28		20.0	19.1	17.3	13.3	
29		**20.1**	19.0	17.4	13.3	
30		19.8	18.7	16.8	13.2	
31		19.9	18.7	--	13.1	

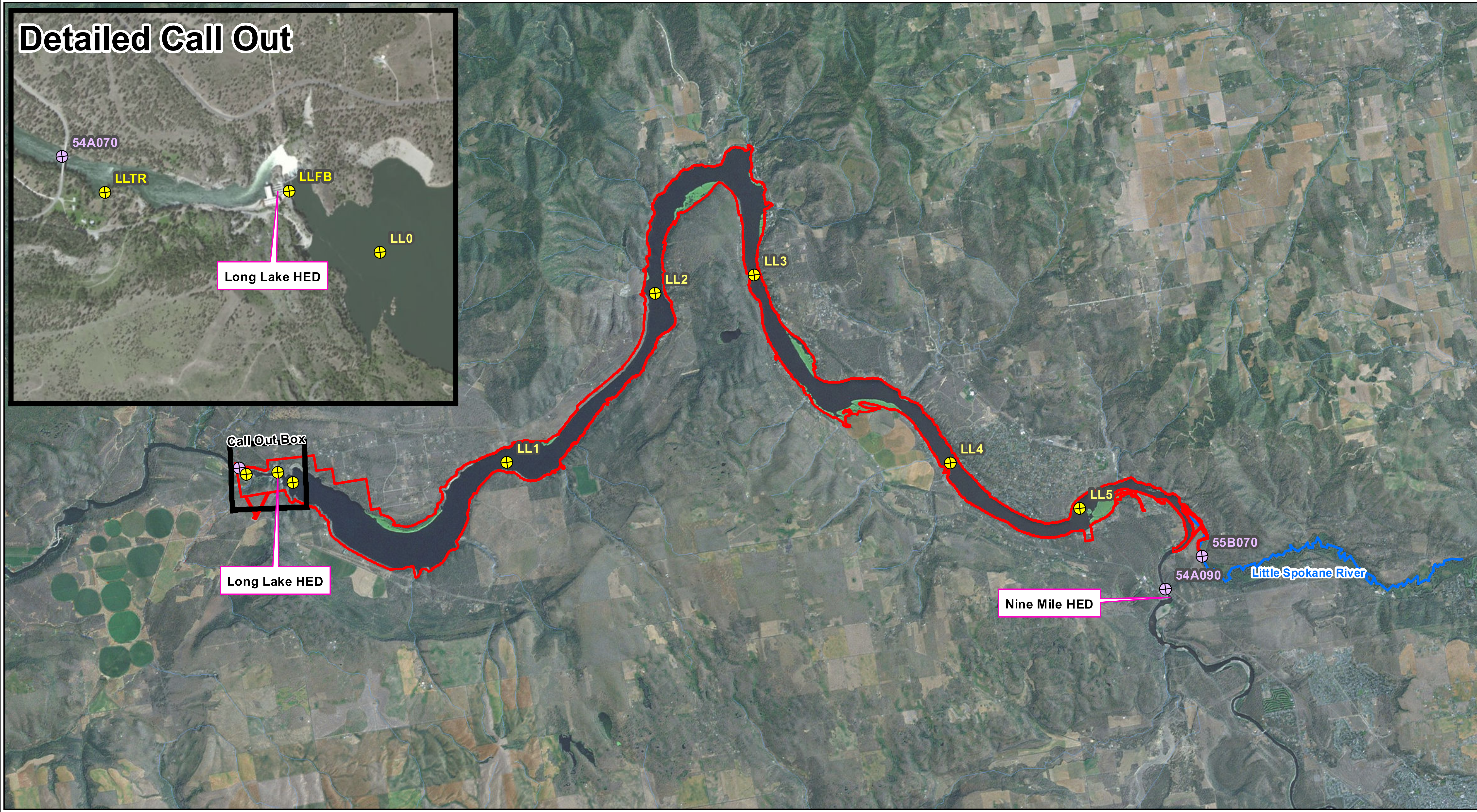
Notes:
-- = not applicable
Shaded and bold values indicate an exceedance of the 20.0°C criterion.
Data collected as part of Avista's Washington Detailed DO Phase II Feasibility and Implementation Plan.

Table 5-1: Comparison of LLTR 2014 Values to Tribe WQ Standards

Day	July	August	September	October
1	#N/A	**20.0**	**18.7**	**16.6**
2	#N/A	**19.9**	**18.6**	**16.4**
3	#N/A	**20.0**	**18.6**	**16.2**
4	18.2	**19.9**	**18.5**	**16.1**
5	18.3	**20.0**	**18.4**	**16.1**
6	**18.6**	**20.0**	**18.3**	**16.0**
7	**18.8**	**19.9**	**18.3**	**15.9**
8	**18.9**	**19.9**	**18.3**	**15.8**
9	**19.1**	**19.9**	**18.3**	**15.7**
10	**19.2**	**20.0**	**18.2**	**15.6**
11	**19.5**	**20.0**	**18.2**	**15.6**
12	**19.6**	**20.0**	**18.0**	**15.4**
13	**19.6**	**19.9**	**18.0**	**15.3**
14	**19.8**	**19.9**	**17.9**	**15.2**
15	**19.9**	**19.9**	**17.7**	**15.1**
16	**20.0**	**19.8**	**17.5**	**15.0**
17	**20.0**	**19.7**	**17.4**	**14.8**
18	**20.0**	**19.7**	**17.3**	**14.6**
19	**20.1**	**19.7**	**17.3**	**14.6**
20	**20.3**	**19.7**	**17.2**	**14.5**
21	**20.2**	**19.7**	**17.2**	**14.3**
22	**20.1**	**19.6**	**17.1**	**14.2**
23	**20.2**	**19.5**	**17.1**	**14.0**
24	**20.2**	**19.5**	**17.0**	**13.9**
25	**20.2**	**19.4**	**17.0**	**13.7**
26	**20.1**	**19.3**	**17.1**	**13.6**
27	**20.0**	**19.1**	**17.0**	**13.5**
28	**20.0**	**19.0**	**16.9**	**13.4**
29	**20.0**	**19.0**	**16.9**	**13.3**
30	**19.9**	**18.9**	**16.8**	**13.2**
31	**20.0**	**18.7**	**16.7**	**13.2**

Notes:
#N/A = not enough days to calculate the 7-DADM
Shaded and bold values indicate an exceedance of the Tribe's 7-DADM Criteria.
Data collected as part of Avista's Washington Detailed DO Phase II Feasibility and Implementation Plan.

FIGURES



LEGEND

Long Lake HED Boundary

Little Spokane River

Temperature Monitoring Stations

Sampling Entity

Avista

Ecology

0 1 2
Miles

Map Projection:
NAD 1983 StatePlane Washington
North FIPS 4601 Feet

Source:
ESRI (Aerial Imagery, Little Spokane River),
Avista (Avista HED), Golder Associates (Long Lake Boundary,
Tempurature Monitoring Locations)

N

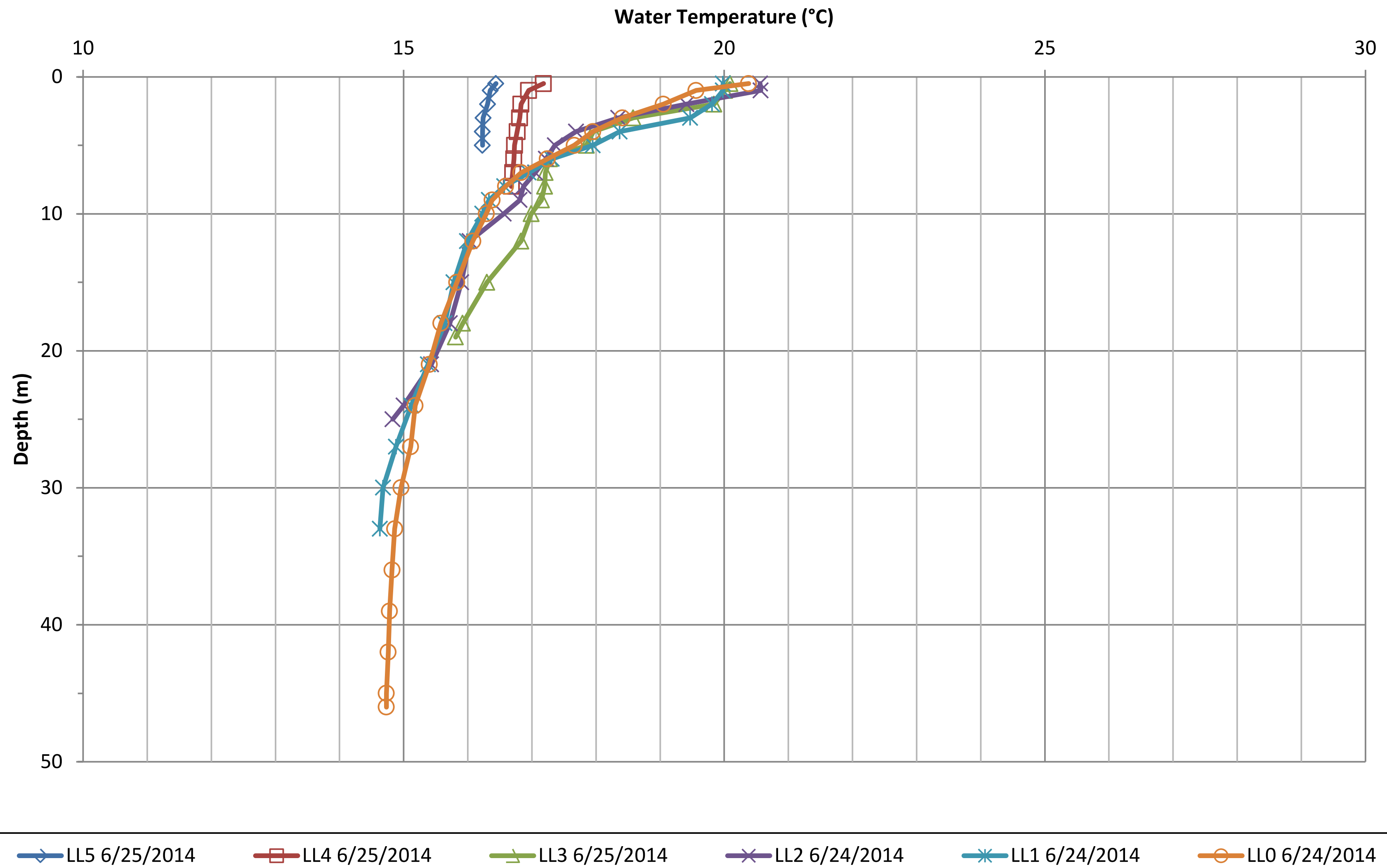
This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

FIGURE **2-1**

Long Lake HED 2014
Temperature Monitoring Stations

Golder Associates

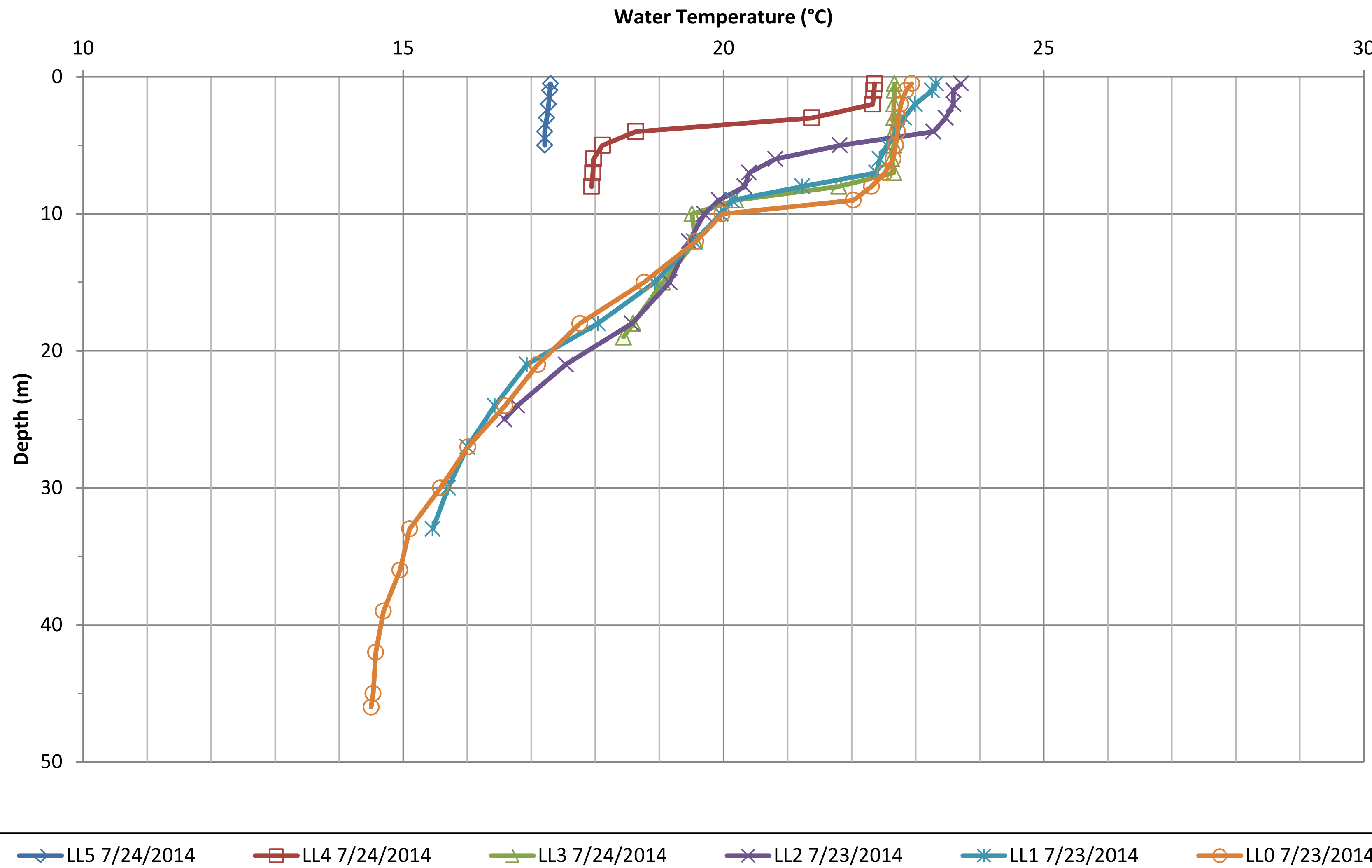
Path: M:\Projects\2010\10393119_AvistaAquaticWeeds\10393119_AvistaAquaticWeeds\MXD\R01\LakeSpokane_Temp_Monitoring_Sites Fig_2_1_20150211R01.mxdGLEHMAN



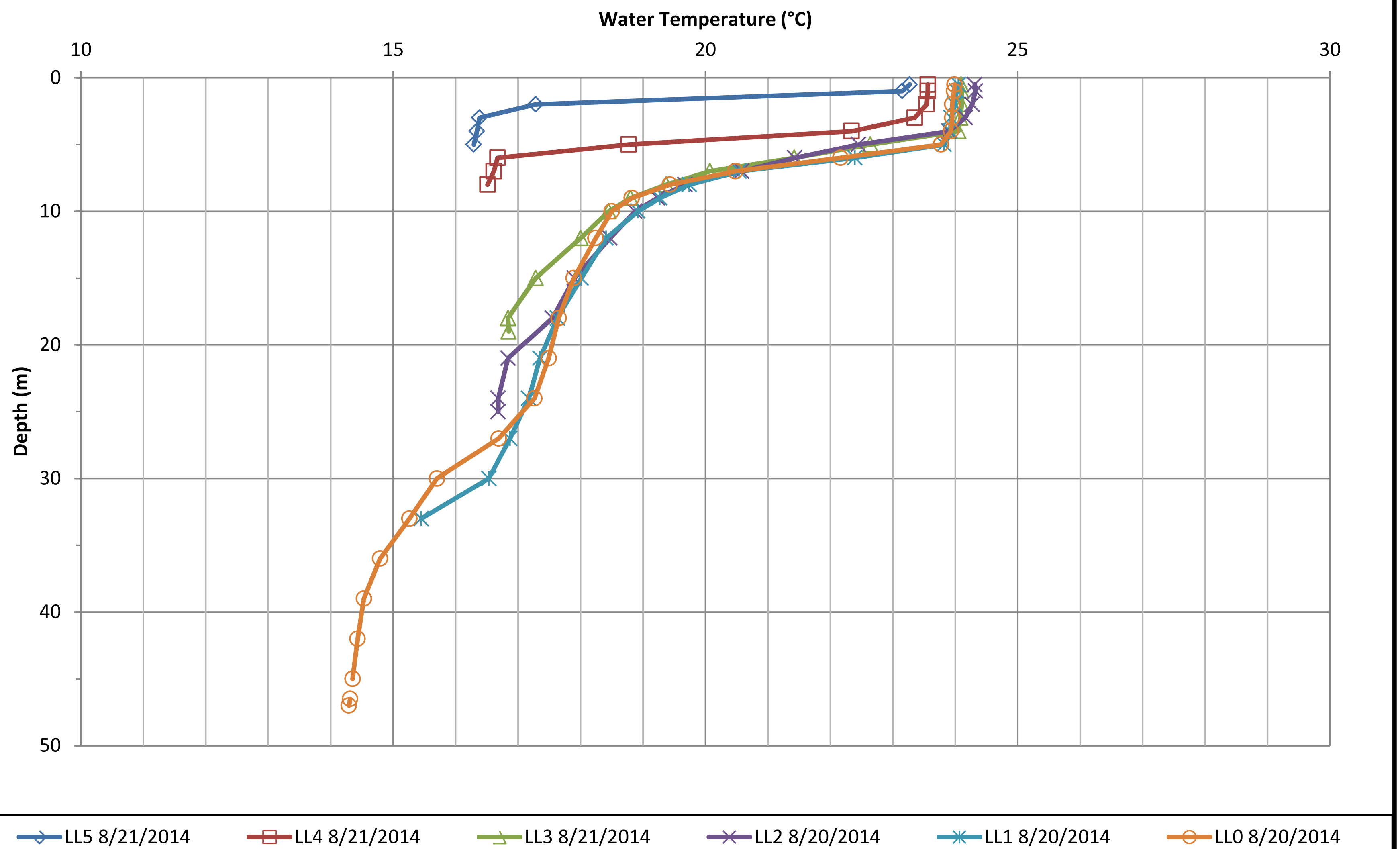
Golder Associates

Title: Lake Spokane Temperature Vertical Profiles, Late June 2014

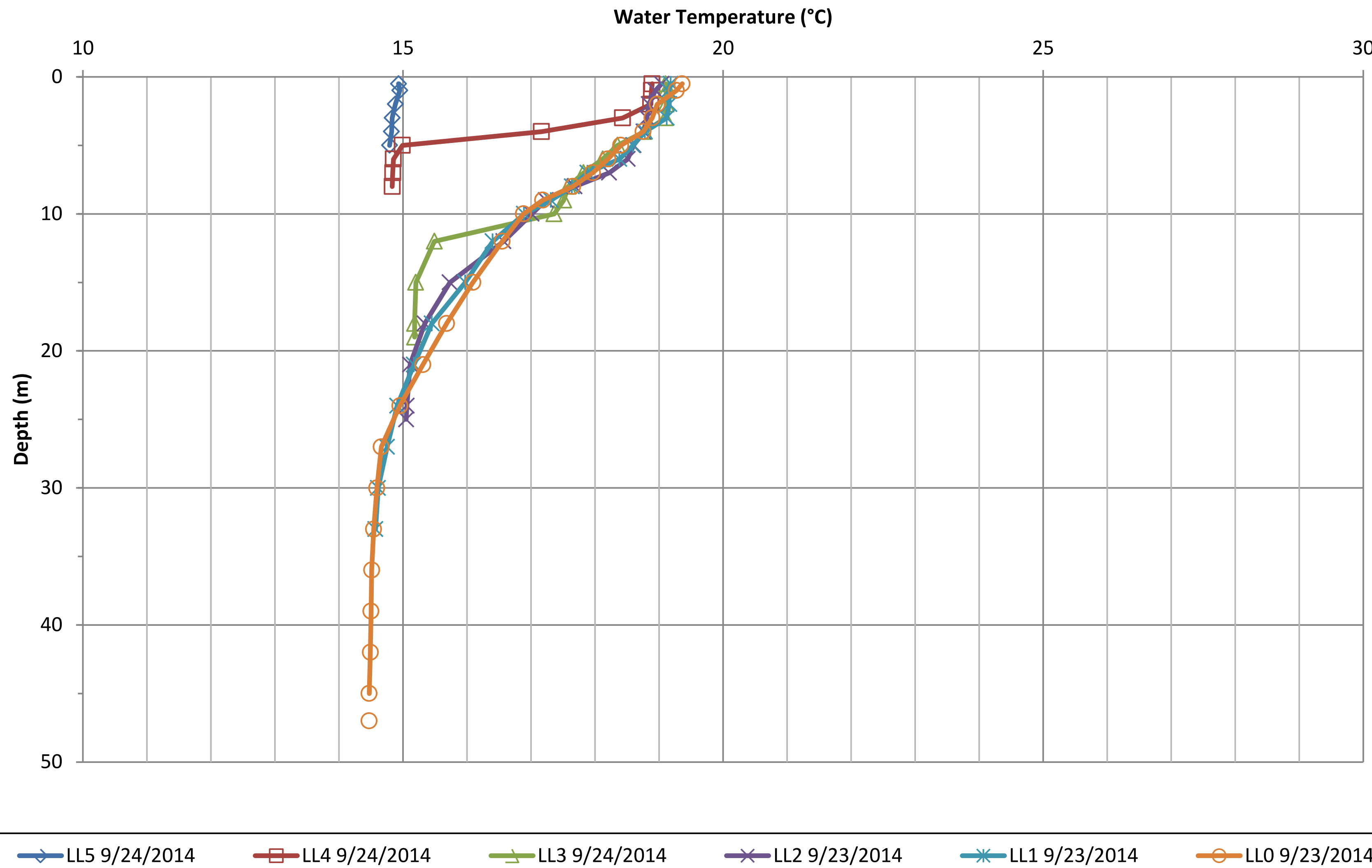
Project Name	LL HED Temp Monitoring Report	Project No.	073-93081-13-100	FIGURE 3-1
Client Name	Avista	Date	February 27, 2015	



Golder Associates	Title: Lake Spokane Temperature Vertical Profiles, Late July 2014		
	Project Name: LL HED Temp Monitoring Report	Project No. 073-93081-13-100	FIGURE 3-2
	Client Name: Avista	Date: February 27, 2015	

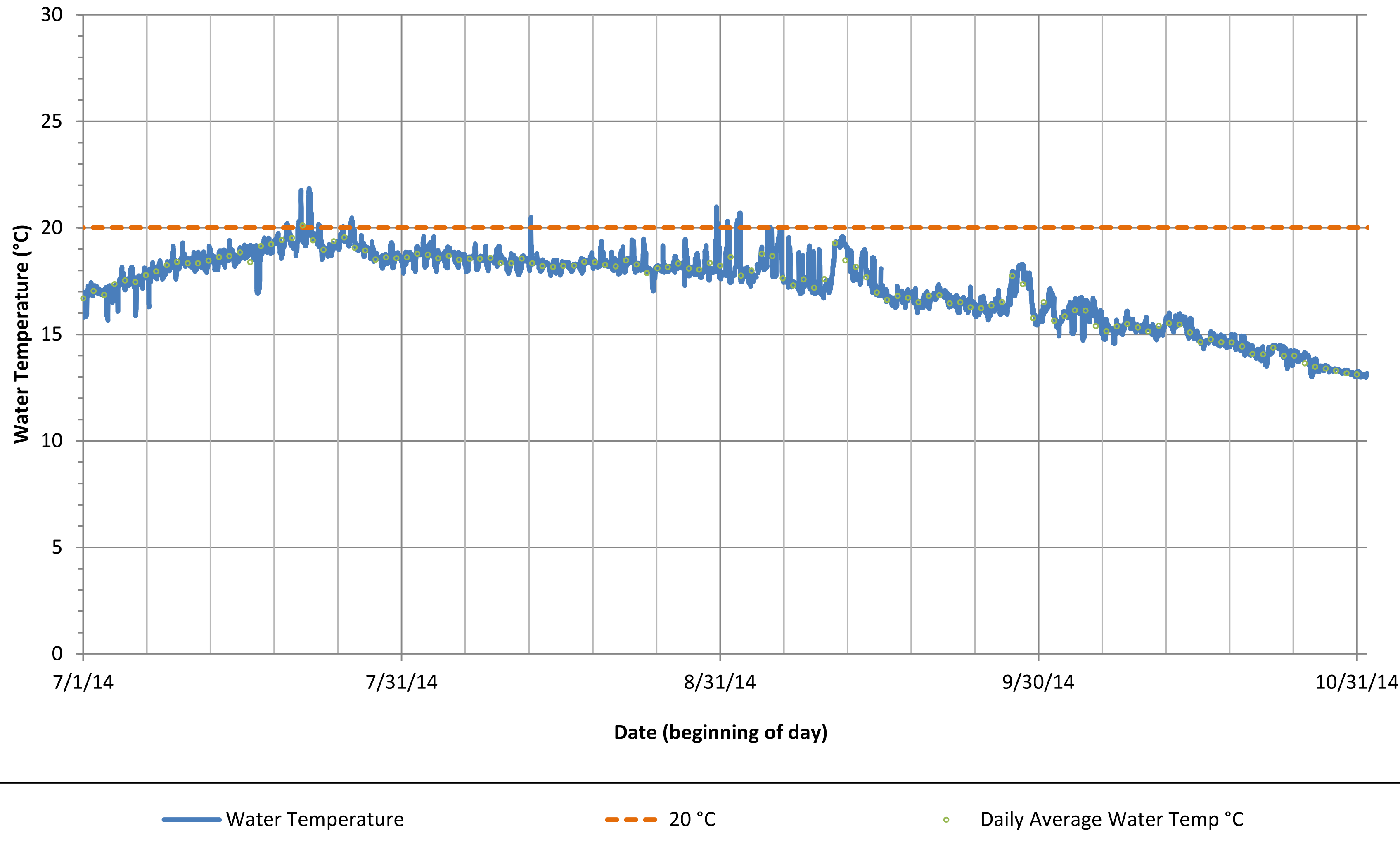


Golder Associates	Title: Lake Spokane Temperature Vertical Profiles, Late August 2014		
	Project Name: LL HED Temp Monitoring Report	Project No.: 073-93081-13-100	FIGURE 3-3
	Client Name: Avista	Date: February 27, 2015	



Golder Associates	Title: Lake Spokane Temperature Vertical Profiles, Late September 2014		
	Project Name: LL HED Temp Monitoring Report	Project No. 073-93081-13-100	FIGURE 3-4
	Client Name: Avista	Date: February 27, 2015	

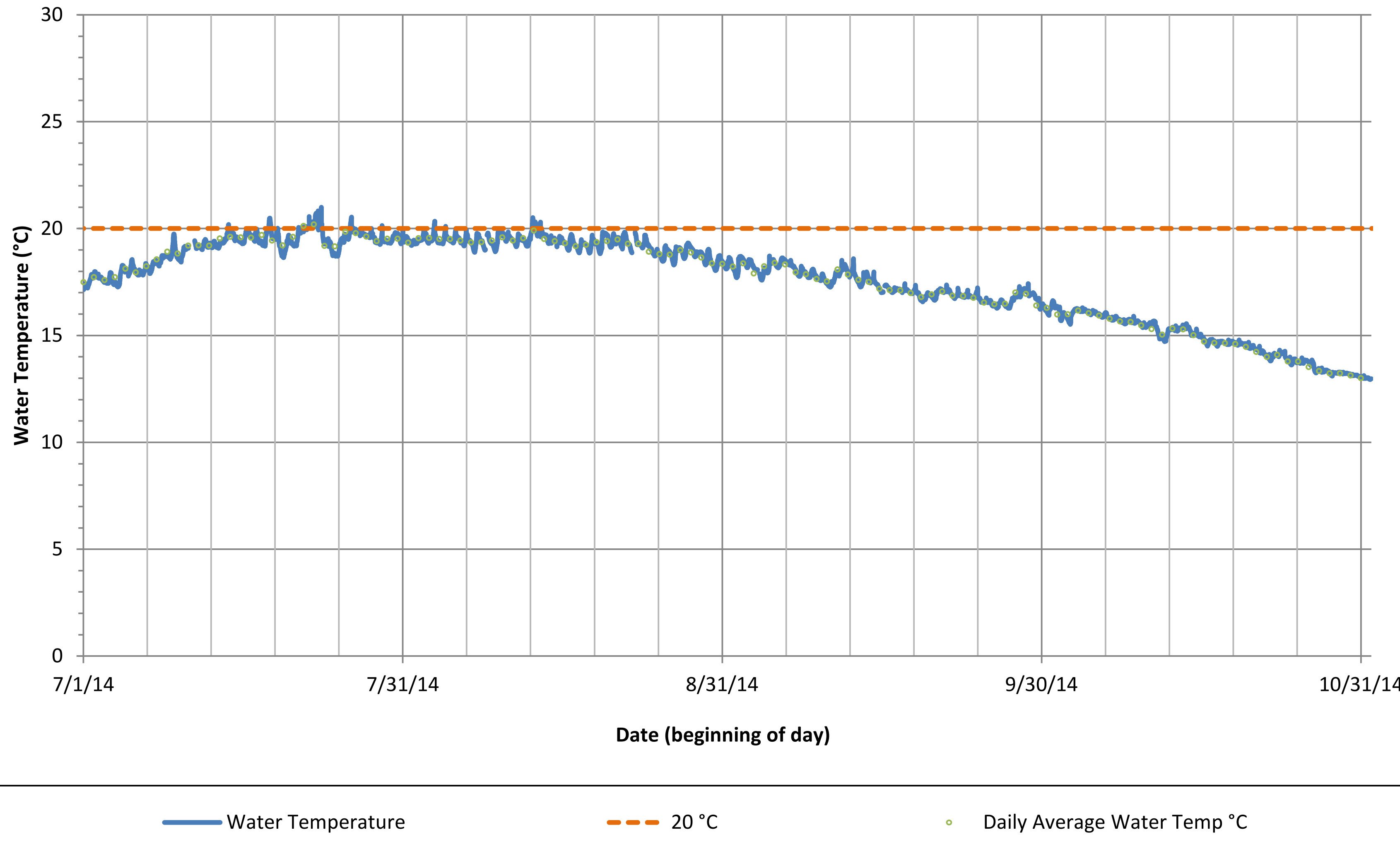
022715blm1_2014_Temp_WQAP_Tables_Figures_withFormulas.xlsx: Fig 3-4



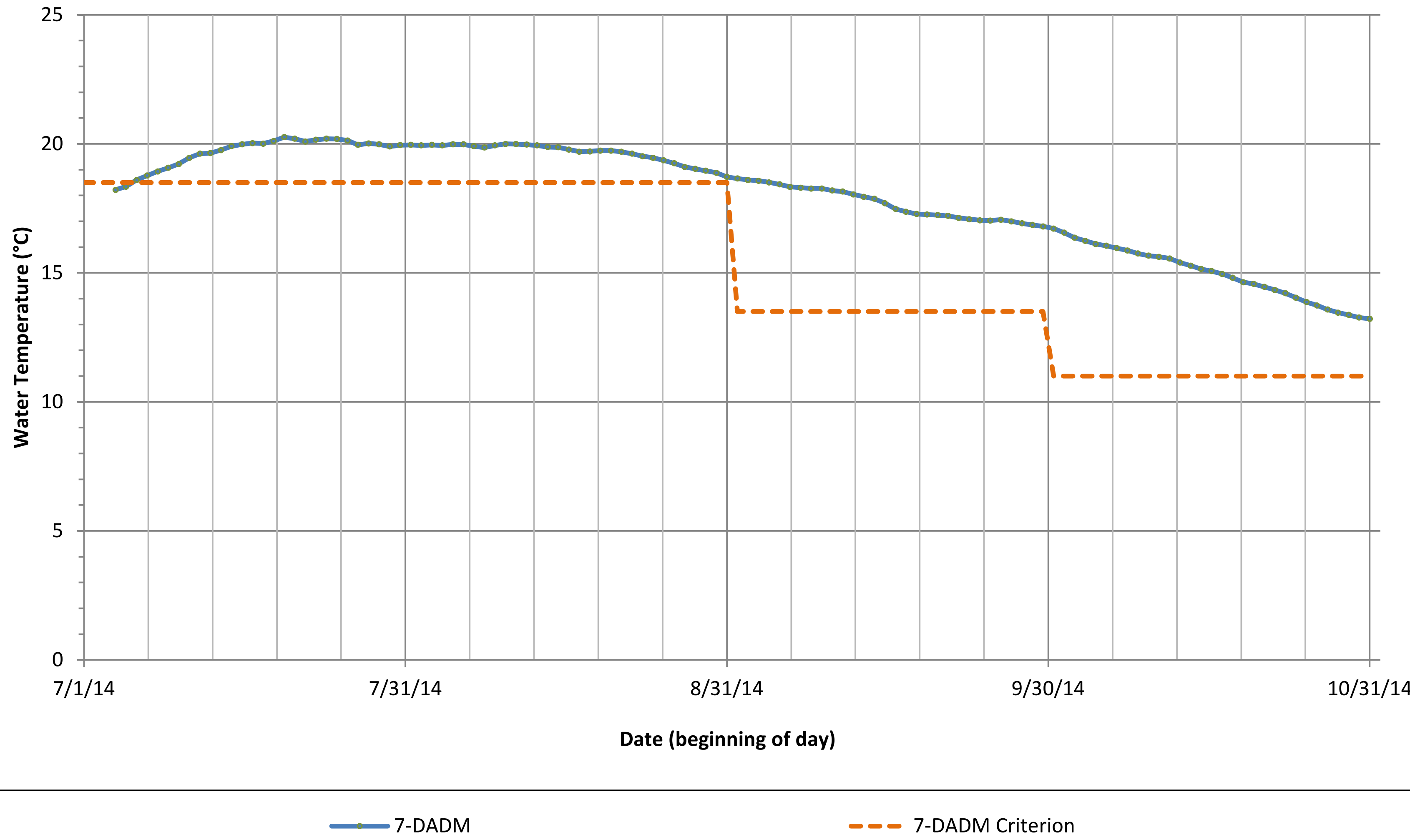
Golder Associates

Title	LLFB Temperature Time Series, 2014
Project Name	LL HED Temp Monitoring Report
Project No.	073-93081-13-100
Client Name	Avista
Date	February 27, 2015

FIGURE 3-5



Golder Associates	Title	LLTR Temperature Time Series, 2014	
	Project Name: LL HED Temp Monitoring Report	Project No. 073-93081-13-100	FIGURE 3-6
	Client Name: Avista	Date: February 27, 2015	



Golder Associates

Title	LLTR 7-DADM Time Series, 2014		
Project Name	LL HED Temp Monitoring Report	Project No.	073-93081-13-100
Client Name	Avista	Date	February 27, 2015

FIGURE 5-1

022715blm1_2014_Temp_WQAP_Tables_Figures_withFormulas.xlsx: Fig 5-1

APPENDIX A

CONSULTATION RECORD

AVISTA
1411 East Mission Avenue
PO Box 3727
Spokane, WA 99220-3727

February 27, 2015

Mr. Patrick McGuire, Water Quality Program
Washington Department of Ecology
Eastern Region Office
4601 N Monroe Street
Spokane, WA 99205-1295

RE: Spokane River Hydroelectric Project, FERC Project No. 2545
2014 Long Lake Hydroelectric Development Temperature Monitoring Report

Dear Mr. McGuire:

I have enclosed the 2014 Long Lake Hydroelectric Development Temperature Monitoring Report (Temperature Monitoring Report) for your review and approval. The Temperature Monitoring Report was completed in accordance with the Long Lake Dam Reservoir and Tailrace Temperature Water Quality Attainment Plan, which was required by the Federal Energy Regulatory Commission (FERC) Spokane River Hydroelectric Project License Appendix B, Section 5.5.B.

We request your review and approval by **March 31, 2015**. This will allow us time to incorporate your comments and recommendations as appropriate, and submit the Temperature Monitoring Report to FERC by **April 15, 2015**.

Please feel free to call me at (509) 495-4643 if you have any questions about the Temperature Monitoring Report.

Sincerely,

Meghan Lunney
Aquatic Resource Specialist

Enclosure (1)

cc: Chad Brown, Ecology
Brian Crossley, Spokane Tribe

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
4601 N Monroe Street • Spokane, Washington 99205-1295 • (509)329-3400

April 13, 2015

Ms. Meghan Lunney
Aquatic Resource Specialist
Avista Corporation
1411 East Mission Avenue, MSC-1
Spokane, WA 99220-3727

RE: Request for Ecology Review and Approval – *2014 Long Lake HED Temperature Monitoring Report.* Spokane River Hydroelectric Project, No. P-2545

Dear Ms. Lunney:

The Department of Ecology (Ecology) has reviewed the *2014 Long Lake HED Temperature Monitoring Report* sent to Ecology on February 27, 2015. The report is a requirement in FERC License Appendix B, Section 5.5.B.

Ecology APPROVES the *2014 Long Lake HED Temperature Monitoring Report* as submitted.

Please contact me at (509) 329-3567 or pmcg461@ecy.wa.gov if you have any questions.

Sincerely,

Pat McGuire

Patrick McGuire
Eastern Region FERC License Coordinator
Water Quality Program

PDM:jab

cc: Elvin "Speed" Fitzhugh, Avista

ECOLOGY COMMENTS AND AVISTA RESPONSES

Ecology Comment
Ecology did not provide any comments in their approval letter.

Avista Response
No response is required.

AVISTA
1411 East Mission Avenue
PO Box 3727
Spokane, WA 99220-3727

February 27, 2015

Brian Crossley
Water & Fish Program Manager
Spokane Tribe Natural Resources
P.O. Box 480
Wellpinit, WA 99040

RE: Spokane River Hydroelectric Project, FERC Project No. 2545
2014 Long Lake Hydroelectric Development Temperature Monitoring Report

Dear Mr. Crossley:

I have enclosed the 2014 Long Lake Hydroelectric Development Temperature Monitoring Report (Temperature Monitoring Report) for your review and comment. The Temperature Monitoring Report was completed in accordance with the Long Lake Dam Reservoir and Tailrace Temperature Water Quality Attainment Plan, which was required by the Federal Energy Regulatory Commission (FERC) Spokane River Hydroelectric Project License Appendix B, Section 5.5.B.

Per the October 2008 Settlement Agreement between Avista and the Spokane Tribe, we would like to receive any comments that you may have on the Temperature Monitoring Report by **March 31, 2015**. This will allow us time to incorporate your comments as appropriate, and submit the Temperature Monitoring Report to FERC by **April 15, 2015**.

Please feel free to call me at (509) 495-4643 if you have any questions about the Temperature Monitoring Report.

Sincerely,

Meghan Lunney
Aquatic Resource Specialist

Enclosure (1)

cc: Patrick McGuire, Ecology

Spokane Tribal Natural Resources
P.O. Box 480 • Wellpinit, WA 99040 • (509) 626 - 4400 • fax 258 - 9600

3/30/2015

Megan Lunney
1411 East Mission Avenue
PO Box 3727 MSC-25
Spokane WA 99220

Dear Megan:

I have reviewed the 2014 dissolved oxygen and temperature monitoring reports with the assistance of DNR staff. These reports focus on Long Lake Dam and its effect on dissolved oxygen, total dissolved gas and temperature. The changes to dissolved oxygen at the tailrace of Long Lake are substantial. The monitoring data also indicates that the dissolved oxygen doesn't decline as precipitously as expected once generation stops. We appreciate the detail shown in the figures showing the daily range of dissolved oxygen concentrations. The standard at LLTR for dissolved oxygen is 8.0 mg/L and is not predicated upon whether power generation is occurring at Long Lake. The report could make this point clearer.

These comments from March 2014 should be considered:

- Additional questions and evaluations should be made to understand the potential for cooling the water through the DO tubes and the alternatives to "normal" operations that might improve the DO sags when the turbines are off. For example, could one turbine remain on during the night at a lower level to keep oxygen from declining?
- Analysis of the air temperature being used by the DO aeration as well as the concept of variable depth withdrawals should be addressed. The Temperature Attainment Plan is broad in its scope but should be willing to approach such topics.

Sincerely,

Brian Crossley
Water & Fish Program Manager
crossley@spokanetribe.com

cc: Patrick McGuire, Dept. of Ecology
BJ Kieffer, Director Dept. of Natural Resources
Matt Wynne, Tribal Council

SPOKANE TRIBE COMMENTS AND AVISTA RESPONSES

The Spokane Tribe's March 30, 2015 letter had only two comments applicable to the 2014 Long Lake HED Temperature Monitoring Report.

Spokane Tribe Comment
Additional questions and evaluations should be made to understand the potential for cooling the water through the DO tubes and the alternatives to "normal" operations that might improve the DO sags when the turbines are off. For example, could one turbine remain on during the night at a lower level to keep oxygen from declining?

Avista Response
Avista will assess the data that has been collected to determine whether or not water passing through the turbines could be cooled using colder than atmospheric air through the existing aeration system.

Spokane Tribe Comment
Analysis of the air temperature being used by the DO aeration as well as the concept of variable depth withdrawals should be addressed. The Temperature Attainment Plan is broad in its scope but should be willing to approach such topics.

Avista Response
HDR (the Consulting Firm that designed and evaluated the aeration system) determined that based upon the field data, when the aeration system is working and when it is not, there is no discernible difference in water temperature in the tailrace. This is because only a very small amount of air is introduced into the flow path (~80 to 100 standard cubic feet per second) compared to the total flow of water (~800 to 1,500 cubic feet per second) passing through the draft tube. Avista provided this evaluation to the Tribe via e-mail on March 27, 2015.

During a phone conversation on April 7th, Avista and the Tribe revisited the configuration of Long Lake Dam's intakes and that the design does not accommodate variable depth withdrawals. Withdrawing deeper water that is cooler and oxygen-depleted could negatively impact the positive benefits of aerating the tailrace and downstream river that we have already achieved. Avista and the Tribe will continue to work together through adaptive management to look at other ways to improve temperature in the river.