BITTERROOT RIVER TRIBUTARIES SAMPLING PROJECT — 2012

Sampling and Analysis Plan

Prepared for:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
Water Quality Monitoring and Assessment and Water Quality Management Sections, Water Quality Planning Bureau
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Approvals

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1.0 Introduction and Background Information

This project is to support TMDL development in the Bitterroot TMDL Planning Area (TPA) and 303(d) list assessment (DEQ 2011a, Suplee *et al*. 2008). The focus will be on collecting metals, nutrients, chlorophyll *a*, and macroinvertebrate samples.

The Bitterroot River is located in Missoula and Ravalli counties in southwestern Montana. The river begins where the east and west forks come together and flows north until it drains into the Clark Fork River at Missoula. The valley contains a diverse variety of nutrient sources including septic, urban, suburban, agricultural, silvicultural and natural sources. Other anthropogenic sources of impairment might also include past mining activity. The streams in the Bitterroot TPA have been assigned a B-1 beneficial use classification (ARM 17.30.623).

The Water Quality Planning Bureau (WQPB) of the Montana Department of Environmental Quality (MDEQ) has identified fifteen Category 5 streams impaired for nutrients in the Bitterroot watershed. These waterbodies include two segments of the Bitterroot River (MT76H001_020, MT76H001_030) and thirteen tributaries to the river. Of these, twelve tributaries and both Bitterroot River segments will be sampled in 2012 to meet the proposed nutrient criteria (Suplee and Sada, 2011). Though not currently listed, the third Bitterroot River segment (MT76H001_010) will also be sampled for nutrients and chlorophyll *a*. These are listed in Table 1.1 below.

MDEQ has also identified four waterbodies currently impaired for metals. Of these four, only Skalkaho Creek requires additional sampling to meet requirements for the metals proposed assessment method (Drygas, 2011).

Additionally, a risk-based assessment method will be applied to the watershed to determine anthropogenic sources of metals. For this project, a GIS was created with the STATE.ABANDONED_MINES_MBMG layer to look at past mining activity on Bitterroot tributaries. Additional metals sampling will take place on waterbodies with significant abandoned mining activity, but without listed metal impairments and also on unlisted waterbodies with no apparent past mining history. This information is displayed in Table 1.2.

All of the assessment unit segments are located in the Columbia Basin (4th code HUC 17010205) and are contained within the Middle Rockies and Idaho Batholith Level III ecoregions.

Table 1.1 – Current 303(d) nutrient listings and waterbodies to be sampled for nutrients and/or Chlorophyll *a* and/or macroinvertebrates in the Bitterroot TPA

Waterbody	AUID	2012 303(d) Nutrient Listings
Ambrose Creek	MT76H004_120	Nitrogen (Total) Phosphorus (Total)
Bass Creek	MT76H004_010	Nitrogen (Total)
Bitterroot River	MT76H001_010	-
Bitterroot River	MT76H001_020	Nitrate/Nitrite (Nitrite + Nitrate as N) Phosphorus (Total)
Bitterroot River	MT76H001_030	Nitrogen, Nitrate

Waterbody	AUID	2012 303(d) Nutrient Listings
Lick Creek	MT76H004_170	Phosphorus (Total) Total Kjehldahl Nitrogen (TKN) Chlorophyll-*a*
Miller Creek	MT76H004_130	Phosphorus (Total) Nitrate/Nitrite (Nitrite + Nitrate as N) Chlorophyll-*a*
Muddy Spring Creek	MT76H004_180	Nitrate/Nitrite (Nitrite + Nitrate as N)
North Burnt Fork Creek	MT76H004_200	Phosphorus (Total) Nitrogen (Total)
North Fork Rye Creek	MT76H004_160	Nitrogen (Total) Phosphorus (Total)
Rye Creek	MT76H004_190	Nitrogen (Total) Phosphorus (Total)
Sleeping Child Creek	MT76H004_090	Nitrogen (Total) Phosphorus (Total)
Sweathouse Creek	MT76H004_210	Phosphorus (Total)
Tin Cup Creek	MT76H004_080	Nitrogen (Total)
Willow Creek	MT76H004_110	Nitrogen (Total) Chlorophyll-*a*

Table 1.2 – Current 303(d) metal listings and waterbodies to be sampled for metals in the Bitterroot TPA

Waterbody	AUID	2012 303(d) Metal Listings	Mainstem Source Assessment	
			History of Mining	No Apparent History of Mining
Bass Creek	MT76H004_010	None	X	
Bitterroot River	MT76H001_010	Copper		X
Bitterroot River	MT76H001_020	None		X
Bitterroot River	MT76H001_030	Copper, Lead		X
Eightmile Creek	None Assigned	None	X	
Lick Creek	MT76H004_170	None		X
Miller Creek	MT76H004_130	None	X	
North Burnt Fork Creek	MT76H004_200	None		X

Waterbody	AUID	2012 303(d) Metal Listings	Mainstem Source Assessment	
			History of Mining	No Apparent History of Mining
Rye Creek	MT76H004_190	None	X	
Skalkaho Creek	MT76H004_100	Mercury	X	
Sleeping Child Creek	MT76H004_090	None	X	
Sweathouse Creek	MT76H004_210	None	X	
Tin Cup Creek	MT76H004_080	None		X
West Fork Bitterroot River	MT76H003_010	None	X	
Willow Creek	MT76H004_110	None		X

2.0 Objectives and Design of the Investigation

2.1 Project Objectives

The goals for this project are as follows:

1. Collect metals (total recoverable; dissolved Al; low-level Hg) and total suspended solids (TSS) in those streams listed in Table 1.2; collect nutrients (total phosphorus (TP), total nitrogen (TN), and nitrate + nitrite (NO_{2+3})), and chlorophyll *a*/ash-free dry weight samples on all streams listed in Table 1.1.
2. Assess macroinvertebrate assemblages on Muddy Spring Creek, Tin Cup Creek, and Sweathouse Creek.
3. Measure physical parameters (temperature, dissolved oxygen, pH, and conductivity) *in situ* and monitor flow throughout the sampling timeframe on all waterbody segments.

2.2 Sampling Timeframe

Sampling for metals will occur once per site during high flow (anticipated early June). All other sampling events for metals, nutrients, chlorophyll *a*/ash-free dry weight, and macroinvertebrates will occur during the "growing season" for the Middle Rockies Level III Ecoregion (July 1 – September 30) (MDEQ 2011a). Approximately 30 days will pass between sampling events at each site (MDEQ 2011a).

3.0 Field Sampling Methods

3.1 Selection of Sites

Table 3.1 lists the potential monitoring sites to be sampled during the 2012 field season and Figure 3.1 and 3.2 depict the location of each waterbody. Table 3.2 summarizes the sampling needs per site visit to each of these waterbodies. These sites are proposed locations and changes may be made based on land access or other unforeseen problems.

Table 3.1 – Monitoring site names and locations to be sampled in the Bitterroot TPA during the 2012 field season

Waterbody	Station ID	Latitude	Longitude
Ambrose Creek	BTR-AMBROSE1	46.56074	-114.02373
	THMAMBPARK-2	46.5579	-113.99683
	THMAMBCONFL-1	46.56452	-114.03505
	New: AmbroseCreek-1	46.5492	-113.9685
Bass Creek	C05BASSC20	46.57577	-114.09946
	C05BASSC01	46.5745	-114.1344
	BASS93S	46.5739	-114.09414
	New: Bass Creek-1	46.575949	-114.1095
Bitterroot River MT76H001_010	C05BITRR22	46.1984	-114.169
	C05BITRR01	46.092222	-114.174167
	USGS Site near Darby	45.972142	-114.141474
Bitterroot River MT76H001_020	BWMBELCROS	46.443611	-114.123333
	BWMPKRJORR	46.580278	-114.0775
	C05BITRR23	46.3128	-114.1444
Bitterroot River MT76H001_030	C05BITTR01	46.853333	-114.098889
	BWMBUKHSBR	46.831667	-114.053611
	C05BITRR14	46.7215	-114.0463
Eightmile Creek	New: Eightmile Creek	46.63325	-114.049964
Lick Creek	New: Lick Creek-1	46.07768	-114.2259
	New: Lick Creek-2	46.0827	-114.206
	New: Lick Creek-3	46.09424	-114.189557
	C05LICK10	46.07583	-114.25534
Miller Creek	MILLERTRAILS	46.78839	-114.04338
	BTR-MILLER2	46.78048	-114.01286
	C05MILRC02	46.77748	-113.96509
Muddy Spring Creek	New: Muddy Spring Creek-1	46.387	-113.945
	New: Muddy Spring Creek-2	46.3831	-113.914
North Burnt Fork Creek	BURNTWILD	46.5272	-114.08805
	C05BRFNC01	46.54057	-114.09318
North Fork Rye Creek	NFRYECONF	45.97784	-114.03825
	C05RYNFC01	45.9973	-114.0299
	New: N F Rye Creek-1	45.988001	-114.033568
	New: N F Rye Creek-2	46.01222	-114.023293
Rye Creek	New: Rye Creek-2	45.974139	-114.064571
	BITR-C05RYEC02	45.96634	-114.135
	New: Rye Creek-1	45.967041	-114.107866
Skalkaho Creek	C05SKALC10	46.21284	-114.15129
	C05SKALC20	46.17877	-114.07135
	C05SKALC30	46.16237	-113.94258
Sleeping Child Creek	BITR-C05SLPCC02	46.16113	-114.15811
	New: Sleeping Child Creek-1	46.151656	-114.128032
	New: Sleeping Child Creek-2	46.141559	-114.099117
	New: Sleeping Child Creek-3	46.137994	-114.07225
Sweathouse Creek	New: Sweathouse Creek-1	46.42396	-114.145099
	New: Sweathouse Creek-2	46.410881	-114.190614
	New: Sweathouse Creek-3	46.417977	-114.229446

Waterbody	Station ID	Latitude	Longitude
Tin Cup Creek	New: Tin Cup Creek-1	46.013906	-114.170664
West Fork Bitterroot River	New: West Fork Bitterroot	45.909188	-114.169958
Willow Creek	New: Willow Creek-1	46.295299	-114.044823
	New: Willow Creek-2	46.29195	-113.958116
	C05WILL30	46.32355	-114.13319

Figure 3.1 – Location of waterbodies to be sampled for nutrients in the Bitterroot TPA during the 2012 field season (northern points)

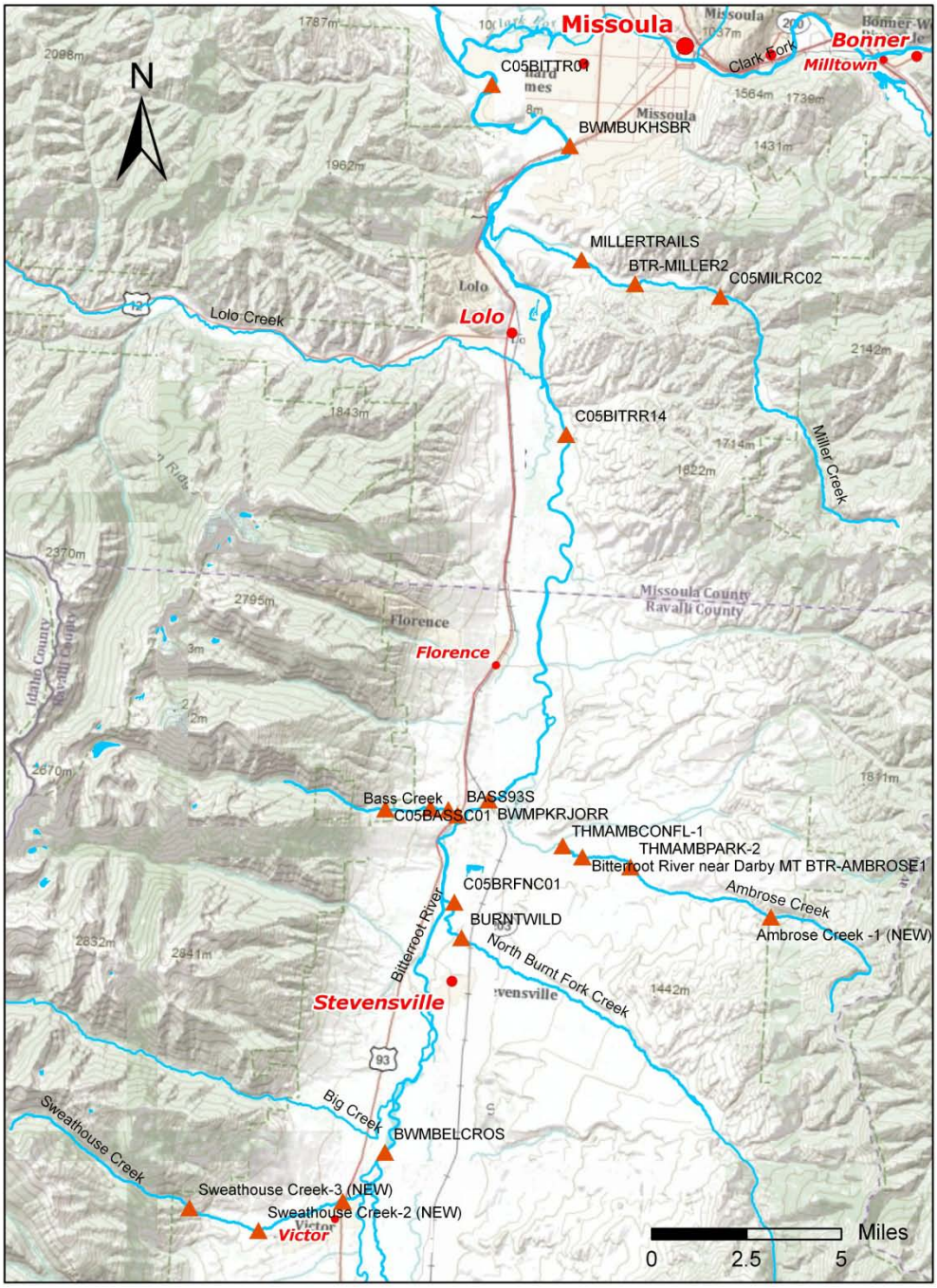

Figure 3.2 – Location of waterbodies to be sampled for nutrients in the Bitterroot TPA during the 2012 field season (southern points)

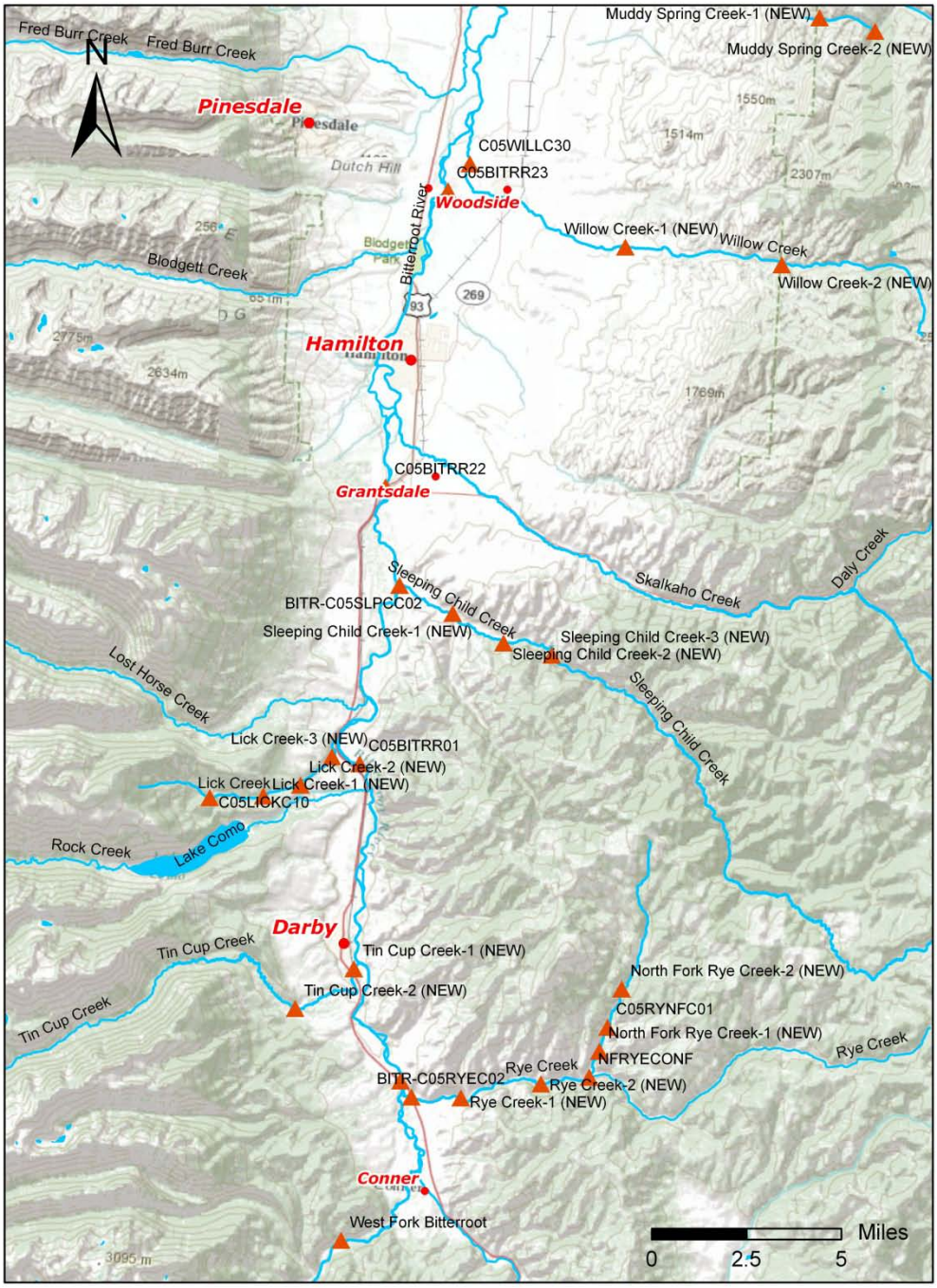

Table 3.2 - Number of samples to be collected per parameter per waterbody in 2012

Site Visit #	Parameter Group	Waterbody Name (# of potential sites)				
		Ambrose Creek (4)	Bass Creek (4)	Bitterroot River MT76H001_010 (3)	Bitterroot River MT76H001_020 (3)	Bitterroot River MT76H001_030 (3)
1	Nutrients (TN, TP, NO_{2+3})	-	-	-	-	-
	Chlorophyll *a* & Ash-Free Dry Weight	-	-	-	-	-
	Macroinvertebrates	-	-	-	-	-
	TSS, Total Recoverable Metals, Total Dissolved Aluminum	-	1	1	3	1
	Low-Level Mercury	-	-	1	3	1
	in situ measurements, & flow	-	1	1	3	1
2	Nutrients (TN, TP, NO_{2+3})	4	4	3	3	3
	Chlorophyll *a* & Ash-Free Dry Weight	3	2	3	3	3
	Macroinvertebrates	-	-	-	-	-
	TSS, Total Recoverable Metals, Total Dissolved Aluminum	-	1	1	3	1
	Low-Level Mercury	-	-	1	3	1
	in situ measurements, & flow	4	4	3	3	3
3	Nutrients (TN, TP, NO_{2+3})	4	4	-	-	-
	Chlorophyll *a* & Ash-Free Dry Weight	-	-	-	-	-
	Macroinvertebrates	-	-	-	-	-
	TSS, Total Recoverable Metals, Total Dissolved Aluminum	-	1	1	3	1
	Low-Level Mercury	-	-	1	3	1
	in situ measurements, & flow	4	4	1	3	1

Site Visit #	Parameter Group	Waterbody Name (# of potential sites)						
		Eight mile Creek (1)	Lick Creek (4)	Miller Creek (3)	Muddy Spring Creek (2)	North Burnt Fork Creek (2)	North Fork Rye Creek (4)	Rye Creek (3)
1	Nutrients (TN, TP, NO_{2+3})	-	-	-	-	-	-	-
	Chlorophyll *a* & Ash-Free Dry Weight	-	-	-	-	-	-	-
	Macroinvertebrates	-	-	-	-	-	-	-
	TSS, Total Recoverable Metals, Total Dissolved Aluminum	1	1	1	-	1	-	1
	Low-Level Mercury	1	-	-	-		-	
	in situ measurements, & flow	1	1	1	-	1	-	1
2	Nutrients (TN, TP, NO_{2+3})	-	4	3	2	2	4	3
	Chlorophyll *a* & Ash-Free Dry Weight	-	3	2	1	2	2	-
	Macroinvertebrates	-	-		1	-	-	-
	TSS, Total Recoverable Metals, Total Dissolved Aluminum	1	1	-	-	1	-	1
	Low-Level Mercury	1	-	-	-	-	-	-
	in situ measurements, & flow	1	4	3	2	2	4	3
3	Nutrients (TN, TP, NO_{2+3})	-	4	2	2	2	4	2
	Chlorophyll *a* & Ash-Free Dry Weight	-	-	-	1	-	-	-
	Macroinvertebrates	-	-	-	1	-	-	-
	TSS, Total Recoverable Metals, Total Dissolved Aluminum	1	1	1	-	1	-	1
	Low-Level Mercury	1	-	-	-	-	-	-
	in situ measurements, & flow	1	4	2	2	2	4	2

Site Visit #	Parameter Group	Waterbody Name (# of potential sites)					
		Skalkaho Creek (3)	Sleeping Child Creek (4)	Sweathouse Creek (3)	Tin Cup Creek (2)	West Fork Bitterroot (1)	Willow Creek (3)
1	Nutrients (TN, TP, NO_{2+3})	-	-	-	-	-	-
	Chlorophyll *a* & Ash-Free Dry Weight	-	-	-	-	-	-
	Macroinvertebrates	-	-	-	-	-	-
	TSS, Total Recoverable Metals, Total Dissolved Aluminum	3	1	1	1	1	1
	Low-Level Mercury	3	1	-	-	1	-
	in situ measurements, & flow	3	1	1	1	1	1
2	Nutrients (TN, TP, NO_{2+3})	-	4	3	2	-	3
	Chlorophyll *a* & Ash-Free Dry Weight	-	2	1	2	-	3
	Macroinvertebrates	-	-	1	1	-	
	TSS, Total Recoverable Metals, Total Dissolved Aluminum	3	1	1	1	1	1
	Low-Level Mercury	3	1	-	-	1	-
	in situ measurements, & flow	3	4	3	2	1	3
3	Nutrients (TN, TP, NO_{2+3})	-	4	-	2	-	2
	Chlorophyll *a* & Ash-Free Dry Weight	-	-	-	1	-	-
	Macroinvertebrates	-	-	-	-	-	-
	TSS, Total Recoverable Metals, Total Dissolved Aluminum	3	1	1	1	1	1
	Low-Level Mercury	3	1	-	-	1	-
	in situ measurements, & flow	3	4	1	2	-	2

3.2 Physical parameters

3.2.1 *In Situ* Measurements

During each sampling event at each sampling site, a YSI 85 field meter will be used to collect *in situ* measurements of temperature, dissolved oxygen, and specific conductance, and a portable pH meter will be used to measure pH. These measurements will be collected prior to the collection of water samples or other physical disturbances to the water column or substrate. See details about calibration in Section 6.0.

3.2.2. Flow Measurement

Flow will be measured at each site during each sampling event using the quantitative flow meter method, although the semi-quantitative float method will be used, as necessary, when high flows prevent wading (DEQ 2011b).

3.3 Nutrient & Other Water Chemistry Sample Collection

Water (grab) samples will be collected at each site after completing the *in situ* YSI 85 measurements. All water samples from the stream will be collected in new acid-washed high-density polyethylene (HDPE) bottles. Sample replicates will be randomly taken on at least 10% of the total samples for each parameter. Field blanks will be made prior to departure from the field at the end of each sampling run ("trip").

3.3.1 Nutrient and Other Water Chemistry Sample Collection

Table 3.3 summarizes sampling volumes, containers, preservation and holding time requirements for all water chemistry samples collected from these three water bodies.

Dissolved Aluminum: A 60 cm^3 syringe and a 0.45 um filter disposable filter are used. 50 ml of the filtrate will be placed in a 250 ml HDPE bottle, preserved with nitric acid, and kept on ice until analyzed (Table 3.3). Filtration will be accomplished with a large syringe connected to a disposal filter capsule. A small amount of the sample will be wasted through the filter before the filtered sample is collected. Sample bottles and lids will be pre-rinsed with a small amount of the filtered sample before collecting the final filtered sample. Detailed methodology can be found in MDEQ (2011).

Nutrients, TSS and Metals: Summary information is shown in Table 3.2. TP and NO_{2+3} will be collected in a 250 ml HDPE bottle. This sample will be preserved with sulfuric acid, and held on ice. TN will be collected in another 250 ml HDPE bottle, no preservative, and held on ice. Total recoverable metals will be collected in a 250 ml HDPE bottle, preserved with nitric acid, and held on ice. Hardness will be calculated from the TR metals bottle. TSS will be collected in a 500 ml HPDE bottle, no preservative, and held on ice. NOTE THE SHORT HOLDING TIME FOR TSS. Detailed methodology can be found in MDEQ (2011). Total recoverable mercury using the ultra-low level method follows a different procedure. A detailed explanation can be found in the MDEQ Ultra-low level mercury Standards Operating Procedure (2010).

Table 3.3 - 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)	30 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 Recoverable Metals	250 ml	HDPE bottle	Nitric acid	Cool to <6 °C (on ice)	180 days
Dissolved Aluminum	250 ml	HDPE bottle	0.45 um field filtered, nitric acid	Cool to <6 °C (on ice)	180 days
Ultra Low Level Hg	100 ml	Glass	0.5 ml 12N HCl	Cool to <6 °C (on ice)	28 days
Chlorophyll-*a*	N/A	Ziplock bag (hoop), centrifuge tube (template), or centrifuge tube (core)	None	Dry ice	45 days
Macroinvertebrates (species presence)	1000 ml	HPDE bottle	Ethanol	No ice	NA

3.4 Chlorophyll *a* and Ash-Free Dry Weight

Chlorophyll *a* sampling will take place on each waterbody following the EMAP reach-wide procedure (Peck *et al.* 2006; DEQ 2011c). Samples will *not* be composited, and ash-free dry weight analysis will be done from the chlorophyll *a* samples only in hoop and templates.

3.5 Macroinvertebrates

Macroinvertebrate sampling will take place on each waterbody using the EMAP reach-wide procedure (Peck *et al*. 2006). Macroinvertebrate samples will be stored in 1L HDPE bottles topped off with ethanol (MDEQ 2011b).

3.6 Digital Photographs

Digital photographs will be taken (at a minimum) at transect F of each site. At sites where chlorophyll *a* samples are collected, at least one photograph will be taken at each transect (A-K). The objective of these photos is to document visible changes in the stream flora as time passes and, as such, photos will be a combination of close-ups and stream panoramas. The photo number and pertinent transect information will be recorded for each photo.

3.7 Aquatic Plant Tracking Form and Aquatic Plant Visual Assessment Form

Both forms will be completed when chlorophyll *a* samples are collected according to DEQ protocol (DEQ 2011, 2012).

4.0 Sample Handling Procedures

This project follows the WQPB "internal process". Appropriate storage times for water quality samples are discussed in Section 3.3 and shown in Table 3.3. Water chemistry and chlorophyll *a* samples will be delivered to Energy Labs and macroinvertebrate samples will be delivered to Rhithron, Inc. for analysis.

5.0 Laboratory Analytical Measurements

Table 5.1 summarizes, per analyte, the analytical methods and detection/reporting limits to be used for this project during field season 2012.

Table 5.1 - Analytical Methods and Required Reporting Limits*

Analyte	Method	Required Reporting Limit (mg/L)
Water Sample - Nutrients		
Total Phosphorus (TP)	EPA 365.1	0.003
Total Nitrogen (TN)	4500-N B or C	0.04
Nitrate + Nitrite-Nitrogen (NO_2+NO_3-N)	EPA 353.2	0.01
Water Sample – Common Ions		
Total Suspended Solids (TSS)	A 2540 D	4
Water Sample – Dissolved Metals		
Aluminum	EPA 200.7	30
Water Sample – Total Recoverable Metals		
Arsenic	EPA 200.8	3
Cadmium	EPA 200.8	0.08
Chromium	EPA 200.8	1
Copper	EPA 200.8	1
Iron	EPA 200.7	50
Lead	EPA 200.8	0.5
Selenium	EPA 200.8	1
Silver	EPA 200.8	0.5

Analyte	Method	Required Reporting Limit (mg/L)
Water Sample – Total Recoverable Metals		
Zinc	EPA 200.7	10
Water Sample – Total Metals		
Ultra low level Mercury	EPA 245.7	0.005
Biological Samples - Algae		
Chlorophyll *a*	A 10200 H	n/a
Ash-Free Dry Weight (AFDW)	A 10300 C (5)	n/a

6.0 Quality Assurance and Quality Control Requirements

All QA/QC requirements followed by MT DEQ "internal process" will be instituted for this project. The QA/QC requirements are described in DEQ (2005).

YSI 85 meter calibration: Pre-calibration of the YSI 85 meter will be undertaken in the laboratory. The YSI meter will also be calibrated in the field just prior to measuring dissolved oxygen for site-specific altitude at each site following the instructions in the YSI 85 operations manual.

Hand-held pH meter calibration: The pH meter will be pre-calibrated in the laboratory using the two-point method (pH 4.0 and 7.0 standards), and checked against a 4.0 and 7.0 standard each day of sampling in the field, according to the instrument's operations manual.

7.0 Data Analysis, Record Keeping, and Reporting Requirements

This project will follow the WQPB "internal process". Site Visit/Chain of Custody forms, field forms, digital photos, and laboratory results will be processed by WQPB staff following QA/QC procedures as indicated in section 6.0

8.0 Schedule

The Water Quality Monitoring and Assessment staff will sample these waterbodies as indicated in Table 3.2. High flow metals sampling will take place in June 2012. All site visits for nutrient sampling will occur from July 1 – September 30, 2012, during the growing season for the Middle Rockies Level III ecoregions (DEQ 2011a).

9.0 Project Team and Responsibilities

The Water Quality Monitoring and Assessment Section will conduct this project. Darrin Kron will oversee the overall monitoring & assessment component, Jessica Clarke will lead the monitoring and assessment project, and Steven Reistroffer and Katie Makarowski will help with data collection in the field. Christian Schmidt will lead the nutrient TMDL component, and Dean Yashan will oversee the overall TMDL component.

10.0 References

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Prepared for:

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Approvals

_____ _____
Darrin Kron (WQ Monitoring & Assessment Section Manager) Date

_____ _____
Mindy McCarthy (QA Officer) Date

Sampling and Analysis Plan Addendum

This document is an addendum to the Sampling and Analysis Plan (SAP) developed for the 2012 Bitterroot River Tributaries Sampling Project. It details changes made to sampling plans and only pertinent information that was not detailed in the initial SAP is included; additional project details can be found in the original document.

1.0 Introduction and Background Information

The Water Quality Planning Bureau (WQPB) of the Montana Department of Environmental Quality (MDEQ) has identified four waterbodies currently impaired for metals. Originally it was determined that only Skalkaho Creek would need additional sampling to meet requirements for the metals proposed assessment method (Drygas, 2011). While the East Fork Bitterroot River has sufficient data to make assessment decisions, the Environmental Protection Agency (EPA) has determined it will be beneficial to TMDL development to have additional low-flow metal data.

Table 1.1 – Current 303(d) metals listings on tributaries in the Bitterroot TPA

Waterbody	AUID	2012 303(d) nutrient listings
East Fork Bitterroot River	MT76H002_010	Copper, Lead

2.0 Objectives and Design of the Investigation

2.1 Project Objectives

The East Fork Bitterroot River will be added to the list of streams to be sampled for metals.

2.2 Sampling Timeframe

Low-flow sampling for metals will take place in August or September during site visits to nearby waterbodies. The sites on the East Fork Bitterroot River will occur on the same day to characterize in-stream loading.

3.0 Field Sampling Methods

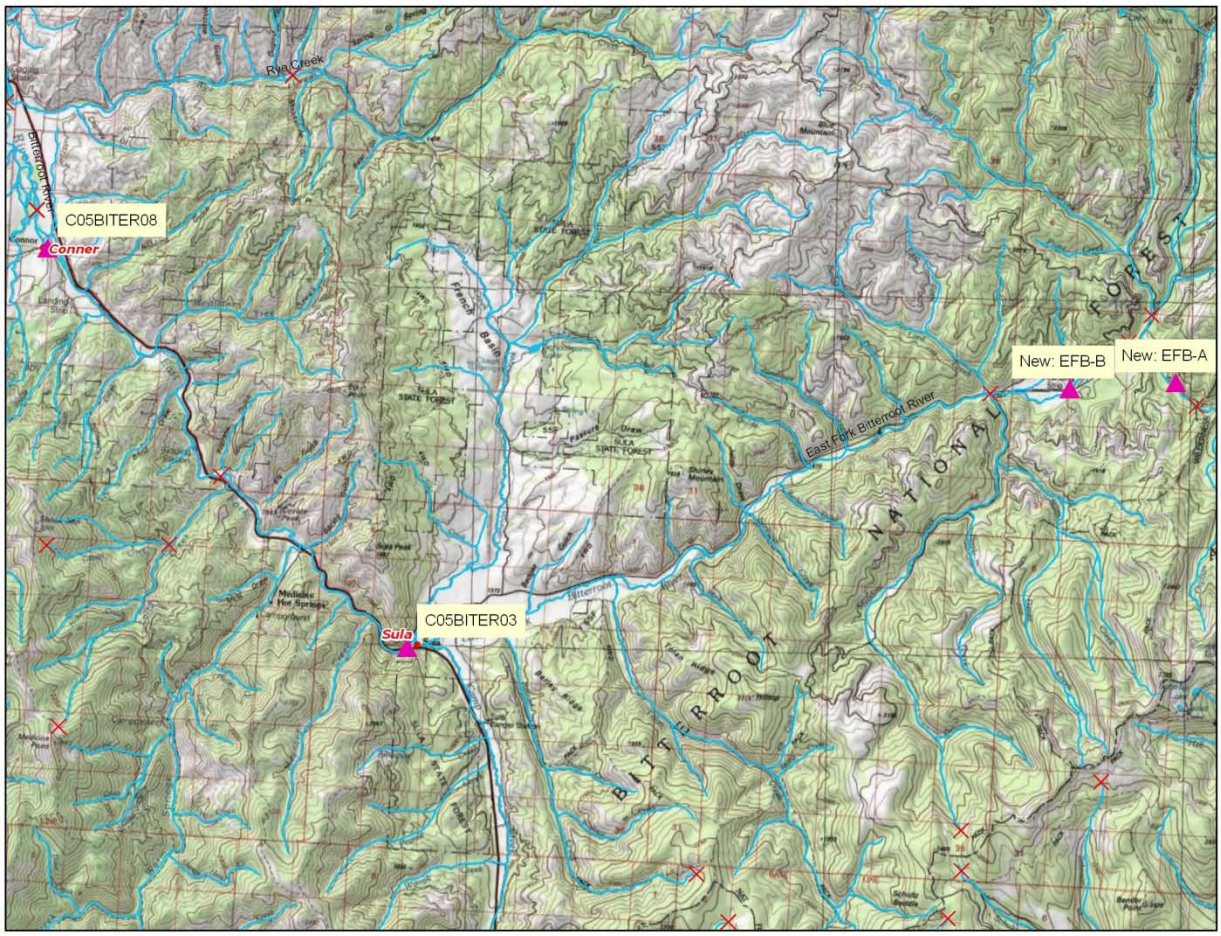
3.1 Selection of Sites

Table 3.1 lists the potential monitoring sites to be sampled on the East Fork Bitterroot River during the 2012 field season. Figure 3.1 depicts the location of each site. These are proposed locations and changes may be made based on land access or other unforeseen problems.

Table 3.1 – Monitoring site names and locations to be sampled in the Bitterroot TPA during the 2012 field season

Waterbody	Station ID	Latitude	Longitude
East Fork Bitterroot River	C05BITER08	45.9308	-114.1229
	C05BITER03	45.8358	-113.9852
	New: EFB-B	45.910	-113.752
	New: EFB-A	45.913	-113.714

Figure 3.1 – Monitoring sites and locations to be sampled on the East Fork Bitterroot River during the 2012 field season



3.2 Water Sample Collection

Water (grab) samples to be tested for metals fractions and TSS will be collected at each of the sites after completing the *in situ* YSI 85 and pH measurements. All metals and TSS samples from the stream will be collected in new acid-washed high density polyethylene (HDPE) bottles. Sample replicates will be randomly taken on at least 10% of the total samples for each parameter. Field blanks will be made prior to departure from the field at the end of each sampling run ("trip loop").

Table 3.2 summarizes sampling volumes, containers, preservation and holding time requirements for these additional metals samples to be collected from these three water bodies.

Dissolved aluminum: Dissolved aluminum will be field filtered through a 0.45 µm filter into a 250 ml HDPE bottle (only 50 ml are necessary), preserved with nitric acid, and held on ice (not frozen) (Table 3.2 of this addendum). Filtration will be accomplished with a large syringe connected to a disposal filter capsule. A small amount of the sample will be wasted through the filter and the bottle will be triple-rinsed with a small amount of filtrate before the final filtered sample is collected.

TSS and Metals: Total recoverable metals will be collected in a 250 ml HDPE bottle, preserved with nitric acid, and held on ice. Hardness will be calculated from the TR metals bottle. TSS will be collected in a 500 ml HPDE bottle, no preservative, and held on ice. NOTE THE SHORT HOLDING TIME FOR TSS. Detailed methodology can be found in MDEQ (2011). Total recoverable mercury using the ultra-low level method follows a different procedure. A detailed explanation can be found in the MDEQ Ultra-low level mercury Standards Operating Procedure (2010).

Table 3.2 - Sampling Volumes, Containers, Preservation, and Holding Times

Analyte	Bottle Size	Container	Preservation	Storage	Holding time
Total Suspended 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 Aluminum	250 ml	HDPE bottle	0.45 um field filtered, nitric acid	Cool to <6 °C (on ice)	180 days
Ultra Low Level Hg	100 ml	Glass	0.5 ml 12N HCl	Cool to <6 °C (on ice)	28 days

4.0 Laboratory Analytical Measurements

Table 4.1 - Analytical Methods and Required Reporting Limits

.Analyte (cont.)	Method (cont.)	Required Reporting Limit (µg/l)
Water Sample - Cations		
Calcium, Magnesium	EPA 200.7	1000
Total Hardness as $CaCO_3$	A2340 B (calculated)	1000
Water Sample - Dissolved Metals		
Aluminum	EPA 200.7	30
Water Sample - Total Recoverable Metals		
Arsenic	EPA 200.8	3

Cadmium	EPA 200.8	0.08
Chromium	EPA 200.8	1
Copper	EPA 200.8	1
Iron	EPA 200.7	50
Lead	EPA 200.8	0.5
Selenium	EPA 200.8	1
Silver	EPA 200.8	0.5
Zinc	EPA 200.7	10
Total Recoverable Metals Digestion	EPA 200.2	N/A
Ultra Low Level Mercury	EPA 245.7	0.005