2015 GROUNDWATER AND SURFACE WATER CORRECTIVE ACTION MONITORING PLAN EAST HELENA FACILITY

-FINAL-

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2015 GROUNDWATER AND SURFACE WATER CORRECTIVE ACTION MONITORING PLAN EAST HELENA FACILITY

-FINAL-

1.0 INTRODUCTION

This Corrective Action Monitoring Plan (CAMP) summarizes the groundwater and surface water monitoring activities to be conducted in 2015 at the East Helena Facility[1] (the Facility), including the former ASARCO East Helena lead smelter site (former smelter)[2] and the surrounding area (Figure 1-1). The CAMP represents an update to the most recent water resources monitoring plan, the 2014 CAMP (Hydrometrics, 2014). The overall objective of the 2015 CAMP is to provide for collection of adequate and appropriate groundwater and surface water monitoring data to support Corrective Measures Study remedy evaluations and allow ongoing evaluation of the effectiveness of groundwater remedies (Interim Measures or IMs) implemented to date at the Facility. The IMs have been developed to reduce offsite migration of groundwater contaminants (primarily arsenic and selenium). The 2015 CAMP also provides for continued monitoring of residential/water supply wells within the City of East Helena, near Lamping Field, and north of the Facility near Canyon Ferry Road, in order to ensure protection of groundwater users (nearby residents) and to support the implementation of a proposed Controlled Groundwater Area (CGWA).

The 2015 data collection program has been developed to support the following project activities:

- Assessment of ongoing groundwater responses to all IMs performed to date (i.e., performance monitoring evaluations), including the South Plant Hydraulic Control (SPHC) and Tito Park Area (TPA) Removal projects, placement of the Phase 1

[1] East Helena Facility refers to the former ASARCO East Helena Lead Smelter and surrounding properties previously owned by ASARCO and currently owned by the Montana Environmental Custodial Trust (MECT).
[2] The former smelter refers to the approximately 142 acres previously occupied by the East Helena Lead Smelter.

Interim Cover System (ICS) and installation of slurry walls in the former Speiss-Dross area;

- Further delineation and quantification of remaining groundwater contaminant sources;
- Completion of Corrective Measures Study (CMS) groundwater remedy evaluations, including the assessment of additional IMs and/or other final corrective measures (CMs);
- Planning and design of potential additional IMs and/or CMs selected through the CMS groundwater remedy evaluations described above;
- Ongoing refinement of the Facility numerical groundwater flow model and contaminant fate and transport model; and
- Periodic updates to the groundwater conceptual site model (CSM) for the Facility.

The 2015 CAMP describes the Facility-related groundwater and surface water monitoring activities; it identifies monitoring objectives and remedy performance evaluation data analysis techniques, and describes the number, type and location of samples to be collected to address these objectives, as well as the sampling and analytical methodologies to be employed. The monitoring activities described in this plan are focused on providing comprehensive synoptic groundwater and surface water quality data, groundwater and surface water elevation measurements, and streamflow data targeting specific project objectives (see Section 1.2). The CAMP is intended to be utilized in association with other Facility planning and guidance documents, including the Quality Assurance Project Plan (QAPP) for Environmental Data Collection Activities (Hydrometrics, 2011a), and the Data Management Plan (DMP) for Environmental Data Collection Activities (Hydrometrics, 2011b). These documents include detailed discussions of the project and Facility history and background, as well as requirements for data review, reporting, and management. Brief summaries are provided in this CAMP for context.

As analysis and implementation of IMs and other potential remedial actions continues at the East Helena Facility in 2015, it is likely that monitoring needs will change, and supplemental monitoring in addition to that specified in this CAMP may be necessary. Modifications describing additional monitoring to be conducted at the Facility will be documented as necessary in focused work plans issued as addenda to this CAMP.

The 2015 groundwater and surface water CAMP is structured as follows:

- Section 1.0 – Introduction;
- Section 2.0 – Sampling Locations and Frequency;
- Section 3.0 – Sampling Methodologies;
- Section 4.0 – Sample Handling and Documentation;

- Section 5.0 – Laboratory Analytical Procedures and Reporting;
- Section 6.0 – Performance Monitoring Data Evaluation Methods; and
- Section 7.0 – References.

1.1 PROJECT BACKGROUND

The Montana Environmental Trust Group, LLC, Trustee of the Montana Environmental Custodial Trust (Custodial Trust), is currently conducting a Corrective Measures Study (CMS) for the East Helena Facility, under the oversight of the United States Environmental Protection Agency (EPA). The CMS is one of the Resource Conservation and Recovery Act (RCRA) Corrective Actions being conducted at the Facility pursuant to the First Modification to the 1998 RCRA Consent Decree (U.S. District Court, 2012).

Soils and non-native fill material (i.e., slag, ore, concentrates, demolition debris) located in the operating areas of the former smelter contain elevated concentrations of a number of contaminants, primarily arsenic, selenium, and certain trace metals. Contaminants within site soils and fill material are the result of more than a century of ore handling and processing; storage and disposal of smelting wastes and byproducts; and periodic releases of high contaminant-concentration plant process waters. The contaminated soils/fill represent the major current and/or historic sources of contaminant loading to groundwater. Loading of contaminants to groundwater has resulted in the generation and migration of groundwater plumes (primarily arsenic and selenium) from the former smelter to the north and northwest. The primary purpose of the IMs completed to date by the Custodial Trust under the CMS program for the Facility is to reduce contaminant mass loading to, and the migration of, contaminants in groundwater from the former smelter in order to protect public health and the environment.

1.2 2015 MONITORING PROGRAM OBJECTIVES

The 2015 East Helena groundwater and surface water monitoring program has been developed to guide the collection of information necessary to continue the comprehensive assessment of groundwater quality status and trends within and downgradient of the former smelter, and to evaluate the groundwater response to and effectiveness of interim and other remedial measures implemented at the Facility in terms of reducing the migration of groundwater contaminants. To achieve this goal, the following specific 2015 monitoring objectives have been established:

1. Document and track contaminant plume extent, along with groundwater chemistry and groundwater flow responses to IMs implemented to date:
    a. In historic and current source areas, at locations within and adjacent to areas of historic impacts or releases;

   b. In downgradient areas, at locations in the City of East Helena, Lamping Field, and further north along the verified extent of the downgradient plumes;
2. Continue monitoring overall arsenic and selenium plume stability, in terms of the overall geographic location and extent of water quality standard exceedances as well as the extent and magnitude of the areas of highest concentration (source areas);
3. Provide ongoing data on residential/public water supply well water quality in the area of former smelter site impacts, to provide protection of water users;
4. Support the planning and implementation of a Controlled Groundwater Area (the East Valley CGWA); and
5. Provide detection monitoring of groundwater quality in the Phase I and II CAMU areas, in order to evaluate any groundwater quality changes potentially attributable to the CAMUs.

One of the principal tools that will be used to evaluate the effectiveness of the groundwater remedial measures implemented to date at the Facility will be a performance monitoring program consisting of a visual and statistical contaminant trend analysis and contaminant mass flux analysis. These analyses will be conducted using groundwater data collected under this 2015 CAMP and in previous years. The monitoring wells selected for the performance monitoring evaluation are described in Section 2.1, and a detailed discussion of the performance monitoring data evaluation methods is in Section 6.

The overall multi-year CAMP Program is one component of the CMS currently being implemented at the Facility by the Custodial Trust. The 2015 CAMP details the CAMP Program objectives and monitoring activities for the current year, and fulfills requirements of the First Modification to the 1998 RCRA Consent Decree (U.S. District Court, 2012). As noted above, the 2015 CAMP data will also support additional project activities, including refinement of a groundwater contaminant fate and transport model, planning and design of additional IMs and/or CMs, assessment of ongoing groundwater responses to past remedial actions and periodic updates to the groundwater conceptual site model (CSM) for the Facility, all in support of the Facility CMS program and consistent with the First Modification.

2.0 SAMPLING LOCATIONS AND FREQUENCY

This section of the CAMP describes the groundwater and surface water sampling locations and the frequency of sampling selected to meet the project objectives described in Section 1.2, and to allow evaluation of the remedy performance evaluation metrics specified in Section 6. Details on sampling methodologies, sample handling, and analytical requirements are presented in Sections 3, 4 and 5, respectively. The 2015 CAMP will be implemented in accordance with the QAPP and DMP prepared for the East Helena Facility (Hydrometrics, 2011a and 2011b).

Based on the objectives outlined above in Section 1.2, the overall scope of water resources monitoring under this 2015 CAMP will include seasonal monitoring at a set of groundwater and surface water locations with sufficient spatial distribution to provide a thorough synoptic evaluation of groundwater conditions utilizing groundwater and surface water hydrographs, surface water flow measurements, groundwater potentiometric maps, parameter trends, contaminant mass flux calculations and assessment of contaminant plume geometry (including any observed changes). The 2015 groundwater monitoring well network includes a subset of monitoring wells installed on the former smelter site (also referred to as "on-site"), as well as monitoring, residential, and municipal water supply wells in areas upgradient and downgradient of the former smelter (also referred to as "off-site"). On-site sampling locations include selected wells located near identified contaminant sources (i.e., near or downgradient of former plant activities) and along historically identified plume migration routes. Off-site sampling locations include monitoring wells located in East Helena, in and north of Lamping Field (west of East Helena), and residential and municipal water supply wells located south, west, and north of the Facility. 2015 monitoring well locations are shown on Exhibit 1. Residential and municipal water supply well locations selected for monitoring in 2015 are shown on Exhibit 2. Monitoring and water supply wells selected to address specific project objectives are discussed in Section 2.1.

Surface water monitoring locations were selected to represent Lower Lake, Prickly Pear Creek, gravel pit ponds near Prickly Pear Creek, and drainage through the former area of Upper Lake and from the Upper Lake marsh. Surface water monitoring locations selected for 2015 are shown on Figure 2-1. Surface water monitoring locations selected to address specific project objectives are discussed in Section 2.2.

An overall summary schedule for the 2015 East Helena Facility groundwater and surface water monitoring is shown in Table 2-1. Table 2-1 presents the monthly schedule for various groundwater and surface water monitoring activities, along with the monitoring objectives (see Section 1.2) addressed by each activity.

2.1 GROUNDWATER MONITORING

Specific wells selected for the 2015 groundwater monitoring program for the East Helena Facility, and the monitoring frequencies assigned to each well, are summarized in Tables 2-2 (monitoring wells) and 2-3 (residential and water supply wells). For the monitoring wells scheduled for groundwater quality sampling, Table 2-2 also presents a well-by-well summary of the primary purpose for including each well in the monitoring program, although the majority of the wells sampled will address multiple monitoring objectives. The schedule table indicates the total number of wells addressing each of the monitoring program objectives outlined in Section 1.2, and also indicates those wells selected to address the performance monitoring evaluations described in Section 6 (trend analysis and contaminant mass flux calculations). As shown in Table 2-2, the number of wells selected to primarily address each of the Section 1.2 program objectives includes:

- Source Area Effectiveness Monitoring (IM Response): 32 wells;
- Downgradient Effectiveness Monitoring (IM Response): 38 wells;
- Plume Stability (Arsenic and Selenium Plumes): 30 wells; and
- CAMU Area Groundwater Quality/Detection Monitoring: 11 wells.

In addition, 46 wells have been included as trend analysis/contaminant mass flux performance evaluation monitoring wells (Table 2-2). For clarity, the trend analysis/contaminant mass flux monitoring well set is also denoted separately in Table 2-4. The mass flux evaluation transects are shown on Exhibit 1. Details regarding the performance monitoring evaluations to be conducted using data from these wells are in Section 6.

Note that the overall groundwater monitoring program as a whole, including both the monitoring well sampling and the residential/municipal well monitoring programs, will address Objectives (3) and (4) in Section 1.2, protection of local groundwater users and support for planning and implementation of a Controlled Groundwater Area.

Groundwater quality sampling will be performed in accordance with applicable SOPs summarized in Sections 3 and 4 and provided in the project QAPP. Field parameters and static water levels will be recorded when water samples are collected. Samples will be analyzed for common ions, dissolved metals, total metals (for residential and municipal water supply wells) and arsenic/selenium speciation (for selected monitoring wells) as described in Section 5. Groundwater sampling and water level measurement activities will be performed in the shortest time period practical (approximately 1 day for comprehensive water level measurement events, 2 to 3 days for early season and summer groundwater quality monitoring events, and 6 to 10 days for spring and fall semiannual groundwater quality monitoring events) to provide a synoptic snapshot of hydrogeologic conditions. The sampling schedule for residential and municipal water supply wells will depend to some extent on coordinating with various well owners to arrange access; however, sampling and water level measurement activities will be performed in the shortest time period practical to provide a synoptic snapshot of hydrogeologic conditions.

2.1.1 Semiannual Monitoring Well Sampling

A total of 111 monitoring wells have been scheduled for semiannual sampling during spring (June) and fall (October-November) 2015. The objectives of the semiannual monitoring program are outlined in Section 1.2 and in Table 2-1. The semiannual monitoring is intended provide information to monitor IM effectiveness in source areas and downgradient, evaluate water quality trends and plume stability, provide protection of groundwater users, support planning and implementation of the CGWA, support CAMU area groundwater quality and detection monitoring, and supply data for the performance monitoring metrics discussed in Section 6. The semiannual monitoring well set includes many wells that will also be sampled during the early season and summer monitoring events described below in Sections 2.1.2 and 2.1.3 (see Table 2-2). Monitoring wells selected for sampling only during the semiannual events are those for which: (1) extensive datasets have already been obtained through historic monitoring; (2) groundwater quality information is also available from nearby wells that are being sampled at a higher frequency; and/or (3) well locations are further away from key areas (plume sources, axes or boundaries). For these wells, semiannual monitoring has been deemed sufficient to achieve the stated objectives when combined with the early season and summer monitoring programs described in Sections 2.1.2 and 2.1.3. The wells selected for semiannual monitoring in 2015 are listed in Table 2-2 and shown on Exhibit 1.

2.1.2 Early Season Monitoring Well Sampling

In addition to the semiannual monitoring events described in Section 2.1.1, early season monitoring will be conducted to monitor stability of both the arsenic and selenium plumes (Objective 2 in Section 1.2 and Table 2-1), and to evaluate sitewide and downgradient responses to recent IMs (Objectives 1a and 1b). The early season monitoring data will also be used to evaluate additional IMs and/or CMs in key source areas, if necessary. Wells selected for early season monitoring in 2015 at the East Helena Facility include:

- Recently installed wells with relatively limited existing data sets, selected to expand the groundwater quality database, to further define seasonal variability and to allow for evaluation of temporal trends;
- Selected wells along the selenium plume axis and boundaries from the plant site to Canyon Ferry Road;

- Plant site wells in key areas that define arsenic and selenium source areas and migration paths; and
- Selected wells that have shown water level and water quality responses to current IMs.

The wells selected for early season (March-April 2015) monitoring are summarized in Table 2-2 and shown on Exhibit 1. A total of 30 wells are included in the early season groundwater monitoring event.

2.1.3 Summer Monitoring Well Sampling

Based on continued elevated selenium and arsenic concentrations in groundwater in certain portions of the former smelter site and in downgradient areas, a subset of wells has been selected for an additional summer groundwater monitoring event to occur in August-September 2015 (Table 2-2). This sampling event is intended to continue more frequent water quality monitoring in source areas and the near downgradient area where water quality and/or water level responses to IMs are expected to be greatest, in order to evaluate the effectiveness of recent and 2015 planned IMs, through assessment of water quality trends and changes in plume geometry (Objectives 1a, 1b and 2 in Section 1.2 and Table 2-1). The summer groundwater monitoring data will also be used to evaluate additional IMs and/or CMs in key source areas, if necessary. The wells selected for summer monitoring (August-September 2015) are listed in Table 2-2 and shown on Exhibit 1. A total of 15 wells are included in the summer groundwater monitoring event.

2.1.4 Sitewide Water Level Monitoring

A Facility-wide set of monitoring wells and piezometers (206) is scheduled for measurement of groundwater levels in 2015 (Table 2-2). Measurement locations are shown on Exhibit 1. Water level data from these wells will be used in combination with surface water flow and elevation data to provide information to develop groundwater potentiometric surface maps, to further evaluate groundwater/surface water interactions on a seasonal basis, to provide additional data to support refinement of the groundwater flow and transport model, to assess the potential impact of seasonal variability in flow direction and surface water gain/loss on contaminant plume geometry, and to refine future monitoring programs (CAMPs). Monitoring well static water level measurement will be supplemented by measurement of water levels in residential wells (subject to access limitations) during the residential well monitoring events described in Section 2.1.5.

Water level monitoring will be performed monthly between March and November 2015 (Table 2-2), to capture the effects of potentially dynamic conditions (e.g., spring melt, wet season, and initiation of flow in irrigation ditches and canals). Manual measurements will be obtained at all locations. Transducers may be installed in selected locations to obtain continuous water level measurements.

Water level measurements will be obtained in accordance with applicable SOPs summarized in Sections 3 and 4. During those months when comprehensive groundwater quality sampling is scheduled (June and October-November 2015), a complete round of water level measurements will be obtained prior to initiation of the sampling event. To the extent feasible, sitewide water level monitoring events will be conducted in coordination with the surface water elevation and flow measurement monitoring events described in Section 2.2, in order to provide a complete representation of groundwater and surface water elevations across the project area.

2.1.5 Semiannual Water Supply Well Monitoring

Residential and public water supply wells are included in the 2015 groundwater monitoring program to ensure protection of groundwater users (i.e., nearby residents) and to support the planning and implementation of a Controlled Groundwater Area (see Section 1.2 and Table 2-1). As noted in the RCRA groundwater protection guidance (EPA, 2004), documenting and addressing potential human exposures is one of EPA's high priority short-term protection goals.

The residential and municipal water supply wells included in the 2015 semiannual water quality sampling program are listed in Table 2-3, and shown on Exhibit 2. Monitoring will be performed at 37 wells on a semiannual basis (June and October 2015). A number of the wells listed in Table 2-3 were not sampled in 2014, and although many of these wells have been sampled in the past, their current condition is unknown. Therefore, the initial residential well monitoring task will be a survey of well owners to determine current well status for those locations where this information is lacking. The actual number of residential wells sampled may be lower than planned, subject to the results of well owner interviews, as some wells may be inactive, abandoned, or otherwise unavailable for sampling.

2.2 SURFACE WATER MONITORING

This section describes the locations selected for monitoring water levels, water quality, and streamflow in surface water bodies near the Facility. Surface water sampling and measurement locations and frequencies are listed in Table 2-5 and shown on Figure 2-1.

The 2015 surface water monitoring program has been designed to achieve the following objectives (see Section 1.2 and Table 2-1):

- Evaluate hydrologic response to IM implementation near and downgradient of the facility; and

- Continue to assess the effects of recharge from surface water features (i.e., pond leakage or losing stream reaches) on the direction or rate of groundwater flow and plume migration.

In addition to the objectives outlined above, the 2015 surface water monitoring program will also provide data to evaluate potential water quality and flow changes in the former Upper Lake/Lower Lake area, in response to the realignment of Prickly Pear Creek (part of the SPHC IM).

2.2.1 Elevation Monitoring

Surface water elevation measurements will be collected concurrently with sitewide groundwater level monitoring, from April through November 2015 (Table 2-5). Monthly monitoring is intended capture potentially dynamic conditions (e.g., spring melt, wet season, initiation of flow in irrigation ditches and canals), and to provide information on season groundwater-surface water interactions. Water elevation measurements at stream, ditch, and pond locations will be obtained using a survey-grade global positioning system (GPS) instrument. Sites selected for elevation monitoring (20 sites) are listed in Table 2-5 and shown on Figure 2-1.

2.2.2 Surface Water Flow and Water Quality Sampling

Surface water flow measurements and water quality monitoring for 2015 will be conducted during high flow (June) and low flow (October-November) conditions. Locations selected for flow measurement and water quality sampling (11 sites) are listed in Table 2-5 and shown on Figure 2-1. The timing of the surface water quality monitoring events will be coordinated with the semiannual groundwater monitoring events to obtain a comprehensive synoptic understanding of groundwater and surface water conditions near the Facility.

Instantaneous flow measurements will be obtained using current velocity meters and the cross-section method, or (for smaller flows) flumes or volumetric methods. Flow measurement methods are further described in Section 3.2.1. Surface water quality sampling on flowing water bodies with more than one sampling location (Prickly Pear Creek) will be conducted in a synoptic fashion, although the monitoring events will not be true synoptic sampling events since all tributary inflows and diversion outflows will not be included. Sites will be sampled and streamflows measured from downstream to upstream in a single day, to provide information on streamflow gains and losses, potential interactions with groundwater, and in-stream parameter loading trends across various stream reaches, while minimizing the possibility of temporal variability. Samples from ponds and flowing water bodies with only one sampling location may be collected in any order.

The surface water quality sampling and flow measurements will be performed in accordance with applicable SOPs summarized in Sections 3 and 4. Field parameter measurements and streamflows will be recorded when samples are collected. Samples will be analyzed for common ions and total recoverable metals as described in Section 5.

3.0 SAMPLING METHODOLOGIES

Groundwater and surface water sampling activities described in the 2015 CAMP will be conducted in accordance with the procedures described in the 2014 CAMP (Hydrometrics, 2014), and consistent with the East Helena Facility QAPP (Hydrometrics, 2011a). Standard Operating Procedures (SOPs) for planned and anticipated field activities are listed in Table 3-1. The sampling methodologies outlined below for groundwater (Section 3.1) and surface water (Section 3.2) are based on the 2014 CAMP methodologies, which were derived from the SOPs and the QAPP. Collection of field quality control (QC) samples for groundwater and surface water is discussed in Section 3.3.

3.1 GROUNDWATER MONITORING

Groundwater samples will be collected from both monitoring wells and private (residential or water supply) wells in 2015. Procedures for collection of samples at these two types of wells differ, since private wells typically have dedicated pumps installed, and are pumped frequently in comparison to monitoring wells. Collection of samples from monitoring wells (Section 3.1.1) and private wells (Section 3.1.2) are discussed separately below.

3.1.1 Monitoring Well Samples

The collection of groundwater samples from site monitoring wells generally will consist of three steps:

1. Measurement of static water level;
2. Well purging and monitoring for field parameter stabilization; and
3. Water quality sample collection.

3.1.1.1 Static Water Level Measurement

Before collection of samples or removal/introduction of any equipment into the well, the static water level will be measured, to the nearest 0.01 foot, at each well using an electric water level probe to determine the depth of groundwater below a specified measuring point (typically the top of the polyvinyl chloride [PVC] well casing). Water level measurements and surveyed measuring point elevations will be used to compute groundwater elevations at each monitoring point. A complete set of static water level measurements will be obtained at all wells designated for water levels before initiating a quarterly or semiannual water quality sampling event. This procedure allows static water levels to be measured over a shorter time period (usually one day) than would be possible if measurements were collected concurrently with water quality sampling activities (i.e., days to weeks).

3.1.2 Well Purging, Field Parameter Measurement and Water Quality Sample Collection

In general, groundwater sampling will proceed in order from "clean" wells (with lower concentrations of constituents of concern), to "dirty" wells based on previous data collected at the Facility, to reduce the potential for cross-contamination of water samples. Field personnel will determine the appropriate sampling order before conducting sampling in cooperation with the field team leader, the project manager, and METG.

Dedicated high-density polyethylene (HDPE) tubing is installed in all monitoring wells. Submersible pumps (either a 12-volt submersible pump for shallower wells, or a 2-inch Grundfos pump or equivalent for deeper wells) will be utilized for purging and sampling. Purging will be conducted using the "standard purge" method of removing three to five well volumes while routinely monitoring field parameters (pH, dissolved oxygen, temperature, specific conductance, turbidity and ORP).

Following removal of the first well volume, field measurements will be collected at regular time intervals during purging of the second and third well volumes, based on the purge rate and required purge volume. A minimum of five sets of field parameter measurements will be collected during well purging to monitor stabilization of field parameters. Field parameters will be measured using a flow-through device to minimize potential effects from atmospheric exposure. Field meters will be calibrated daily according to factory instructions, with calibration results recorded on calibration forms. All purge water will be containerized and routed to the Facility water treatment system for disposal.

Samples for laboratory analysis will be collected only after one of the following purge conditions is met:

- A minimum of three well volumes has been removed, and three successive field parameter measurements agree to within the stability criteria given below.
- At least five well volumes have been removed although field parameter stabilization criteria are not yet met.
- The well has been pumped dry and allowed to recover sufficiently such that adequate sample volumes for rinsing equipment and collecting samples can be removed.

Criteria for field parameter stabilization are as follows:

Parameter (Units)	Stability Criteria
pH (standard units)	±0.1 pH unit
Water temperature (°C)	±0.2°C
Specific conductance (µmhos/cm)	±5% (SC ≤100 µmhos/cm) ±3% (SC >100 µmhos/cm)
Dissolved oxygen (mg/L)	±0.3 mg/L
Turbidity (NTU)	±10% (turbidity 10-100 NTU) or 3 consecutive readings <10 NTU

NOTES:

Stability criteria obtained from USGS *National Field Manual for the Collection of Water Quality Data: Chapter A4, Collection of Water Samples* (September 1999). Turbidity criteria modified for low turbidity (<10 NTU) samples.

ORP measurements will be monitored during stabilization; however, given the inherent variability of ORP measurements, the USGS does not recommend its use as an indicator of stabilization, and it will not be included as a stabilization indicator during groundwater sampling under the 2015 East Helena CAMP.

Following well purging, final field parameter measurements will be collected and recorded, and groundwater quality samples will be obtained. Sample bottles will be filled directly from a sampling port, before the pumped water passes through the flow-through cell. Samples for dissolved metals analyses (including the common cations calcium, magnesium, sodium and potassium) will be filtered through a 0.45-micrometer (µm) filter before preservation. Samples for common anions (sulfate, chloride, bicarbonate) will not be filtered.

Clean sample containers will be obtained from the analytical laboratory before sample collection. Following sample collection, samples will be preserved as appropriate, and stored on ice in coolers at approximately 4±2°C during transport. Water quality sample container and preservation requirements are specified in the project QAPP (Hydrometrics, 2011a) and in Table 3-2.

All samples will be stored in coolers or refrigerated from the time of collection until delivery to the analytical laboratory. All water quality sampling information, including sample sites, sample numbers, date and time of sample collection, field parameter measurements, flow measurements, and other notes and observations, will be documented in waterproof ink in a dedicated project field notebook and on standard field forms.

Groundwater sampling equipment reused between monitoring locations (flow cell, 12-volt sampling pump and short piece of discharge line used to connect to the dedicated well tubing, Grundfos 2-inch pump system, and any non-dedicated tubing) will be thoroughly decontaminated between uses. Equipment decontamination will consist of the following steps:

- Rinse with soapy water (clean tap water plus Alconox or other non-phosphate detergent).
- Rinse thoroughly with clean tap water.
- Final rinse with deionized water.

The effectiveness of the decontamination procedure will be evaluated through the periodic collection of equipment rinsate and deionized water blanks, as outlined in Section 3.3, the East Helena Facility QAPP and SOPs.

3.1.3 Residential/Water Supply Well Samples

Collection of water samples from private wells will follow the same general sequence as that for monitoring wells:

1. Measurement of static water level.
2. Well purging and monitoring for field parameter stabilization.
3. Water quality sample collection.

An SOP for residential/private well monitoring was developed for 2011 FSAP monitoring (METG, 2011). This document (METG-SOP-001) is included in Table 3-1 and in Appendix A, and should be consulted as the guide for conducting private well sampling as part of this 2015 CAMP. A general description of the private well monitoring procedure is provided below.

Property access and a scheduled sampling time will be arranged with the well owner prior to visiting the site for sampling. Static water level measurements will be obtained prior to sampling, at those private wells where an access port is present.

Purging of private wells will be accomplished through a purge hose (as necessary), with water discharge directed away from the wellhead and any nearby buildings. Purge volumes will generally be based on an estimate of the total water present in the well casing, piping, and water storage system (i.e., pressure tank), and approximately three well volumes will be purged prior to sampling. Purge rates will be determined volumetrically using a five-gallon bucket. Field parameter measurements will be collected at the beginning, middle, and end of the purging cycle, using a flow cell or other system arranged to allow flow of purged water across field parameter sensors prior to contact with the atmosphere.

Purge rates will be reduced prior to collecting samples. If a purge hose was used, the hose should be removed and water samples collected directly from the faucet or spigot. Private well samples will be collected for analysis of common constituents, dissolved metals and total metals in accordance with Table 3-2. Following sample collection, samples will be preserved as appropriate, and stored on ice in coolers at approximately 4±2°C during transport. All samples will be stored in coolers or refrigerated from the time of collection until delivery to the analytical laboratory. All water quality sampling information, including sample sites, sample numbers, date and time of sample collection, field parameter measurements, flow measurements, and other notes and observations, will be documented in waterproof ink in a dedicated project field notebook and on standard field forms.

Prior to leaving the sampling location, the homeowner will be notified that sampling has been completed, and a completed "Private Well Water Sampling Notice" will be left at the door or other convenient location (see METG-SOP-001).

3.2 SURFACE WATER MONITORING

Surface water monitoring will consist of one or more of the following steps (depending on the monitoring schedule):

1. Measurement of water elevation;
2. Measurement of streamflow; and
3. Water quality sample collection.

3.2.1 Water Elevation Measurement

Water elevation measurements for ponds and flowing water sites will be collected using a survey-grade GPS instrument (Topcon Hiper+/Legacy E). Real-time kinematic (RTK) surveys will be conducted using a base station set up at a known East Helena control point (typically a monitoring well). Data collected will include horizontal coordinates (NAD83 Montana State Plane international feet) and elevations in feet above mean sea level (AMSL).

3.2.2 Streamflow Measurement

Surface water flow measurements at flowing water sites will be collected using a Marsh-McBirney current meter and wading rod (area-velocity method) or equivalent equipment following the appropriate project SOPs (see Table 3-1). If measurement conditions are unsafe because of high flows, the field sampling team will estimate the flow. Stage measurements (water surface elevations) also will be recorded at sites equipped with staff gages, or by measurement from established survey points.

Measurement of streamflow is performed in accordance with the area-velocity method developed by the U.S. Geological Survey (USGS) (Turnipseed and Sauer, 2010). In general, the entire stream width is divided into subsections and the stream velocity measured at the midpoint of each subsection and at a depth equivalent to six-tenths of the total subsection depth, or at two-tenths and eight-tenths if the water depth exceeds 2.5 feet. The velocity in each subsection is then multiplied by the cross-sectional area to obtain the flow volume through each subsection. The subsection flows are then summed to obtain the total streamflow rate. Streamflow measurements are typically collected in a stream reach that is as straight and free of obstructions as possible, to minimize potential measurement error introduced by converging or turbulent flow paths.

3.2.3 Field Parameters and Water Quality Sample Collection

Field parameters measured at surface water quality monitoring sites will include the following:

- pH;
- Specific conductance;
- Dissolved oxygen; and
- Water temperature.

Field meters will be calibrated daily according to factory instructions, with calibration results recorded in the field notebook and/or on calibration forms. Field parameter measurements will be obtained directly in the stream if possible; however, high-velocity areas should be avoided to limit possible pH measurement errors caused by streaming potentials. Alternatively, a clean container may be filled with sample water for parameter measurement. Results are recorded in the field notebook and on standard sample forms. Field meters are checked periodically throughout the day for drift by measuring standard solutions (pH buffers, specific conductivity solutions, etc.), and are recalibrated as necessary.

A water quality sample will be collected from each surface water monitoring location by passing an uncapped sample container across the area of flow. When wading, samples are collected across the area of flow upstream of the sampler; during unsafe wading conditions, samples are collected from the stream bank. Water quality sample container and preservation requirements for surface water sites are specified in the project QAPP (Hydrometrics, 2011a) and in Table 3-2.

Samples will be preserved as appropriate for the intended analysis (e.g., place samples for metals analysis in precleaned and prepreserved laboratory supplied containers containing nitric acid to acidify the sample to a pH < 2), and stored on ice in coolers at approximately

4±2°C for transport. Note that surface water samples will be analyzed for total recoverable metals concentrations (unfiltered samples).

All samples will be stored in coolers or refrigerated from the time of collection until delivery to the analytical laboratory. All water quality sampling information, including sample sites, sample numbers, date and time of sample collection, field parameter measurements, flow measurements and other notes and observations, will be documented in waterproof ink in a dedicated project field notebook and on standard field forms.

3.3 FIELD QUALITY CONTROL SAMPLES

Field QC samples will be collected and analyzed as part of the 2015 groundwater and surface water monitoring programs and in accordance with the project quality assurance program. Details for collection and submittal of quality assurance and quality control samples are also discussed in the QAPP (Hydrometrics, 2011a).

Required field QC sample types and frequencies for the groundwater and surface water monitoring programs will include the following:

- Equipment rinsate blanks (monitoring well sampling only).
- Deionized (DI) water blanks (groundwater and surface water sampling, including both monitoring and private wells).
- Field duplicate samples (groundwater and surface water sampling, including both monitoring and private wells).

3.3.1 Field Blanks (Rinsate Blanks and DI Blanks)

Equipment rinsate blanks consist of deionized water processed through decontaminated sampling equipment (including filtration equipment as appropriate), collected into sample bottles and preserved. DI blanks consist of deionized water placed directly from storage containers into sample containers and preserved. Rinsate and DI blanks for monitoring well groundwater samples, and DI blanks for surface water samples will be collected at a frequency of one per twenty samples (1/20) or one per day, whichever is greater. DI blanks for private/residential well groundwater samples will be collected at a frequency of one per twenty samples (1/20) over the course of the complete private well monitoring event. Deionized water for collection of field blanks will be obtained from the analytical laboratory.

Additional information regarding collection of rinsate blank samples is provided in the applicable SOP and in the project QAPP (Hydrometrics, 2011a).

3.3.2 Field Duplicates

Field duplicate samples are replicate samples from a single sampling location submitted to a laboratory for the same set of analyses. For the purposes of this project, field duplicates will be collected by filling two samples containers consecutively from the sampling location. Duplicates will be sent to the same laboratory, but will be identified with different sample numbers. Field duplicates for monitoring well groundwater samples and surface water samples will be collected at a minimum frequency of one per twenty (1/20) or one per day, whichever is greater. Field duplicates for private/residential well groundwater samples will be collected at a frequency of one per twenty samples (1/20) over the course of the complete private well monitoring event.

All field QC samples will be submitted blind to the laboratory (QC samples will be packaged and shipped in such a manner that the laboratory will not be aware of the nature of the samples). Additional information regarding collection of duplicate samples is provided in the applicable SOP and in the project QAPP (Hydrometrics, 2011a).

4.0 SAMPLE HANDLING AND DOCUMENTATION

All samples transferred to the laboratory for analysis will follow standard documentation, packing, and chain-of-custody procedures. Samples will be stored in iced coolers or refrigerated following collection, then hand-delivered to the laboratory in iced coolers to maintain sample temperatures of approximately 4±2°C. The SOPs for sample labeling, documentation, and chain-of-custody procedures are listed in Table 3-1 and discussed further in the project QAPP (Hydrometrics, 2011a).

Sample custody (responsibility for the integrity of samples and prevention of tampering) will be the responsibility of sampling personnel until samples are shipped or delivered to the laboratory. Any containers used to ship samples via independent courier will be sealed with custody seals before shipping, and the receiving laboratory will record the condition of the seals upon arrival to ensure that the containers have not been opened during transport. Custody seals are not required for samples that are maintained under the direct custody of sampling personnel until being hand-delivered to the laboratory. Upon arrival at the laboratory, sample custody shifts to laboratory personnel, who are responsible for tracking individual samples through login, analysis and reporting. At the time of sample login, the laboratory will assign a unique laboratory sample number, which can be cross-referenced to the field sample number and used to track analytical results.

Documents generated during sample collection will consist of:

1. Sample collection field notes and forms;
2. Chain-of-custody forms; and
3. Shipping receipts in the event that samples are sent to a laboratory via independent courier.

Sampling activities will be recorded in a project-specific field notebook, and the appropriate water sample collection form will be completed. Each sample will be identified with a unique sample number, along with the date and time of collection, on adhesive labels attached to sample bottles. All labels will be completed using waterproof ink.

Field notebooks used to record pertinent sampling information will include, at a minimum, the following:

- Project name;
- Date and time;
- Sample location;
- Sample number;

- Sample depth (if applicable);
- Media type;
- Field meter calibration information;
- Sampling personnel present;
- Analyses requested;
- Sample preservation;
- Field parameter measurements;
- Weather observations; and
- Other relevant project-specific site or sample information.

Entries will be made in permanent ink. Corrections to field notebooks will be made by crossing out erroneous information with a single line and initialing the correction. Field books will be signed and dated at the bottom of each page by personnel making entries on that page.

Individual samples (including QC samples) will be assigned unique sample numbers according to the following sample numbering scheme:

AAA[A]-YYMM-XXX

where AAA[A] is a three- or four-character code denoting the project, YYMM is a four-digit code denoting the year and month (e.g., 1506 for June 2015), and XXX is a three-digit code that is incremented sequentially for each successive sample.

5.0 LABORATORY ANALYTICAL PROCEDURES AND REPORTING

Laboratory analysis will be conducted by Energy Laboratories' Helena, Montana branch. Energy Laboratories is certified by EPA Region 8 and the State of Montana under the Safe Drinking Water Act. Field parameters will be analyzed by field personnel using the procedures outlined in Section 3 above, and in the applicable SOPs (see Table 3-1). All laboratory analysis will be fully documented and conducted in accordance with EPA-approved and/or industry standard analytical methods.

5.1 GROUNDWATER ANALYSES

Required parameters, analytical methods, and project-required detection limits (PRDLs) for 2015 groundwater quality samples collected at the Facility are shown in Table 5-1. Groundwater samples will be analyzed for physical parameters, common constituents and a comprehensive suite of trace constituents. Trace constituents will be analyzed as dissolved for monitoring well samples, and as both dissolved and total for private well samples.

A selected set of wells (see Table 2-2) will also be analyzed for arsenic and selenium speciation during each monitoring event. The wells selected for arsenic and selenium speciation analysis are those source area and near downgradient wells where variable speciation has been observed in the past, and where groundwater geochemical changes are predicted to have the most significant influence on contaminant mobility and migration.

The PRDLs for individual parameters have been set at concentrations normally achievable by routine analytical testing in the absence of unusual matrix interference. These limits will support project objectives for contaminant plume characterization, comparison with regulatory standards for groundwater, and risk assessment. It must be recognized that the PRDL is a detection limit goal, which may not be achieved in all samples because of sample matrix interference or other problems. If a PRDL is not met by the laboratory, the data will be reviewed to determine if any actions (e.g., sample reanalysis or selection of an alternative analytical method) are required.

5.2 SURFACE WATER ANALYSES

Required parameters, analytical methods, and project-required detection limits for surface water quality samples collected at the Facility are shown in Table 5-2. Similar to groundwater, surface water samples will be analyzed for physical parameters, common constituents, and a comprehensive suite of trace constituents. The PRDLs for individual parameters have been set at concentrations normally achievable by routine analytical testing in the absence of unusual matrix interference. These limits will support project objectives for ongoing trend analysis, evaluation of groundwater/surface water interactions, comparison with regulatory standards for surface water, and risk assessment; therefore, PRDLs for a number of parameters are different in surface water compared to groundwater. It must be recognized that the PRDL is a detection limit goal, which may not be achieved in all samples because of sample matrix interference or other problems. If a PRDL is not met by the laboratory, the data will be reviewed to determine if any actions (e.g., sample reanalysis or selection of an alternative analytical method) are required.

5.3 DATA REVIEW AND REPORTING

Procedures for data review, validation, and reporting are presented and discussed in the Site QAPP (Hydrometrics, 2011a) and in the DMP (Hydrometrics, 2011b), including control limits and criteria for specific types of field and laboratory QC samples, data validation and verification methods, potential corrective actions if criteria are not met, and database management issues. The DMP includes checklists for review of both field and laboratory documentation (prior to formal validation of laboratory data), and post-validation review and approval of the East Helena database (Hydrometrics, 2011b). Both of these checklists will be completed for each monitoring event conducted during 2015.

All data deliverables containing analytical data and QC information will be reviewed for overall completeness of the data package. Completeness checks will be administered on all data to determine whether deliverables specified in the project planning documents (including this CAMP) are present. At a minimum, deliverables will include field notes and/or forms, transmittal information, sample chain-of-custody forms, analytical results, methods and practical quantification limits (PQL), and laboratory QC summaries. The reviewer will determine whether all required items are present and request copies of missing deliverables.

The number and type of samples collected will be compared to project specifications to ensure conformance with the sampling process design. Review of sample collection and handling procedures will include verification of the following:

- Completeness of submittal packages;
- Completeness of field documentation, including chain-of-custody documentation;
- Field equipment calibration and maintenance and/or quality of field measurements; and
- Adherence to proper sample collection procedures.

All data will be reviewed for completeness of deliverables, and adherence to the sampling and analytical protocols prescribed in this FSAP and the project QAPP (Hydrometrics, 2011a). Data validation will include a detailed review of all analytical results, including:

- Reporting limits (RL) and PQLs vs. PRDLs;
- Holding times;
- Analytical methods;
- Field QC sample results; and
- Laboratory QC sample results.

Data qualifiers will be applied to any analytical results associated with QC exceedances, as outlined in the QAPP.

All project data will be archived in hard copy format, and also will be imported to and stored in the electronic project database software, along with associated data qualifiers. The project Data Management and Validation Coordinator will be responsible for reviewing, organizing, revising, and certifying the integrity of the project database. Maintenance and use of the project database, including uploading of analytical results and downloading of data in various formats to support other Facility-related investigations are presented in detail in the DMP (Hydrometrics, 2011b).

6.0 PERFORMANCE MONITORING DATA EVALUATION METHODS

In their *Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action* (EPA, 2004), EPA defines performance monitoring as "the periodic measurement of physical and/or chemical parameters to evaluate whether a remedy is performing as expected." More recently published EPA guidance on groundwater remediation completion strategies (EPA, 2013, 2014a, 2014b) includes a discussion of recommended remedy evaluation (performance monitoring) strategies. Among the pertinent questions regarding the performance of IMs implemented to date by the East Helena cleanup project, as well as the adequacy of the groundwater conceptual site model (CSM), are the following:

- Are there changes (trends) in groundwater contaminant of concern (COC) concentrations?
- Are groundwater elevations and flow directions as expected and have temporal, seasonal, and matrix diffusion influences been assessed and considered?
- Is there evidence of attenuation, degradation, and/or stabilization of COCs?
- Is the spatial (lateral and vertical) extent of contaminated groundwater changing?

EPA recommends evaluating groundwater data and information on a well-by-well basis to monitor remedial actions during two distinct phases of groundwater restoration activities (EPA, 2013), including:

1. The remediation phase, referring to the phase of the remedy where remedial activities are being actively implemented and groundwater data are used to monitor progress toward groundwater cleanup levels specified in a remedy decision document; and
2. The attainment monitoring phase, occurring after EPA has determined that the remediation monitoring phase is complete.

The East Helena Facility is currently in the remediation phase. During this phase, groundwater data "typically are collected to evaluate contaminant migration and changes in COC concentration over time" (EPA, 2014a). Therefore, one of the primary objectives of the 2015 CAMP water resources monitoring data collection program is to provide sufficient data to evaluate progress toward groundwater cleanup levels specified in the CMS Work Plan for the Facility (CH2MHill, 2014). Information and evaluations used to address these questions will include trend analysis (visual and/or quantitative statistical analysis), along with estimates of reductions over time in contaminant plume volumes and/or the mass flux of contaminants migrating offsite (EPA, 2014b). The specific data evaluation techniques to be used as IM performance monitoring tools are described below.

Groundwater elevation and quality data from the East Helena Facility will be used to evaluate the status of and changes in groundwater conditions and geochemistry both within and downgradient of the Facility, through the preparation of groundwater potentiometric maps, groundwater and surface water hydrographs, temporal concentration plots, Stiff diagrams summarizing general groundwater chemistry, contaminant plume maps and other water quality and quantity assessment tools. The 2015 CAMP monitoring results will be summarized in a 2015 Water Resources Monitoring Report. In addition to the assessments of groundwater quality and quantity noted above, the 2015 Water Resources Monitoring Report will include analysis of the following two specific performance metrics which have been established to aid in the quantitative evaluation of IM performance and progress toward groundwater cleanup goals, as suggested in EPA (2014a):

1. Groundwater elevation and Contaminant of Concern (COC) trend analysis (Section 6.1.1); and
2. Contaminant mass flux evaluation (Section 6.1.2).

6.1.1 Trend Analysis

As recommended in EPA guidance (EPA, 2014a), visual and statistical trend analysis will be conducted for the primary COCs at the Facility (arsenic and selenium) at selected monitoring wells. Groundwater hydrographs comparing pre-IM and post-IM groundwater elevations will also be prepared to evaluate IM effectiveness. To supplement the trend analysis of primary COCs, trend analysis of additional groundwater contaminants and/or indicator constituents of interest may also be conducted. Trend plots of arsenic and selenium concentrations over time will be prepared and updated as additional data are collected in 2015, to provide an ongoing non-statistical delineation of contaminant concentration trends throughout the area of interest. In addition, statistical trend testing will be used to test for statistically significant arsenic and/or selenium trends over time at selected wells, including:

- Plant site wells in identified contaminant source areas; and
- Downgradient wells along multiple transects approximately perpendicular to the groundwater flow direction.

Statistical trend analysis will be conducted as appropriate for the observed data distribution for each contaminant at each well using appropriate parametric (e.g., linear regression) or nonparametric (e.g., Mann-Kendall trend test) techniques for normal and non-normal data distributions, respectively. Appropriate statistical methods for evaluating groundwater data, including trend testing and normality testing, are discussed in EPA's *Unified Guidance* (EPA, 2009). Software that will be used to conduct trend analysis may include EPA's ProUCL Version 5.0 (Singh and Maichle, 2013), Groundwater Statistics Tool (EPA, 2014c), the Mann-Kendall Toolkit (GSI, 2012) or similar calculation tools. Trend analysis will be based on comparison to an appropriate set of baseline concentration data for each well, obtained prior to the initiation of remedial activities under the RCRA Corrective Measures program in 2011.

Visual and statistical evaluation of contaminant concentration trends at wells in these areas will provide ongoing information on the effectiveness of remedial activities in terms of both qualitative and quantitative measures of any observed reductions in concentration over time. Wells selected for trend analysis are described in Section 2.1 and are shown in Table 2-4. Note that the selected wells represent the minimum number of locations for which trend analysis will be performed; additional wells and/or trend analysis of additional groundwater constituents (such as sulfate, chloride or other indicator parameters) may also be conducted as part of data evaluation activities as warranted.

6.1.2 Contaminant Mass Flux Analysis

The second component of groundwater remedy performance evaluation for the East Helena Facility will consist of a contaminant mass flux analysis for the primary groundwater COCs, arsenic and selenium. Mass flux can be defined as the mass discharge rate of a contaminant in a groundwater plume in units of mass per time passing across a plume transect. The mass flux analysis will complement the trend analysis discussed above in Section 6.1.1. While contaminant concentration trends at individual wells may show varying trends (increasing or decreasing), particularly during the remediation phase of remedy monitoring, evaluation of mass flux changes over time will allow a more comprehensive assessment of the total contaminant mass migrating off the Facility and through downgradient areas.

Six plume transects have been established for mass flux measurements as part of the remedy performance monitoring at the East Helena Facility. The transect locations and individual wells comprising each transect are shown on Exhibit 1 and in Table 2-4, and include:

- Transects 1a and 1b – Downgradient Site Boundary (Arsenic and Selenium Mass Flux); calculations will be conducted for the mass fluxes migrating from the western plant site (Transect 1a), the eastern plant site (Transect 1b) and for the Downgradient Site Boundary as a whole (sum of west plant site and east plant site mass fluxes).
- Transect 2 – City of East Helena West Section (Arsenic and Selenium Mass Flux).
- Transect 3 – City of East Helena East Section (Arsenic and Selenium Mass Flux).
- Transect 4 – Lamping Field (Selenium Mass Flux).
- Transect 5 – Lamping Field North Boundary (Selenium Mass Flux).

Mass flux at each transect will be calculated from observed constituent concentrations and hydrogeologic information including hydraulic gradients, hydraulic conductivity, groundwater seepage velocities and overall groundwater flux rates, yielding an estimate of the overall contaminant flux at each transect at a particular point in time. Mass flux calculations based on 2015 data can then be compared to calculations based on similar data collected in previous years, to evaluate any changes over time.

Arsenic and selenium contaminant mass flux values will be calculated using simple spreadsheet models, or more sophisticated software developed specifically for mass flux calculations such as the Mass Flux Toolkit (GSI, 2011), as appropriate. Groundwater data collected under this 2015 CAMP and during previous site monitoring will be used as input to the mass flux calculations; in addition, relevant data from the Facility groundwater flow and fate and transport model prepared by NewFields may also be used to provide input data and/or to cross-check any mass flux values calculated external to the groundwater model.

7.0 REFERENCES

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TABLES

Table 2-1. East Helena Facility 2015 Water Resources Monitoring Schedule and Objectives

<table>
<tr><th colspan="2"></th><th colspan="4">Groundwater Monitoring Activity</th><th colspan="3">Surface Water Monitoring Activity</th></tr>
<tr><th colspan="2">Month</th><th>Semiannual Private Well Monitoring</th><th>Early Season Monitoring Well Sampling Event</th><th>Semiannual Monitoring Well Sampling Event</th><th>Summer Monitoring Well Sampling Event</th><th>Elevation Monitoring</th><th>Flow Monitoring</th><th>Surface Water Quality Monitoring</th></tr>
<tr><td colspan="2">March</td><td></td><td rowspan="2">X</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">April</td><td></td><td></td><td></td><td>X</td><td></td><td></td></tr>
<tr><td colspan="2">May</td><td></td><td></td><td></td><td></td><td>X</td><td></td><td></td></tr>
<tr><td colspan="2">June</td><td>X</td><td></td><td>X</td><td></td><td>X</td><td>X</td><td>X</td></tr>
<tr><td colspan="2">July</td><td></td><td></td><td></td><td></td><td>X</td><td></td><td></td></tr>
<tr><td colspan="2">August</td><td></td><td></td><td></td><td rowspan="2">X</td><td>X</td><td></td><td></td></tr>
<tr><td colspan="2">September</td><td></td><td></td><td></td><td>X</td><td></td><td></td></tr>
<tr><td colspan="2">October</td><td>X</td><td></td><td rowspan="2">X</td><td></td><td>X</td><td rowspan="2">X</td><td rowspan="2">X</td></tr>
<tr><td colspan="2">November</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td rowspan="7">Monitoring Objectives Addressed (see CAMP Section 1.2)</td><td>1. Document/Track Water Chemistry/Flow Response to IMs</td><td colspan="7"></td></tr>
<tr><td>1(a). Source Area Response/Effectiveness</td><td></td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>1(b). Downgradient Response/Effectiveness</td><td></td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>2. Monitor Plume Stability</td><td></td><td>X</td><td>X</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td>3. Ensure Protection of Groundwater Users</td><td>X</td><td></td><td>X</td><td></td><td></td><td></td><td></td></tr>
<tr><td>4. Support Planning and Implementation of East Valley Controled Groundwater Area (CGWA)</td><td>X</td><td>X</td><td>X</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td>5. Monitor CAMU Area Water Quality/Detection Monitoring</td><td></td><td></td><td>X</td><td></td><td></td><td></td><td></td></tr>
</table>

Table 2-2. 2015 Monitoring Well Sampling Schedule -- East Helena Facility

Well ID	Northing	Easting	MP Elevation	Monthly Water Levels	Supplemental Early Season Monitoring	Semiannual Monitoring	Supplemental Summer Monitoring	Redox Status Wells (As/Se Speciation)		Primary Monitoring Objective Addressed				
				Monthly from March-November	1x (March-April)	2x (June, October-November)	1x (August-September)	As Speciation	Se Speciation	*Contaminant Trend/Mass Flux Transect Well*	*Source Area IM Response*	*DG IM Response*	*Plume Stability*	*CAMU*
APSD-7	859330.03	1361317.85	3924.04	X		X					***			
APSD-8	859082.86	1361339.82	3923.93	X		X					***			
ASIW-1	859803.75	1362064.52	3913.75	X										
ASIW-2	860471.83	1363184.59	3909.13	X										
DH-1	861171.53	1359021.49	3910.89	X		X						***		
DH-10A	861456.81	1360608.82	3886.97	X										
DH-11	859948.68	1361576.86	3912.36	X		X							***	
DH-12	860548.24	1359804.81	3910.16	X										
DH-13	860561.05	1359795.41	3915.87	X										
DH-14	859527.88	1361225.11	3916.06	X		X					***			
DH-15	861541.06	1360257.00	3889.82	X		X				Transect 1b	***			
DH-16	861008.82	1359678.88	3905.77	X										
DH-17	860997.41	1359668.63	3904.84	X	X	X	X	X		Source Area Well	***			
DH-18	860535.29	1359814.83	3916.45	X		X					***			
DH-19R	859443.14	1360086.52	3919.67	X	X	X		X		Source Area Well	***			
DH-2	859910.43	1358532.44	3936.91	X										
DH-20	858989.37	1360128.45	3930.89	X		X					***			
DH-21	860286.89	1359997.44	3916.98	X										
DH-22	859690.07	1359816.23	3941.28	X										
DH-23	860270.22	1360217.49	3915.93	X										
DH-24	861412.63	1359442.01	3899.59	X		X				Transect 1a		***		
DH-27	859923.85	1360046.46	3912.77	X										
DH-3	858002.57	1359985.22	3947.48	X										
DH-30	859935.19	1360099.56	3914.32	X		X		X	X		***			
DH-31	860189.79	1360063.74	3919.16	X										
DH-32	860268.98	1359861.91	3918.23	X										
DH-33	860349.34	1359900.91	3918.81	X										
DH-34	860322.77	1359962.83	3916.55	X		X					***			
DH-35	860275.87	1360058.19	3911.81	X										
DH-36	860631.50	1359936.34	3907.98	X		X		X	X		***			
DH-37	860170.52	1359927.71	3916.71	X										
DH-38	860024.22	1359976.91	3918.86	X										
DH-4	859526.82	1361217.20	3917.26	X		X					***			
DH-42	859587.20	1359938.80	3931.61	X		X					***			
DH-47	859460.02	1360402.02	3922.33	X	X	X					***			
DH-48	861493.55	1358990.71	3905.96	X										
DH-49	861441.36	1359297.07	3904.07	X		X				Transect 1a		***		

Table 2-2. 2015 Monitoring Well Sampling Schedule -- East Helena Facility

Well ID	Northing	Easting	MP Elevation	Monthly Water Levels	Supplemental Early Season Monitoring	Semiannual Monitoring	Supplemental Summer Monitoring	Redox Status Wells (As/Se Speciation)		Primary Monitoring Objective Addressed				
				Monthly from March-November	1x (March-April)	2x (June, October-November)	1x (August-September)	As Speciation	Se Speciation	*Contaminant Trend/Mass Flux Transect Well*	*Source Area IM Response*	*DG IM Response*	*Plume Stability*	*CAMU*
DH-5	859641.38	1360792.82	3921.18	X										
DH-50	861385.26	1359571.76	3904.76	X										
DH-51	861330.25	1359700.33	3904.34	X		X				Transect 1a/1b		***		
DH-52	861372.14	1360876.16	3889.18	X		X				Transect 1b		***		
DH-53	861343.68	1361117.67	3892.87	X		X				Transect 1b		***		
DH-54	862057.30	1359471.15	3890.27	X										
DH-55	860568.82	1360945.56	3972.76	X		X					***			
DH-56	861098.43	1360350.74	3958.17	X	X	X	X	X	X	Source Area Well	***			
DH-57	860328.95	1360256.39	3915.26	X										
DH-58	860620.35	1360149.80	3899.64	X										
DH-59	859632.08	1360058.60	3917.74	X		X					***			
DH-5A	859639.68	1360786.27	3921.92	X										
DH-6	861527.08	1360252.42	3889.85	X	X	X	X	X	X	Transect 1b	***			
DH-61	860401.86	1359292.93	3923.76	X										
DH-62	860406.74	1359291.47	3923.48	X		X						***		
DH-63	861507.16	1359149.83	3905.37	X										
DH-64	861382.75	1359476.26	3904.02	X	X	X	X			Transect 1a		***		
DH-65	861207.20	1360879.41	3945.85	X										
DH-66	861005.14	1359333.41	3916.15	X	X	X	X		X	Source Area Well	***			
DH-67	861657.64	1359095.51	3899.77	X	X	X	X		X	Transect 1a		***		
DH-68	859814.16	1361072.20	3943.28	X										
DH-69	859899.60	1360783.89	3934.40	X		X						***		
DH-7	861281.52	1361580.68	3898.66	X		X				Transect 1b			***	
DH-70	859738.60	1360346.81	3918.94	X										
DH-71	859876.69	1359640.54	3938.63	X		X					***			
DH-72	859627.55	1360069.20	3918.51	X		X					***			
DH-73	860573.78	1360394.40	3899.82	X		X					***			
DH-74	860942.46	1360679.47	4001.49	X		X					***			
DH-75	860942.10	1360685.11	4001.55	X		X					***			
DH-76	860173.63	1360887.06	3994.28	X										
DH-77	860292.48	1359639.25	3930.05	X	X	X	X	X	X		***			
DH-78	860848.96	1359368.22	3918.85	X	X	X	X	X	X		***			
DH-8	860693.17	1359404.72	3920.62	X	X	X	X		X	Source Area Well	***			
DH-9	860570.68	1360370.61	3896.56	X										
East-PZ-1	860384.38	1362260.69	3911.93	X										
East-PZ-2	859218.10	1362203.25	3924.58	X										
East-PZ-4	857903.64	1362039.59	3935.66	X										
East-PZ-6	857123.21	1362002.49	3943.83	X										

Table 2-2. 2015 Monitoring Well Sampling Schedule -- East Helena Facility

Well ID	Northing	Easting	MP Elevation	Monthly Water Levels	Supplemental Early Season Monitoring	Semiannual Monitoring	Supplemental Summer Monitoring	Redox Status Wells (As/Se Speciation)		Primary Monitoring Objective Addressed				
				Monthly from March-November	1x (March-April)	2x (June, October-November)	1x (August-September)	As Speciation	Se Speciation	*Contaminant Trend/Mass Flux Transect Well*	*Source Area IM Response*	*DG IM Response*	*Plume Stability*	*CAMU*
East-PZ-7	858720.49	1361949.30	3928.83	X										
EH-100	862197.19	1358800.89	3889.83	X	X	X	X	X		Transect 2		***		
EH-101	862185.06	1359841.73	3879.95	X		X				Transect 3		***		
EH-102	862174.53	1360751.10	3880.45	X		X				Transect 3		***		
EH-103	862095.33	1359303.12	3890.54	X		X						***		
EH-104	862312.66	1358282.52	3887.83	X	X	X				Transect 2		***		
EH-106	862709.93	1358337.12	3882.07	X	X	X	X			Transect 2		***		
EH-107	862700.49	1358801.99	3880.15	X	X	X	X			Transect 2		***		
EH-109	862428.79	1358738.30	3885.67	X										
EH-110	862408.94	1359199.73	3884.05	X		X				Transect 2		***		
EH-111	863063.82	1358121.67	3876.50	X	X	X		X	X			***		
EH-112	863053.56	1358509.63	3875.78	X										
EH-113	863390.21	1357972.37	3871.34	X										
EH-114	863127.75	1357769.76	3878.07	X	X	X							***	
EH-115	862717.81	1357963.04	3883.29	X		X							***	
EH-116	863344.59	1357810.98	3874.52	X										
EH-117	863491.19	1357815.10	3871.33	X	X	X							***	
EH-118	863059.91	1357370.97	3879.95	X	X	X						***		
EH-119	863617.62	1357263.09	3873.75	X		X				Transect 4		***		
EH-120	864330.24	1357409.93	3865.78	X	X	X				Transect 4		***		
EH-121	864410.14	1358127.82	3869.49	X		X				Transect 4			***	
EH-122	864415.31	1358469.65	3868.08	X										
EH-123	863027.35	1356631.31	3885.71	X		X				Transect 2		***		
EH-124	863928.39	1356666.49	3874.46	X	X	X				Transect 4		***		
EH-125	864978.44	1357089.97	3863.22	X		X						***		
EH-126	865515.80	1356002.80	3870.00	X	X	X				Transect 5		***		
EH-127	865361.56	1357810.28	3860.75	X										
EH-128	863371.55	1355903.64	3892.17	X										
EH-129	865649.69	1355425.09	3870.21	X		X				Transect 5		***		
EH-130	866018.01	1356641.21	3858.55	X		X				Transect 5			***	
EH-131	867032.64	1356912.02	3834.44	X		X							***	
EH-132	864040.35	1355360.41	3893.90	X		X				Transect 4			***	
EH-133	864766.27	1355354.83	3884.36	X										
EH-134	865643.48	1355425.55	3870.21	X		X				Transect 5		***		
EH-135	865688.59	1357384.98	3852.25	X		X				Transect 5			***	
EH-136	866625.88	1357248.90	3838.59	X										
EH-137	867047.78	1357895.67	3839.66	X										
EH-138	867179.05	1355646.47	3839.70	X	X	X							***	

Table 2-2. 2015 Monitoring Well Sampling Schedule -- East Helena Facility

Well ID	Northing	Easting	MP Elevation	Monthly Water Levels	Supplemental Early Season Monitoring	Semiannual Monitoring	Supplemental Summer Monitoring	Redox Status Wells (As/Se Speciation)		Primary Monitoring Objective Addressed				
				Monthly from March-November	1x (March-April)	2x (June, October-November)	1x (August-September)	As Speciation	Se Speciation	*Contaminant Trend/Mass Flux Transect Well*	*Source Area IM Response*	*DG IM Response*	*Plume Stability*	*CAMU*
EH-139	867197.45	1354635.30	3839.78	X		X							***	
EH-140	867962.26	1356224.79	3812.08	X		X							***	
EH-141	868713.30	1354782.70	3813.32	X	X	X							***	
EH-142	870077.47	1353868.60	3804.68	X	X	X							***	
EH-143	870683.75	1354372.76	3803.37	X	X	X							***	
EH-144S	874170.36	1354091.18	3778.70	X		X							***	
EH-144M	874170.21	1354096.29	3778.95	X		X							***	
EH-144D	874170.14	1354086.12	3778.86	X		X							***	
EH-200	862018.26	1353065.25	3953.33	X										
EH-201	861475.90	1353968.19	3973.48	X										
EH-202	861250.68	1357113.74	3930.56	X										
EH-203	860233.86	1356623.21	4003.92	X										
EH-204	860660.99	1358703.60	3925.69	X		X						***		
EH-205	861652.52	1358687.06	3900.66	X										
EH-206	862969.40	1356012.78	3898.10	X		X							***	
EH-208	863930.49	1354401.57	3910.58	X										
EH-209	864742.20	1353102.00	3898.34	X										
EH-210	861653.60	1358674.68	3901.19	X		X				Transect 1a		***		
EH-211	862223.94	1356747.92	3905.75	X		X				Transect 1a			***	
EH-212	862222.63	1356753.36	3905.90	X		X				Transect 1a			***	
EH-50	862195.69	1358818.00	3889.39	X	X	X	X	X		Transect 2		***		
EH-51	862186.98	1359828.42	3880.09	X		X				Transect 3		***		
EH-52	862191.66	1360752.34	3880.50	X		X				Transect 3		***		
EH-53	863387.47	1358268.83	3872.82	X		X							***	
EH-54	863345.39	1359822.33	3869.66	X		X							***	
EH-57	862618.43	1357736.48	3885.05	X										
EH-57A	862625.90	1357731.04	3885.45	X	X	X	X			Transect 2		***		
EH-58	861985.39	1361553.20	3888.15	X		X				Transect 3			***	
EH-59	862766.01	1361023.24	3876.57	X		X				Transect 3			***	
EH-60	862093.37	1359295.78	3888.46	X		X		X				***		
EH-61	862095.86	1359282.10	3889.77	X		X						***		
EH-62	863373.62	1358812.98	3875.07	X		X							***	
EH-63	862682.49	1359427.43	3878.32	X		X				Transect 2/3			***	
EH-64	862710.92	1359200.87	3882.67	X										
EH-65	862702.98	1358789.93	3879.96	X	X	X	X			Transect 2		***		
EH-66	864406.90	1358105.33	3869.48	X		X				Transect 4			***	
EH-67	864405.91	1358454.57	3869.46	X										
EH-68	863877.13	1360331.47	3867.60	X										

Table 2-2. 2015 Monitoring Well Sampling Schedule -- East Helena Facility

Well ID	Northing	Easting	MP Elevation	Monthly Water Levels	Supplemental Early Season Monitoring	Semiannual Monitoring	Supplemental Summer Monitoring	Redox Status Wells (As/Se Speciation)		Primary Monitoring Objective Addressed				
				Monthly from March-November	1x (March-April)	2x (June, October-November)	1x (August-September)	As Speciation	Se Speciation	*Contaminant Trend/Mass Flux Transect Well*	*Source Area IM Response*	*DG IM Response*	*Plume Stability*	*CAMU*
EH-69	863791.12	1360852.61	3869.10	X		X							***	
EH-70	864971.91	1357077.78	3863.48	X		X						***		
EHMW-3	868386.97	1356618.42	3825.45	X										
EHTW-3	868576.07	1356692.19	3827.66	X										
GPPZ-06	858200.88	1361048.05	3923.36	X										
GPPZ-12	857622.12	1360941.61	3928.09	X										
GPPZ-14	857650.64	1361569.05	3927.32	X										
GPPZ-18	857005.18	1360924.13	3926.53	X										
MW-1	858771.65	1358766.76	3953.05	X		X								***
MW-10	858554.20	1359549.27	3946.28	X		X								***
MW-11	857959.47	1358516.75	3973.33	X		X								***
MW-2	859191.64	1358745.84	3945.97	X		X								***
MW-3	859196.82	1359132.39	3940.95	X		X								***
MW-4	858802.48	1359150.01	3947.06	X		X								***
MW-5	858414.70	1358930.24	3956.18	X		X								***
MW-6	858876.27	1359556.47	3938.14	X		X								***
MW-7	858777.00	1358177.77	3963.67	X		X								***
MW-8	857962.24	1359400.93	3958.65	X		X								***
MW-9	857977.44	1358978.98	3965.36	X		X								***
AirLiqNorth	859173.55	1361517.37	3920.62	X										
AirLiqSouth	859080.61	1361533.50	3922.05	X										
PBTW-1	861055.89	1359662.68	3907.85	X										
PBTW-2	861165.79	1359622.43	3906.73	X										
PPCRPZ-01	858505.66	1361257.86	3923.96	X										
PPCRPZ-02	858388.35	1360904.92	3919.76	X										
PPCRPZ-03	858172.93	1361351.22	3924.59	X										
PPCRPZ-04	857967.86	1361064.82	3922.73	X										
PPCRPZ-05	857361.45	1361226.21	3926.56	X										
PPCRPZ-06	857000.56	1361280.44	3928.48	X										
PPCRPZ-07	857033.74	1361539.94	3928.08	X										
PRB-1	861019.37	1359488.18	3910.87	X		X		X	X		***			
PRB-2	861114.81	1359753.60	3905.34	X										
PRB-3	860983.81	1359418.53	3916.31	X										
PZ-102	859121.83	1361453.08	3922.21	X										
PZ-103	859334.60	1361357.20	3921.82	X										
PZ-33B	861144.75	1361484.50	3894.26	X										
PZ-36A	864560.52	1358731.29	3858.96	X										
PZ-36B	864557.57	1358724.52	3858.75	X										

Table 2-2. 2015 Monitoring Well Sampling Schedule -- East Helena Facility

Well ID	Northing	Easting	MP Elevation	Monthly Water Levels	Supplemental Early Season Monitoring	Semiannual Monitoring	Supplemental Summer Monitoring	Redox Status Wells (As/Se Speciation)		Primary Monitoring Objective Addressed				
				Monthly from March-November	1x (March-April)	2x (June, October-November)	1x (August-September)	As Speciation	Se Speciation	*Contaminant Trend/Mass Flux Transect Well*	*Source Area IM Response*	*DG IM Response*	*Plume Stability*	*CAMU*
PZ-36C	864554.65	1358718.76	3859.60	X										
PZ-9A	865510.38	1357868.39	3850.70	X										
PZ-9B	865507.23	1357867.10	3849.43	X										
SC-1	862189.02	1358846.93	3890.42	X										
SDMW-1	860514.59	1359962.88	3914.36	X										
SDMW-2	860448.26	1359851.23	3914.21	X	X	X		X		Source Area Well	***			
SDMW-3	860203.94	1359859.36	3925.16	X		X					***			
SDMW-4	860218.12	1360144.94	3917.69	X		X					***			
SDMW-5	860446.70	1359750.31	3925.34	X		X					***			
SP-3	861487.40	1358277.05	3905.91	X										
SP-4	861277.83	1358887.39	3908.16	X										
SP-5	861578.60	1358912.30	3903.52	X										
STW-1	861262.57	1359587.71	3905.58	X										
ULM-PZ-1	857498.25	1360521.73	3924.40	X										
ULM-PZ-2	857491.50	1360953.45	3925.41	X										
ULTP-1	858779.06	1360264.29	3919.63	X										
ULTP-2	858262.18	1360427.46	3921.23	X										

	Monthly Water Levels	Supplemental Early Season Monitoring	Semiannual Monitoring	Supplemental Summer Monitoring							
Total Sites Per Monitoring Event	**206**	**30**	**111**	**15**							
Total Water Level Measurements Planned for 2015	**1442**										
Total Groundwater Quality Samples Planned for 2015		**267**									
# of Wells Addressing Primary Objective							**46**	**32**	**38**	**30**	**11**

NOTES: Monitoring Locations shown on Exhibit 1

Contaminant Trend/Mass Flux Transects shown on Exhibit 1

Total number of planned groundwater quality samples does not include field quality control samples (Rinsate blank, DI blank, and duplicate samples each collected at frequency of 1 per 20 or 1 per day)

Table 2-3. 2015 Residential/Water Supply Well Sampling Schedule -- East Helena Facility

Map Key (Exhibit 2)	Site ID	Northing	Easting	Semiannual Monitoring (June and October)
1	EHC-1	872558.37	1356681.06	X
2	2843 Canyon Ferry	872346.42	1354330.00	X
3	2853 Canyon Ferry	872391.53	1354773.24	X
4	2865 Canyon Ferry	872086.41	1355030.70	X
5	EHPW-3	868437.60	1356673.10	X
6	2540 Wylie	866156.57	1356934.48	X
7	2489 Wylie Dr	864206.53	1358674.56	++
8	3885 US HWY 12	862259.92	1355055.07	X
9	802 Manlove	861781.59	1356290.54	X
10	800 Manlove	861925.29	1356400.09	X
11	701 Manlove	861784.41	1356574.41	X
12	409 Gail Street	863278.12	1357979.20	++
13	405 Gail Street	863264.10	1358105.44	++
14	401 Gail Street - S	863255.39	1358240.44	X
15	317 Gail Street	863250.07	1358456.08	++
16	305 Gail Street	863257.08	1358568.29	++
17	203 Gail Street	863263.27	1359031.01	X
18	201 Gail Street	863250.07	1359185.43	++
19	109 Gail Street	863266.68	1359337.84	X
20	108/110 Gail Street	863425.39	1359501.01	++
21	105 Gail Street	863270.75	1359501.67	X
22	24 W Groschell	863109.81	1359725.42	++
23	9 Gail Street	863256.45	1359757.14	X
24	7 Gail Street	863233.58	1359840.14	++
25	3 Gail Street	863256.45	1359904.15	X
26	1 Gail Street	863237.91	1360019.06	X
27	202 W Main	862450.60	1359157.38	++
28	126 East Clinton-I	863327.86	1360948.64	++
29	126 East Clinton-H	863296.03	1360955.74	X
30	303 Thurman	863069.96	1361069.38	++
31	210 E Groschell	863053.71	1361184.11	++
32	107 E Groschell	862873.52	1360767.10	++
33	111 E Groschell	862864.36	1360861.52	++
34	316 N. Montana	863376.30	1361815.27	++
35	212 E Pacific	861861.51	1361212.16	++
36	224 E Pacific	861854.50	1361415.54	++
37	690 Smelter Rd Yard	855347.37	1359909.48	X

Total Measurements - June 2015	**37**
Total Measurements - October 2015	**37**
Total Measurements for 2015	**74**

NOTE: ++ = location not monitored in 2014 (added in 2015)

Table 2-4. 2015 Performance Evaluation Monitoring Wells - East Helena Facility

Well	Location	Performance Monitoring Metric	
		Trend Analysis	Contaminant Mass Flux
DH-17	Source Area Well	X	
DH-19R	Source Area Well	X	
DH-56	Source Area Well	X	
DH-66	Source Area Well	X	
DH-8	Source Area Well	X	
SDMW-2	Source Area Well	X	
DH-24	Transect 1a - Downgradient Site Boundary West	X	X
DH-49	Transect 1a - Downgradient Site Boundary West	X	X
DH-64	Transect 1a - Downgradient Site Boundary West	X	X
DH-67	Transect 1a - Downgradient Site Boundary West	X	X
EH-210	Transect 1a - Downgradient Site Boundary West	X	X
EH-211	Transect 1a - Downgradient Site Boundary West	X	X
EH-212	Transect 1a - Downgradient Site Boundary West	X	X
DH-51*	Transect 1a - Downgradient Site Boundary West Transect 1b - Downgradient Site Boundary East	X	X
DH-15	Transect 1b - Downgradient Site Boundary East	X	X
DH-52	Transect 1b - Downgradient Site Boundary East	X	X
DH-53	Transect 1b - Downgradient Site Boundary East	X	X
DH-6	Transect 1b - Downgradient Site Boundary East	X	X
DH-7	Transect 1b - Downgradient Site Boundary East	X	X
EH-100	Transect 2 - City of East Helena West Section	X	X
EH-104	Transect 2 - City of East Helena West Section	X	X
EH-106	Transect 2 - City of East Helena West Section	X	X
EH-107	Transect 2 - City of East Helena West Section	X	X
EH-110	Transect 2 - City of East Helena West Section	X	X
EH-123	Transect 2 - City of East Helena West Section	X	X
EH-50	Transect 2 - City of East Helena West Section	X	X
EH-57A	Transect 2 - City of East Helena West Section	X	X
EH-65	Transect 2 - City of East Helena West Section	X	X
EH-63**	Transect 2 - City of East Helena West Section Transect 3 - City of East Helena East Section	X	X
EH-101	Transect 3 - City of East Helena East Section	X	X
EH-102	Transect 3 - City of East Helena East Section	X	X
EH-51	Transect 3 - City of East Helena East Section	X	X
EH-52	Transect 3 - City of East Helena East Section	X	X
EH-58	Transect 3 - City of East Helena East Section	X	X
EH-59	Transect 3 - City of East Helena East Section	X	X
EH-119	Transect 4 - Lamping Field	X	X
EH-120	Transect 4 - Lamping Field	X	X
EH-121	Transect 4 - Lamping Field	X	X
EH-124	Transect 4 - Lamping Field	X	X
EH-132	Transect 4 - Lamping Field	X	X
EH-66	Transect 4 - Lamping Field	X	X
EH-126	Transect 5 - Lamping Field North Boundary	X	X
EH-129	Transect 5 - Lamping Field North Boundary	X	X
EH-130	Transect 5 - Lamping Field North Boundary	X	X
EH-134	Transect 5 - Lamping Field North Boundary	X	X
EH-135	Transect 5 - Lamping Field North Boundary	X	X

NOTE: Wells and Transects are shown on Exhibit 1
*Well EH-51 is part of both Transects 1a and 1b (see Exhibit 1)
**Well EH-63 is part of both Transects 2 and 3 (see Exhibit 1)

Table 2-5. 2015 Surface Water Monitoring Schedule -- East Helena Facility

Site ID	Northing	Easting	Water Elevation Measurements (GPS Survey)	Instantaneous Flow Measurements	Water Quality Monitoring
			Monthly -April through November	Semiannual (June and Oct-Nov)	Semiannual (June and Oct-Nov)
PPC-3A	856283.87	1361694.37	X	X	X
PPCB-1	859218.73	1361864.62	X	X	X
Trib-1	858008.43	1360249.85	X	X	X
SG-05	858797.46	1361263.58	X	X	X
Lower Lake	859613.71	1360690.93	X		X
Former PPC-BD	859466.51	1361434.66	X	X	X
PPC-5	859954.78	1361478.38	X	X	X
PPC-7	861473.74	1360743.50	X	X	X
PPC-8	863372.55	1360137.99	X		
PPC-36A	864556.11	1358753.31	X	X	X
PPC-9A	865772.47	1357760.10	X		
PPC-10	867712.58	1356117.83	X	X	X
SG-16	872677.17	1350559.96	X	X	X
HVIC-1	870433.13	1354118.75	X		
GP-1	869382.84	1355642.76	X		
GP-2	870307.35	1354223.32	X		
GP-3	872295.33	1352636.82	X		
GP-4	869942.71	1352286.21	X		
GP-5	868811.08	1355741.50	X	X	
GP-5A	867206.54	1357125.85	X		

Total Measurements Per Monitoring Event	**20**	**11**	**11**
Total Monitoring Events	**8**	**2**	**2**
Total Measurements for 2015	**160**	**22**	**22**

Table 3-1. Standard Operating Procedures Applicable to East Helena Facility Water Resources Monitoring

SOP #(1)	Title
HSOP-2	Determination, Identification, and Description of Field Sampling Sites
HF-SOP-3	Preservation and Storage of Inorganic Water Samples
HSOP-4	Chain-of-Custody Procedures, Packing and Shipping Samples
HSOP-5	Global Positioning System (GPS) Equipment Operation
HSOP-7	Decontamination of Sampling Equipment
HF-SOP-9	Logging of Monitoring Wells - Geologic Conditions, Construction and Development
HF-SOP-10	Water Level Measurement with an Electric Probe
HF-SOP-11	Sampling Monitoring Wells for Inorganic Parameters
HSOP-13	Equipment Rinsate Blank Collection
HF-SOP-15	Measurement of Stream or Pond Stage
HF-SOP-17	Streamflow Measurement Using a Parshall Flume
HF-SOP-19	Obtaining Water Quality Samples from Streams
HF-SOP-20	Field Measurement of pH using a pH Meter
HF-SOP-22	Field Measurement of Dissolved Oxygen
HF-SOP-23	Field Measurement of Redox Potential (Eh)
HF-SOP-26	Streamflow Measurement Using a Flume
HF-SOP-27	Flow Estimation Method for Springs and Culverts
HSOP-29	Labeling and Documentation of Samples
HF-SOP-30	Decision Process for Field Variances and Nonconformances
HSOP-31	Field Notebooks
HF-SOP-37	Streamflow Measurement Using a Marsh-McBirney Water Current Meter
HF-SOP-44	Flow Measurements Using a Portable 90° V-Notch Cutthroat Flume
HF-SOP-46	Streamflow Measurement Using a Portable 3-inch Parshall Flume (Montana Flume)
HF-SOP-49	Use of a Flow Cell For Collecting Field Parameters
HF-SOP-50	Synoptic Runs on Streams
HSOP-58	Guidelines for Quality Assurance of Environmental Data Collection Activities: Data Quality Planning, Review, and Management
HF-SOP-71	Fluid Sampling With Peristaltic Pump
HF-SOP-73	Filtration of Water Samples
HF-SOP-79	Field Measurement of Specific Conductivity
HF-SOP-80	Water Level Monitoring With The Stevens Multilogger 9200
HF-SOP-81	Operation of The Stevens Type A/F Multilogger
HF-SOP-84	Field Measurement of Temperature
HF-SOP-102	Sampling of Municipal Wells
HSOP-105	Low Flow Sampling of Monitoring Wells for Inorganic Parameters
HSOP-106	Field Measurement of pH, Dissolved Oxygen, Conductivity, ORP, and Temperature Using a Multi-Meter
METG-SOP-001(2)	Residential Well Sampling for Inorganic Parameters

Notes:

(1) SOPs were prepared by Hydrometrics, Inc. and presented in various plans (e.g., QAPP; 2011a).

(2) SOP was prepared by METG and is presented in Appendix A.

Table 3-2. Sample Container and Preservation Requirements

Matrix	Parameters	Sample Container	Preservative
Groundwater	Field Parameters	None	None
	Common Constituents	1000 mL HDPE	Cool to 4°C
	Dissolved Metals(1)	250 mL HDPE	Filter samples (0.45 µm) HNO3 to pH <2 Cool to 4°C
	Total Metals (2)	250 mL HDPE	Unfiltered samples HNO3 to pH <2 Cool to 4°C
	As Speciation (3)	250 mL HDPE	Filter samples (0.45 µm) HCl to pH<2, Cool to 4°C
	Se Speciation (3)	500 mL HDPE	Filter samples (0.45 µm) Cool to 4°C
Surface Water	Field Parameters	None	None
	Common Constituents	1000 mL HDPE	Cool to 4°C
	Total Recoverable Metals	250 mL HDPE	Unfiltered samples HNO3 to pH <2 Cool to 4°C

Notes:

(1) Dissolved metals will be analyzed in both monitoring and private (residential/water supply) well samples.

(2) Total metals will be analyzed in private well samples only.

(3) As and Se speciation will be analyzed at selected wells.

Table 5-1. 2015 Groundwater Sample Analytical Parameter List -- East Helena Facility

Parameter	Analytical Method (1)	Project Required Detection Limit (mg/L)
Physical Parameters		
pH	150.2/SM 4500H-B	0.1 s.u.
Specific Conductance	120.1/SM 2510B	1 µmhos/cm
TDS	SM 2540C	10
TSS	SM 2540D	10
Common Ions		
Alkalinity	SM 2320B	1
Bicarbonate	SM 2320B	1
Sulfate	300	1
Chloride	300.0/SM 4500CL-B	1
Calcium	215.1/200.7	5
Magnesium	242.1/200.7	5
Sodium	273.1/200.7	5
Potassium	258.1/200.7	5
Trace Constituents (Total and/or Dissolved) (2)(3)		
Antimony (Sb)	200.7/200.8	0.003
Arsenic (As)	200.8/SM 3114B	0.002
Beryllium (Be)	200.7/200.8	0.001
Cadmium (Cd)	200.7/200.8	0.001
Chromium (Cr)	200.7/200.8	0.001
Copper (Cu)	200.7/200.8	0.001
Iron (Fe)	200.7/200.8	0.02
Lead (Pb)	200.7/200.8	0.005
Manganese (Mn)	200.7/200.8	0.01
Mercury (Hg)	245.2/245.1/200.8/SM 3112B	0.001
Nickel (Ni)	200.7/200.8	0.01
Selenium (Se)	200.7/200.8/SM 3114B	0.001
Thallium (Tl)	200.7/200.8	0.001
Zinc (Zn)	200.7/200.8	0.01
Metal Speciation (Dissolved) (3)(4)		
Arsenic (As)	E 1632A Mod	0.002
Selenium (Se)	A 3114 B Mod	0.001
Field Parameters (5)		
Static Water Level	HF-SOP-10	0.01 ft
Water Temperature	HF-SOP-20	0.1 °C
Dissolved Oxygen (DO)	HF-SOP-22	0.01 mg/L
pH	HF-SOP-20	0.01 pH standard unit
Turbidity		0.1 NTU
ORP/Eh	HF-SOP-23	1 mV
Specific Conductance (SC)	HF-SOP-79	1 µmhos/cm

Notes:

(1) Analytical methods are from *Standard Methods for the Examination of Water and Wastewater* (SM) or EPA's *Methods for Chemical Analysis of Water and Waste* (1983).

(2) Residential/water supply well samples will be analyzed for both total and dissolved trace constituents; monitoring well samples will be analyzed for dissolved metals only

(3) Samples to be analyzed for dissolved constituents will be field-filtered through a 0.45 µm filter.

(4) Arsenic and selenium speciation will be analyzed at selected monitoring wells to evaluate redox status.

(5) Field parameters should be measured in a flow cell in accordance with project SOPs.

Table 5-2. 2015 Surface Water Sample Analytical Parameter List -- East Helena Facility

Parameter	Analytical Method [1]	Project Required Detection Limit (mg/L)
Physical Parameters		
pH	150.2/SM 4500H-B	0.1 s.u.
Specific Conductance	120.1/SM 2510B	1 µmhos/cm
TDS	SM 2540C	10
TSS	SM 2540D	10
Common Ions		
Alkalinity	SM 2320B	1
Bicarbonate	SM 2320B	1
Sulfate	300	1
Chloride	300.0/SM 4500CL-B	1
Calcium	215.1/200.7	5
Magnesium	242.1/200.7	5
Sodium	273.1/200.7	5
Potassium	258.1/200.7	5
Trace Constituents (Total Recoverable)		
Antimony (Sb)	200.7/200.8	0.0005
Arsenic (As)	200.8/SM 3114B	0.001
Beryllium (Be)	200.7/200.8	0.0008
Cadmium (Cd)	200.7/200.8	0.00003
Chromium (Cr)	200.7/200.8	0.01
Copper (Cu)	200.7/200.8	0.002
Iron (Fe)	200.7/200.8	0.02
Lead (Pb)	200.7/200.8	0.0003
Manganese (Mn)	200.7/200.8	0.01
Mercury (Hg)	245.2/245.1/200.8/SM 3112B	0.000005
Nickel (Ni)	200.7/200.8	0.002
Selenium (Se)	200.7/200.8/SM 3114B	0.001
Thallium (Tl)	200.7/200.8	0.0002
Zinc (Zn)	200.7/200.8	0.008
Field Parameters		
Stream Flow	HF-SOP-37/-44/-46	NA
Water Temperature	HF-SOP-20	0.1 °C
Dissolved Oxygen (DO)	HF-SOP-22	0.01 mg/L
pH	HF-SOP-20	0.01 s.u.
Specific Conductance (SC)	HF-SOP-79	1 µmhos/cm

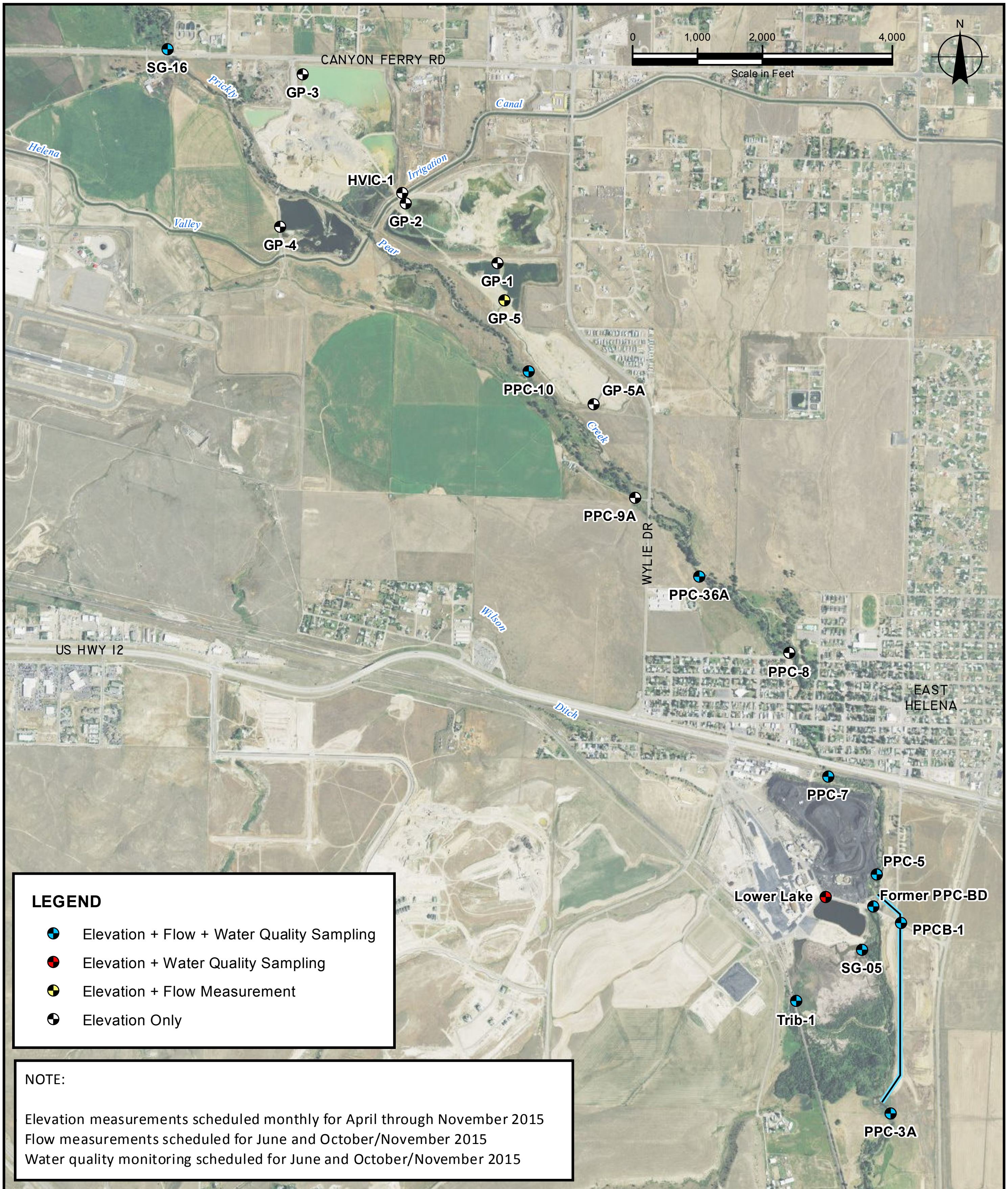
Notes:

(1) Analytical methods are from *Standard Methods for the Examination of Water and Wastewater* (SM) or EPA’s *Methods for Chemical Analysis of Water and Waste* (1983).

FIGURES

Hydrometrics, Inc. Consulting Scientists and Engineers Date Saved: 3/27/2015 12:30:08 PM	EAST HELENA FACILITY 2015 CORRECTIVE ACTION MONITORING PLAN	**GENERAL LOCATION MAP**	**FIGURE** **1-1**

Path: V:\10022\GIS\2015 CAMP\2015_General_Location.mxd



LEGEND

- Elevation + Flow + Water Quality Sampling
- Elevation + Water Quality Sampling
- Elevation + Flow Measurement
- Elevation Only

NOTE:

Elevation measurements scheduled monthly for April through November 2015
Flow measurements scheduled for June and October/November 2015
Water quality monitoring scheduled for June and October/November 2015

Hydrometrics, Inc. Consulting Scientists and Engineers Date Saved: 3/27/2015 12:32:04 PM	EAST HELENA FACILITY 2015 CORRECTIVE ACTION MONITORING PLAN	**2015 SURFACE WATER MONITORING LOCATIONS**	FIGURE **2-1**

Path: V:\10022\GIS\2015 CAMP\2015_Surface_Water.mxd

APPENDIX A

METG-SOP-001
RESIDENTIAL WELL SAMPLING
FOR INORGANIC PARAMETERS

STANDARD OPERATING PROCEDURE

RESIDENTIAL WELL SAMPLING FOR INORGANIC PARAMETERS

METG-SOP-001

1.0 PURPOSE

This procedure describes the methods to be used in collection of groundwater samples from private residential wells. The purpose of this standard operating procedure (SOP) is to describe the general methodology for collecting representative groundwater samples from residential wells within the vicinity of the Montana Environmental Trust Group – East Helena Site. The procedure is designed for sampling residential wells where inorganic constituents are the contaminants of interest. This procedure is intended to serve as guidance for field crews collecting these samples – this SOP does not cover communication with residential well owners (e.g., obtaining access authorization, sampling notification). Methods presented in this SOP are based on recent USGS guidance (USGS, 2006).

2.0 SCOPE

This procedure applies to all METG personnel and any assigned contractors tasked with sampling residential wells. The scope of work includes the preparation, preservation, collection, and submittal of samples for analytical analysis.

3.0 GENERAL

This technical procedure has been established to standardize the sampling team preparation, collection, preservation, and submittal of residential well water samples to the analytical laboratory. Analyses conducted on these samples may include inorganic compounds (metals, sulfate, anions, cations, etc.) and must be conducted by a Montana certified laboratory. Procedures and methodologies may only be added or changed at the direction of the METG or its designated contractor. To ensure the sample collected is representative of the groundwater, the system must be purged prior to sample collection. This SOP will be used in conjunction with the East Helena QAPP (Hydrometrics, 2010 or its equivalent) and applicable field sampling and analyses plans (SAPs) to ensure the sampling event is properly performed, documented and yields quality results.

4.0 RESPONSIBILITIES

METG and assigned field staff shall ensure that:

- Property access has been obtained at each well to be sampled;
- Each property owner is notified and provided with the anticipated sample date and time before each sampling event;

- Residential well sampling schedules are coordinated to extent practical with other METG directed groundwater monitoring activities; and
- Representative residential drinking water well samples are obtained according to this procedure and other applicable QAPP or SAP requirements.

5.0 EQUIPMENT

Residential wells will be sampled using existing pumps installed in the wells by the property owners. Additional equipment needed to conduct sampling activities may include:

- Summary of addresses, well locations, preferred sampling location (inside, outside, spigot, faucet, etc.), estimated purge volumes (or calculator for determining purge volumes, holding tank volume), and other special instructions
- Distilled or deionized water
- 0.45 µm filter apparatus with inert filters
- Laboratory supplied pre-cleaned and preserved sample containers for analyses
- Stopwatch or watch with second hand
- Field logbook
- Sampling sheets
- Sample labels
- Chain-of-custody sheets
- Custody seals
- Chemical-free paper towels
- Waterproof pens (Sharpies)
- Paper towels
- Trash bags
- Nitrile gloves
- Garden hoses
- Buckets (5-gallon, 2-gallon)
- Pliers
- Standard connectors
- Sample coolers
- Extra-large zip-lock bags
- Ice for sample preservation
- Safety glasses
- Cell phone or two-way radio
- Water quality meters (Eh, pH, conductivity, ORP, temperature)

- Flow through cell
- Copies of Private Well Water Sampling Notice

6.0 PROCEDURES

6.1 Well Access

Upon arrive at the property, introduce yourself to the property owner/occupant and discuss the purpose of the sampling and the planned sampling protocols. Ask the property owner/occupant if they have been recently using the well and about the well's general usage. Record the answer.

If the information hasn't already been provided, the property owner should be questioned as to the well depth and pressure tank capacity, if known. Additionally, the owner should be asked if they have a water filtration or conditioning unit in their system. If a water filter is connected to the water system, permission should be asked to obtain the sample before the water passes through such systems. If the property owner is not home but has given permission to sample, consult the sampling instructions for the location of the outside spigot.

6.2 Well Purging

The purpose of purging the well is to remove any stagnant water within the system and to obtain a representative sample of the groundwater. The following steps should be followed to the extent practicable:

A. **Locate the well and sampling port**. Locate the sampling port nearest to the wellhead. The sampling port should be before the holding tank, pressure tank, water filtration, or water treatment system. If the sample port is outdoors, ask if the owner has a preference for where to discharge the purge water. It may be necessary to run a hose from the sampling port to an acceptable discharge location away from the house or other features.

B. **Obtain water level measurement** (see water level HF-SOP-010), if well has an access port. NOTE: electric water level probes are typically not recommended for sounding wells; instead, use a weighted measuring tape or other equipment. Measurements should not be made when the pump is operating.

C. **Prepare sampling port for purging.**

Houses with inside tap:

- If the faucet is fixed with an aerator (a small screen), remove the aerator carefully. If pliers are needed, place a nitrile glove or similar between the pliers and aerator to protect it.
- Establish a constant flow and determine the purge flow rate using a known volume container and timer.

Houses with outside spigot:

- If a hose is already connected, disconnect it.

- Attach the purge hose and direct end of hose so that water discharges away from the house, wellhead, etc.

D. **Determine the well purge volume.** This task can be done in advance and verified in the field, if information is obtained from the well owner before visiting the property. The volume of water to be purged before groundwater samples are collected will be calculated as follows:

- If the house has a holding tank and the volume is known, estimate length of piping to the well, and the well depth[1]. The total volume to purge the system is

  = tank volume[2] + well casing volume[3] + water line volume[4].

  The well casing volume, expressed in gallons (1 ft^3 = 7.48 gallons), is

  $$= \frac{\pi * d^2 * h}{77.01}$$

  Where:

  π = 3.14;
  d = Diameter of the well casing expressed in inches; and
  h = Total depth of the water column in the well in feet (well depth – static water level, see Static Water Level Determination HF-SOP-010).

- If the holding tank volume is unknown:
  - Assume a 35-gallon pressure tank.
  - Assume that ~ 5 gallons are contained in the water line.
  - Assume well volume ≈ 20 gallons.
  - Assume total purge volume = 60 gallons.

E. **Determine the purge time**

- Turn the spigot on and establish a constant flow. Determine the purge flowrate using a known volume container and a timer Time the filling of a 5-gallon bucket (outside) or a 2-liter beaker (inside).
- Calculate the purge time based on the purge rate in gallons per minute (gpm) and the total purge volume in gallons as follows:

---

1 The well depth may be obtained from well logs, owners statements, or direct measurements – if wellhead is accessible.
2 This value should include the volume of holding tank and/or pressure tank between the well and the sampling port. All samples should be obtained before any water filtration or water treatment systems.
3 A minimum of one well casing volume should be purged prior to sampling if the well is actively used. If the well has been stagnant or infrequently used three to five well casing volumes should be purged.
4 The water line volume can be calculated using the formula for the well casing volume by replacing d with the inside diameter of the pipe and h with the estimated length of the water line in feet.

$$= \frac{\text{Well Purge Volume (gallons)}}{\text{Purge Rate (gpm)}}$$

Where:

$$\text{Purge Rate} = \frac{\text{Volume of Container (gallons)}}{\text{Time to fill container (minutes)}}$$

Example:
Well Purge Volume calculated to be 60 gallons. If it takes 45 seconds to fill one 5-gallon bucket, the purge rate would be 6.8 gpm [5 gallons / 45 seconds (0.75 minutes)]. The estimated purge time would be about 9 minutes (60 gallons/6.8 gpm or 12 (# of bucket volumes in the system) x 45 (seconds) = 540 seconds or about 9 minutes.

F. **Purge the system**

- Let the water flow for the required purge time.
- Follow any homeowner instruction regarding where to direct the purge water. All reasonable efforts should be made to prevent water ponding near the residence.
- As the water system is purging:
    - Fill in the following information on the sample labels and apply them to the sample containers (see HSOP-29):
        - sample date;
        - sample time; and
        - samplers initials.
    - Complete entries in the Field Logbook (see Section 8 and HSOP-31)
    - Using a calibrated water quality measurement meters (YSI or equivalent)[5] and a low flow cell, record the following measurements at the beginning, middle and end of the purging period (see applicable SOP listed in Section 9):
        - dissolved oxygen;
        - oxygen reduction potential;
        - temperature;
        - pH;
        - specific conductance; and
        - turbidity (Hach Turbidometer or equivalent).

    Field parameters are considered "stable" when the variability between sequential measurements is as follows:

Parameter	Stability Criteria
pH	$\pm$0.1
Temperature (°C)	$\pm$0.2
SC (μmhos/cm)	$\pm$5% (SC $\leq$ 100) or $\pm$3% (SC > 100)

[5] Preference is that water quality parameters be measured using a low flow cell. Other measurement methods are acceptable, but should be documented.

Dissolved oxygen (mg/L)	±0.3
Turbidity (NTU)	±10% (NTU < 100)

Modifications of the standard purge procedure are allowable if site conditions, the project work plan, or study objectives dictate such modifications.

- Note and record any unusual color, turbidity or odor associated with the water as it is purging and during sampling.

6.3 Sample Collection

- Once purging is complete, sample collection can begin. If a hose was used to direct away the purge water, remove the hose before filling the sample bottles. To collect the sample:
  - Use a very low flow rate. Turn the faucet down to a flow of < 100 mL/min and allow the water to run a few seconds before collecting the sample.
  - Sample bottles may be filled directly from the tap for most analyses. For dissolved metal analyses water should be field filtered using 0.45 µm filter apparatus with inert filters (see HF-SOP-073).
  - Wear nitrile gloves to fill the sample bottles. This is to maintain the integrity of the sample and to protect your skin from any spillage of the preservative in the bottles.
  - Fill the bottles at arm's length, pointing away from you. Wear safety glasses.
  - Sample bottles should be filled as directed by the Analytical Laboratory.
  - Do not allow bottles with preservative to overflow. If a preserved bottle overflows, discard it and sample again with a new bottle to avoid dilution of the preservative.
  - Preserve and store samples as appropriate for the intended laboratory analysis.
  - After the samples have been collected, they should immediately be placed in an ice filled cooler until relinquished or shipped to the appropriate contract laboratory (see HSOP-4).
  - Replace any faucet aerators, or reattach homeowner's hose, if necessary.
  - Pick up and remove all waste and wipe up any water spillage.
  - If the owner is present, tell them you have completed the task and are leaving. If the owner is not present, place the "Private Well Water Sampling Notice" in the door or other convenient location (Note: do not place in mailbox).

7.0 DECONTAMINATION

Equipment that is shared between sampling locations (water level meters, water quality meters) should be decontaminated before leaving the property (see Decontamination of Sampling Equipment HSOP-7). Buckets and hoses should be emptied on site. If it is known that the residential well is contaminated, equipment should be thoroughly rinsed with potable water.

8.0 RECORDS

Accurate record keeping is necessary to demonstrate sampling methodologies and the validity of the samples. Field notes shall be kept in a bound field logbook as specified in the Field Notebook technical procedure (HSOP-31). Records shall be recorded using waterproof ink. Sampling records should include:

- Site Name/Number;
- Date and time of sampling;
- Names of Sampling Team members;
- Weather conditions;
- Location and address of residential well;
- Well use history;
- Location of sampling (inside or outside);
- Field sketch of property/structure showing where sample was collected;
- Photograph of well location and sampling port location;
- Description of sample port type (e.g., ¾” gate value, kitchen faucet with aerator)
- Calculations (e.g., calculation of purged volume);
- Data for purge volume calculation (e.g., well depth, SWL, casing diameter, etc.);
- Volume of water purged before sampling;
- Location of sample tap;
- Discharge rate of faucet;
- Starting field parameters;
- Progressive field parameters as a function of time;
- Demonstration of field parameter stabilization, (i.e., at least 3 consecutive stable measurements);
- Parameters (inorganic compounds, metals, etc.) for which sample is to be analyzed;
- Sample volume, number, and container types;
- Laboratory chain of custody form;
- Sample cooler shipping document number, if applicable;
- Sample preservation;

- QA/QC samples collected; and
- Irregularities or problems.

9.0 ASSOCIATED DOCUMENTS

A. Decontamination of Sampling Equipment **(HSOP-7)**
B. Water Level Measurement with an Electric Probe **(HF-SOP-010)**
C. Field Measurement of pH using a pH Meter **(HF-SOP-020)**
D. Field Measurement of Dissolved Oxygen **(HF-SOP-022)**
E. Field Measurement of Specific Conductivity **(HF-SOP-079)**
F. Field Measurement of Temperature **(HF-SOP-084)**
G. Filtration of Water Samples **(HF-SOP-073)**
H. Chain-of-Custody Procedures, Packing, and Shipping Samples **(HSOP-4)**
I. Labeling and Documentation of Samples **(HSOP-29)**
J. Field Notebooks **(HSOP-31)**

The following forms will be completed and retained in the project file:

A. Water Sampling Form;
B. Chain-of-Custody Form; and
C. Shipping receipts.

10.0 REFERENCES

USGS, 2006. *National Field Manual for the Collection of Water-Quality Data: Chapter A4, Collection of Water Samples.* USGS TWRI Book 9, September 1999; Revised 2006..

Hydrometrics, 2010. *Quality Assurance Project Plan for Environmental Data Collection Activities – East Helena Facility*. Prepared by Hydrometrics, Inc. for the Montana Environmental Trust Group. May 2010.

Date/Time: ________________________

Dear Neighbor:

Thank you for allowing us to sample your well today. We will be submitting the water sample for analytical testing. We anticipate the results of this testing will be available in approximately one month and will provide the results to you.

Please feel free to contact METG if you have any questions or concerns regarding this sampling by either:

Phone: (406) 227-3734 or

Email at lg@g-etg.com

You cooperation is greatly appreciated.

Sincerely,

Montana Environmental Trust Group, LLC
1000 Smelter Road, P.O. Box 1230
East Helena, MT 59635

Date/Time: ________________________

Dear Neighbor:

Thank you for allowing us to sample your well today. We will be submitting the water sample for analytical testing. We anticipate the results of this testing will be available in approximately one month and will provide the results to you.

Please feel free to contact METG if you have any questions or concerns regarding this sampling by either:

Phone: (406) 227-3734 or

Email at lg@g-etg.com

You cooperation is greatly appreciated.

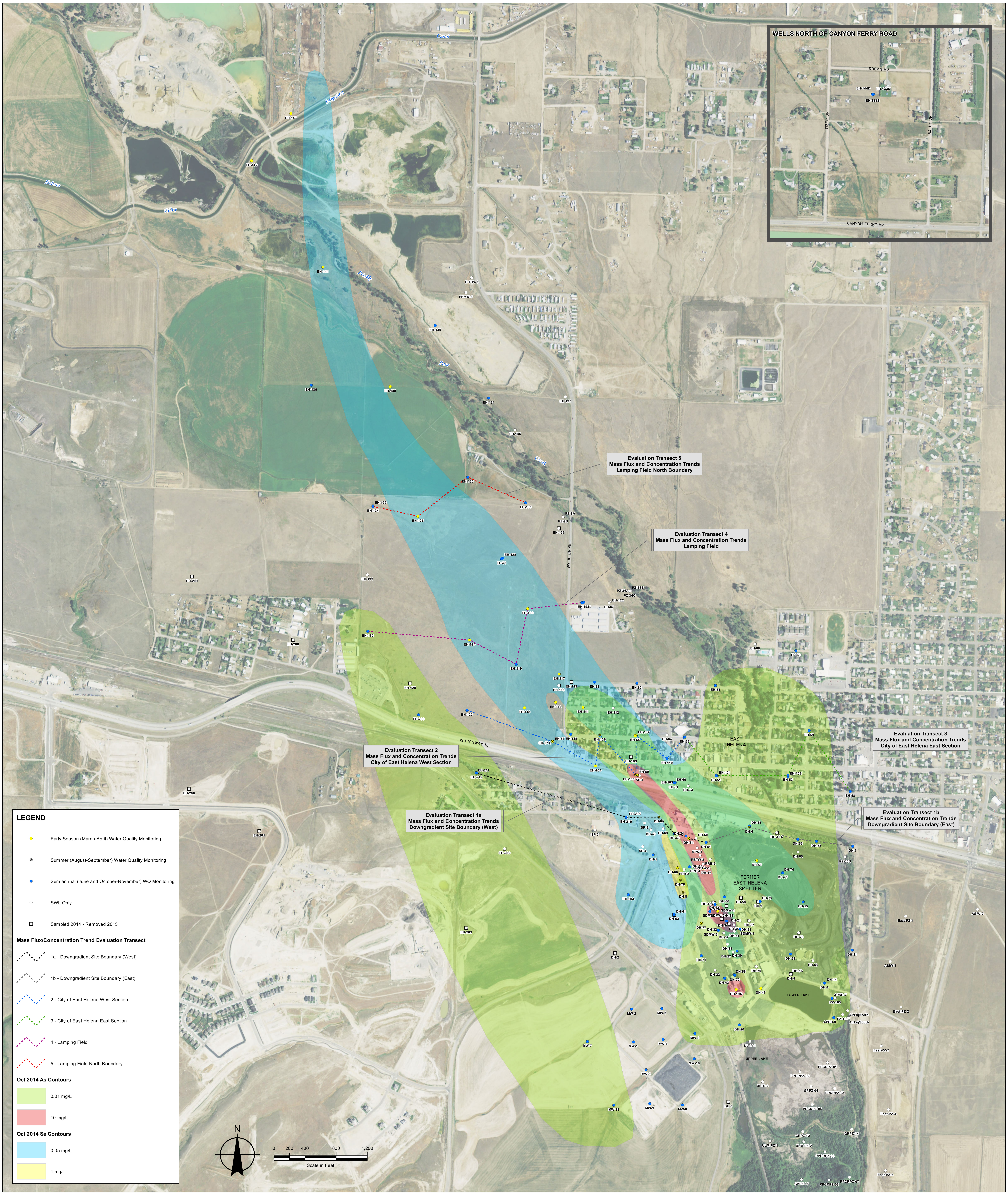
Sincerely,

Montana Environmental Trust Group, LLC
1000 Smelter Road, P.O. Box 1230
East Helena, MT 59635

EXHIBIT 1

EAST HELENA FACILITY

2015 MONITORING WELL SAMPLING LOCATIONS



Hydrometrics, Inc.
Consulting Scientists and Engineers

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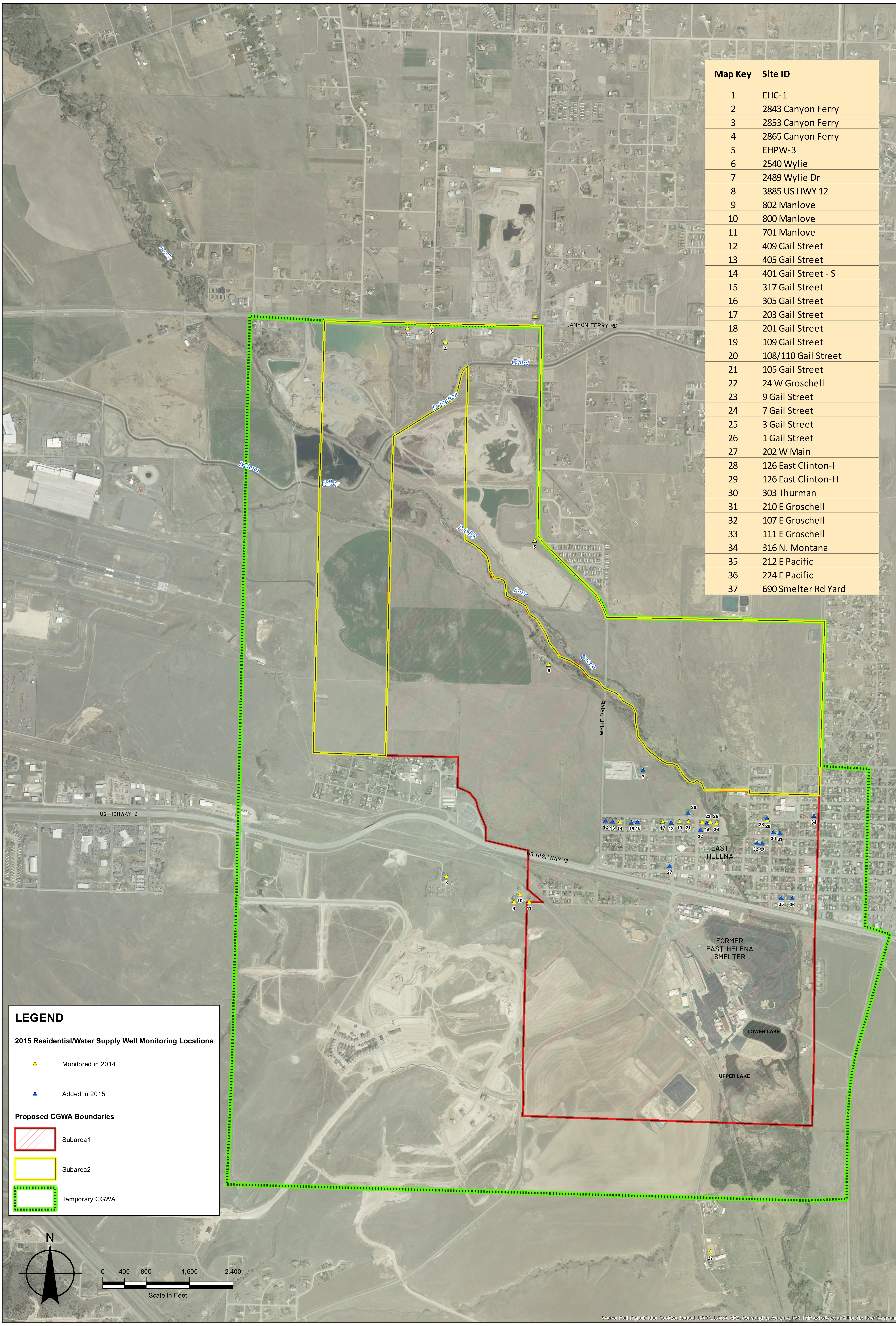
2015 EAST HELENA CORRECTIVE ACTION MONITORING PLAN	EAST HELENA FACILITY 2015 MONITORING WELL SAMPLING LOCATIONS	EXHIBIT 1

EXHIBIT 2

EAST HELENA FACILITY
2015 RESIDENTIAL / WATER SUPPLY
WELL MONITORING LOCATIONS



Map Key	Site ID
1	EHC-1
2	2843 Canyon Ferry
3	2853 Canyon Ferry
4	2865 Canyon Ferry
5	EHPW-3
6	2540 Wylie
7	2489 Wylie Dr
8	3885 US HWY 12
9	802 Manlove
10	800 Manlove
11	701 Manlove
12	409 Gail Street
13	405 Gail Street
14	401 Gail Street - S
15	317 Gail Street
16	305 Gail Street
17	203 Gail Street
18	201 Gail Street
19	109 Gail Street
20	108/110 Gail Street
21	105 Gail Street
22	24 W Groschell
23	9 Gail Street
24	7 Gail Street
25	3 Gail Street
26	1 Gail Street
27	202 W Main
28	126 East Clinton-I
29	126 East Clinton-H
30	303 Thurman
31	210 E Groschell
32	107 E Groschell
33	111 E Groschell
34	316 N. Montana
35	212 E Pacific
36	224 E Pacific
37	690 Smelter Rd Yard

Hydrometrics, Inc.
Consulting Scientists and Engineers

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2015 EAST HELENA CORRECTIVE ACTION MONITORING PLAN

EAST HELENA FACILITY
2015 RESIDENTIAL/WATER SUPPLY WELL MONITORING LOCATIONS

EXHIBIT
2