KALISPEL INDIAN RESERVATION
QUALITY ASSURANCE PROJECT PLAN (QAPP)
FOR SURFACE WATER MONITORING ACTIVITIES

Revised October 1, 2011

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Note: This Quality Assurance Project Plan has been prepared in substantial conformance with the format outlined in the document titled EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, dated February 1988 (EPA reference document number EPA/600/R-98/018).

A. PROJECT MANAGMENT

This Quality Assurance Project Plan (QAPP) provides project overview, describes collection parameters, and defines QA/QC activities that will be implemented as part of the Kalispel Tribe of Indians' Natural Resource Department's (KNRD) surface water monitoring activities. Data generated under this QAPP will be used for internal planning and evaluation purposes.

Surface water monitoring is currently being conducted by the KNRD as part of the Water Quality Management Program. Kalispel Tribal Ceded Lands are located largely within the Pend Oreille/Clark Fork drainage. Surface water monitoring is used as a primary means of tracking quality and quantity trends, identifying impacted waters requiring restoration, and measuring success or failure of water management programs and plans. The majority of surface water measurements are collected on a monthly basis. The document titled "Kalispel Natural Resources Department Fish and Wildlife Management Plan" provides water quality objectives and description of activities. Incorporation of future target sampling of specific areas or parameters of interest shall be by addition of specific sampling plans included as an appendix to the QAPP.

A.1 Distribution List

This document will be distributed to the following persons or agencies:

Kalispel Tribe of Indians Representative

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A.2 Project/Task Organization

A.2.1 Purpose/Background

The purpose of project organization is to provide involved parties with clear understanding of the role that each party plays in the investigation or study and to provide the lines of authority and reporting for the project.

A.2.2 Roles and Responsibilities

The KNRD is an organizational branch of the Kalispel Tribe of Indians. The KNRD Fish & Wildlife Management Plan outlines the mission, goals, and objectives for sound resource management on and in the ceded lands of the Kalispel Tribe of Indians. The plan focuses on a pragmatic watershed approach to natural resource management. The KNRD has been monitoring surface water at select sites since the early-1990s. This Quality Assurance Project Plan (QAPP) supplements activities associated with the surface water monitoring by providing sample collection, handling, shipping, and data generation protocol that will be utilized during sample implementation and evaluation. Specific functions/positions of the KNRD include:

KNRD Director:	Deane Osterman
Water Resources Program Manager & QA/QC Officer:	Ken Merrill
Water Resources Project Manager:	Dan McMeekan
Water Resources Technician:	Darren Reeves

A.2.3 Organizational Chart

See Appendix A for Kalispel Tribe KNRD organizational chart.

A.3 Problem Definition/Background

A.3.1 Purpose, Problem Statement, and Background

The purpose of the sampling project is to provide a basis for intermittent sample collection and analysis such that data will be representative, comparable and suitable for potential future specific project design or grant submission. Water monitoring activities on the Kalispel Indian Reservation are used for internal planning and evaluation purposes. However, applicable federal, state, and local surface water standard will be used as a conservative threshold to determine the need for additional study. Typically water monitoring activities are used to characterize existing water quality and quantity conditions and is referred to as ambient or baseline monitoring. The scope of water monitoring activities and the parameters measured are periodically modified in response to historic monitoring results and to meet changing needs. The problem statement is as follows:

"How to ensure that sampling data is defensible and can be relied upon for future planning?"

Since the early 1990s, the KNRD has been monitoring surface water parameters. The Kalispel Tribe approaches water quality management from a watershed perspective. Water quality and aquatic habitat are treated as functions of overall watershed conditions. The mission of the KNRD water quality program is to ensure adequate water quality for all existing and future tribal water uses. Current uses include domestic and industrial use, cultural and ceremonial, fish and wildlife habitat, and recreation. Purpose of monitoring is to track water quality and quantity trends, identify impacted waters requiring restoration, provide water quality information for Fish and Wildlife management, and to measure the success or failure of water management programs and plans. The water quality program also investigates the effect of historic regional timber harvesting practices on water quality to help evaluate forest practices rules.

A.4 Project/Task Description and Schedule

A.4.1 Description of the Work Performed

Purpose of sample design is to collect samples of sufficient quality that data can be relied upon for future decisions. Currently the water quality program is sampling approximately 58 sites in the Pend Oreille River drainage basin on monthly basis. Sampled parameters include pH, water temperature, turbidity, conductivity, total dissolved gas, flow rate and dissolved oxygen. Nutrients, metals, and biological parameters may be sampled on a project specific basis. Data is used as an indicator of overall watershed health. Should analytical results suggest a potential concern, additional sampling or study design will be initiated.

Surface water samples are collected monthly from accessible locations and analytical results are compared to applicable current Federal, State, and Tribal water quality standards.

This project requires field personnel with water sampling protocol training. In addition, field personnel need to be familiar with the Kalispel Tribe's processes and have some human relation skills. Standard water sampling field equipment is required.

A.5 Quality Objectives and Criteria for Measurement Data

The overall data quality objectives (DQO) are to develop and implement QA/QC procedures for field sampling, chain-of-custody, laboratory analysis, and reporting. Work conducted in accordance with this QAPP should yield results that are technically sound, properly documented, and that can be confidently used to support decisions regarding water monitoring activities.

Precision, bias, accuracy, representativeness, comparability, and completeness are criteria that are necessary when addressing quality objectives. These criteria are defined as:

Precision: A qualitative term used to denote the scatter of results. Precision is said to improve as the scatter among results becomes smaller. Usually measured as standard deviation or relative percent difference (RPD).

Bias: That part of inaccuracy of analytical results caused by systematic error. Systematic errors are indicated by a tendency of results to consistently be greater or smaller than the true value. Bias can usually be considered to be equivalent to systematic error.

Accuracy: The degree of agreement of an analytical result with the true value. The accuracy of a result is affected by both systematic errors, i.e., bias, and random errors, i.e., imprecision. Some analyses improperly use accuracy to denote only systematic error.

Calculations for precision and accuracy are found in Section C.1 of this QAPP.

Representativeness: Where data collected from a small group represents the entire community from which the small group was taken.

Comparability: The ability to compare different test groups using common factors. Although there is no regulatory requirement, the common factor used for this QAPP is the guidelines and standards of the current Washington State surface water standards.

Completeness: The determination of how complete a study is which is determined by how well the design of the study is fulfilled.

A.6 Special Training Requirements/Certification

Water quality technicians will, at a minimum, will have undergone 4 hours of training specific to water sample collection. In addition, the Water Quality Program Manager will have completed a minimum of two years course work at the collegiate level in hydrology, hydrogeology and/or related fields. Training documentation will be maintained in personnel files.

The analytical laboratory selected will be federally or state certified for the analytical methods requested. Laboratory personnel conducting analysis will be trained in accordance with the Laboratory's internal QA/QC policy.

A.7 Documentation and Records

A copy of all project documentation, analysis, data files, and summary reports will be maintained in the Water Quality Program office during project duration. Grant summary records will be archived for the duration of the project plus 30 years. All grant supporting documentation and backup files will be archived for 5 years beyond the date of generation. Format of the data-reporting package will be consistent with Section A.9.3 of this QAPP.

Water Resources Technicians will document the following field operations, listed below. Field operation documentation will be archived by the Water Quality Program office for the length of time identified above.

1. Sample collection parameters
2. Chain-of-custody
3. Record QC samples
4. Record general field procedures
5. Record any necessary corrective actions

The Laboratory will document the following data associated with analytical procedures. Documentation and supporting QA/QC data will be archived by the Laboratory consistent with their internal quality assurance program. Analytical data reports submitted to KNRD will include a summation of QA/QC data.

1. Sample analytical data
2. Sample management records
3. Test methods used
4. QA/QC reports
5. Discrepancies in chain-of-custody information

B. MEASUREMENT/DATA ACQUISITION

B.1 Sampling Process Design

B.1.1 Purpose/Background

Purpose of sample design is to collect samples of sufficient quality that data can be relied upon for future decisions. Currently the water quality program is sampling approximately 58 sites in the Pend Oreille River and Priest River drainage basins on a monthly basis. Sampled parameters include pH, temperature, turbidity, conductivity, total dissolved gas, and dissolved oxygen. Data is used as an indicator of overall watershed health. Should analytical results suggest a potential concern, additional sampling will be initiated

If additional sampling and analysis is deemed appropriate, then anticipated future sampling parameters may include iron, arsenic, manganese, cadmium, lead, nitrogen species, phosphorous species, and coliform bacteria. Sample locations, process, and parameters are periodically modified to accommodate changing needs and results of historic monitoring.

B.1.2 Scheduled Project Activities, Including Measurement Activities

Selection of surface water monitoring frequency is based on economics of multiple sampling events, logistics of sampling during inclement weather, expected seasonal variability, and

historic monitoring results. Based on historic sampling results and project objectives monthly monitoring was selected as the most appropriate frequency for field measurements using standard methods and portable instruments. This includes determination of ambient streamflows and specific water quality parameters. The frequency of effectiveness and compliance monitoring are determined on a case-by-case basis.

B.1.3 Rationale for the Design

The purpose of the sampling project is to provide a basis for intermittent sample collection and analysis such that data will be representative, comparable, and suitable for potential future project design or grant submission. The data collected during this project is not designed to establish compliance with any specific regulation; however, applicable federal, state, and local surface water standards will be used as a general threshold for determining the need for further evaluation. The water quality environmental study was designed to evaluate physical, chemical, and biological parameters of Kalispel Tribe managed surface waters as an overall indicator of watershed health.

B.1.4 Design Assumptions

The methodology identified in this QAPP is based on the assumption that the medium to be sampled is homogeneous, that samples collected are representative of the sample medium, and the sampling conditions are stable during sample collection. In the event that any of the assumptions are invalid for a specific sampling event, exceptions will be noted on the sample collection form and field notes shall be considered when interpreting sample data. Consistent or reoccurring anomalies shall be incorporated into a specialized sampling plan and attached as an appendix to this document.

B.1.5 Procedures for Locating and Selecting Environmental Samples

Currently KNRD is collecting samples from 58 sites in the Pend Oreille River and Priest River drainage basins. However, KNRD anticipates existing sample locations may be modified in the future. Basis for sample location selection will include historic monitoring results, data collection need, expected seasonal variability, and weather impact on accessibility. Modified sample locations will be identified in project specific sampling plans, which will be attached as an appendix to this document. Sampling plans will include criteria for finding sample locations and an assessment of location bias. Deviations such as inaccessible sample locations will be noted in the field-sampling log and assessed during data evaluation.

B.1.6 Classification of Measurements as Critical or Noncritical

All sample analysis will be used for informational purposes therefore, classification of measurements is noncritical.

B.1.7 Validation of any Nonstandard Sampling Methods

Standard sampling methods will be utilized during this project. Therefore, validation of nonstandard sampling methods should not be required. Should nonstandard sampling methods be required, the need to validate the method will be determined on a case-by-case basis and will be incorporated into the individual sampling plan.

B.2 Sampling Methods Requirements

B.2.1 Purpose/Background

The water quality environmental study was designed to evaluate baseline physical, chemical, and biological parameters of Kalispel Tribe-managed surface waters. Applicable federal, state, and local surface water standards will be used as a general threshold for determining the need for further evaluation. The purpose of the sampling project is to provide a basis for intermittent sample collection and analysis such that data will be representative, comparable, and suitable for potential future project design or grant submission. Incorporation of future sampling that targets parameters of interest shall be by addition of a sampling plan included as an appendix to the QAPP.

B.2.2 Sample Collection, Preparation, and Decontamination Procedures

Water monitoring parameters were selected based on their ability to characterize baseline physical, chemical, and biological water quality conditions in Kalispel Tribal-managed surface waters. Streamflow monitoring parameters were selected based on their ability to determine seasonal runoff volumes and timing and are consistent with methods developed by U.S. Geological Survey described in "Techniques of Water-Resources Investigations of the United States Geological Survey, Applications of Hydraulics (Book 3)." Water quality and quantity parameters are predominately measured at surface water locations and include periodic stream sampling and project specific lake sampling.

Following is a summary of collection procedures for the various types of water sources that may be sampled, a summary of sample preparation for the different types of analyses, and decontamination procedures.

B.2.2.1 Sampling Procedure for Open Bodies of Water

Grab sampling is the methodology most frequently used for sampling open bodies of water. This procedure is applicable for water sampling from sources such as rivers, streams, lakes, reservoirs, and pipelines or conduits.

Normally, samples collected from open bodies of water are taken without separation of particulate matter. If constituents are present in colloidal or flocculent suspension, samples are taken so that they are present in representative proportion.

Sampling point should be chosen with extreme care so that a representative sample of the water to be tested is obtained. Surface scum should be avoided. Samples collected near the shoreline have a wider variation in composition due to inflowing tributaries or other disturbances. A reasonable estimate of open water composition can be made from samples collected far enough from the shoreline to avoid variation from inflowing tributaries or other discharges.

Because of the wide variety of conditions found in streams, lakes, reservoirs, and other bodies of water, it is not possible to prescribe the exact point of sampling. Stream water is generally mixed so as to approach uniformity; a sample taken at any point in the stream cross-section is generally satisfactory.

For large rivers or for streams not likely to be uniformly mixed, more samples are required to adequately characterize the body of water. A number of points across the entire surface width and at varying depths are required. Ordinarily, samples taken at various points are combined to obtain a sample representative of the entire water body. Alternatively, testing of the individual grab samples can be used to determine the point of highest contaminate concentration. When boats are used for sample collection, care should be taken to avoid sampling where propeller or oar turbulence has disturbed the water characteristics.

Sampling point location should be chosen with respect to the information desired and in conformity to local conditions. The sample collector should allow sufficient distance downstream from a tributary of source of pollution to permit thorough mixing. If this is not possible, it is better to sample the stream above the tributary or source of pollution and, in addition, sample the tributary or source of pollution. In general, a distance of 1 to 3 miles below the tributary is sufficient.

Samples should be collected at least 0.5 mile below dams or waterfalls to allow time for the escape of entrained air. When lakes, reservoirs, or other bodies of water are sampled, it is necessary to avoid non-representative areas such as those created by inlet streams, more stagnant areas, or abrupt changes in shorelines, unless determining the effect of such local conditions is a part of the sampling program.

It is desirable to take a series of samples from any source of water to determine whether differences in composition are likely to exist before final selection of the sampling point.

Specific depth unconfined water samples from ponds, lagoons, reservoirs, etc., should be collected using a sampling apparatus that transfers the depth sample directly through a tube to the sample container. Samples that will be submitted for organic analysis will be collected with teflon-lined tubing. When no determination of dissolved gases is to be made, a less complicated apparatus may be used that will permit the collection of a sample at a desired depth.

A continuous flow of not less than 500 milliliters per minute through the sampling apparatus will be established. If the sample is to be collected for special constituents, the sampling method for the specific test should be used. Recommended minimum purging periods for different sizes of sampling lines will be calculated as follows:

$$t = (D / 3)^2$$

where:
t = time in seconds, and
D = inside diameter, mm.
Approximate purging periods for sample lines equivalent to Schedule 40 are as follows:

Pipe Size, in.	Purging Period Per Foot of Line, seconds
1/8	5
1/4	10
3/8	15
1/2	25
3/4	40
1	60

These purging times provide three to four times the sample line volume.

B.2.2.2 Field Sampling Procedures

KNRD's current surface water monitor program includes collection of water quality and stream flow data in the field. Purpose of field sampling procedures summarized in this section, is to show method and cautions to be used during field data collection. The field sampling procedures are separated into water quality parameters and stream flow collection.

B.2.2.2.1 Water Quality Parameters

Total dissolved gas, dissolved oxygen, pH, temperature, conductivity, and turbidity are measured in the field using a Rugged Reader Handheld unit with an attached In-Situ Troll 9500 Multi-probe. This equipment may be changed in the future for newer but substantially similar equipment. Analysis is conducted by placing the sensor probe directly into the water in a location selected as identified in Section B.2.2.1. The probe is immersed until analytical readouts stabilize and data is recorded.

The method for measuring all six parameters will be the same, as only one piece of equipment is needed. The method process is outlined in the following steps.

1. Determine a cross-sectional profile of the water body.
2. From the water body profile, identify those locations that represent most of the water flowing in a reach.
3. Rinse the sensor with deionized water.
4. Submerge the sensor directly into the water at the locations to be measured.

5. Record the measurements. Measurements are recorded in a handheld Juniper Systems field computer. Files are automatically synchronized with an excel file, where measurements are appended with master water year datasheets.
6. Rinse the sensor with deionized water and store.

When using the sensor, the water resource technician should ensure that the body of water measured is not too deep or swift. The following areas should be avoided when selecting a site for water quality measurements:

1. Areas of turbulent flow.
2. Banks of the water body.

Water quality technicians conducting velocity and flow measurements will be trained in accordance with Section A.6 of the "Kalispel Indian Reservation Quality Assurance Project Plan for Surface Water Monitoring Activities."

B.2.2.2.2 Stream Flow Procedures

Current velocity and stream flow will be measured in substantial conformance with the midsection method developed by United States Geological Survey (U.S.G.S) as a standard procedure to determine velocity discharge.

In summary, the technician takes the current meter to the river and places the wading rod on the bottom of a stream in order to make the measurements. This process is outlined in the following steps.

1. Choose a straight reach with a smooth shoreline.
2. Fasten a tape measure perpendicularly across the stream from bank to bank, just above the water level.
3. Determine the number and length of intervals needed to define the channel's bed contour. A channel is typically divided into 15 to 30 intervals at approximately 0.5 to 1.0 feet.
4. At the midpoint of each interval, place the wading rod vertically into the stream until it reaches the stream bed and orient the probe into the stream flow at the first reading point.
5. With the foot of the wading rod at the stream bed, adjust the depth rod up or down until the tip of the propeller is intersected by the stream surface and read and record the depth (d_1) on the depth rod scale for that interval.
6. Lower the meter to 0.6 times the depth of the stream and measure the velocity (v_1) for that interval.
7. Repeat this process for each interval.
8. If the water is deeper than 2 feet, the average velocity at 0.2 depth and 0.8 depth should be used.
9. The discharge (q_1) for an interval of width (w_1) is given by:

$$q_1 = v_1 d_1 w_1$$

10. The total discharge (Q) for the stream is the sum of the discharge for each interval. For a measurement with "m" intervals.

$$Q = \sum_{i=1}^{m} q_1$$

11. If measuring from a bridge using a cable-suspended meter, follow the same procedure as outlined above; however, a swift current may draw the meter downstream. Therefore, a correction must be made based on the angle of the cable from the vertical.
12. If measurements are to be made through ice, a series of holes are cut in the ice across the stream and the current is measured by the same procedure outlined above. To compensate for friction between the ice and the underlying stream, the velocity should be measured at 0.2 depth, 0.6 depth, and 0.8 depth and average the results.
13. Velocity measurements are recorded to the nearest 0.01 feet per second (ft/s) and flow calculations are reported to the nearest 0.1 ft/s.

When using the current meter with a wading rod, the technician should ensure that the stream is not too deep or swift to wade. The following areas should be avoided when selecting a site for velocity measurements and flow:

1. Areas where tributaries influence flow regimes in the stream being monitored.
2. Areas downstream of rapid changes in stream gradient and velocity.
3. Areas with brush hanging in the water, or areas with weeds and/or rocks. These areas will interfere with stream flow.
4. Areas with back-eddies; they will over-estimate the total discharge. The current meter will not distinguish the direction of flow.

Water quality technicians conducting velocity and flow measurements will be trained in accordance with Section A.6 of the "Kalispel Indian Reservation Quality Assurance Project Plan for Surface Water Monitoring Activities." See Appendix B for addition stream flow measurement information.

B.2.2.3 Sample Preparation for Various Analytical Methods

Use the following general procedures during sample collection and preparations. Wear new protective gloves during water sampling activities. Chemically preserve samples as required by the analytical method being requested. Check the sample lid to ensure cleanliness and that it is secured. Carefully label the sample bottle with the appropriate information. Use only waterproof ink to complete sample container labels. After label information as been completed, secure labels to the sample container by wrapping clear tape over the label and around the container. Transfer samples to a cooler. Preserve samples at 4° C, if required by analytical method being requested. Record pertinent information on chain-of-custody forms. Record all pertinent field information in the field logbook, such as:

1. Sample location designation
2. Sampling location condition and pertinent observations of surrounding area
3. Weather conditions
4. Manufacturer, model number, and calibration results of meters/instruments used to measure field parameters
5. Time required to reach measured parameter equilibrium
6. Field parameter measurements made for each required volume measurements
7. Time of sample collection
8. Initials of sampler(s)
9. Laboratory analysis to be performed
10. Preservatives used
11. Any miscellaneous comments or observations

When collecting samples for multiple analysis, collect water samples in the order of the analytical parameters' degassing sensitivity. Table B.2.2.3 summarizes the preferred order of sample collection based on analytical methodology or combination of analytical methodologies likely to be requested from a single container sample. All of the following analysis or combination of analysis will not be measured at every sample location. Each sample location will have a designated suite of analysis to be collected. Collect the number of designated analysis or suite of analysis for the specific sample location in the order presented. A discussion on sample packaging and preservation follows the table.

Table B.2.2.3 Sample Collection Order Based on Analytical Methodology.

Microbiological	
Parameter of Interest	Analytical Methodology
Total Coliform	SM 9222D
E. coli	SM 9222G1c1
General Chemistry	
Parameter of Interest	Analytical Methodology
Total Alkalinity	SM 2320B(4a)
Chloride	EPA 300.0
Fluoride	EPA 300.0
Sulfate	EPA 300.0
Total Hardness	SM 2340B
Calcium	EPA 200.7/SM 6010B
Magnesium	EPA 200.7/SM 6010B
Metals	
Parameter of Interest	Analytical Methodology
Mercury	EPA 245.1/SM 6010B
Arsenic	EPA 200.7/SM 6010B
Cadmium	EPA 200.7/SM 6010B
Chromium	EPA 200.7/SM 6010B
Copper	EPA 200.7/SM 6010B
Iron	EPA 200.7/SM 6010B

Lead	EPA 200.7/SM 6010B
Magnesium	EPA 200.7/SM 6010B
Nutrients	
Parameter of Interest	Analytical Methodology
Ammonia	EPA 350.1
Nitrate/Nitrite	EPA 300.0
Total Phosphorus	EPA 365.4
Ortho-phosphate	EPA 365.1
Total Kjeldahl Nitrogen	EPA 351.2
Physical	
Parameter of Interest	Analytical Methodology
Turbidity	EPA 180.1
pH	EPA 150.2
Dissolved Oxygen	EPA 360.1
Specific Conductance	EPA 120.1
Total Dissolved Gas	NIST Certification
Temperature	NIST/DKD Certification

B.2.2.3.1 Nitrate/Nitrite, Metals, Ammonia, Total Phosphorus, Orthophosphate, Total Kjeldahl Nitrogen and Hardness

Use the following procedure for nitrate/nitrites and metals. Consult the project specific sampling plan attached to this QAPP in Appendix B to determine if filtered or non-filtered samples are required.

1. If dissolved metals are to be analyzed, filter sample with a capsule filter.
2. Fill one labeled pre-preserved 500 ml plastic bottle, avoiding aeration, for metals analysis.
3. If required to reduce pH below 2, add additional nitric acid. Use gloves and splash-proof goggles when handling acid.
4. Cap with plastic screw cap liner.
5. Collect a second unfiltered sample in a labeled un-preserved 500 ml plastic bottle, avoiding aeration, for nitrate/nitrite analysis.
6. Cap the second plastic bottle with plastic screw cap liner.
7. Fill additional bottles as described above for field and equipment blanks, duplicates, or split samples, as necessary.
8. Store bottles in an ice-filled cooler with a minimum/maximum thermometer at 4° C.
9. Analyze within holding times identified in Section B.2.3.

B.2.2.3.2 Fecal Coliform and *E. coli*

Use the following procedure to collect samples for Fecal Coliform and *E. coli* analysis.

1. When taking a sample from a sample line or tap, allow the water to run for at least 5 minutes or long enough to flush six to ten times the volume of any part of the system that has been stagnant for 2 hours or more.
2. Choose a sterile plastic sample bottle containing sodium thiosulfate ($Na_2S_2O_3$) if the water being sampled contains residual chlorine. Preservative is not required if water being sampled is unchlorinated.
3. Remove the stopper from the sample bottle. Grasp the stopper by the dust cover so as not to contaminate it by touching it; do not lay it down.
4. Hold the bottle by the bottom to avoid touching the neck.
5. Do not rinse the bottle with the sample.
6. Quickly hold the bottle under the flowing water to be sampled until it is about three-fourths full to permit mixing by shaking prior to testing.
7. Replace the stopper and promptly crimp the dust cover in place over the neck of the bottle. Take care that the stopper and bottle neck are not touched during this operation and that no dust blows into the bottle.
8. Secure bottles for immediate transport to the analytical facility.
9. Analyze within holding times identified in Section B.2.3.

B.2.2.4 Decontamination

Disposable latex or similar gloves will be used while collecting samples. New disposable gloves will be used for each sample location. Field equipment that directly contacts water samples or sample containers will be decontaminated prior to use and between each sampling event. The following procedures will be utilized to prevent cross contamination of samples collected during this project.

Gross contamination will be removed by dry brushing or shaking excess moisture from equipment. Field equipment will then be washed in a solution of Alconox, Liquinox, or comparable non-hazardous laboratory detergent product, and deionized water. Washed equipment will be double rinsed with deionized water. Field equipment will then be placed on clean toweling or similar material and allowed to air dry.

All sample containers will be precleaned as required by SW-846, Standard Methods for the Examination of Water and Wastewater, and laboratory QA/QC protocol by the container manufacturer or selected analytical laboratory prior to shipping for sample collection. Sample containers will not be used for sample collection and storage without being certified clean by the manufacturer or analytical laboratory.

After the sample is collected and the container lids are tightly sealed the exterior portion of the sample container will be cleaned. Care will be taken to ensure that sample labels remain legible during the exterior container cleaning.

B.2.3 Sample Containers, Preservation, and Holding Time Requirements

Following is a summary of required sample containers, preservation methods, and holding time for anticipated analytical parameters. Incorporation of specific sampling requirements for a specific project or parameters of interest shall be by addition of a sampling plan included as Appendix B to the QAPP. Analytical precision and accuracy are defined by the analytical test methodology and selected Laboratory's QA/QC program. All analytical method accuracy, precision, and detection limits will be within laboratory certification requirements and below the contaminate concentration of concern as defined by the sampling plan. Refer to the specific sampling plan for details of specific contaminant of concern concentration levels. Contact the analytical laboratory manager for additional information and questions.

Table B.2.3 Analytical Sample Containers, Preservation, and Holding Times.

Nutrients				
Analysis	**Method**	**Sample Container**	**Preservation**	**Holding Time**
Ammonia	EPA 350.1	1 Liter plastic	Sulfuric Acid to ph < 2,	28 days
Nitrate/Nitrite	EPA 300.0	1 Liter plastic	cool to < 4°C. All	28 days
Total Phosphorus	EPA 365.4	1 Liter plastic		28 days
Ortho-phosphate	EPA 365.1	1 Liter plastic		28 days
Total Kjeldahl Nitrogen	EPA 351.2	1 Liter plastic		28 days
Metals				
Analysis	**Method**	**Sample Container**	**Preservation**	**Holding Time**
Mercury	EPA 245.1	1 Liter plastic	Nitric Acid to pH < 2,	14 days for Hg
Arsenic	EPA 200.7	1 Liter plastic	all	6 months
Cadmium	EPA 200.7	1 Liter plastic		6 months
Chromium	EPA 200.7	1 Liter plastic		6 months
Copper	EPA 200.7	1 Liter plastic		6 months
Iron	EPA 200.7	1 Liter plastic		6 months
Lead	EPA 200.7	1 Liter plastic		6 months
General Chemistry				
Analysis	**Method**	**Sample Container**	**Preservation**	**Holding Time**
Alkalinity	SM 2320B(4a)	1 Liter plastic	Cool < 4°C	24 hours
Chloride	EPA 300.0	1 Liter plastic	None required	28 days
Fluoride	EPA 300.0	1 Liter plastic	None required	28 days
Sulfate	EPA 300.0	1 Liter plastic	Cool < 4°C	28 days
Total Hardness	SM 2340B	1 Liter plastic	Nitric Acid to pH < 2	6 months
Calcium	EPA 200.7	1 Liter plastic	Nitric Acid to pH < 2	6 months
Magnesium	EPA 200.7	1 Liter plastic	Nitric Acid to pH < 2	6 months
Microbiological				
Analysis	**Method**	**Sample Container**	**Preservation**	**Holding Time**
Total Coliform	SM 9222D	500ml	Cool < 10°C	Same day
E. coli	SM 9222G1c1	500ml	Cool < 10°C	Same day
Physical				
Analysis	**Method**	**Sample Container**	**Preservation**	**Holding Time**

pH	EPA 150.2	N/A	N/A	N/A
Dissolved Oxygen	EPA 360.1	N/A	N/A	N/A
Turbidity	EPA 180.1	N/A	N/A	N/A
Specific Conductance	EPA 120.1	N/A	N/A	N/A
Total Dissolved Gas	NIST Cert	N/A	N/A	N/A
Temperature	NIST Cert	N/A	N/A	N/A

B.3 Sample Handling and Custody Requirements

The selected analytical laboratory will provide appropriate sample containers for sample collection, and chain-of-custody forms. Upon request, the laboratory will supply pre-preserved containers or will preserve samples upon receipt. Each sample will be placed in the appropriate pre-cleaned container and sealed. Disposable latex gloves will be worn during the sampling process. Gloves will be changed between sample areas or if the gloves have been damaged in any manner. Sample documentation will be completed immediately following sample collection. The chain-of-custody forms will be filled out in ink and placed in a plastic bag to avoid damage. Duplicates will be maintained in the KNRD files. The original will be sent to the analytical laboratory. The forms will include the date, site designation, sample designation, analysis required, turnaround, preservation, and authorized signatures.

B.3.1 Sample Custody Procedure

B.3.1.1 Field Sample Custody Procedure

Each sample location will have a specific location designation. The specific designation for the samples will be based on the location number, date of sampling, and number representing the sequence that the sample was collected during the day. For example, sample number P32-062001-11 would represent location number P32, sampled on June 20, 2001, and the eleventh sample collected that day. All sample containers will be affixed with a label to prevent misidentification of samples. At a minimum, label information will include:

1. Initials of the collector(s)
2. Date and time of collection
3. Location
4. Sample number
5. Analytical method(s) requested

A chain-of-custody record will be filled out and accompany each sample to document sample possession from sample collection through analytical reporting. All pertinent fields shown on the chain-of-custody form will be completed using an ink pen prior to sample shipment. A copy of this record will be maintained with analytical results and included in subsequent data reporting.

Samples that need to go to an off-site laboratory will be hand delivered or transported by a next-day delivery service to the laboratory for analysis. The chain-of-custody record will accompany

the samples. Packaging and shipping of samples to the off-site laboratory will be per the following protocol:

1. Sample container lids will be secured with custody tape and packing tape as necessary.
2. About 2 inches of cushioning material will be placed in the bottom of the cooler.
3. Sample containers will be placed in the cooler in a manner to prevent breakage.
4. Sample containers will be placed in waterproof seal plastic bags and centered in the cooler to prevent breakage.
5. Samples will be packed in ice that is enclosed in plastic bags or freeze packs.
6. QA/QC samples will be packaged with the samples that they control.
7. Cooler will be filled with cushioning material.
8. Chain-of-custody paper work will be placed in plastic bags and placed inside the cooler.
9. Cooler will be wrapped with strapping tape to seal it closed.
10. Appropriate Laboratory address will be affixed to the top of the cooler via a shipping label.

When a sample set is picked up by the delivery service, the shipper will receive a copy of the shipping documentation. This documentation will be placed in the project file with the chain-of-custody paperwork.

B.3.1.2 Laboratory Sample Custody Procedure

Upon receipt of the shipping container, the lab will inspect the integrity of the container seal. The cooler will be opened and the shipment checked versus the chain-of-custody record. Any inconsistencies or problems with a sample shipment will be noted and resolved. The samples will be tracked through the laboratory by internal custody procedures. QA/QC procedures to be followed by the selected laboratory will be per the pertinent laboratory QA manual.

B.4 Analytical Methods Requirements

Analytical procedures for establishing compliance with state and federal drinking and surface water quality standards are specified by regulation. Although the purpose of this QAPP is not to demonstrate compliance with drinking and surface water standards, comparison of QAPP data with drinking and surface water standards is one of several benchmarks of water quality that may be utilized. For that reason, analytical methods selected for the QAPP are generally consistent with applicable regulatory guidelines and standards for drinking and surface water analysis.

The analytical methods chosen for this project will follow those presented in “Test Methods for Evaluation of Solid Waste (SW-846),” September 1986, “Standard Methods for the Examination of Water and Wastewater,” or other EPA references listed in Section E.

Table B.4 Summary of Analytical Requirements and Associated Methodology.

Metals		
Parameter of Interest	**Analytical Methodology**	**Notes**
Mercury	EPA 245.1/SM 6010B[1]	
Arsenic	EPA 200.7/SM 6010B[1]	
Cadmium	EPA 200.7/SM 6010B[1]	
Chromium	EPA 200.7/SM 6010B[1]	
Copper	EPA 200.7/SM 6010B[1]	
Iron	EPA 200.7/SM 6010B[1]	
Lead	EPA 200.7/SM 6010B[1]	
Nutrients		
Parameter of Interest	**Analytical Methodology**	**Notes**
Ammonia	EPA 350.1	
Nitrate/Nitrite	EPA 300.0[1]	
Total Phosphorus	EPA 365.4	
Ortho-phosphate	EPA 365.1	
Total Kjeldahl Nitrogen	EPA 351.2	
General Chemistry		
Parameter of Interest	**Analytical Methodology**	**Notes**
Total Alkalinity	SM 2320B(4a)	
Chloride	EPA 300.0	
Fluoride	EPA 300.0	
Sulfate	EPA 300.0	
Total Hardness	SM 2340B	
Calcium	EPA 200.7/SM 6010B	
Magnesium	EPA 200.7/SM 6010B	
Microbiological		
Parameter of Interest	**Analytical Methodology**	**Notes**
Total Coliform	SM 9222D	
E. coli	SM 9222G1c1	
Physical		
Parameter of Interest	**Analytical Methodology**	**Notes**
Turbidity	EPA 180.1[2]	Calibrated multi-probe as per manufactures recommendations/daily pre and post calibration frequency.
pH	EPA 150.2	
Dissolved Oxygen	EPA 360.1[2]	
Specific Conductance	EPA 120.1	
Total Dissolved Gas	NIST Certification	NIST certification as per manufactures recommendations
Temperature	NIST/DKD Certification[2]	

[1] Refer to Appendix E for a summary of parameters of interest that are identified under this methodology and their corresponding detection limits.

[2] Refer to Appendix E for a summary of parameters of interest that are identified under this methodology and procedures for individual physical measurements.

B.5 Quality Control Requirements

B.5.1 Field QC Requirements

Duplicates, and split samples will be generated by laboratory services as part of water monitoring activities. These samples are used to confirm that collection and handling procedures have not affected sample-water quality. Sample chain-of-custody forms are located in Appendix C.

Duplicate samples are used to check the precision of field collection or laboratory analyses and verifies repeatability of the sample data. Duplicates are collected the same time as the water quality sample. The duplicate sample will be collected by evenly splitting the collected sample such that the both sub-samples are comparable and representative of the single sample. Collect duplicate samples from the sample location that is believed to have elevated levels of a particular compound. Duplicates will be collected on 20 percent of samples (per analytical method) or at least one per day whichever is greater.

Split samples are additional water quality samples that are collected and handled identically as the others in the field, but are sent to a different laboratory or as blind samples for analysis to the same laboratory. Split samples check on laboratory handling and procedures. Split samples will be collected at a rate of one every day or 5 percent, whichever is greater.

B.5.2 Laboratory QA/QC Requirements

The laboratory will be responsible for following their established QA/QC procedures and those required by the analytical methods. The following minimum QA/QC procedures will apply:

1. Sample holding and preservation requirements will be in accordance with analytical method reference parameters.
2. Instrument tuning and calibration will be performed as required by the analytical method.
3. Laboratory QA/QC samples (blanks, surrogate spikes, matrix spike/matrix spike duplicates) will be analyzed at frequencies specified by EPA and analytical reference methods.
4. The laboratory will review the data package for performance, quality, and completeness.
5. The method detection limit for the parameter analyzed is below the concentration of concern.
6. All laboratory parameters (recoveries, spikes, duplicates, etc.) are within their stated limits.

Laboratory instrumentation will meet applicable calibration requirements to ensure that the instrumentation is capable of producing acceptable quantitative data. Initial calibration demonstrates that the instrument is capable of acceptable quantitative performance at the onset of analysis; calibration during operation verifies acceptable performance of the instrument on a day-

to-day basis. Tuning and instrument performance criteria will also be established, as appropriate, to ensure that instrument measurements may be interpreted correctly.

Laboratory calibration procedures are specified in the protocol for the specific analytical methods used. When there are no previously defined specification, the calibration procedures will include:

1. An initial and final three-point calibration will be conducted before and after a run.
2. A mid-range calibration will be conducted for every tenth sample.

B.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Field instruments and equipment will be inspected and tested prior to, and at the conclusion of, each day's sampling to ensure proper function and integrity. Should any instrument be dropped or similarly impacted during the sampling day, the instrument will be immediately inspected to determine if any damage has occurred and shall be recalibrated.

Field instruments will be maintained as described and scheduled by manufacturer recommendations. All testing, inspection, and maintenance activities will be recorded in the equipment maintenance logs and in the field notebook.

B.7 Instrument Calibration and Frequency

Field instruments that will require calibration are stream velocity (flow), turbidity, pH, total dissolved gas, dissolved oxygen, temperature, and conductivity meters. The field instruments will be calibrated prior to each day's use in accordance with procedures and schedules recommended by the manufacturer. All calibration data will be recorded in the instrument log, and field notebook. Operation and calibration procedures for each field instrument will be conducted prior to the start of sampling.

Water Quality Technicians are responsible for employing properly functioning equipment. If an equipment malfunction is suspected, the Water Quality Technician is to stop work and verify that the equipment is functioning properly. If the equipment is found to be malfunctioning, the Water Quality Technician will make a determination as to whether or not it can be repaired in the field without affecting the integrity of the equipment. If the repair can be accomplished under these constraints, then the Water Quality Technician will do so, i.e., battery replacement. If the repair will affect the equipment integrity then the equipment will be tagged to identify the suspect problem and set aside until a qualified technician can repair the equipment or the equipment is replaced.

Equipment that fails calibration or becomes inoperable during use will be removed from service and either segregated to prevent inadvertent use or tagged to indicate it is out of calibration. Such equipment will be repaired and satisfactorily recalibrated prior to reuse. Equipment that cannot be repaired will be replaced.

Data collected with equipment that later fails recalibration will be evaluated. If the data appears to be affected, the results of the evaluation will be documented and the appropriate personnel notified.

B.8 Inspection/Acceptance Requirements for Supplies and Consumables

Upon receipt, inspect all supplies and consumables for shipping carton, individual package, and product integrity. Discard or return any product whose individual package is torn or opened to the environment. Also discard or return any product that is cracked, leaking, or otherwise damaged.

Each carton of new sample containers should be accompanied by a certificate indicating the sample container lot and statement that they have been cleaned in accordance to applicable standards. A statement of cleaning should also accompany sample containers that have been pre-cleaned and pre-preserved by the laboratory.

All sampling supplies and consumables should be acquired prior to initiating field activities.

B.8.1 Identification of Critical Supplies and Consumables

Following is a minimum list of supplies and consumables that will be required to conduct sampling.

1. Field notebook
2. Rubber or latex gloves
3. Sample containers
4. Sample labels
5. Preservative, if required
6. Ice
7. Chain-of-custody forms
8. Field instruments (Flow meter, temperature, turbidity, total dissolved gas, dissolved oxygen, pH, and electrical conductivity meters)
9. Calibration reagents
10. Decontamination equipment (buckets, spray bottles, brushes, soap, etc.)
11. Deionized water
12. Insulated shipping containers (coolers or ice chests)
13. Bleach
14. Batteries AAA, AA,C and D sizes.

B.9 Data Acquisition Requirements (Non-Direct Measurements)

Non-direct data measurements are those items that require a subjective assessment. Items such as weather, sampling location, stream condition, problems with sample collection, etc. will be recorded by the Water Quality Technicians in the field notebooks.

B.10 Data Management

Field data will be recorded by Water Quality Technicians in the field notebooks, or field computer, and on chain-of-custody forms. Up to date field forms or a print out of field computer forms are located in Appendix D. Laboratory data will be transmitted to KNRD in hard copies of the laboratory analytical reports. The Laboratory, in accordance with their internal QA/QC program, will review and validate analytical data.

The Water Resources Project Manager will review the Technician's field data and the analytical laboratory's analytical data to assure that all pertinent information is accounted for and is correlated. The Water Resources Project Manager will summarize sample collection data and analytical data in a database for review and evaluation. The Water Resources Project Manager will review and assess water sample analytical data.

Hard copies of all field notebooks, chain-of-custody forms, analytical data, laboratory reports, assessment reports, and all electronic field forms and databases will be maintained in the KNRD office until project completion. Upon project completion, summary records will be archived for a period of 30 years beyond final project completion date. Support and backup data will be archived for 5 years beyond date of data generation.

C. ASSESSMENT/OVERSIGHT

C.1 Assessments and Response Actions

This project involves sampling of designated sites (shown on map in Appendix F) at least biweekly. Certain events (e.g. storms, rain on snow) will necessitate more frequent sampling at some sites. Results will comprise a database of long term monitoring results.

Quality control for this project involves calibration of field instruments and checks of laboratory analysis. Field instruments include flow meters and hand held water quality multi-parameter monitoring systems. Field instruments are calibrated daily using calibrating solutions within ranges of field measurements and flow meters are calibrated monthly using protocols supplied with the instruments.

Laboratory quality control is performed by respective laboratories; Tshimakain Creek Labs for nutrients, metals, general chemistry and microbiological sampling and Anatek Labs, Inc. for duplicates and quality control. Occasional duplicates are compared with regular samples. This occurs approximately four times annually (samples are submitted monthly).

The project involves regular sampling of water quality parameters and discharge. Sites on the enclosed map are sampled at least biweekly, as accessible. Winter conditions prevent access to higher elevation sites. The monitoring program is conducted solely by the Kalispel Natural Resources Department but sampling regimes and results are coordinated with the Pend Oreille Conservation District, Tri-State Water Quality Council, and Washington State Department of Ecology.

Quality assurance assessments include calibration using commercially available solutions within the range of field measurements expected. Ranges are determined using recent and historical data. Success criteria include accurate readings of calibration solutions and/or effective calibration to standards. Calibration occurs monthly and is performed by Kalispel Natural Resources Department, Water Resources Program technicians.

The Kalispel Tribe is not responsible for laboratory quality control but their quality control plans are included.

Results are reported on standard sampling forms adapted to calibration exercises. Sampling forms are filed with field sampling forms and results are entered into the Water Quality Program's database of monitoring results.

Regular monitoring is performed primarily by Kalispel Tribal employees under supervision of the Tribe's Water Resources Program Manager. Contracted services through certified laboratories are used for nutrients, metals, and coliform according to the Kalispel Tribe's sampling schedule.

Tribally employed assessors are not authorized to stop work but to report errant measurements or calibration results to the Program Manager. Errant measurements or results will be handled in-house if possible, however, current staff are not trained in instrument maintenance beyond routine calibration. Further problems result in shipping instruments to qualified personnel for necessary maintenance.

Regular monitoring has been in place for some years and this provides a range of anticipated conditions. Field personnel deal with unanticipated and non-conforming conditions if possible. Results are reported to the Program Manager. Short-term non-conforming conditions result in, at most, loss of data for that period. Longer-term events result in review of the monitoring program with any necessary adjustments.

Response actions are either recommended by technicians or suggested by the Program Manager. Technicians are responsible for implementation of response actions. Verification is provided through calibration exercises.

C.2 Reports to Management

Identify the preparer and the recipients of the reports, and the specific actions management is expected to take as a result of the reports.

Reporting is performed by technicians and included on sampling forms used for calibration. Routine results and calibration require no further action. Errant or inexplicable results not corrected by routine calibration generally result in maintenance performed off-site by qualified personnel.

Informal discussions between program staff regarding project results occur approximately monthly. During these discussions, recent results and long-term trends are analyzed. Errant or unusual measurements are also discussed. No formal reporting of these sessions occurs. Short-term (seasonal) trends in environmental data are generally documented and known and these can be compared to recent results. Long-trends are developing and reporting of trends takes place annually. Significant quality assurance problems are not anticipated in this monitoring program. Problems outside of regular calibration are handled by qualified instrument technicians off-site.

C.3 Procedures for Calculating Precision and Accuracy

Precision and accuracy are defined in Section A.5 of this QAPP. Following are the calculations that correspond with each.

Precision can be measured with duplicate samples and calculated as standard deviation or relative percent difference (RPD). For the purposes of this QAPP, precision is calculated as RPD:

Relative Percent Difference (RPD): The difference between duplicate results for analyses of a sample, relative to the mean (average) value of those results, and expressed as a percent.

$$RPD = 100(d_1 - d_2)/[(d_1 + d_2)/2]$$

$$= 200(d_1 - d_2)/(d_1 + d_2)$$

where d_1 is the result of the first analysis, and d_2 the second.

Accuracy will be measured with spiked samples and calculated as Percent Recovery (*%R*) and defined as 100 times the observed concentration, divided by the true concentration.

Percent Recovery (%R): That percent of a known amount of material "spiked" or added to a sample being analyzed which is reported at the end of the analysis.

$$\%R = 100(R_2 - R_1)/A$$

where R_1 is the result for the sample without the spike, and R_2, the result for the spiked sample, and A is the equivalent concentration added in the spike sample.

D. DATA VALIDATION AND USABILITY

Data generated during sampling activities is for internal use and assessment. The data collected during this project will not be used for establishing compliance with any specific regulation. Therefore, an extensive data validation program will not be instituted. Rather data validation on

random samples up to 10% will be instituted to assure that data is reasonably accurate and usable.

The Water Resources Project Manager is responsible for assessing sampling design, sample collection procedures, sample handling, analytical procedures, quality control, calibration, data reduction, and data processing to determine if they have been satisfactorily instituted during the water monitoring activities.

E. DOCUMENT REFERENCES

American Public Health Association, American Water Works Association & Water Environment Federation. (n.d.) Standard methods for the examination of water and wastewater. (18th ed.) (U.S. Environmental Protection Agency-approved)

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Appendix A

Kalispel Natural Resource Department Organizational Chart

Page under revision

Appendix B

Stream Flow Measurement Information and Ambient Monitoring Plan

Page under revision

Appendix C

Laboratory Forms

Page under revision

Appendix D

Field Documentation and Calibration Forms

KNRD WATER RESOURCES FIELD FORM 2011

Site:
Party:
Date:
Time:

circle one below

HYDROLAB 5X	TROLL 9500

PARAMETER		Value		THERMOGRAPH LOCATION / MANUAL TEMP
WATER TEMPERATURE	→	_____	°C	RB: ☐
SPECIFIC CONDUCTANCE	→	_____	uS/cm @25°C	LB: ☐
pH	→	_____	Units	TEMP: _____
DISSOLVED OXYGEN	→	_____	mg/L	COMMENTS: _____
BAROMETRIC PRESSURE	→	_____	mmHg	_____
TURBIDITY	→	_____	Ntus	_____
AIR TEMPERATURE	→	_____	°C	

COMMENTS: _____

_____

_____

TRACKER PT4

TDG % Measurements:	BP mmHg	Temp	TGP mmHg	ΔP
.3 M _____	_____	_____	_____	_____

KNRD WATER RESOURCES FIELD FORM 2011

Site:
Party:
Date:
Time:

AA	PYG MY

AC	DIST(FT)	WIDTH(FT)	DEPTH(FT)	DEPTH (FT)	REV OL	TIME	AT POINT	VERT (FT/S)	ADJ. ANGLE	AREA(FT)	Q=(cfs)

KNRD Water Resources Pre-Post Calibration Forms

Project Name: _____ Date: _____
Sonde #: _____ Use date(s): _____ Time: _____
Precalibration □ Barometric press: _____ inHg
Mid-run calibration □ _____ mmHg
Postcalibration □

	Pre	Temp	Standard	Corrected Standard	Post	Sucessful Calibration?	Comments
Conductivity 0 µS/cm						□	
Conductivity 100 µS/cm						□	
pH-7						□	
pH-10						□	
DO % saturation			100%			□	
Turb						□	
						□	

Project Name: _____ Date: _____
Sonde #: _____ Use date(s): _____ Time: _____
Precalibration □ Barometric press: _____ inHg
Mid-run calibration □ _____ mmHg
Postcalibration □

	Pre	Temp	Standard	Corrected Standard	Post	Sucessful Calibration?	Comments
Conductivity 0 µS/cm						□	
Conductivity 100 µS/cm						□	
pH-7						□	
pH-10						□	
DO % saturation			100%			□	
Turb						□	
						□	

Appendix E

Laboratory Detection Limits, Supplemental Monitoring and Calibration Procedures

Metals[1]		
Parameter of Interest	**Analytical Methodology**	**Detection Limit**
Mercury	EPA 245.1/SM 6010B	.000065
Arsenic	EPA 200.7/SM 6010B	.00043
Cadmium	EPA 200.7/SM 6010B	.0005
Chromium	EPA 200.7/SM 6010B	.0009
Copper	EPA 200.7/SM 6010B	.005
Iron	EPA 200.7/SM 6010B	.027
Lead	EPA 200.7/SM 6010B	.004
Nutrients[1]		
Parameter of Interest	**Analytical Methodology**	**Detection Limit**
Ammonia	EPA 350.1	.005
Nitrate/Nitrite	EPA 300.0	.005
Total Phosphorus	EPA 365.4	.002
Ortho-phosphate	EPA 365.1	.002
Total Kjedahl Nitrogen	EPA 351.2	.02
General Chemistry		
Parameter of Interest	**Analytical Methodology**	**Detection Limit**
Total Alkalinity	SM 2320B(4a)	
Chloride	EPA 300.0	.01
Fluoride	EPA 300.0	.01
Sulfate	EPA 300.0	.01
Total Hardness	SM 2340B	
Calcium	EPA 200.7/SM 6010B	.016
Magnesium	EPA 200.7/SM 6010B	.024
Bacteria		
Parameter of Interest	**Analytical Methodology**	**Detection Limit**
Total Coliform	SM 9222D	1
E. coli	SM 9222G1c1	1
Physical		
Parameter of Interest	**Analytical Methodology**	**Detection Limit**
Turbidity	EPA 180.1[2]	N/A
pH	EPA 150.2	N/A
Dissolved Oxygen	EPA 360.1[2]	N/A
Specific Conductance	EPA 120.1	N/A
Total Dissolved Gas	NIST Certification	N/A
Temperature	NIST/DKD Certification[2]	N/A

KNRD Water Resources Department

Procedures for D.O calibration - Unit Conversion for the Rugged Reader.

For calibration of the Troll 9500 dissolved oxygen probe, the KNRD water resources department prepares the D.O calibration in tap water using the In-Situ bubbler Kit.
Calibration is mandatory once weekly or if the unit, during the pre-calibration period appears to have drifted by a maximum of ± 2% of 100% while immersed in tap water, whichever occurs first.

To perform the D.O calibration using the Rugged Reader, the probe is calibrated in % D.O. For the purposes of reporting D.O concentrations, % D.O is converted to oxygen concentration in milligrams per liter of water (mg/L). This is shown on the Rugged Reader interface, under the profiler setting, and is expressed as Rugged Dissolved Oxygen (RDO) in mg/L.

The unit conversions require that the field technician set up the Rugged Reader display by changing the unit preferences by going to the Home site on the user interface and selecting the Setup parameter. The technician must then choose Oxygen saturation in %-100% D.O. The In-Situ probe is then calibrated in tap water @ 100% saturation. This form of calibration is calculated using barometric pressure, and water temperature. The In-Situ probe automatically measures the barometric pressure and temperature and corrects the D.O readings accordingly using these inputs. Barometric pressure and temperature are taken directly from the Rugged Reader unit.

Once the probe has been calibrated the unit preferences must be changed back to the original display. This is accomplished by going back to the user interface Windows Home site button, selecting the Windows Setup parameter once again, and changing the % D.O Saturation back to Rugged Dissolved Oxygen (RDO) concentrations in milligrams of oxygen per liter of water (mg/L).

To establish that the changes have taken place, the water resource technician must then navigate through the Rugged Reader interface to the profiler setting and check to make sure that the unit is reading in RDO mg/L. Once completed, the probe need not be recalibrated for D.O% until the end of the week.

KNRD Water Resources Department

Procedures for turbidity calibrations during summer base flow.

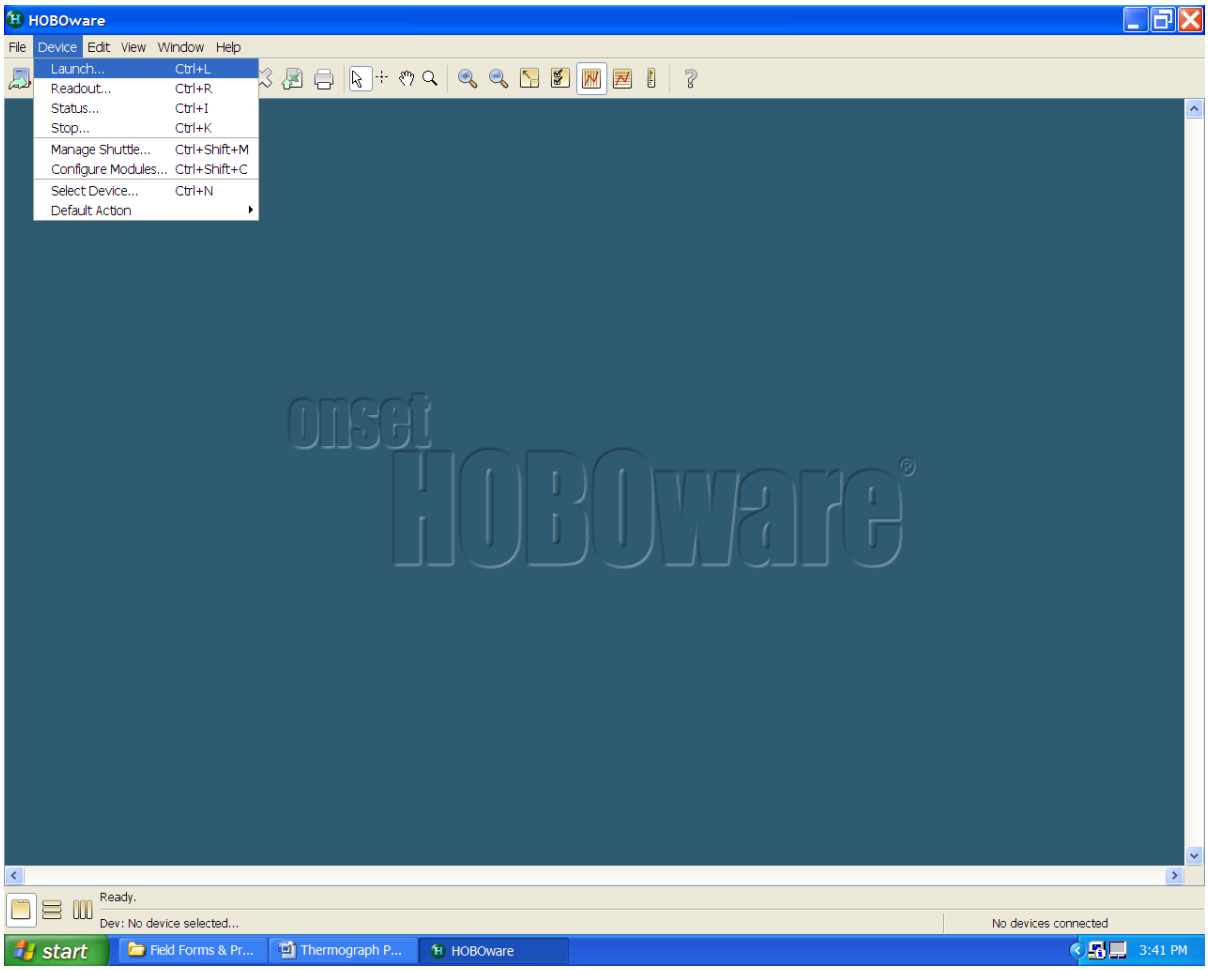
1. From Step 7., Section 18, from the TROLL 9500 Operator's Manual, on *page 126,* choose the single point calibration procedure, and move to Step 12 in the manual.
2. We are choosing a single calibration standard of 0.0 NTU during the summer base flows. This most accurately reflects those turbidity measurements our department is likely to encounter during the summer base flows e.g., < 2.0 NTUs.
3. Calibration standard is performed using distilled water as per the manufactures instruction (personal communications).
4. Calibration procedure is performed in the standard with the ***sensor protective cap installed over the sensors.*** Failure to calibrate the turbidity sensor with the protective cap on will result in turbidity measurements lower than normal.
5. At Step 12, the value to enter as the turbidity standard is 0.0 for distilled water.
6. At Step 13, select run as instructed in the operator's manual.
7. As this is a single point calibration procedure move to step 17 as instructed in the operator's manual.
8. Select finish in the program to accept the new calibration coefficients.

KNRD Water Resources Department

ONSET Stowaway Tidbit Quality Assurance and Quality Control Guidelines QA/QC
KNRD

Purpose: The Water Resources Department for KNRD has developed QA/QC guidelines for the testing of accuracy and resolution of our temperature thermographs. In addition to the process of testing the instruments for these parameters, the department permanently stores the thermograph test results. Records are kept on file ensuring that the thermographs have undergone basic testing criteria. Records are kept in two electronic formats, and are backed up by a server, daily. QA/QC guidelines include calibration protocols as suggested by the manufacturer, as well as the KNRD water resources protocols to ensure that standardized data is gathered. Procedures outlined in our design, occur prior to equipment being deployed in the field, and occur again when equipment is retrieved from the field. By implementing this process, we will likely minimize error in the data collected. This procedure is inclusive for new thermographs, as well as for thermographs that are being redeployed.

Procedure: Testing of a thermograph begins by launching the device in the HOBOware software. This is accomplished by navigating with the mouse curser to the “device” tab in the upper left corner of the software window. Once the “device” tab is chosen, a drop down window suite is opened.



Navigate with the mouse cursor to the "launch" tab in the dropdown window and click once on the tab to begin a launch of the thermograph. Once done, the thermograph is named according to standard conventions, labeled as a test, and set to log at an interval of 5 seconds. As part of the manufactures recommendation, the loggers are tested for both accuracy and resolution. To accomplish this, the logger(s) are put in an ice-water bath and are left to sit for 15+ minutes. In order for the logger to pass the QA/QC criteria, the logger(s) must reach a temperature of <0.2°C, ±0.2°C (i.e must reach <.4°C) for accuracy, and reach this temperature within 15 minutes to test for resolution.

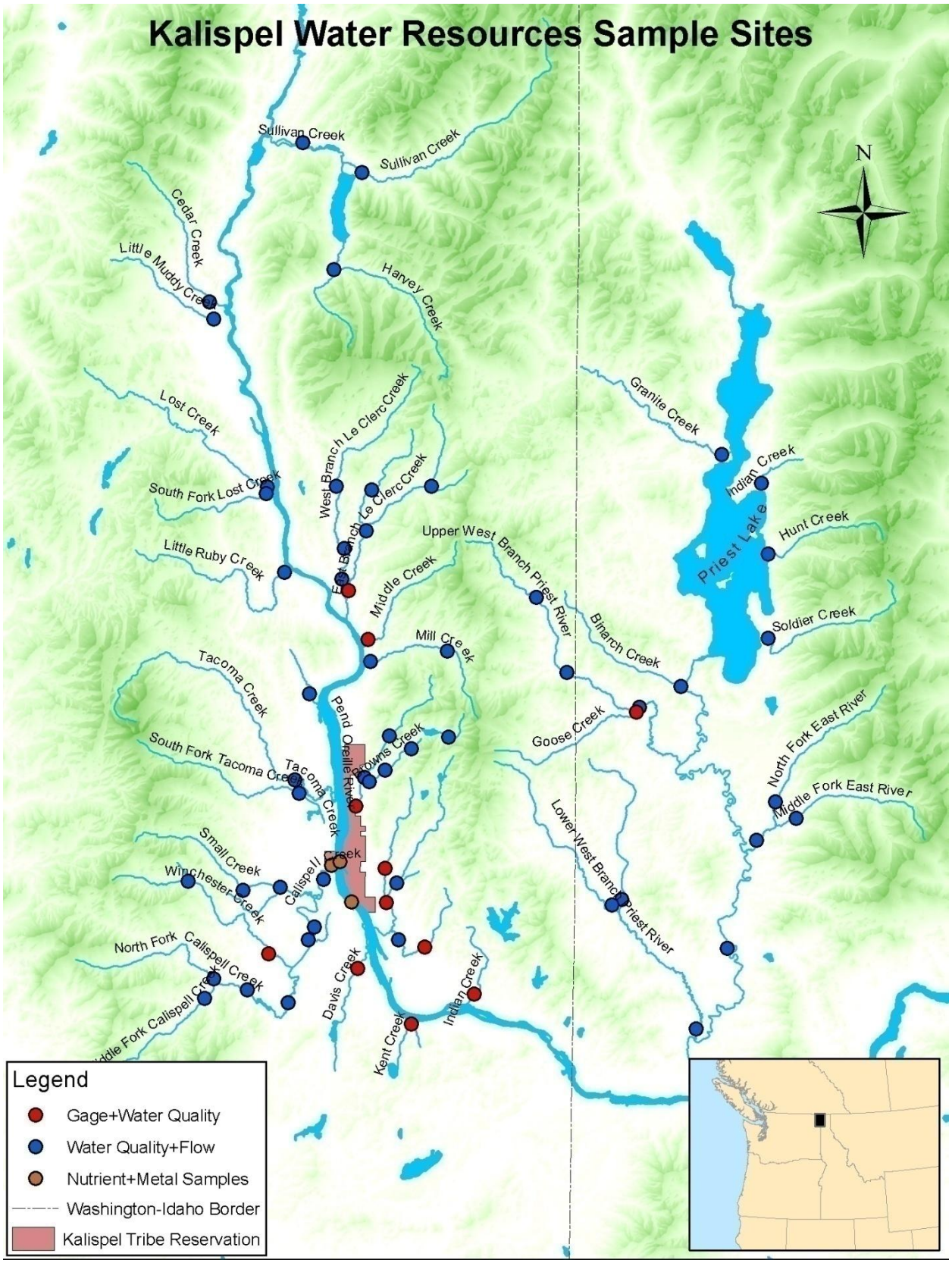
Loggers that pass both standards, are then graphed, and saved to the HOBOware file system. Individual graphs show the temperatures reached on the y-axis and time logged on the x-axis. Once data is saved into a HOBOware dtf. format, the graph is then exported into an excel spreadsheet. The spreadsheet is then saved on the shared network drive under the QA/QC file, O:\QAQC Tidbits\2009 Calibration Reports, by water year.

- Pulverized ice needed to reach near 0°C for temperature bath
- Up to 6+ thermographs can be calibrated simultaneously

- 15+ minutes, reaching <.4°C within the 15 minute time limit for Accuracy and Resolution
- Stored in multiple electronic formats and backed up
- HOBOware dtf. file is the master data, excel or text file is on the server and backed up
- Standardizes the temperature data being collected
- File folder to save in is O:\QAQC Tidbits\2009 Calibration Reports

Appendix F

Map of Monitoring Locations in Pend Oreille and Priest River Drainages


Kalispel Water Resources Sample Sites
N
Sullivan Creek
Sullivan Creek
Cedar Creek
Little Muddy Creek
Harvey Creek
Lost Creek
West Branch Le Clerc Creek
South Fork Lost Creek
East Branch Le Clerc Creek
Little Ruby Creek
Middle Creek
Mill Creek
Tacoma Creek
Pend Oreille River
Browns Creek
South Fork Tacoma Creek
Tacoma Creek
Small Creek
Winchester Creek
Calispell Creek
North Fork Calispell Creek
Davis Creek
Kent Creek
Indian Creek
Granite Creek
Indian Creek
Priest Lake
Hunt Creek
Upper West Branch Priest River
Binarch Creek
Soldier Creek
Goose Creek
North Fork East River
Middle Fork East River
Lower West Branch Priest River
Legend
Gage+Water Quality
Water Quality+Flow
Nutrient+Metal Samples
Washington-Idaho Border
Kalispel Tribe Reservation