

# AVISTA CORPORATION

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## COEUR D'ALENE RESERVATION WATER QUALITY MONITORING PLAN

4(e) CONDITION NO. 5

SPOKANE RIVER HYDROELECTRIC PROJECT  
FERC PROJECT NO. 2545

Prepared By:  
Coeur d'Alene Tribe

In Cooperation With:  
Avista Corporation

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## **Section 1: Introduction**

### **1.1 Background**

On June 18, 2009, the Federal Energy Regulatory Commission (FERC) issued Avista Corporation (Avista) a new license for the Spokane River Hydroelectric Project (Spokane River Project), FERC Project No. 2545-091 for a 50-year license term (FERC, 2009). The new FERC license (License) became effective on June 1, 2009 and includes operation of the Post Falls Hydroelectric Development (HED) in Idaho as a component of the Spokane River Project.

The Post Falls HED includes three dams located on the Spokane River approximately nine miles downstream from the outlet of Coeur d'Alene Lake. Coeur d'Alene Lake is a natural lake created by a channel restriction at the outlet, with the outlet serving as the headwaters of the Spokane River. The Post Falls HED's Project boundary encompasses Coeur d'Alene Lake, Spokane River upstream of the Post Falls Dams, and the lower reaches of the St. Joe, Coeur d'Alene and St. Maries rivers (Figure 1) to the normal full pool water elevation of 2,128 feet.

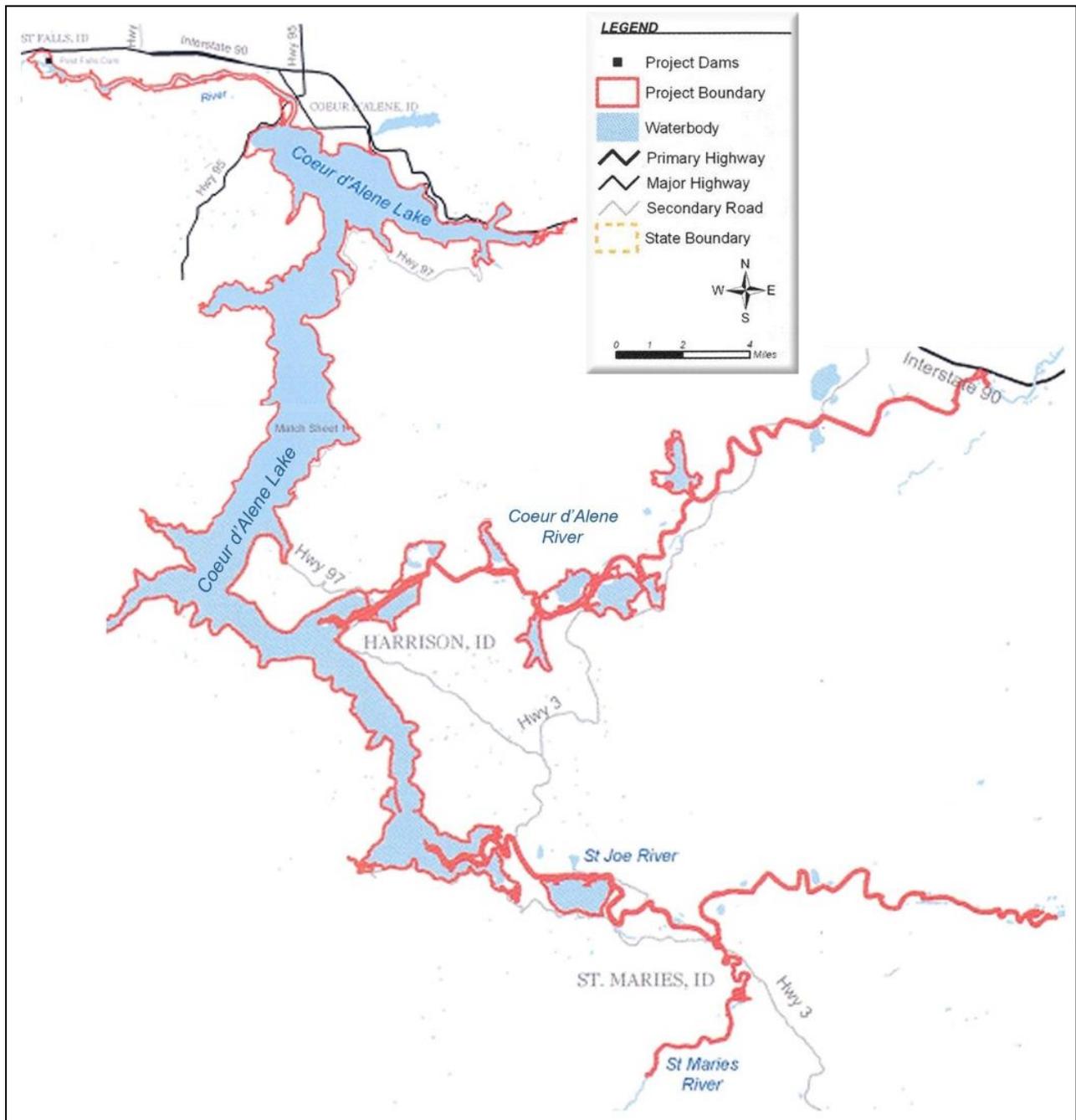
### **1.2 License Requirements**

Ordering Paragraph G of the license incorporated the U.S. Department of Interior's (Interior's) January 27, 2009 Federal Power Act 4(e) Conditions (Conditions). The Conditions can be found in Appendix D of the license. Pursuant to Ordering Paragraph G and Section 3 of Appendix D, Avista filed an Annual Implementation Report (AIR) with FERC on November 2, 2009 (AIR, 2009). FERC approved the 2009 AIR on December 23, 2009.

Condition No. 5 of Appendix D of the license regarding Water Quality Standards and Water Quality Monitoring (Condition 5) requires Avista to complete a Coeur d'Alene Indian Reservation Water Quality Monitoring Plan (WQMP), in collaboration with the Coeur d'Alene Tribe (Tribe), within one year of license issuance (June 18, 2010). The license specifies:

*The Licensee shall submit the Plan to the Secretary for review and approval at least 60 days before filing it with the Commission. When filing the Plan with the Commission, the Licensee shall include documentation of collaboration with the Tribe, and copies of any comments and recommendations from the Tribe. If the Licensee files the Plan with the Commission without first obtaining the Secretary's approval, the Licensee shall include specific reasons for doing so. The Licensee shall implement the Plan upon its approval by the Secretary and the Commission.*

This WQMP was developed in accordance with Condition 5 as well as the water quality monitoring activities identified in the approved 2009 AIR.



**Figure 1: Coeur d'Alene Lake and Spokane River (Post Falls HED) Project Boundary**

## **Section 2: Water Quality Monitoring Plan**

The following sections describe a WQMP that when approved and implemented will satisfy Condition 5 as stated above in Section 1.2.

### **2.1 Water Quality Monitoring Project Organization**

Avista and the Tribe will collaborate to implement the WQMP with the Tribe performing the work under contract with Avista. The following Sections, 2.1.1 and 2.1.2 describe the responsibilities of Avista and the Tribe under the WQMP.

#### ***2.1.1 Avista Responsibilities***

Avista shall provide the Tribe's Water Resource Program funding through the Coeur d'Alene Reservation Trust Resources Restoration Fund (CDR Fund), identified as Condition No. 2 of Appendix D of the license, to facilitate the staffing, equipment, sample analysis, data management, quality assurance (QA), quality control (QC), and reporting depicted in this WQMP as long as the Tribe continues to contract to implement the WQMP. In the instance the Tribe does not conduct the work identified under this WQMP Avista and the Tribe will hire a contractor to complete it and will modify this Plan as needed to clarify the roles of Avista, the Tribe and the contractor. Each April 1st Avista will submit an AIR to Interior for approval, which will include a cost estimate for the upcoming year's water quality monitoring activities. All work implemented under this WQMP will be funded through the CDR Fund whether completed by Avista, the Tribe, or others.

Avista shall provide contract oversight to ensure the schedule, budget, and monitoring requirements identified in Condition 5 are being met.

#### ***2.1.2 Coeur d'Alene Tribe Responsibilities***

Avista currently contracts with the Tribe's Water Resource Program to conduct the water quality monitoring, QA/QC, data analysis, data management, and reporting requirements described in this WQMP. Under this WQMP the Tribe is responsible to fulfill its contractual obligations to Avista in regard to implementing Condition 5. The Tribe will follow the methods and procedures identified in Appendix A in the implementation of this WQMP. All necessary equipment and supplies, identified in Appendix B of this WQMP, that are required to complete the water quality monitoring, will be purchased and/or rented through the CDR Fund. As stated in the 2009 AIR the Tribe will transmit all data collected in the field to Avista within 30 working days after collection or laboratory analysis.

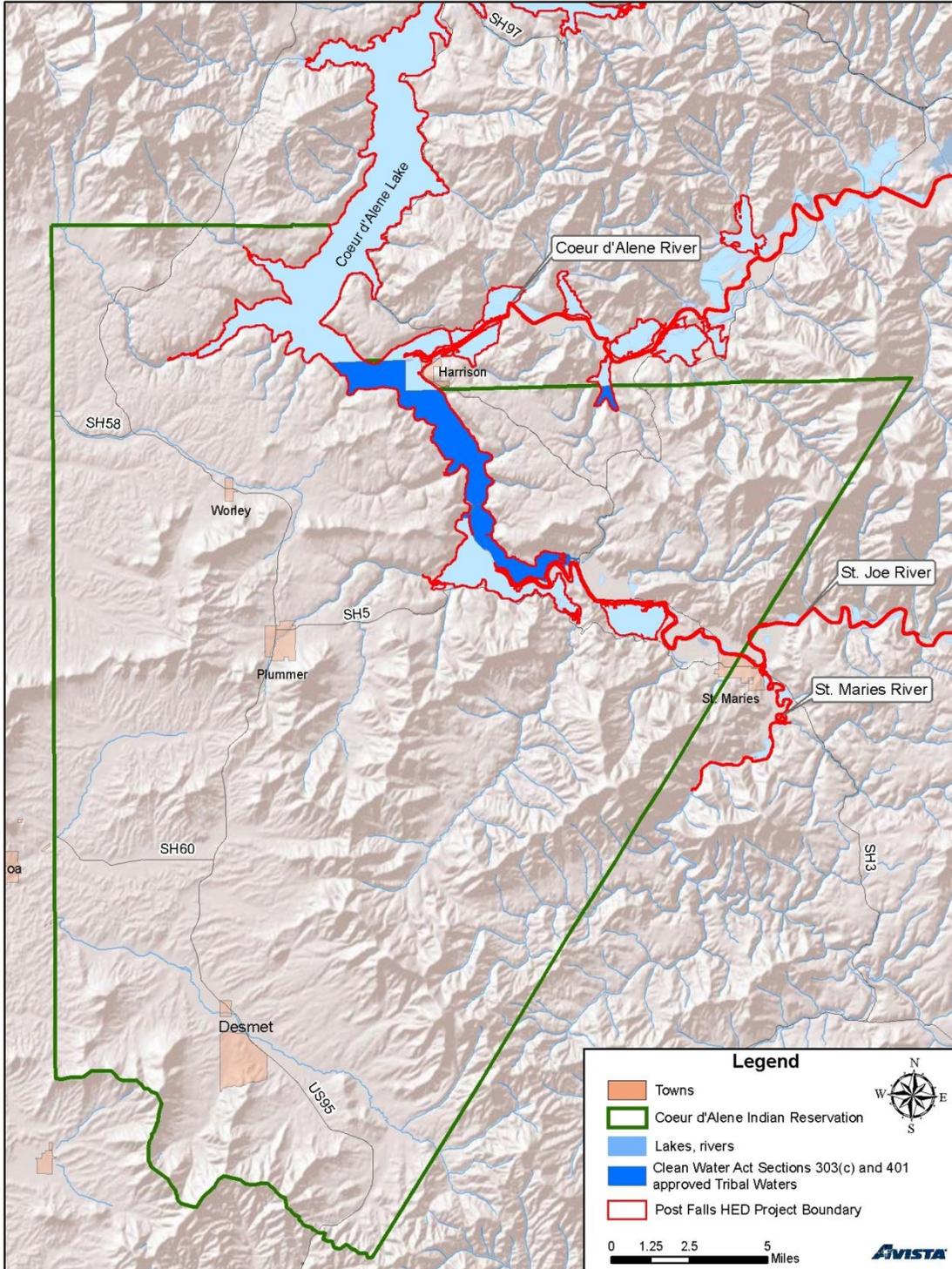
### **2.2 Water Quality Monitoring Description**

This WQMP is structured closely with the existing quality assurance project plan (QAPP), a guidance document developed for water quality monitoring under the Coeur d'Alene Lake Management Plan (LMP, 2009). The LMP and the QAPP were jointly developed by the Tribe and the Idaho Department of Environmental Quality (IDEQ). The QAPP is revised by the Tribe and IDEQ and subsequently reviewed by the United States Environmental Protection Agency (USEPA) on an annual basis. In addition, several United States Geological Survey (USGS) documents were used as guidance for: 1) sampling preparation (Wilde 2005); 2) Equipment cleaning (Wilde 2004); 3) sample collection (Wilde et al. 1999); 4) sample processing and handling (Wilde et al. 2004); and 5) field measurements (Wilde 2005).

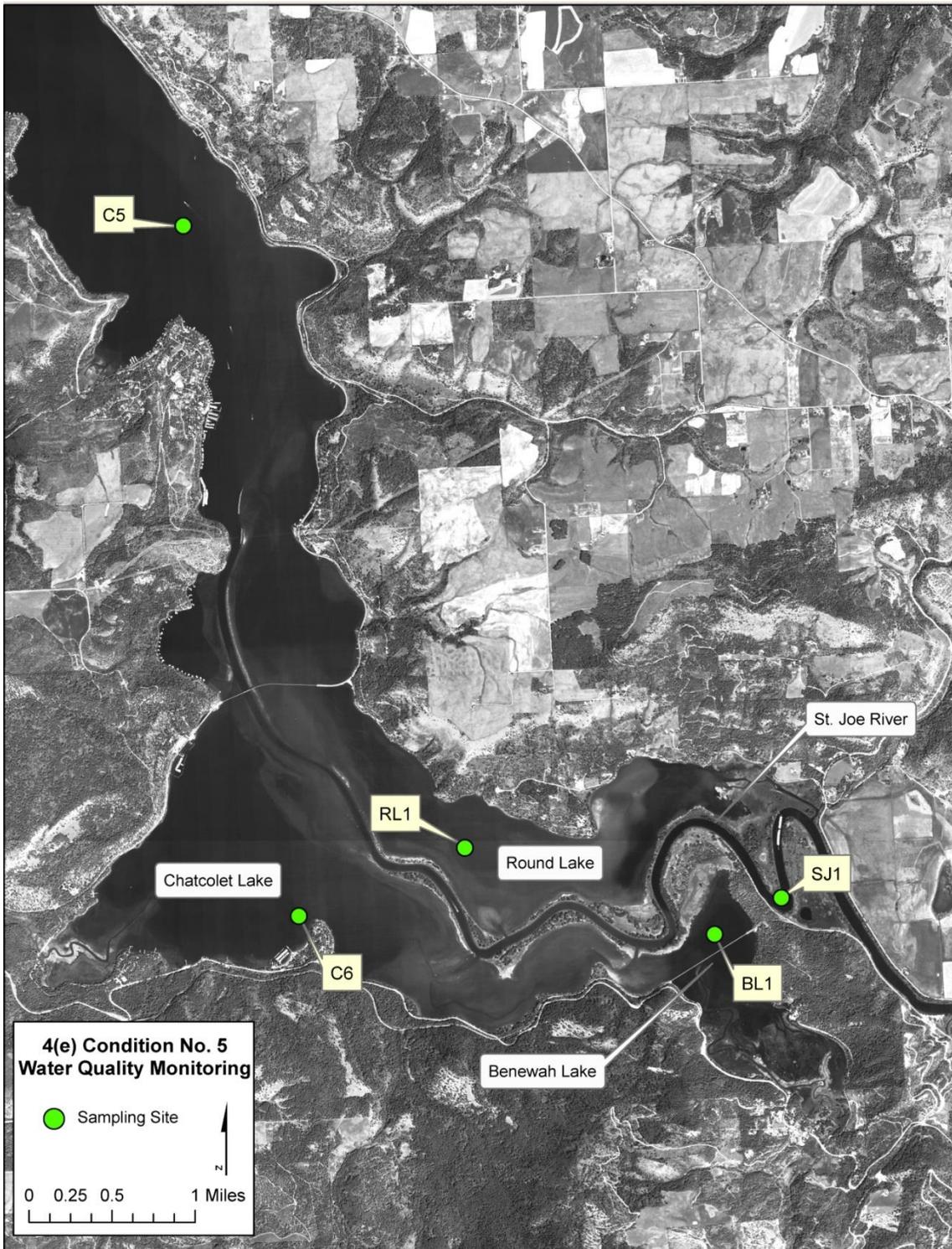
Section 2.2.1 describes the schedule and location of where the Tribe will complete *in-situ* measurements and water quality sampling. These locations correspond to the sites identified in Part A(1)(a-e) of Condition 5. Figure 2<sup>1</sup> displays the location of the Coeur d'Alene Reservation Boundary and Figure 3 shows the locations of the five sample locations (C5, C6, BL1, SJ1, and RL1). Section 2.2.2 describes the water quality constituents that require laboratory analysis, analysis methods and reporting limits. Section 2.2.3 describes physical and chemical variables that the Tribe will measure *in-situ* at each site, twice per month, and continuously with an instrument/buoy system that will be deployed annually at **four of the five sites** on a five-year rotational cycle, **with each rotation being a year-long timeframe**.

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<sup>1</sup> Consistent with Section 1.1. of the Settlement Agreement between Avista, the Tribe, and the United States Department of the Interior (DOI), executed on December 16, 2008, nothing in this Plan, including Figure 1 or Figure 2, is intended or shall be construed to address or resolve: (a) any claims by the Tribe and/or DOI regarding alleged trespass by Avista on Reservation lands or annual charges Avista may owe pursuant to § 10(e) of the Federal Power Act, 16 U.S.C. § 803(e), for Avista's occupancy, use and enjoyment of those Reservation lands; or (b) any claims the Tribe may have with respect to the submerged lands of Coeur d'Alene Lake that are located outside the current Reservation boundaries or that lie within the boundaries of Heyburn State Park within the current Reservation boundaries.



**Figure 2: Current Exterior Boundaries of the Coeur d'Alene Indian Reservation**



**Figure 3: Map of sampling sites in Coeur d'Alene Lake and the St. Joe River for the 4(e) Condition 5 Water Quality Standards and Water Quality Monitoring.**

**2.2.1 Monitoring Sites and Sampling Schedule**

The Tribe will collect water quality samples from five sites (C5, C6, BL1, SJ1, and RL1) located within the Coeur d’Alene Reservation (Reservation) in the southern end of Coeur d’Alene Lake and the St. Joe River (Figure 3 and Table 1. These five sites correspond to the sites identified in Part A(1)(a-e) of Condition 5.

**Table 1: Description and coordinates of water quality sampling site locations per Part A(1)(a-e) of Condition 5.**

| Site Code | Site Name & Location  | Total Depth (meters)* | Site Latitude     | Site Longitude    |
|-----------|---|-----------------------|-------------------|-------------------|
| C5        | <u>Coeur d’Alene Lake</u><br>mid-lake between Browns Point and north-end of Shingle Bay (near Chippy Point), south of Harrison, ID (referred to as C5)  | 17                    | N47° 25' 15.927"  | W116° 45' 30.509" |
| C6        | <u>Chatcolet Lake</u><br>Chatcolet Lake in the central portion of the deepest area, 0.4 miles northwest of Rocky Point near Plummer, ID (referred to as C6)   | 11                    | N47° 21' 30.272"  | W116° 44' 54.080" |
| BL1       | <u>Benewah Lake</u><br>East of Chatcolet Lake, south of St Joe River (referred to as BL1)   | 3                     | W116° 41' 42.743" | N47° 21' 17.551"  |
| SJ1       | <u>Lower St. Joe River</u><br>the “60-foot deep hole” in the sharp bend upstream of USGS gage 12415140, St. Joe River near Chatcolet, Idaho and ~1 km downstream of USGS gage 12415135 at Ramsdell (referred to as SJ1) | 18                    | N47° 21' 27.906"  | W116° 41' 10.986" |
| RL1       | <u>Round Lake</u><br>East of Chatcolet Lake, north of St Joe River (referred to as RL1)   | 3                     | N 47° 21' 48.925" | W116° 43' 35.865" |

\* At full summer pool, lake surface elevation 2128 feet.

### *2.2.1.1 Site Descriptions*

Site C5 is a 17 meter deep site that represents conditions in the southern pelagic waters of Coeur d'Alene Lake. Site C6 is located at the deepest point (approximately 11 meters) of Chatcolet Lake. Site SJ1 is located within the lower St. Joe River. Sites RL1 and BL1 are each located within a shallow lake, Round Lake and Benewah Lake, respectively. These two lakes are located on opposite sides of the St. Joe River and were once seasonally isolated from the St. Joe River through natural river levees, but are now connected with the St. Joe River and Chatcolet Lake.

### *2.2.1.2 Sample Depths*

The Tribe will collect water samples for nutrients at each of the five sites (Table 1 and Figure 3) once per month from June through November on an annual basis, for the term of the license. During monthly sampling, at each of the five sites, water samples will be collected from the following depths as indicated in Part A(5) of Condition 5:

- 1) euphotic zone composite (defined as 3-5 evenly spaced samples taken from 0.5 m below the surface to the depth to which 1% of incident solar radiation at the surface penetrates, composited in a churn splitter, and from which subsamples are withdrawn for laboratory analysis);
- 2) one meter above the lake bottom; and
- 3) at Site C5 only (part of A(1)(a) of Condition 5), in the zone of maximum chlorophyll fluorescence.

### *2.2.2 Water Quality Variables*

The water samples collected at each of the five monitoring locations at the depths previously identified will be analyzed by the Tribe for the following nutrients as defined in Part A(6)(a-g) of Condition 5: total Nitrogen; nitrite (NO<sub>2</sub>) + nitrate (NO<sub>3</sub>) Nitrogen; ammonia nitrogen (NH<sub>3</sub>); total Phosphorus; dissolved Phosphorus; ortho Phosphorus; and chlorophyll a (in the euphotic composite and zone of maximum chlorophyll fluorescence samples).

Also, as required by Part A(7) of Condition 5, the Tribe will collect one phytoplankton sample per month, June through November, from the euphotic zone composite in accordance with Part A(5)(a) of Condition 5 at each of the five monitoring locations previously identified. The Tribe will analyze subsamples for taxa present (identified to species level whenever possible), and the number of organisms present by taxon. Table 2 summarizes the annual sampling schedule including the sample analysis parameters, location, depth and the sampling frequency.

The Tribe will contract with a certified laboratory to analyze the water quality samples for the parameters and method detection limits identified in Parts A(6)(a-g) and A(7). These parameters along with their appropriate acceptance criteria are summarized in Table 3. The laboratory methods used to analyze all water quality constituents in this WQMP are either United States Environmental Protection Agency (USEPA) methods or "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association, 2000). Table 3 also summarizes the laboratory methods that will be utilized for the nutrient analysis completed for this WQMP.

**Table 2: Annual water quality sampling schedule for Condition 5.**

| <b>Variables</b>  | <b>Sites/Depths</b>   | <b>Sample Interval</b>   |
|---|---|--|
| <p><b><u>Nutrients</u></b><sup>1</sup>:</p> <ol style="list-style-type: none"> <li>total nitrogen</li> <li>nitrite + nitrate, Nitrogen</li> <li>ammonia nitrogen</li> <li>total phosphorus</li> <li>dissolved phosphorus</li> <li>ortho phosphorus</li> </ol>     | <p><b><u>Sites</u></b><sup>2</sup>:</p> <p>C5, C6, SJ1, RL1 and BL1</p> <p><b><u>Sample Depths</u></b><sup>3</sup>:</p> <ol style="list-style-type: none"> <li>euphotic zone composite</li> <li>1 meter above lake bottom</li> <li>Maximum chlorophyll Fluorescence (C5 only).</li> </ol> | <p>Once per month<sup>4</sup><br/>(Jun-Nov)</p>  |
| <p><b><u>Pigment:</u></b></p> <ol style="list-style-type: none"> <li>chlorophyll <i>a</i><sup>5</sup></li> </ol>  | <p><b><u>Sites</u></b><sup>5</sup>:</p> <p>C5, C6, SJ1, RL1 and BL1</p> <p><b><u>Sample Depths</u></b><sup>5</sup>:</p> <ol style="list-style-type: none"> <li>euphotic zone composite</li> <li>Maximum chlorophyll fluorescence (C5 only)</li> </ol>                                     | <p>Once per month<sup>5</sup><br/>(Jun-Nov)</p>  |
| <p><b><u>Phytoplankton</u></b><sup>6</sup>:</p> <ol style="list-style-type: none"> <li>cell counts per ml</li> <li>biovolume</li> </ol>   | <p><b><u>Sites</u></b><sup>6</sup>:</p> <p>C5, C6, SJ1, RL1 and BL1</p> <p><b><u>Sample Depths</u></b><sup>6</sup>:</p> <p>euphotic zone composite</p>  | <p>Once per month<sup>6</sup><br/>(Jun-Nov)</p>  |
| <p><b><u>Quality Control/Quality Assurance</u></b><sup>7</sup>:</p> <ol style="list-style-type: none"> <li>all nutrient constituents</li> <li>all phytoplankton constituents</li> </ol>   | <p><b><u>Equipment Blanks and Replicates</u></b><sup>7</sup>:</p> <ol style="list-style-type: none"> <li>Equipment blanks</li> <li>Sample replicates</li> <li>Field replicates</li> </ol>   | <p>Equipment blanks<br/>(pre-season and<br/>2 sample dates)</p> <p>Sample replicates<br/>(4 sample dates)</p> <p>Field replicates<br/>(3 sample dates)</p> |
| <p><b><u>Water Column Profiles</u></b><sup>8</sup>:</p> <ol style="list-style-type: none"> <li>temperature</li> <li>specific conductance</li> <li>pH</li> <li>Dissolved oxygen</li> <li>chlorophyll <i>a</i> fluorescence ( )</li> <li>solar radiation</li> </ol> | <p><b><u>Sites</u></b><sup>8</sup>:</p> <p>C5, C6, SJ1, RL1 and BL1</p> <p><b><u>Sample Depths</u></b><sup>9</sup>:</p> <p>Water column at 0.5 or<br/>1.0 meter increment</p>   | <p>Twice per month<sup>8</sup><br/>(Jun-Nov)</p>   |
| <p><b><u>Continuous Monitoring of Water Column</u></b><sup>10</sup>:</p> <ol style="list-style-type: none"> <li>temperature</li> <li>specific conductance</li> <li>pH</li> <li>dissolved oxygen</li> </ol>  | <p><b><u>Sites</u></b><sup>11</sup>:</p> <p>C5, C6, RL1 and BL1 (rotated between<br/>the sites, with each rotation being for a<br/>year-long timeframe).</p> <p><b><u>Sample Depths</u></b><sup>10</sup>:</p> <p>Water column at 0.25 or<br/>0.5 meter increment.</p>                     | <p>Once per hour<sup>10</sup>,<br/>(Jun-Nov)</p>   |

Notes:

- (1) = Nutrient parameters as defined in Part A(6)(a-g) of Condition 5.
- (2) = Site locations as defined in Part A(1)(a-e) of Condition 5.

- (3) = Sample depths as defined in Part A(5)(a-c) of Condition 5.
- (4) = Sample interval pursuant to Part A(3) of Condition 5.
- (5) = Chlorophyll *a* sample site, depth, and interval as defined in Parts A(6) and A(6)(g) of Condition 5.
- (6) = Interpretation of phytoplankton subsample requirements as defined in Part A(7) of Condition 5
- (7) = Interpretation of quality assurance/quality control requirements as defined in Part A(6) of Condition 5
- (8) = *In-situ* field measurements, sites, sample depths and sampling interval as defined by Part A(3) of Condition 5.
- (9) = Sample depths requirements as defined in Part A(4) of Condition 5.
- (10) = Interpretation of continuous monitoring requirement as stated in Part A(2) in Condition 5.
- (11) = Part A(2) of Condition 5 lists sites A(1)(b)-(e), which excludes the site C5 as identified in Part A(1)(a). Avista and the Tribe understand the exclusion of site C5 may have been a typo and have therefore included all five sites for the continuous monitoring requirement.

While not a specific requirement of Condition 5, Table 3 provides a summary of the analytical methods and data quality for nutrients and phytoplankton productivity of interest for monitoring water quality in Coeur d’Alene Lake to implement Condition 5.

**Table 3: Analytical methods and data quality for nutrients and phytoplankton productivity.**

| Analyte                                  | Analytical Method  | Method Reporting Limit | Acceptance Criteria  |
|--|--|------------------------|--|
| <i>Nutrients</i> <sup>1</sup>            |  |                        | Precision (RPD) & Accuracy (Completeness)<br><br>+/- 25% (95%) |
| total nitrogen                           | EPA 351.2  | 50 µg/L                |  |
| nitrite + nitrate, nitrogen <sup>2</sup> | EPA 300.0  | 10 µg/L                |  |
| ammonia nitrogen                         | EPA 350.1  | 10 µg/L                |  |
| total phosphorus                         | EPA 365.4  | 5 µg/L                 |  |
| dissolved phosphorus <sup>2</sup>        | EPA 365.4  | 5 µg/L                 |  |
| ortho phosphorus <sup>2</sup>            | EPA 365.1  | 2 µg/L                 |  |
| <i>Biological</i> <sup>3</sup>           |  |                        |  |
| chlorophyll <i>a</i>                     | SM 10200H Spectrometric (pheophytin corrected)                                       | 1.0 µg/L               |  |
| phytoplankton                            | SM 1002 C-F – identification & enumeration with sedimentation and 1500 magnification | N/A                    | N/A  |

Notes:

- (1) = Nutrient parameters as required and defined in Part A(6)(a-g) of Condition 5.
- (2) = Samples will be field filtered through a 0.45 µm pore size capsule filter for dissolved analysis.
- (3) = Biological parameters include chlorophyll *a*, as defined by Part A(6)(g) of Condition 5 and phytoplankton as defined by Part A(7) of Condition 5.

While not a specific requirement of Condition 5, Table 5 provides a summary of the sample bottles, handling and preservatives, and holding times for each water quality variable covered in this WQMP. Data quality in the form of laboratory, equipment and field QA/QC is further described in Section 2.3.

**Table 4: Water sample containers, preservation, and holding times.**

| Analysis  | Container Size    | Container Type          | Preservation  | Holding Times |
|---|-------------------|-------------------------|---|---------------|
| total nitrogen  | 500 mL            | opaque polyethylene     | H <sub>2</sub> SO <sub>4</sub> to pH<2, cool to 4°C | 28 days       |
| nitrite + nitrate, Nitrogen                                     | 500 mL            | opaque polyethylene     | cool to 4°C   | 48 hours      |
| ammonia nitrogen  | 50 mL             | opaque polyethylene     | cool to 4°C (lab filters and preserves sample)      | 28 days       |
| total phosphorus  | 500 mL            | opaque polyethylene     | H <sub>2</sub> SO <sub>4</sub> to pH<2, cool to 4°C | 28 days       |
| dissolved phosphorus  | 500 mL            | opaque polyethylene     | H <sub>2</sub> SO <sub>4</sub> to pH<2, cool to 4°C | 28 days       |
| ortho phosphorus  | 500 mL            | opaque polyethylene     | cool to 4°  | 48 hours      |
| chlorophyll <i>a</i>  | 50 mm             | petri dish foil covered | 3 drops MgCO <sub>3</sub> dry ice                   | 6 months      |
| phytoplankton ID & enumeration                                  | 250 ml            | brown polyethylene      | 3 ml Lugol's solution                               | 6 months      |
| filters for dissolved nutrients                                 | 0.45 µm pore size | capsule filters         |   |               |
| filters for chlorophyll <i>a</i>                                | 0.3 µm pore size  | glass fiber filter      |   |               |
| H <sub>2</sub> SO <sub>4</sub> vials certified contaminant free | 1 mL              | glass ampules           |   |               |
| bulk certified contaminant free HCl for 5% cleaning solutions   | 2.5 L             | glass                   |   |               |
| certified contaminant free water for equipment & field blanks   | 20 L cubitainers  | clear polyethylene      |   |               |
| deionized water for cleaning rinses                             | 4 L carboys       | opaque polyethylene     |   |               |

**2.2.3 Profiles and Continuous Monitoring**

Additional physical and chemical variables will be measured by the Tribe *in-situ* at each site, twice per month with a Hydrolab® DS5X multi-probe from lake surface to lake bottom to create depth-profiles for variables listed in Table 5, and required by Part A(3) of Condition 5.

Continuous monitoring of the parameters identified in Part A(2) of Condition 5 using a YSI 6600V2-4 M buoy/multi-probe system will occur at **four of the five sites (C5, C6, BL1, and RL1)**, June through November. **The continuous monitoring probe will be located at one of the four stations for a full season, over a five-year rotation** (one station will be monitored twice during this rotation). **Site SJ1 is not included in this rotation as the Tribe has determined deploying the continuous buoy monitoring system at this site would present a navigational hazard.** Data collected at the five-year increments is more than adequate to assess whether the water quality monitoring program is effectively providing a better and thorough understanding of nutrient based water quality trends within the lower portion of Coeur d’Alene Lake. While not specifically required by Condition 5, the accuracy and precision for each variable measured by the YSI 6600V2-4 M buoy/multi-probe system are listed in Table 5.

**Table 5: Physical and chemical variables measured in-situ with a Hydrolab DS5X multi-probe for discrete depth profiles at the five sites, and a YSI 6600V2-4 multi-probe for continuous monitoring at one site per person.**

| Variable                           | Units                 | Resolution | Accuracy    |
|------------------------------------|-----------------------|------------|-------------|
| <b><u>Hydrolab DS5X</u></b>        |                       |            |             |
| temperature                        | °C                    | 0.01       | ±0.10       |
| specific conductance               | mS/cm                 | 0.0001     | ±1.0%+0.001 |
| pH                                 | unit                  | 0.01       | ±0.2        |
| dissolved oxygen                   | mg/L                  | 0.01       | ±0.01       |
| dissolved oxygen                   | % Sat                 | 0.1        | ±0.1        |
| chlorophyll- <i>a</i> fluorescence | µg/L                  | 0.01       | ±3.0%       |
| solar radiation                    | µmol/s/m <sup>2</sup> | 1.0        | ±5.0%       |
| <b><u>YSI 6600V2-4 M</u></b>       |                       |            |             |
| temperature                        | °C                    | 0.01       | ±0.15       |
| specific conductance               | mS/cm                 | 0.0001     | ±0.5%+0.001 |
| pH                                 | unit                  | .01        | ±0.2        |
| dissolved oxygen                   | mg/L                  | 0.01       | ±0.01       |
| dissolved oxygen                   | % Sat                 | 0.1        | ±0.1        |

**2.2.4 Documentation and Records**

To improve quality control and project performance, the Tribe will strive to have all field notes entered once into an electronic format. Electronic field sheets for notes and data collection will be used by the Tribe. These field sheets will be customized spreadsheets with a consistent file name format. To safeguard against data loss, all electronic field sheets will be duplicated and

backed to a flash drive in the field, prior to moving to the next sample site. In addition, at the end of each sampling day, the electronic field sheet will be copied from the field laptop to the project manager's desktop computer and then backed-up on the Tribes LAN server(s). A hard copy of all field sheets will be available during sampling in case of laptop computer malfunction. All laboratory documentation and records are the responsibility of the laboratory and covered in the laboratory Standard Operating Procedures (SOPs). Laboratory SOPs for record keeping are intensive due to the certification requirements of the USEPA. These procedures meet the requirements of Part A(8) of Condition 5.

### **2.3 Data Quality Control**

Data quality control for this project will entail consistent sampling methods, proper maintenance and calibration of laboratory and field equipment, error-free sample transfer to the laboratories, proper laboratory quality control and responsiveness when QA/QC metrics detect a data quality issue. The following sections 2.3.1 through 2.3.4 describe the data quality control mechanisms for this project.

#### ***2.3.1 Sample Handling and Chain of Custody***

The Tribe will maintain proper sample handling and custody procedures in order to ensure the custody and integrity of samples beginning at the time of sampling and continuing through transport, sample receipt, preparation, and analysis. A sample is in custody if it is in actual physical possession or in a secured area that is restricted to authorized personnel. Prior to sampling, the Tribe will complete chain of custody (COC) forms as the sample labels are prepared. The COC form is used to document sample handling during transfer from the field to the laboratory. The record of the physical sample (location and time of sampling) will be joined with the analytical results through accurate accounting of the sample custody. Sample custody applies to both field and laboratory operations. Analytical laboratory sample custody procedures are included in the laboratory QA plans or SOPs, which identify the roles of both the sample custodian and the laboratory coordinator. The Tribe will include the items listed below on the COC form:

1. Date and time of collection
2. Site identification
3. Sample matrix
4. Number of containers
5. Preservative used
6. Analysis required
7. Name of collector
8. Custody transfer signatures and dates and time of transfer
9. Name of laboratory admitting the sample

#### ***2.3.2 Analytical Methods***

Analytical methods for sample analysis are presented in Table 3 along with method reporting limits, and quality control criteria (precision, accuracy, and completeness). Laboratory QA will be implemented and maintained according to the laboratory's QA plans and SOPs. Any limitation in data quality due to analytical problems (e.g. elevated reporting limits) will be identified within 48 hours and brought to the attention of the Tribe project manager.

### **2.3.3 In-Situ Water Column Measurements**

The two multi-probe instruments described in section 2.2.2 require calibration of sensors prior to sampling. The Tribe will maintain a calibration log for both instruments to track their routine sampling calibration and annual factory calibration. The Tribe will use a Hydrolab® DS5X multi-probe twice per month at each of the five sites to collect the profile data as required in Condition 5.A.3. Some sensors require calibration every time the instrument is used and others require a factory calibration once per year. Table 5 lists the calibration method and time interval for each sensor on the Hydrolab® DS5X multi-probe. The YSI 6600V2-4 M multi-probe is part of a buoy/probe system that the Tribe will deploy from June through November at one of the five sites each year. The Tribe will maintain and calibrate the YSI 6600V2-4 M multi-probe every two weeks following the same schedule as the water column profile sampling. The Tribe will download data from both multi-probe instruments onto a laptop in the field, and will copy each file onto a flash drive before leaving the site.

### **2.3.4 Field and Laboratory Quality Control**

This section describes the QC samples, data quality indicators and associated acceptance criteria. Field QC and laboratory QC samples will be employed to evaluate data quality. QC samples are controlled samples, collected by the Tribe and submitted to an analytical laboratory. The controlled samples are introduced into the analysis stream whose results are used by the laboratory to review data quality and to calculate the accuracy and precision of the chemical analysis program. The field and laboratory quality control indicators are the metrics used to evaluate if QA/QC standards are being met. The field and laboratory quality control indicators are: 1) accuracy, 2) precision, and 3) completeness. These indicators and their empirical formulas are described in Appendix C.

#### **2.3.4.1 Field Quality Control**

The Tribe will take three types of field quality control samples during the annual sampling period: 1) equipment blanks, 2) sample replicates, and 3) field replicates. The three types of field quality control samples are described below:

##### **Equipment Blanks**

At the beginning of each sampling season of the monitoring program, before equipment and supplies are sent to the field, and on two occasions during the sample season, the Tribe will prepare an equipment blank for the Van Dorn sampler, and churn splitter and submit them to the laboratory for analysis. Equipment blanks are used to detect potential field equipment contamination. Lab-certified constituent-free water is put through all steps of sampling and sample processing, and analyzed for the constituents of concern or interest. A field blank is a sample of reagent water (certified contaminant free) placed in the Van Dorn sampler, and then transferred to the churn splitter. Non-filtered blank samples are placed in the proper laboratory sample bottles. A filtered blank sample is processed through the filter capsules, and then placed in the proper laboratory sample bottles. Equipment blank samples are preserved, sealed, handled, stored, and analyzed in the same manner as regular samples. The analysis of the equipment blank should yield values less than the method reporting limit (MRL) for each analyte (Table 3). Values above the MRL may indicate sources of contamination within either the field monitoring environment and/or the laboratory environment.

### Sample replicates

The Tribe will take sample replicates on four sample runs during the annual sample season. Replicate sets of subsamples are withdrawn from the same volume of water in the churn splitter. They are processed and analyzed separately to assess field sampling precision.

### Field replicates

A field replicate is defined as a second sample from the same location and lake water column zone, collected in immediate succession, using identical techniques. A field replicate provides estimates of the total sampling and analytical precision, and potential heterogeneity in the sampled medium. Replicate samples are preserved, sealed, handled, stored and analyzed in the same manner as the primary sample. The Tribe will collect field replicates on three sample runs during the annual sample season.

#### *2.3.4.2 Laboratory Quality Control*

Laboratory QC checks are accomplished by analyzing calibration standards, laboratory duplicate samples from field samples, method blanks, and matrix spikes from field samples, laboratory control samples, and standard reference materials. The analytical laboratory will complete the laboratory QC for each sampling event, which will be reported in the laboratory analytical report for each sampling event. Laboratory QC sample results are reported with the sample data reports as described below:

### Initial Calibration Standards

Laboratory instrument calibration requirements are summarized in the laboratory SOPs.

### Laboratory Duplicate

The laboratory will use the field-collected water samples to prepare laboratory duplicates. Laboratory duplicates are prepared by drawing separate subsamples from the water sample and analyzing the subsamples separately. Precision of the analytical system is evaluated by using laboratory duplicates. A frequency of one laboratory duplicate in each group of 10 samples (10%) is required.

### Method blank

Method (preparation) blanks are used to check for laboratory contamination and instrument bias. A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in the sample processing, and analyzed with each batch. The method blank is carried through the complete sample preparation and analytical procedure. QC criteria require that no contaminants be detected in the blank(s) above the MRL. If a chemical is detected, the action taken will follow the laboratory SOPs.

### Matrix Spike

Matrix spikes (MS) are used to assess sample matrix interferences and analytical errors, as well as to measure the accuracy and precision of the analysis. For MS samples, known concentrations of analytes are added to field-collected water samples prior to digestion or preparation; the samples are then processed through the entire analytical procedure and the recovery of analytes is calculated. The spiked concentration must be greater than 25% of the non-spiked

concentration in the sample. Results are expressed as percent recovery of the known spiked amount for MS. A frequency of one MS in each group of 10 samples (10%) is required.

#### Laboratory Control Samples

A Laboratory Control Samples (LCS) is a clean matrix spiked with known quantities of analytes. The LCS is processed with field samples through every step of preparation of analyses. Measuring percent recovery of each analyte in the LCS provides a measure of accuracy for the analyte in the project samples.

#### Standard Reference Materials

Standard Reference Materials (SRMs) are used to monitor the laboratory's day-to-day performance of routine analytical methods, independent of matrix effects. The SRMs are extracted and analyzed with each batch of samples. Results are compared on a per-batch basis to established control limits and are used to evaluate laboratory performance for precision and accuracy. Laboratory control samples may also be used to identify any background interference or contamination of the analytical system that may lead to the reporting of elevated concentration levels or false-positive measurements.

### **2.4 Data Management**

Data from this project will come in several forms that will be organized by the Tribe into an efficient data management structure. The different forms of data include laboratory analysis results (nutrients, chlorophyll *a* and phytoplankton identification and enumeration), laboratory QA/QC results, and *in-situ* measurements for water column profiles and the continuous measurements from the buoy/multi-probe system. The Tribe will link all data generated to the site code (i.e. C5, C6, BL1, SJ1, and RL1) where the data was collected. The Tribe will use both spreadsheet and relational data base structures to initially manage the data and will refine the data base(s) following the five-year review of the project. As stated in the 2009 AIR, and as required by Part A(9), the Tribe will transmit all data collected in the field to Avista within 30 working days after collection or laboratory analysis.

### **Section 3: Success Criteria**

To determine the success of the WQMP, Avista and the Tribe will assess whether the water quality monitoring program is effectively providing a better and thorough understanding of nutrient based water quality trends within the lower portion of Coeur d'Alene Lake. This will be evaluated through an analysis of the data collected as compared to Tribal Water Quality Standards. Avista and the Tribe will also assess whether data being collected adequately contributes to the purpose of examining and documenting the influence of the Project on water quality within the Reservation. The analysis of the success of the water quality monitoring program will be completed every five years in parallel with the critical review of the WQMP, with the results of the success analysis incorporated into the subsequent AIR.

### **Section 4: Reporting**

In coordination with Avista, the Tribe's Water Resource Program will develop an **Annual Summary Report** of the water quality monitoring following completion of each monitoring field season (June through November). **The Annual Summary Report will be submitted to Avista by**

March of the following monitoring field season, and the results of the season's sampling activities summarized in the subsequent AIR. If substantive modifications to any measure approved by the Secretary in the prior year's AIR are necessary in response to the results of the prior year's monitoring efforts, Avista and the Tribe will seek additional approval by the Secretary at least 60 days before implementing the next field season.

## **Section 5: WQMP Review**

In accordance with Part B of Condition 5, a critical review of this WQMP will be conducted after the WQMP has been implemented for a period of five years and then again after 10 years to assess whether the data being collected is adequately contributing to the purpose of examining and documenting the influence of the Project on water quality within the Reservation.

The critical review will be conducted by a contractor mutually agreed upon by Avista and the Tribe. Avista will include the results of the critical review in the subsequent AIR and will include an assessment as to whether the WQMP should be updated based upon the following: results of the critical review; new data; new data collection technologies; new remediation technologies; or any other reason. The critical review will also evaluate the success criteria.

The Secretary reserves the right to require changes in this Plan at any time during the license term.

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# **Appendix A**

## **Methods and Procedures for the Collection of Water Quality Data, Coeur d'Alene Tribal Waters (Lake)**

Though not specifically called out as a requirement of Condition 5, Avista and the Tribe have included the following methods and procedures which the Tribe will adhere to in the implementation of the WQMP.

At each site field staff will conduct lake water sampling in the following progression; arrive at site, deploy anchor, collect hydrolab profile and collect incident light (PAR) readings, rinse churn splitter, calculate euphotic zone sample depths and collect water column samples. Staff will decant subsamples from the churn splitter, filter appropriate samples, add needed preservatives and place samples on ice. Similar procedures will be followed for chlorophyll maximum and 1 meter from bottom samples.

### **1. Site Arrival and Setup**

- 1.1. Anchor on station (using GPS waypoint). Note depth reading on boat depth sounder.
- 1.2. Record field observations in bound field notebook including: time; date; general description of weather and sunshine; cloud cover; wind strength and direction; lake surface conditions such as calmness and height of waves; water clarity and color; as well as any other pertinent information. Record name of person making notes and name(s) of field crew.

### **2. Measure Photosynthetically Active Radiation (PAR)**

- 2.1. Determine incident PAR at surface (with Li-Cor flat sensor, Model 190). Calculate 1% value which will define the lower limit of the euphotic zone. Record both values in field notebook.

### **3. Water Column Profile - Physical / Chemical Conditions**

- 3.1. Collect water column profile of physical/chemical parameters using submersible instrumentation package (Hydrolab). Parameters will include: temperature; specific conductance; photosynthetically active radiation (PAR); pH; dissolved oxygen (DO) concentration; DO saturation; and in-situ algal fluorescence. Readings will be recorded electronically by software installed on a laptop. Data will be immediately backed-up in the field using a flash drive. If a laptop is not available, measures will be recorded manually in the trip field notebook.
- 3.2. Start profile measurements at approximately 0.5 meters depth (lake surface just covering top of Hydrolab instrument sonde), then lower instrumentation to 1 meter (m) depth, then at 0.5-1m depth increments down through the thermocline. The thermocline is defined as the zone where water temperature changes 1 degree Celsius (or more) per meter change in depth. Particular attention should be given to defining the depth of this zone, if possible, in 0.5 to 1.0 m increments. At sites <10 meters, take all measurements at 0.5m depth increments.
  - 3.2.1. A zone of maximal phytoplankton density (as indicated by maximal in situ chlorophyll fluorescence and subsequent laboratory chlorophyll analyses) is likely to be encountered in the region of the thermocline. Note and record in the field notebook the depth of maximal in situ chlorophyll fluorescence.

#### 4. Water Sample Collection and Processing

Please note the following sections (4.1 – 4.6) depict the detailed procedures for collection of water from the lake water column, decanting subsamples from the churn splitter, and procedures for filtering those subsamples. Section 4.1, 4.2 and 4.3 describe equipment rinsing and proper procedures (QA/QC) to sample lake water. Sections 4.4 – 4.6 describe in detail the procedures required to properly decant un-filtered and filtered subsamples from the churn splitter. Sections 4.7 and 4.8 describe the subsequent collection of additional samples of the depth of Chlorophyll maximum and 1 meter from lake bottom samples. Section 4.9 describes procedures necessary to decontaminate sampling equipment when moving between lake sampling sites.

- 4.1. *Equipment*, Discrete water samples will be collected at specific depths with a non-metallic Van Dorn or Niskin sampler suspended from a depth-calibrated line and closed at a specific depth by a messenger slid down the line. Samples will be composited in a churn splitter.
- 4.2. *Field Rinsing the Churning Splitter*: Prior to collecting the 5 sample composite from the euphotic zone, collect a sampler full of water from below the water surface (~ 1m deep) and empty into churn splitter. Shake vigorously, rinsing the interior surfaces (including the lid) thoroughly and releasing some of contents through the spigot. Empty completely. Repeat twice more. For samples at the discrete depths (e.g. chlorophyll *a* maxima and 1 m off bottom), collect a sampler full of water from that depth and place about a one-third volume into the churn splitter. Shake vigorously, rinsing the interior surfaces (including the lid) thoroughly and releasing some of contents through the spigot. Empty completely. Repeat twice more with the remaining water in the sampler bottle.
- 4.3. *Euphotic Zone Composite Sample Collection*: Note the depth at which 1% of the surface incident photosynthetically active radiation (PAR) occurs; this is the lower depth limit of the euphotic zone (EZ). Collect 5 equally spaced discrete samples with the sampler, from 1 m depth to the 1% depth, using the sampling chart prepared for equal depth samples at 0.25 m resolution. NOTE: the sampler suspension line should be non-stretching, with the “zero” point set at the mid-point of the sampler body when hanging vertically, and calibrated (marked) accordingly in 0.5 m increments.
  - Composite the samples, by carefully emptying sampler contents into the churn splitter, preferably while wearing gloves, through the sampler spigots or by carefully opening the lower end seal and letting the contents drain directly into the churn without spilling, or contacting gloved hands or other potentially contaminating surfaces, or allowing drips from the line which has been in contact with deck bilge to enter the churn splitter.
- 4.4. *Subsample Bottle Rinse and Collection Procedures*:  
 Subsample Bottle Rinsing and Handling Procedure: This procedure is applicable for every bottle filled with either filtered or unfiltered water for subsequent shipment to lab for analyses, with the exception of the phytoplankton sample.

With the field sampling personnel wearing powder-free vinyl or nitrile gloves (changed out with each sample set processed), rinse subsample bottles three times with either filtered or unfiltered water by pouring a small amount of sample water (20 milliliters) into the bottle. Shake a few times to completely wet and rinse the entire inside surface of bottle with the cap held loosely in place. Repeat the rinse two more times for a total of three rinses. Fill bottles with either filtered or unfiltered water following the appropriate procedure outlined in sections 4.5 and 4.6.

- 4.5. *Unfiltered Sub-Sample Procedures:* For water chemistry constituents requiring unfiltered samples (or for samples that will be collected by a subsequent filtration process such as chlorophyll), subsamples for laboratory analysis will be withdrawn directly into appropriate sample containers from the well-mixed contents of the churn splitter; subsamples requiring subsequent or no filtration will be withdrawn from the churn splitter first.
- *Collect Unfiltered Phytoplankton Subsample :* From the Euphotic Zone Composite in the churn splitter, withdraw (while churning) a subsample into a 250 mL brown plastic bottle. Add 3 mL Lugols iodine solution. Cap and invert several times to mix. Label appropriately.
  - *Collect Unfiltered Nutrient Subsamples:* Two bottles will be rinsed and filled directly from the churn splitter with unfiltered water. The first bottle is for total phosphorus and total Kjeldahl nitrogen, and is preserved with H<sub>2</sub>SO<sub>4</sub>. The second bottle is for ammonia and is unpreserved and put on ice immediately.
  - *Collect Chlorophyll Subsample*
    - From the Euphotic Zone Composite in the churn splitter, fill (while churning) a 1 L graduated cylinder for subsequent filtration of chlorophyll sample onto a glass-fiber filter. Assemble the vacuum hand pump / filter plate / filter flask filtration apparatus with glass fiber filter (Advantec MFS GF-75 0.3 μm nominal rating 47 mm diameter) in place.
    - Working in the shade and out of direct sunlight, slowly suck the 1 L of water in the graduated cylinder through the glass-fiber filter. Vacuum should be kept to less than 5 inches Hg and the graduated cylinder holding the sample should be occasionally swirl agitated to keep the algal cells in suspension. Rinse down the sides of the graduated cylinder with deionized water after the last of the sample is poured into the filter cup, swirl again and pour into filter cup. When the last of the sample in the filter cup is about 1 cm deep, add 1 eye dropper full of MgCO<sub>3</sub> buffer solution. Gently rinse down sides of filter cup (to entrain all algal cells present on filter).
    - Release vacuum, remove filter from plate with forceps, place in plastic petri dish, fold in half (filtered sides together), label Petri dish with station #, date/time, volume filtered. Wrap petri dish in foil, label outside of foil, and place in small zip-lock bag. IMMEDIATELY PLACE ON DRY ICE IN

SEPARATE SMALL COOLER!! IMMEDIATELY PUT IN FREEZER UPON RETURN FROM SAMPLING! KEEP FROZEN AT ALL TIMES DURING SHIPMENT TO LAB FOR ANALYSIS.

- 4.6. *Filtered Sub-Sample Procedures:* **After all unfiltered samples are decanted from the churn splitter, filtered samples shall be collected from the remaining water within the churn splitter.** Samples will be filtered in the field under positive pressure provided by a battery-powered, adjustable-speed peristaltic pump and using disposable 0.45 micron pore-size capsule filters generally following the procedures developed by USGS and used by researchers in the 2004 – 2006 Coeur d’Alene Lake studies. Wearing a new pair of powder-free vinyl gloves, punch inlet and outlet ends of the capsule filter through bag (leave bag on the filter), attach filter inlet to peristaltic pump outlet hose. (NOTE: flow through filter is directional – make sure flow direction is correct as indicated by arrow on filter). Pump 1 L of deionized (DI) water through filter, holding the filter outlet upright (to fill filter completely leaving no “bubbles” or dry spots throughout filter media). Use a small bucket to collect all rinse water from filter preparation/decontamination and bottle rinsing steps. Continue pumping to clear all DI rinse water from lines. With the filter outlet pointing down, shake out excess water. Clamp filter into stand with filter outlet pointing down.
- Place pump inlet hose into churn splitter, ensuring that hose end will remain submerged through entire pumping procedure. Care should be taken to minimize hose contamination (especially the inlet hose which is placed into the churn splitter) by thorough rinsing of the outside with DI water, minimizing contact with potentially contaminating surfaces, handling only with gloved hands, and storing/transporting while coiled in a zip-lock bag.
  - Switch on pump. After the filter fills and a stable and steady stream of water is emerging from filter outlet (e.g. no bubbles or pulsations other than those from the action of the pump itself), the triple-rinse bottle rinse process and collection of the filtered samples can begin. The pump can be switched off between rinses and filling of different bottles. The goal is to pump as little water through the filter as necessary while adequately rinsing and filling bottles to minimize loading of the filter media with particulate matter, thus maintaining as near constant as possible filtration conditions and filtrate characteristics during the collection of the several filtered subsamples.
  - *Collect Filtered Nutrient Subsamples:* Two bottles will be rinsed and filled with filtered water from the procedure above. Use gloved hands to fill both bottles. The first bottle is for total dissolved phosphorus and is preserved with H<sub>2</sub>SO<sub>4</sub>. Fill bottle within 1-2 cm of top to leave room for the H<sub>2</sub>SO<sub>4</sub> preservative. The second bottle is nitrate, nitrite and orthophosphate and is unpreserved and put on ice immediately.

#### 4.7. *Water Quality Sample Preservation, Record-keeping, and Transport*

Add appropriate preservative acids to appropriate bottles. Assure that all bottles are properly labeled and lab analysis request / chain-of-custody forms are completely and properly filled out. Put bottles in appropriate ziplock bags and into cooler on ice.

*4.8. Collection of Chlorophyll a Maximum:*

The depth of chlorophyll maximum is the depth where the highest fluorescence value is measured by the fluorometer on the Hydrolab. Collect one sample from the depth of chlorophyll maximum to rinse the churn splitter as in step 4.2 above.

- Collect three samples from the depth of chlorophyll maximum described in part 3.2.1 above placing each in the churn splitter.
- Follow the same steps as in sections 4.5 and 4.6 above to collect subsamples for nutrients.

*4.9. Collection of Samples at 1 m above bottom:*

- Collect water samples from desired depth with Van Dorn sampler; collect enough sampler volumes to fill the churn splitter with enough water for bottle rinsing and withdrawal of appropriate subsample volumes.
- Collection of samples 1 m above bottom is determined by the station depth recorded with the Hydrolab and sonar. If any signs of entrained bottom sediment are observed in the sample bottle, discard the sample and clean sampler with 5% HCl solution and deionized water. Repeat the process until a clean sample is obtained.

#### Peristaltic Pump Line Decontamination and Transport

- 1) While still wearing gloves, remove the capsule filter from the peristaltic pump outlet hose and discard.
- 2) Run pump until hoses are empty.
- 3) Pump 1 L of 5% hydrochloric acid (prepared from lab-certified contaminant-free concentrate) through hoses.
- 4) While holding hoses over waste bucket, rinse outside of hoses with deionized water using a spray bottle.
- 5) Carefully coil hoses into zip lock bag (without removing from pump), seal bag as much as possible.

# **Appendix B**

## **Equipment and Supplies List**

## Field Equipment

1. Li-Cor<sup>®</sup> Deck Cell system with LI-250A digital readout and deck-side 190SA Quantum Sensor.
2. Hydrolab<sup>®</sup> DS5X multiprobe (50 m cable) with Turner Designs CYCLOPS-7 fluorometer and Li-Cor<sup>®</sup> Spherical Quantum Sensor
3. 2.2 L Van Dorn sampler
4. 14 L Churn Sampler
5. Peristaltic pump

## Field and Lab Supplies

1. Winch and depth meter for Van Dorn sampler
2. Non-stretching, high quality woven, 3/8" cord for Van Dorn sampler (30 m length)
3. 20 cm black & white Secchi disk with measuring cord
4. Nalgene 1000 ml filter receiver with lid, for filtered metals and nutrients
5. Millipore capsule filters, 0.45  $\mu\text{m}$  pore size, 600  $\text{cm}^2$  filter area,
6. Clear, PVC tubing, 1/4" ID
7. 500ml, clear HDPE sample bottles from Spokane Tribal Laboratory for nutrients
8. Nalgene 1000 ml filter receiver with 500 ml funnel, for chlorophyll *a*
9. 1000 ml graduated cylinder, Teflon, for chlorophyll *a* water
10. Advantec MFS GF-75 0.3 $\mu\text{m}$  nominal rating 47mm diameter for chlorophyll *a*
11. Double capped Petri dishes, 47 mm diameter
12. Aluminum foil
13. Stainless steel forceps
14. 250 ml brown HDPE sample bottles for phytoplankton ID
15. 1 gallon LDPE jugs for 5% HCl rinse, DIW, and IBW
16. 10 L LDPE carboys with spigots for DIW and IBW
17. 1000 ml glass graduated cylinder for preparing 5% HCl acid rinse solution
18. 1.5 ml graduated, disposable polyethylene pipets for  $\text{MgCO}_3$  and Lugols
19. Safety wash bottles for 5% HCl rinse solution
20. Wash bottles for DIW and IBW
21. Vinyl, powder free gloves
22. Safety glasses
23. Rubberized cloth apron
24. Nonmetallic bottle brushes and non-colored sponges
25. Field logbooks, water resistant paper
26. Logbook for in-office equipment calibrations and QA/QC notes and actions
27. Coolers, ice packs, and dry ice for sample storage and shipping

**Reagents**

1. Certified, contaminant-free water (inorganic blank water, IBW)
2. Deionized water (DIW)
3. Non-phosphate cleaning detergent (e.g., Liqui-Nox)
4. Hydrochloric acid (HCl), Trace Metal, to prepare 5% solution for cleaning (acid rinses)
5. Sulfuric acid (H<sub>2</sub>SO<sub>4</sub>), concentrated, in 2 ml ampules for preservation of nutrient samples
6. pH 7 & 10 buffer solution to calibrate Hydrolab pH probe
7. Potassium chloride conductivity standard 74  $\mu$ S/cm to calibrate Hydrolab and YSI conductivity probes
8. Lugols solution for phytoplankton ID samples
9. Saturated MgCO<sub>3</sub> solution for chlorophyll *a* filters
10. Turbidity standards 1.0 NTU and 100 NTU to calibrate Hydrolab

# **Appendix C**

## **Quality Control Indicators**

Though not specifically called out as a requirement of Condition 5, Avista and the Tribe have included the following section which describes the quality control indicators (precision, accuracy and completeness) that will be implemented by the selected analytical laboratory.

**Precision:**

Precision is defined as the degree of agreement between independent, similar, or repeated measures. Precision is expressed in terms of analytical variability. For this project, analytical variability will be measured as the relative percent difference (RPD) or coefficient of variability between sample replicates and laboratory duplicates, and between the matrix spike (MS). The field duplicates incorporate both monitoring and laboratory variability, while the laboratory duplicates isolate analytical variability.

Precision will be calculated as the RPD as follows:

$$\% RPD_i = \frac{2|O_i - D_i|}{(O_i + D_i)} \times 100\%$$

where:

$\%RDP_i$  = relative percent difference for compound  $i$   
 $O_i$  = value of compound  $i$  in original sample  
 $D_i$  = value of compound  $i$  in duplicate sample

The resultant laboratory RPD for laboratory duplicates and sample replicates will be compared to the acceptance criteria in Table 3, and deviations from precision and accuracy will be reported. If the acceptance criteria are not met, the laboratory will supply a justification of why the acceptance criteria were exceeded and implement the appropriate corrective actions. If a laboratory duplicate RPD is within acceptance criteria, but a sample replicate RPD is not, the Tribe's project managers will examine the field procedures for collecting sample replicates. The RPDs will be reviewed during data quality review, and deviations from the acceptance criteria will be noted. The effect of any deviations on the reported data will be commented upon by the data reviewers.

**Accuracy:**

Accuracy is the amount of agreement between a measured value and the true value. It will be measured as the percent recovery of matrix spike and standard reference samples. Additional potential bias will be quantified by the analysis of method blank samples.

Accuracy will be calculated as percent recovery of analytes as follows:

$$\% R_i = (Y_i \div X_i) \times 100\%$$

where:

$\%R_i$  = percent recovery for compound  $i$   
 $Y_i$  = measured analyte concentration in sample  $i$   
 (measured concentration minus original sample concentration)  
 $X_i$  = known analyte concentration in sample  $i$

The resultant percent recoveries will be compared to acceptance criteria, and deviations from specified limits will be reported. If the objective criteria are not met, the laboratory will supply a justification of why the acceptability limits were exceeded and implement the appropriate corrective actions. Percent recoveries will be reviewed during data quality review, and deviations from the specified limits will be noted and the effect on reported data commented upon by the data reviewers.

**Completeness:**

Completeness for usable data is defined as the percentage of usable data obtained from the total amount of data generated. When feasible, the amount of samples collected will be sufficient to reanalyze the sample, should the initial results not meet QC requirements. Less than 100 percent completeness could result if sufficient chemical contamination exists to require sample dilutions, resulting in an increase in the project-related detection/quantitation limits for some parameters. Highly contaminated environments can also be sufficiently heterogeneous to prevent the achievement of specified precision and accuracy criteria. The target goal for completeness shall be 95% for all data. Quality data are data obtained in a sample batch for which all QC criteria were met.

Completeness will be calculated as follows:

$$\%C = \frac{A}{I} \times 100\%$$

where:

$\%C$  = percent completeness (analytical)  
 $A$  = actual number of samples collected/valid analyses obtained  
 $I$  = intended number of samples/analyses requested