
OTTER CREEK WATERSHED WATER CHEMISTRY MONITORING

Sampling and Analysis Plan **2013**

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1.0 INTRODUCTION AND BACKGROUND

This document constitutes the Sampling and Analysis Plan (SAP) for the completion of water chemistry sampling in 2013 for the Otter Creek watershed to assist with TMDL development.

1.1 DESCRIPTION OF THE OTTER CREEK WATERSHED

The Otter Creek TMDL Project Area includes the entire Otter Creek watershed. The Otter Creek watershed is approximately 454,000 acres (709 square miles or about 1,833 square kilometers) and is located within Lower Tongue Hydrologic Unit Code # 10090102. Otter Creek originates near the Montana – Wyoming border and flows approximately 108 miles to its confluence with the Tongue River at Ashland, MT. The Tongue River enters the Yellowstone River near Miles City downstream from Ashland. **Figure 1** shows the extent of the Otter Creek TMDL Project Area.

Table 1 shows the waterbody segment to be sampled in the Otter Creek watershed in 2013 and the pollutant group(s) impairment listings that appear on the 2012 303(d) List associated with these segments.

Table 1. Waterbody segment in the Otter Creek watershed to be sampled in 2013 and its associated 303(d) listings.

Waterbody ID	Waterbody Segment Name & Description	Pollutant Group			
		Salinity	Metals	Sediment	Nutrients
MT42C002_020	Otter Creek, headwaters to mouth (Tongue River)	Salinity	Iron	Solids (Suspended/Bedload)	none

Table 2 indicates the pollutant group (nutrients and metals) sampling that is covered in this SAP for Otter Creek. Sediment and habitat monitoring may also be conducted in Otter Creek in 2013; however the details of that monitoring will be covered in a separate sediment and habitat SAP.

Table 2. Pollutant groups to be monitored on the Otter Creek watershed in 2013 covered in this SAP.

Waterbody ID	Waterbody Segment Name	Pollutant Group	
		Nutrients	Metals
MT42C002_020	Otter Creek	X	X



Figure 1. Boundary of the Otter Creek Watershed

1.2 OVERVIEW OF MONITORING EFFORTS AND COORDINATION

There are three pollutant causes of impairment within the Otter Creek watershed as identified on Montana's 2012 303(d) List: iron, sediment, and salinity. These three pollutant causes of impairment date back to the 1996 303(d) List and have remained associated with this waterbody in subsequent Water Quality Integrated Report cycles. As noted in DEQ's assessment files, this is because insufficient information has been collected to enable DEQ to fully evaluate this stream's water quality status in recent years. This sampling and analysis plan specifically addresses data needs to assist in developing the iron TMDL and characterizing the general water chemistry of the Otter Creek watershed.

Previous monitoring and assessment efforts for iron and general water chemistry include:

1. USGS gaging station data collection

There are 5 existing or historic USGS gage station locations within the Otter Creek drainage.

These include:

- MT 06307665 (Otter Creek near Otter)
- MT 06307717 (Otter Creek below Fifteenmile Creek near Otter)
- MT 06307725 (Otter Creek above Tenmile Creek near Ashland)
- MT 06307735 (Home Creek near Ashland)
- MT 06307740 (Otter Creek at Ashland)

Most sites have been retired in recent years with the Otter Creek at Ashland site being used the most in recent years. Recent increased interest in data collection has led USGS to resume sampling at the Otter Creek site below Fifteenmile Creek.

2. Hydrometrics data collection

Baseline data is currently being collected by Otter Creek Coal through Hydrometrics, Inc. as part of their permit application and includes a variety of groundwater, surface water, habitat, wildlife, and cultural data. They have been gathering data for several years at 26 surface water monitoring stations located on Otter Creek and its tributaries around the proposed mine area. Monitoring at these stations will continue this year and data collected at the following sites will be used for TMDL development, and sampling at these sites should therefore follow the procedures outlined in this SAP:

- SW2 (Otter Creek upstream from Threemile)
- SW16 (Otter Creek between Threemile and Tenmile)
- SW22 (Otter Creek upstream from Tenmile)
- SW25 (Otter Creek below Threemile)
- SW3 (in Threemile)
- SW23 (in Tenmile)

These six sites will need sampling in 2013 during high and low flow for total recoverable metals and hardness, dissolved Aluminum and Iron, TSS and TDS, measured flow, temperature, pH, DO, and SC. In addition during the low flow sampling at these five sites, nutrients and sediment metals chemistry will be sampled. Site photos will be taken at each visit. All of the above listed parameters will need to adhere to DEQ reporting requirements and quality assurance and quality control detailed in this SAP.

2.0 OBJECTIVES AND DESIGN

The primary objective of the 2013 sampling event is to provide increased spatial and temporal sampling results to support iron TMDL development for Otter Creek. At this time, a significant data set for iron exists; however, it is primarily from the USGS gage station at Ashland, near the mouth of Otter Creek. Additional sampling in the area of the proposed Otter Creek Coal Mine will supplement the existing iron dataset. Yet, there is still a need for upstream sampling because the proposed mine area is located in the lower portion of the watershed and limited data exists upstream, which is necessary to understand water quality conditions basin-wide. Two sampling events are planned to capture higher spring flow

conditions as well as low summer flow conditions. Ideally, the sampling dates will be coordinated to align with ongoing sampling activities at the USGS gage stations and proposed mine area.

The sampling results will provide a basis for iron source assessment, and as such will include dissolved iron, total recoverable iron, and total suspended solids to help differentiate between ground water and surface water flow paths and to help determine linkages between iron and sediment loading to Otter Creek. Sediment metals chemistry sampling at each location during the low flow summer sampling is also included to help define iron sources throughout the watershed and help delineate iron loading “hot spots” that might otherwise be missed since the extent of high flow sampling is limited.

A second objective is to enhance the spatial distribution of data for other metals (Pb, Cu, Cd, etc.). Like the iron dataset, the available metals data is generally limited to the USGS gage station near the mouth and the proposed mine location. This information will assist with future metals assessment updates for Otter Creek, and can also help with iron source assessment information since some potential iron sources, such as historical mining, might additionally be a source of other metals. The same sample bottles used for iron analysis can be used for the additional metals analysis. Therefore these additional metals represent a logical addition to the suite of parameters for laboratory analysis.

A third objective is to enhance the nutrient data for Otter Creek. The data collection would only occur during the summer low flow sampling event (between July 1 – September 30) and would supplement similar data being collected at two downstream USGS sites as well as at mine characterization sites. The resulting information will assist with future nutrient assessment updates. The collection of nutrient data in the upper portions of the watershed has the potential to benefit TMDL source assessment for both iron and sediment, since elevated nutrient loading can be an indicator of elevated sediment loading, which might also be linked to elevated iron loading as discussed above.

In addition to the above parameters, flow measurements are necessary so concentrations can be translated into loads where applicable. The normal suite of field parameters (pH, specific conductance, water temperature and dissolved oxygen) will also be collected for sampling consistency.

In order to meet these objectives, the six existing Hydrometrics sites (**Section 1.2**) and six new proposed sites will be sampled by Hydrometrics in 2013 (**Table 3**). These twelve sites (**Figure 2**) will be sampled during high (May) and low (July) flow for a suite of total recoverable metals and hardness, dissolved Aluminum and Iron, TSS and TDS, measured flow, temperature, pH, DO, and SC. In addition, during the low flow sampling at all twelve sites, nutrients and sediment metals chemistry will be sampled. Site photos will be taken during each visit. All of these parameters will need to adhere to DEQ reporting requirements and quality assurance and quality control procedures (**Section 6**).

Table 3. Proposed Monitoring Site Locations & Site Choice Rationale

Proposed New Site Locations	Station ID	Latitude	Longitude
Otter Creek below East Fork Otter Creek, (below major tributary)	Y16OTTTRC10	45.55827	-106.21500
Otter Creek below Home Creek, (below major tributary)	Y16OTTTRC11	45.54556	-106.20300
Taylor Creek, (below North and South Forks)	Y16TYLRC01	45.26978	-106.10699
Otter Creek below Indian Creek, (below major tributary)	Y16OTTTRC12	45.26026	-106.15200
Otter Creek below Bear Creek, (below major tributary)	Y16OTTTRC13	45.22526	-106.16900
Otter Creek Headwaters, (headwaters sample)	Y16OTTTRC14	45.07573	-106.09800
Existing Hydrometric Site Locations			
Otter Creek upstream from Threemile, (above major tributary that has a sampling location)	SW2	45.50476	-106.17456
Otter Creek between Threemile and Tenmile, (below Tenmile)	SW16	45.48363	-106.16655
Otter Creek upstream from Tenmile, (above major tributary that has a sampling location)	SW22	45.43011	-106.14436
Otter Creek downstream from Threemile, (below major tributary)	SW25	45.51362	-106.18073
Threemile Creek, (major tributary)	SW3	45.50879	-106.16684
Tenmile Creek, (major tributary)	SW23	45.43405	-106.13382

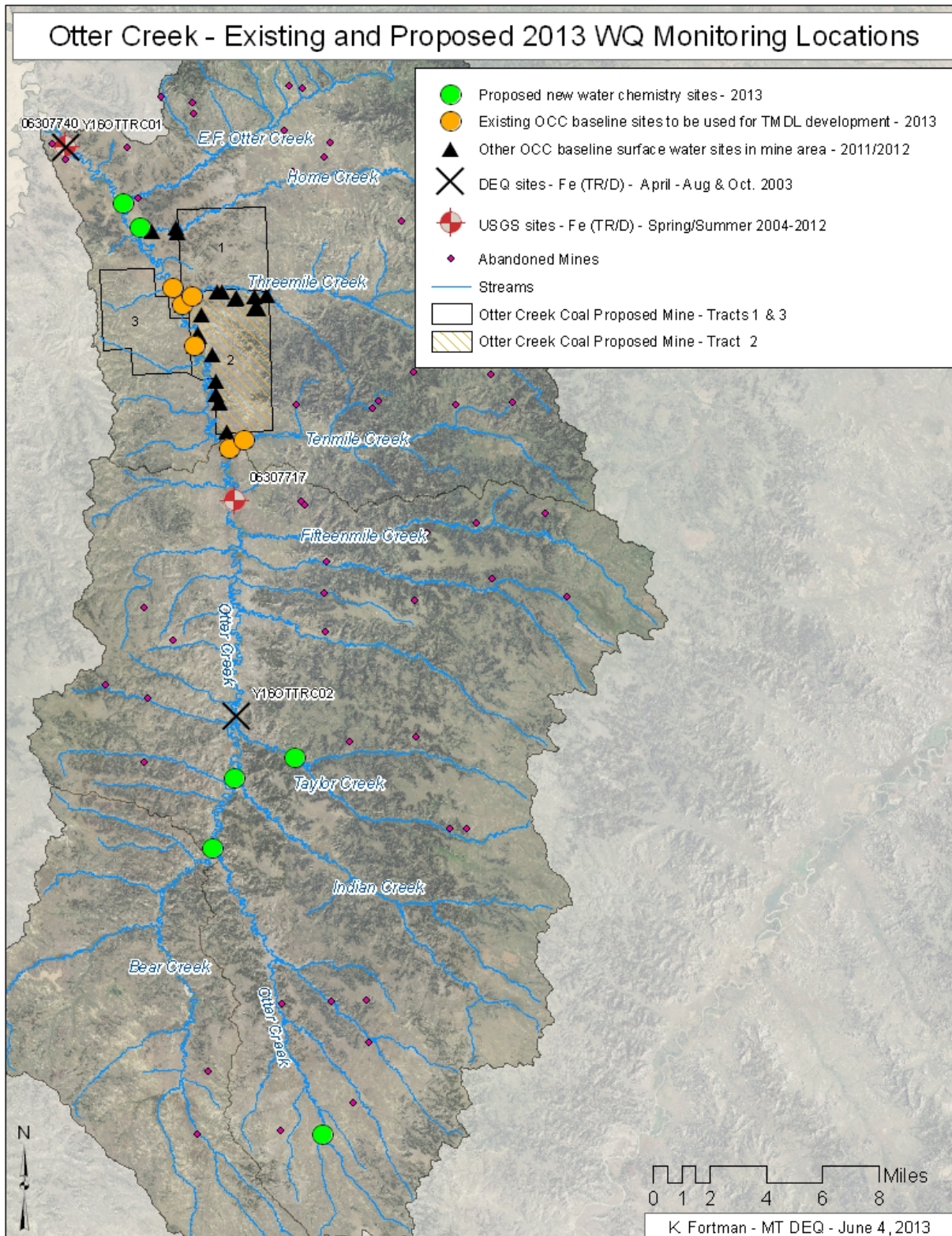


Figure 2. Sample site locations for 2013 monitoring in the Otter Creek watershed

2.1 SAMPLING PLANNING AND SITE SELECTION

Specific site locations listed in **Table 3** were identified using GIS, topographic maps, existing site locations, and field reconnaissance. The existence of potential pollutant sources were also considered, with sites positioned below major tributaries to identify potential sources from subwatersheds. A brief description of each site which states the basic rationale for including these sites is also included in **Table 3**. These sites are proposed locations and changes may be made based on site access permission or other unforeseen problems. Basic considerations for determining sampling locations are discussed in DEQ's Field Procedures Manual (DEQ 2012). **Table 4** summarizes the sampling to be conducted per site visit.

Table 4. Number of Samples Planned Per Site

Site Visit #	Parameter Group	Waterbody Name (# of potential sites)
		Otter Creek (12)
Visit 1 (May)	TR Metals Suite	12
	Dissolved Al and Fe	12
	TSS, TDS, <i>in situ</i> measurements of SC, water temperature, DO, pH, and flow	12
Visit 2 (July)	TR Metals Suite	12
	Dissolved Al and Fe	12
	Nutrients (TN, TP, NO ₂₊₃)	12
	Sediment Metals	12
	TSS, TDS, <i>in situ</i> measurements of SC, water temperature, DO, pH, and flow	12

2.2 SAMPLING TIMEFRAME

The initial metals sampling event will occur during high flow conditions (anticipated in late May to mid-June). Additional sampling events will occur during low flow conditions in July. At least seven days will pass between metals monitoring events at any individual monitoring site (DEQ 2011).

Sampling events for nutrients will occur during low flow conditions throughout the "growing season" for the Northwestern Great Plains Ecoregion 43 (July 1 - September 30).

Sampling events for sediment metals will occur during low flow conditions (July).

Flow, water temperature, pH, DO, and SC will be measured, and photos will be taken, at each site during each site visit in both high and low flow conditions.

3.0 FIELD PROCEDURES

All field procedures described throughout this SAP are documented in DEQ's Water Quality Planning Bureau Field Procedures Manual For Water Quality Assessment Monitoring (DEQ 2012) unless otherwise noted.

3.1 GENERAL SAMPLING SEQUENCE

To minimize site disturbance which may bias samples, parameters that are most sensitive to disturbance will be collected before monitoring parameters that are less sensitive to disturbance. The general sequence is as follows:

1. Chemistry parameters (e.g., *in situ* field measurements, water chemistry)
2. Physical parameters (e.g., flow, photographs)

3.2 COLLECTING IN SITU CHEMISTRY FIELD MEASUREMENTS

Instantaneous field measurements will be collected *in situ* during each sampling event at each sampling site using a YSI 85 or similar meter. These measurements will be collected prior to the collection of water samples or other physical disturbances to the water column or substrate. Instrument-specific operations manuals contain instructions on use of individual field meters used to record continuous field measurements. See **Section 6** for information on calibrating instruments. Parameters will include:

- dissolved oxygen
- pH
- specific conductivity
- water temperature

3.3 COLLECTING CHEMISTRY SAMPLES IN STREAMS AND RIVERS

After *in situ* measurements are complete, chemistry samples will be collected at each site. All water and benthic sediment samples will be collected in new acid-washed high-density polyethylene (HDPE) bottles unless otherwise noted. Detailed methodology for each type of sample collection described below can be found in DEQ's Field Procedures Manual (DEQ 2012). **Table 5** summarizes sample containers, holding times, and preservation.

Collecting water samples for total recoverable fractions (unfiltered, acid-preserved)

Bottles and lids will be triple-rinsed with ambient stream water prior to grabbing the final sample. TN will be collected in a single 250ml HDPE bottle and kept on ice (not frozen) until analyzed. TP and NO₂₊₃ will be collected in a single 250ml HDPE bottle, will be preserved with sulfuric acid and kept on ice (not frozen) until analyzed. TSS and TDS will be collected in a single 500 ml HDPE bottle and kept on ice (not frozen) until analyzed. Total recoverable metals will be collected in a single 250ml HDPE bottle, will be preserved with nitric acid and kept on ice (not frozen) until analyzed. Hardness will be calculated from the total recoverable metals bottle.

Water samples for dissolved fractions (filtered)

Samples will be filtered through a 0.45 µm filter into 250 ml HDPE bottles using a 60 cm³ syringe connected to a disposal 0.45 µm filter capsule. A small amount of the sample will be wasted through the

filter first, and the sample bottle and lid will be triple-rinsed with filtrate before the final filtered sample is collected. For dissolved aluminum and iron, 50 ml of the filtrate will be placed in a 250 ml HDPE bottle, preserved with nitric acid and kept on ice (not frozen) until analyzed (Table 5).

3.4 COLLECTING BENTHIC SEDIMENT SAMPLES FOR METALS ANALYSIS

Sediment collected for metals analysis will be a composite of sediment collected at five depositional areas. Sediment will be passed with a minimal amount of ambient stream water through a Teflon 63-micron mesh sieve using a Buchner funnel into a 2000 ml HDPE bottle. The bottle will be filled no more than 1/5 full (or approximately 1cm deep in a 2L wide-mouth sample bottle) while minimizing the amount of water in the sample bottle. No preservative will be added, and the sample will be held on ice (not frozen) until analyzed.

Table 5. Sampling Volumes, Containers, Preservation, and Holding Times

Analyte	Bottle Size	Container	Preservation	Storage	Holding time
TN	250 ml	HDPE bottle	None	Cool to <6 °C (on ice)	28 days
TP, NO ₂ +NO ₃	250 ml	HDPE bottle	Sulfuric acid	Cool to <6 °C (on ice)	28 days
Total Suspended Solids	500 ml	HDPE bottle	None	Cool to <6 °C (on ice)	7 days
Total Dissolved Solids	500 ml	HDPE bottle	None	Cool to <6 °C (on ice)	7 days
Total Recoverable Metals	250 ml	HDPE bottle	Nitric acid	Cool to <6 °C (on ice)	180 days
Dissolved Metals	250 ml	HDPE bottle	0.45 um field filtered; nitric acid	Cool to <6 °C (on ice)	180 days
Sediment Metals	2000 ml	HDPE bottle	None	Cool to <6 °C (on ice)	180 days

3.5 MEASURING PHYSICAL PARAMETERS

Measuring flow (total discharge)

Flow will be measured at each site during each sampling event using the quantitative flow meter method or the semi-quantitative float method (DEQ 2012). The quantitative flow meter method is preferred, although the float method is acceptable when high flows or other conditions pose a safety hazard and prevent wading.

Taking digital photographs to document the site

Digital photographs will be taken at each monitoring location (DEQ 2012), facing upstream, downstream and across the channel. Additional photos may be taken to document any relevant site-specific characteristics that are observed (e.g., pugging/hummocking, eroding banks, check dams, irrigation returns, and dikes). For each photo, the photo number and a brief description will be recorded on a photo log.

Site Comments

Pertinent site comments or observations by field personnel will be recorded on site visit field forms or in a field logbook.

Dissolved oxygen, specific conductivity, and water temperature

Immediately upon arrival at the site, turn the YSI 85 (or similar meter) instrument on, open the case and allow it to remain undisturbed for ≥ 15 minutes in a shaded location.

Perform field calibration of dissolved oxygen, using the calibration values appendix in the operations manual to verify measurement accuracy.

At the site, submerge the probe in the water, shake vigorously to remove any air bubbles trapped near the probe, and position it facing upstream into the flow. Ensure that there are no obstructions in front of the probe (e.g., rocks, macrophytes, debris). If the water is not flowing, gently move the probe from side to side to circulate the water around the probe.

Allow a few moments for measurements to stabilize and record dissolved oxygen (mg/L), specific conductivity (μS), and water temperature ($^{\circ}\text{C}$).

pH

At the site, submerge the probe in the water. Allow a few moments for instrument measurements to stabilize and record pH.

While in the field at the end of each day of sampling, perform a two-point calibration check to verify performance of the meter.

4.0 SAMPLE HANDLING PROCEDURES

Field samples will be collected and preserved in accordance to **Section 3**. The field crew will be responsible for proper labeling, sample custody documentation and storage in accordance to the specifications in the DEQ Field Procedures Manual (<http://www.deq.mt.gov/wqinfo/qaprogram/sops.mcp>) (DEQ 2012). Water chemistry and sediment metals will be delivered to Energy Laboratory in Billings, Montana for analysis.

5.0 LABORATORY ANALYTICAL METHODS

Chemistry samples will be analyzed according to the methods listed in **Table 6**. In addition, **Table 6** lists the required reporting limits to effectively evaluate the data to meet the project objectives.

Table 6. Analytical Methods and Required Reporting Values

Water Sample – Nutrients		
Analyte	Method	Required Report Limit (ug/L)
Total Persulfate Nitrogen (TPN)	A 4500-N-C	40
Total Phosphorus as P	EPA 365.1	3
Nitrate-Nitrite as N	EPA 353.2	10
Water Sample - Dissolved Metals		
Aluminum	EPA 200.7	9
Iron	EPA 200.7	20
Water Sample - Total Recoverable Metals		
Metal	Method	Required Report Limit (ug/L)
Arsenic	EPA 200.8	1
Cadmium	EPA 200.8	0.03
Chromium	EPA 200.8	1
Copper	EPA 200.8	1
Iron	EPA 200.7	20
Lead	EPA 200.8	0.3
Selenium	EPA 200.8	1
Silver	EPA 200.8	0.2
Zinc	EPA 200.7	8
Total Hardness	A2340B (calculated)	1000
Total Recoverable Metals Digestion	EPA 200.2	N/A
Water Sample - Other		
Analyte	Method	Required Report Limit (ug/L)
Total Suspended Solids (TSS)	A2540 D	4000
Total Dissolved Solids (TDS)	A2540 C	4000

Sediment Sample – Total Recoverable Metals		
Metal	Method	Required Report Limit (mg/kg dry weight)
Arsenic	EPA 200.8	1
Cadmium	EPA 200.8	0.2
Chromium	EPA 200.8	9
Copper	EPA 200.8	15
Iron	EPA 200.7	10
Lead	EPA 200.8	5
Zinc	EPA 200.7	20
Mercury	EPA 7471B	0.05
Total Recoverable Metals Digestion	EPA 200.2	N/A

6.0 QUALITY ASSURANCE AND QUALITY CONTROL REQUIREMENTS

Quality Assurance/Quality Control (QA/QC) procedures for the monitoring will consist of calibrating field meters and collecting field QC samples.

6.1 CALIBRATING FIELD METERS

A YSI 85 or similar meter should be used for measuring parameters including dissolved oxygen, pH, specific conductivity, and water temperature.

In the Laboratory

All field instruments will be calibrated in the laboratory before they are taken into the field. These calibrations will be performed in accordance with instrument-specific acceptance criteria, operations manuals, QAPPs and SOPs. Calibration information will be recorded in the instruments' calibration log(s) and will remain with the instrument at all times (DEQ 2012).

In the Field

Some field meters require *in situ* field calibration in addition to laboratory calibration before they are used in the field. YSI 85 field meters must be calibrated for dissolved oxygen before they are used at each monitoring site. For all dissolved oxygen field calibrations, the following information is recorded in an instrument logbook: 1) date, 2) time, 3) site location, 4) elevation, and 5) the initials of the analyst performing the calibrations. Hand-held pH meters must be calibrated daily using a two-point calibration. Calibration instructions for each meter are located in the user manual kept in each instrument's case.

6.2 FIELD QUALITY CONTROL SAMPLES

Duplicate Samples

For each type of routine water or sediment chemistry parameter, duplicate samples will be collected for at least 10% of the total number collected. One duplicate will be collected for each sampling event. Sites where duplicate samples will be prepared will be randomly selected. When collecting duplicate samples, a sampling location will be chosen that allows for two samples to be taken side-by-side upstream from any previous disturbances. To collect duplicate samples, all procedures performed in collecting, labeling and preserving the routine sample will be followed so that two identical samples have been collected at the same site. Duplicate samples will be submitted to the analytical laboratory along with routine samples.

Field Blanks

For each type of routine water or sediment chemistry parameter, blank samples will be collected for at least 10% of the total number collected throughout the sampling season. Field blanks are prepared in the field each time that routine water samples are to be delivered to the analytical laboratory. Field blanks are prepared in the field after sampling the last site of a multi-site sampling trip, or mid-trip if sample holding times require samples to be delivered to the lab part-way through a multi-site sampling trip. Field blanks will be prepared using distilled water provided by the analytical laboratory which field personnel will keep in clean, triple-rinsed HDPE bottles. One field blank will be prepared and submitted per routine sample type collected throughout the trip. Preparing field blanks will follow the same sample collection, labeling and preservation procedures as those used to collect routine samples except distilled water is used instead of stream water.

7.0 HANDLING SAMPLING RECORDS

Hydrometrics will be responsible for filling out site visit forms and field forms. A site visit form will be filled out at every site regardless if data is collected (i.e., the site is dry). If Hydrometrics uses their own versions of a site visit form, this form must have the equivalent information found in DEQ's Site Visit Form (**Attachment A**). Site Visit Forms, field forms, and digital photos will be sent by Hydrometrics to WQP staff to be processed by WQP staff using DEQ's internal QA/QC procedures. Analytical laboratories will provide results to DEQ in the required EDD format. DEQ will perform the necessary data evaluations and will manage the data in accordance with internal procedures.

8.0 SCHEDULE

Monitoring will be completed during mid-May to early June 2013 during high flow and July 2013 for the low-flow sampling event. All monitoring will be completed prior to the end of the growing season (before September 30). Reporting will be fully complete by August of 2013.

9.0 PROJECT TEAM AND RESPONSIBILITIES

Sampling for this project will be conducted by Hydrometrics, Inc. Team members and their responsibilities for the 2013 sampling event are provided in **Table 7**. Hydrometrics is responsible for field data collection and will submit samples to Energy Laboratories. DEQ will pay for analytical services for

the 6 proposed new sites detailed in **Table 3**. Hydrometrics will pay for analytical services for the 6 existing Hydrometrics site locations (SW2, SW16, SW22, SW3, SW23, SW25) detailed in **Table 3**. Hydrometrics will provide site visit forms, field forms, and photos to DEQ.

DEQ will:

- Place bottle orders prior to each sampling event (Steve Fernandes). A week's notice will be given prior to sampling events.
- Provide a list of landowner contact information for DEQ-selected sites.

Hydrometrics will:

- Pick up bottles, preservatives, coolers, etc. from the lab.
- Call landowners that have requested notification prior to sampling.
- Provide scanned copies of all field forms for both rounds of sampling, including photo logs and discharge monitoring forms to DEQ. Site visit forms must include the station ID and station name, date, field parameters collected, the samples/parameters collected, and the activities performed (e.g., measured flow).
- Provide electronic copies of site photographs.
- Provide an excel spreadsheet of the photo log that will include at a minimum: the photo number and photo description. Electronic file names must match photo numbers in the photo log/Excel spreadsheet. Otherwise, the file name must also be included in the spreadsheet, or the files must be renamed with a descriptive name.
- Direct Energy Laboratories to send invoices for DEQ-selected sites, EDDs, laboratory reports, and chain of custodies to Jolene McQuillan.

Analytical services will be split into 2 work orders (1 for services paid by DEQ, 1 for services paid by Hydrometrics) and result in 2 EDDs, however "MTeWQX" will be entered for the EDD on both chains of custodies.

Table 7. Project team members and responsibilities for the 2013 sampling event

Team Member	Affiliation	Responsibilities	Email
Kristy Fortman	DEQ	DEQ Project Manager, QA oversight during sampling activities	kfortman@mt.gov
Darrin Kron	DEQ	Monitoring and Assessment Section Supervisor, Fiscal contact	dkron@mt.gov
Steve Fernandes	DEQ	Lab logistics	sfernandes@mt.gov
Christina Staten	DEQ	Land access above mine area	cstaten@mt.gov
Heidi Kaiser	Hydrometrics	Project Manager	HKaiser@hydrometrics.com
Carl Lanz, Chris Johnson, and Tyler Swant	Hydrometrics	Field crew member and management of field data	
Energy Laboratories	Lab	Analytical services	
Jolene McQuillan	DEQ	Data management, final WQX approval and upload	JMcQuillan@mt.gov
Mindy McCarthy	DEQ	Quality Assurance Officer; Overall project QA oversight	MMcCarthy3@mt.gov

10.0 REFERENCES

DEQ (Montana Department of Environmental Quality). 2011. Water Quality Assessment Method. Helena, MT: Montana Department of Environmental Quality.

DEQ (Montana Department of Environmental Quality). 2012. Water Quality Planning Bureau Field Procedures Manual For Water Quality Assessment Monitoring Version 3.0. Helena, MT: Montana Dept. of Environmental Quality.