



**2024 INTERIM CORRECTIVE ACTION
PERFORMANCE MONITORING REPORT
EAST HELENA FACILITY**

Prepared for:

Montana Environmental Trust Group, LLC
Trustee of the Montana Environmental Custodial Trust
P.O. Box 1230
East Helena, MT 59635

Prepared by:

Hydrometrics, Inc.
3020 Bozeman Avenue
Helena, MT 59601

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LIST OF ACRONYMS AND ABBREVIATIONS

AMSL	Above Mean Sea Level
bgs	Below Ground Surface
CAMU	Corrective Action Management Unit
CAPM	Corrective Action Performance Monitoring
CAPMP	Corrective Action Performance Monitoring Plan
cfs	Cubic Feet Per Second
CM	Corrective Measure
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
COC	Constituents of Concern
COEH	City of East Helena
Custodial Trust	Montana Environmental Custodial Trust
DI	Deionized
DMP	Data Management Plan
DO	Dissolved Oxygen
EI	Environmental Indicator
ET	Evapotranspiration
EVCGWA	East Valley Controlled Groundwater Area
GMP	Groundwater Monitoring Plan
HHS	Human Health Standard
IC	Institutional Controls
IM	Interim Corrective Measures
MCL	Maximum Contaminant Level
METG	Montana Environmental Trust Group
mg/L	milligrams/liter
ORP	Oxidation-Reduction Potential
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RPD	Relative Percent Difference
SAI	Source Area Investigations
SC	Specific Conductance
SPHC	South Plant Hydraulic Control
SWL	Static Water Level
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
UFS	Unfumed Slag
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
USL	Upper Simultaneous Limits



EXECUTIVE SUMMARY

Montana Environmental Trust Group, LLC (METG), Trustee of the Montana Environmental Custodial Trust (the Custodial Trust) submits this 2024 Interim Corrective Action Performance Monitoring Report (Interim CAPM Report) for the Former ASARCO East Helena Facility (the Facility). The 2024 Interim CAPM program is outlined in the 2024 Interim Corrective Action Performance Monitoring Plan (CAPMP), and has been designed to assess the effectiveness of final Corrective Measures (CMs) completed to date at the Facility on an interim basis, since completion of the remaining CM (slag pile capping) is pending. The Interim CAPM program is consistent in scope and purpose with the anticipated Final Corrective Action Performance Monitoring (CAPM) program, to be developed following slag pile capping. Both the Interim and Final CAPM plans have been and will be prepared pursuant to and in accordance with the requirements of the Statement of Basis for Groundwater, Surface Water and Soil Corrective Measures (Remedy) Decision at Former ASARCO East Helena Facility (USEPA, 2020) and the Former ASARCO East Helena Facility Corrective Measures Implementation (CMI) Work Plan (Hydrometrics, 2021a) conditionally approved by the U.S. Environmental Protection Agency (USEPA) on July 28, 2021. The Interim CAPM program assesses CMs effectiveness by monitoring and evaluating groundwater elevations, surface water flows, and contaminant concentration trends in groundwater and surface water throughout and downgradient of the Facility. The Interim CAPM program builds on the extensive data set collected from investigations and monitoring performed annually at the Facility for nearly 40 years.

The 2024 Interim CAPM Report presents data collected from surface and groundwater sampling events and evaluates water quality status and trends within and downgradient of the Facility. These data are used to evaluate the effectiveness of final CMs as assessed by stable or decreasing concentration trends, plume geometry, and plume stability metrics. As outlined in the 2024 Interim CAPMP, the 2024 performance monitoring program included semiannual streamflow and water quality sampling at 11 surface water sites on or tributary to Prickly Pear Creek, seasonal groundwater level monitoring at 170 monitoring wells, semiannual or annual groundwater quality sampling at 77 monitoring wells, and semiannual water quality monitoring at 16 residential/public water supply wells, including 13 privately-owned residential wells and three wells owned by the City of East Helena (COEH) and used as part of their public water supply system. All water quality samples were analyzed for general chemistry constituents and trace metals, including the primary constituents of concern (COCs) arsenic and selenium. All 2024 data was reviewed and validated for data quality, with valid data entered into the East Helena Project electronic database.

Residential and water supply well monitoring in 2024 showed no maximum contaminant level (MCL) exceedances for arsenic or selenium at any of the sampled wells (the arsenic MCL is 0.010 mg/L and the selenium MCL is 0.050 mg/L). The Custodial Trust provides monitoring results to well owners after each monitoring event, and has worked with area residents to abandon eight private residential wells to date. The Custodial Trust also continues to encourage further private well abandonment through a financial compensation program.



Prickly Pear Creek flows were at or below long-term median values in 2024, due to lower annual precipitation and snowpack conditions near the period of record minimum in the drainage in 2024, following a higher precipitation year in 2023. Stream flow trends and surface water quality results for 2024 were similar to previous observations. Upstream to downstream flow measurements along the reach of Prickly Pear Creek adjacent to the Facility (including the realigned creek segment) continue to indicate no significant net flow gain or loss, suggesting limited interaction between Prickly Pear Creek and the local groundwater system. Downstream of the Facility, 2024 flow data shows streamflow decreases in a downstream direction, indicating leakage from the creek to groundwater and irrigation diversions from the creek; this result is also consistent with historic observations. Concentrations of major ions in Prickly Pear Creek (calcium, magnesium, sodium, potassium, sulfate) in 2024 were consistent from upstream of the Facility to downstream near Canyon Ferry Road.

Exceedances of hardness-dependent chronic aquatic life standards in 2024 Prickly Pear Creek samples were limited to total recoverable lead in June 2024, which exceeded the criteria at all creek sites during the June event. No water quality standard exceedances were observed during the October 2024 monitoring event. The lead standard exceedances in June 2024 occurred upstream, within, and downstream of the Facility, indicating upstream (non-Facility) contaminant sources were generating these exceedances. The occurrence of metals at concentrations above background in Prickly Pear Creek upstream of the Facility has been noted in numerous previous studies, including the watershed total maximum daily load (TMDL) document (USEPA, 2004b), and is attributable largely to historic mining practices. Overall, the 2024 Prickly Pear Creek water quality monitoring results are consistent with past sampling results dating back more than 20 years.

Elevated metals concentrations in a tributary drainage flowing to Prickly Pear Creek through the Facility were documented through previous sampling, resulting in removal of approximately 350 cubic yards of metals-impacted soils in November 2018. In 2024, the sampling location closest to the soil removal area was dry during both semiannual monitoring events, so samples could be collected. Other 2024 results from the tributary drainage showed State of Montana surface water standard exceedances for arsenic (June 2024) and lead (October 2024) at the furthest upstream location (above the soil removal area), and no exceedances of the surface water standards at the tributary location where it discharges to Prickly Pear Creek. Although seasonal surface water standard exceedances have persisted in portions of this tributary drainage, most metals concentrations have decreased at the tributary monitoring locations since the 2018 soil removal and metals concentrations at the tributary location where it flows into Prickly Pear Creek are similar to concentrations in the creek itself.

As noted in previous monitoring reports, groundwater elevations on the Facility have declined by up to 10 feet or more in response to CMs and variations in annual precipitation and recharge, with larger groundwater elevation decreases relative to pre-CM conditions observed during below-average precipitation periods and slightly smaller decreases observed when precipitation is above normal. For example, in 2024 (a lower precipitation year) groundwater levels across the Facility generally declined compared with 2023 (a higher precipitation year). The groundwater level declines in the former



operating area of the Facility have reduced the saturated thickness of contaminated soils by 45 to 75% below the former Acid Plant, West Selenium, and North Plant Arsenic source areas (based on 2024 data), resulting in corresponding reductions in groundwater contaminant flux migrating from the contaminated soil source areas.

In general, groundwater contaminant concentrations have continued to decline at most monitored locations on and downgradient of the Facility in response to CMs implemented to date. Arsenic concentrations at most wells in the Acid Plant, North Plant Arsenic, and Slag Pile source areas and selenium concentrations at most wells in the West Selenium and Slag Pile source areas were observed in 2024 at or near the minimum concentrations since smelter operations ceased in 2001. The 2023 increases in selenium observed some slag pile area wells were temporary, and concentrations decreased rapidly through the latter part of 2023 and throughout 2024. The temporary 2023 increases were likely attributable to the higher precipitation in 2023 leading to increase infiltration and leaching of selenium from the slag to groundwater. Downgradient (north) of the Facility, arsenic and selenium concentrations were generally stable or continued decreasing in 2024 (with few exceptions), in response to CMs and the associated decreasing source area concentrations noted above.

Arsenic concentrations at two wells along the west margin of the downgradient arsenic plume were observed to increase from 2016 through 2021 and remain above historically observed concentrations as of 2024. The arsenic concentrations at these wells have stabilized and have decreased by about 50% from the maximum at one location. The arsenic concentration increase is attributed to a westward shift in the arsenic plume caused by the elimination of a large irrigation ditch to the west (Wilson Ditch), and associated loss of groundwater recharge in this area. The westward shift is also indicated by decreasing arsenic concentrations at several wells along the eastern side of the downgradient arsenic plume.

The leading edge of the selenium plume to the north in 2024, as defined by the approximate location of the 0.050 mg/L MCL groundwater isocontour and the furthest downgradient observation of groundwater selenium exceeding 0.050 mg/L, has retracted approximately 4,000 feet back toward the Facility (south) since the Interim Measures implementation was completed in 2016, from near Canyon Ferry Road to south of Prickly Pear Creek. Wells near the downgradient edge of the selenium plume have shown a mixture of decreasing, stable, and slightly increasing trends in recent years. Similar to the arsenic plume, the selenium plume showed a slight westward shift following elimination of the irrigation ditch to the west. Since the plume shift, the overall geometry of the selenium plume has shown decreasing concentrations and contraction on the western side of the plume, with decreases attributable to upgradient concentration decreases observed in the West Selenium source area due to desaturation of contaminated soils/fill driven by the South Plant Hydraulic Control Corrective Measure.

Evaluation of plume geometry (plume areas, average plume concentrations, and centroid locations) and contaminant concentration trends continue to demonstrate CMs implemented to date are performing as intended to stabilize or reduce concentrations and contaminant migration. These data



show the arsenic plume downgradient of the Facility to be stable and the selenium plume to be receding. Compared with 2016 conditions, the 2024 downgradient arsenic plume stability calculations show approximately the same plume area (64 and 66 acres in 2016 and 2024, respectively) and average concentration (0.167 mg/L in 2016 and 0.180 mg/L in 2024). Since 2016, plume metric calculations show the downgradient selenium plume has decreased in size and average concentration by about 70% and 47%, respectively. Although the downgradient selenium plume area calculated using the plume metrics likely understates the true area of the plume, the decreasing trends in plume area do accurately reflect the decreasing selenium concentrations and associated plume contraction demonstrated by the hand-drawn plume maps. Plume metrics on the Facility across the contaminant source areas show the plumes continuing to decrease in concentration, with the average arsenic and selenium concentrations decreasing by about 60% for selenium and 65% for arsenic from 2010 to 2024.

Groundwater monitoring in the Corrective Action Management Unit (CAMU) landfill area monitoring wells showed consistent groundwater quality in 2024 compared to previous years. Most CAMU area wells continue to show stable concentrations of arsenic (0.003 to 0.018 mg/L) consistent with naturally occurring background arsenic concentrations in this area; note that some of these naturally occurring arsenic concentrations exceed the 0.010 mg/L arsenic MCL. Monitoring well MW-6, which has shown variable arsenic concentrations (typically higher than those observed at other CAMU wells) and other evidence of influence from the Facility in the past, decreased from 0.078 mg/L in 2022 to 0.026 mg/L in 2023 and 0.028 mg/L in 2024, near the lower end of the range of observed arsenic concentrations at this well. Selenium concentrations at all CAMU area wells have consistently been less than the 0.050 mg/L selenium MCL. All other trace metal concentrations were near or less than analytical detection limits in all 2024 CAMU well samples, including parameters that have been documented at elevated concentrations in Facility soils/fill and/or groundwater. Antimony (<0.003 mg/L), cadmium (<0.001 mg/L), lead (<0.005 mg/L), mercury (<0.001 mg/L), zinc (<0.01 mg/L), and thallium (<0.001 mg/L) concentrations were below reporting limits in all 2023 CAMU well samples. Overall, it appears that observed localized arsenic and selenium concentration trends in certain CAMU wells may be redox driven, with changes in redox conditions attributable to variable influence from Facility-impacted groundwater and fluctuating annual precipitation and recharge conditions.

Zinc and cadmium are currently present at concentrations exceeding relevant standards (the MCL of 0.005 mg/L for cadmium and the State of Montana groundwater human health standard (HHS) of 2.0 mg/L for zinc) in some Facility monitoring wells, although concentrations generally remain much lower than those observed during the operational period of the Facility. Zinc is not a primary COC, and cadmium is listed as a constituent of potential concern in the CMI Work Plan. The 2023 increase in zinc concentration at Facility source area well DH-17 was reversed in 2024 (similar to previous temporary concentration increases at this well), with zinc decreasing from 15 mg/L in October 2023 to 0.57 mg/L in October 2024. Relevant standards noted above were exceeded in 2024 at three wells for zinc and five wells for cadmium on the Facility. Despite the elevated zinc and cadmium groundwater concentrations in certain areas of the Facility, no off-site migration at concentrations above the Montana groundwater HHS of 2.0 mg/L is currently indicated for zinc. Offsite exceedances



of the 0.005 mg/L cadmium MCL are limited to one well off-site and north of the Facility (EH-100 at 0.007 mg/L in 2024). No residential wells were observed to exceed the cadmium MCL or the zinc HHS in 2024 with all results near or less than analytical detection limits. Future groundwater monitoring will continue to include collection and evaluation of zinc and cadmium data, to assess any changes in concentration distributions and trends.

Monitoring wells proximate to the slag pile were sampled monthly from January through March 2024 under an Unfumed Slag Processing and Removal Groundwater Monitoring Plan and Sampling Methodology Addendum, separate from the 2024 Interim CAPMP sampling program. These wells were sampled to determine whether unfumed slag (UFS) recovery operations (excavation, processing, and off-site transport) were affecting groundwater quality. The UFS Project and the associated monthly groundwater sampling program were both suspended after March 2024. The 2024 UFS recovery monitoring program consisted of monthly sampling at eight primary wells for field parameters and a targeted parameter list of COCs (arsenic and selenium) and potential other indicators of slag leaching (chloride, sulfate, potassium, and magnesium). Additional wells were added to the slag monitoring program as warranted to monitor any potential downgradient effects of observed trends at the primary wells. As in 2021, 2022, and 2023, the 2024 UFS monitoring results identified no unacceptable water quality impacts to downgradient groundwater from the slag excavation and removal activities. The spring and early summer 2023 selenium concentration increases at some primary UFS monitoring wells decreased in late 2023 and into 2024, indicating these temporary increases were attributable in part to high precipitation in spring 2023 leading to increased selenium leaching from the slag pile.

Finally, the 2024 CAPMP groundwater monitoring program included an evaluation of sample collection techniques and equipment to further evaluate whether the use of low flow/low volume purging and sampling provides representative data of appropriate quality and comparable to historical data collected using standard (3 well volume) well purging techniques. Based on previous comparisons showing comparable results for the two methods, the low flow/low volume technique was adopted for use as the routine sampling method during 2023 for the Interim CAPM program. A total of seven wells were sampled by both conventional and low flow procedures in 2024. The majority of analytes in the seven sample pairs showed comparable results, evidenced by agreement to within criteria normally used for comparing field duplicate quality control samples ($\pm 20\%$ relative percent difference (RPD)), including the primary COCs arsenic and selenium, common indicator parameters such as chloride and sulfate, and major cations calcium, magnesium, sodium, and potassium. Use of low flow/low volume sampling procedures reduces long-term monitoring costs by reducing equipment and labor costs, and reducing the volume of purge water requiring storage and disposal. The low flow/low volume purge method will continue to be used as the routine sampling method for East Helena project wells.



2024 INTERIM CORRECTIVE ACTION PERFORMANCE MONITORING REPORT EAST HELENA FACILITY

1.0 INTRODUCTION

This report presents a summary of 2024 groundwater and surface water monitoring activities and data collected in accordance with the 2024 Interim Corrective Action Performance Monitoring (CAPM) Plan (Hydrometrics, 2024a). The project area includes the former ASARCO East Helena smelter site or Facility¹, and the surrounding area encompassing two groundwater plumes and the project groundwater monitoring network. The Interim CAPM program has been implemented by the Montana Environmental Trust Group (METG), Trustee of the Montana Environmental Custodial Trust (the Custodial Trust). The 2024 performance monitoring activities are part of the Corrective Measures Implementation (CMI) program implemented by the Custodial Trust to identify and address groundwater contamination originating from the Facility, under the Resource Conservation and Recovery Act (RCRA) Corrective Action Program. The Interim CAPM program assesses Corrective Measures (CMs) effectiveness by monitoring and evaluating groundwater elevations, surface water flows, and contaminant concentration trends in groundwater and surface water throughout and downgradient of the Facility. The Interim CAPM Plan was prepared pursuant to and in accordance with the requirements of the CMI Work Plan (Hydrometrics, 2021a) and the Statement of Basis (USEPA, 2020). In addition to the groundwater and surface water data collected under the Interim CAPM program, this report summarizes groundwater data collected in 2024 under a separate groundwater monitoring program specific to the unfumed slag (UFS) recovery project initiated in 2021, as outlined in the Unfumed Slag Processing and Removal Groundwater Monitoring Plan (GMP) (Hydrometrics, 2021b and 2022). Information provided in this report will support the planning and implementation of a future Final CAPM program, to be developed following completion of the final selected CM specified in the Statement of Basis, capping the Facility slag pile (USEPA, 2020).

1.1 PROJECT BACKGROUND

The Facility was formerly a custom lead smelter located near East Helena in Lewis and Clark County, Montana (Figure 1-1). The Facility began operations in 1888 and produced lead bullion from smelting of a variety of foreign and domestic concentrates, ores, fluxes, and other non-ferrous metal bearing materials. In addition to lead bullion, the Facility produced copper by-products and food-grade sulfuric acid. The Facility ceased operation in April 2001.

¹ The former smelter site or Facility refers to the approximately 142 acres previously occupied by the East Helena Lead Smelter.



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PROJECT LOCATION AND
SITE FEATURES

FIGURE

1-1



The Facility covers approximately 142 acres located primarily on the Prickly Pear Creek alluvial plain. The Facility is bounded to the east and northeast by Prickly Pear Creek; to the west and southwest by uplands or foothills comprised of Tertiary-age sediments; and to the north by U.S. Highway 12 and the American Chemet plant (a manufacturer of copper- and zinc-based chemicals). The City of East Helena (COEH) business district and residential areas are located immediately north of Highway 12 (Figure 1-1). Prior to 2014, the Facility was bordered to the south by Upper Lake, a large manmade lake/marsh complex. Upper Lake has been eliminated and the Prickly Pear Creek channel and floodplain lowered to decrease groundwater elevations and groundwater interaction with contaminated soils/fill (Section 1.2). The site background and history of the Facility is described further in numerous reports including Hydrometrics (1999, 2010, 2017), GSI (2014), and CH2M (2018).

Soils and non-native fill material (i.e., slag, ore, concentrates, demolition debris) located on the Facility contain elevated contaminant concentrations, primarily arsenic, selenium, and certain trace metals. Contaminants within site soils (both saturated and unsaturated zone soils) and fill 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 plant process water. The contaminated soil/fill represents the primary historic source of contaminant loading to groundwater. Loading of contaminants to groundwater has resulted in the generation and migration of arsenic and selenium groundwater plumes from the Facility to the north and northwest. The Custodial Trust implemented several interim corrective measures (IMs) concurrent with a corrective measures study (CMS), including the South Plant Hydraulic Control project, contaminant source removal, and an evapotranspiration (ET) cover (CH2M, 2018; METG, 2020). The IMs were adopted as the final CMs for the East Helena Facility with USEPA's issuance of the Statement of Basis (USEPA, 2020). The primary purpose of the CMs completed to date by the Custodial Trust is to reduce contaminant mass loading to groundwater and downgradient migration of contaminants from the Facility to protect public health and the environment.

1.2 CORRECTIVE MEASURES IMPLEMENTATION

The Custodial Trust has completed the CMS for the East Helena Facility, under oversight of the United States Environmental Protection Agency (USEPA), pursuant to the First Modification to the 1998 RCRA Consent Decree (U.S. District Court, 2012). The CMS involved the completion of several site investigations designed to delineate groundwater contaminant source areas and aid in selection of groundwater (CMs). The Custodial Trust has implemented three CMs (the original IMs) to address ongoing groundwater contaminant loading, as described in the Statement of Basis (USEPA, 2020). The three CMs completed to date include:

1. South Plant Hydraulic Control (SPHC): SPHC is a multicomponent remedial action intended to lower groundwater levels and groundwater flux across the Facility. Since the primary source of contaminant loading to groundwater is groundwater flow through contaminated Facility soils/fill and associated contaminant leaching, lowering the water table has reduced the volume of contaminated soil/fill in contact with groundwater, and thus the mass of contaminants available for leaching. Components of SPHC include: (1) dewatering of former



Upper Lake immediately south of the Facility, previously a major source of recharge to the Facility groundwater system; (2) removal of Smelter Dam from Prickly Pear Creek thereby lowering the creek stage by up to 15 feet and reducing leakage from the creek to the shallow groundwater system; and (3) reconstructing Prickly Pear Creek upstream of and adjacent to the Facility to further reduce the creek stage and leakage to groundwater.

2. **Evapotranspiration (ET) Cover:** The ET Cover included placement of an engineered soil cover over approximately 57 acres of the western portion of the Facility where smelting operations and associated activities occurred (the former operational area). The ET Cover is designed to store precipitation infiltration in the engineered soil cap for subsequent evapotranspiration during the growing season. The purpose of the ET Cover is to minimize deep percolation of incident precipitation and snowmelt water through contaminated vadose zone soils/fill and associated leaching of contaminants to groundwater.
3. **Contaminant Source Removal:** Source removal actions were performed on the Facility to remove areas of localized, higher contaminant concentration soils from below the groundwater table. Source removal actions were completed in the southern portion of the Facility (South Plant Area), including the former Tito Park and Upper Ore Storage areas, and in the Former Acid Plant Area. The excavated soils were either placed in the Corrective Action Management Unit (CAMU) or beneath the ET Cover and the excavations backfilled with clean soil.

In addition to these CMs, multiple institutional controls (ICs) have been implemented by the Custodial Trust and other entities to further mitigate potential exposures to contaminated soil and groundwater. These ICs include a well abandonment program to encourage abandonment of private wells located in areas potentially impacted by the groundwater contaminant plumes; deeded land-use restrictions on Trust-owned property; administration of the East Valley Controlled Groundwater Area (EVCGWA) to control and restrict groundwater appropriations within and adjacent to the groundwater contaminant plumes; a prohibition on new well installation within the COEH boundaries; and implementation of the COEH Lead Education and Abatement Program Soil Ordinance to regulate earthwork in areas of potential soil contamination.

Additional information on the completed CMs and the ICs is available in the CMS Report (CH2M, 2018; METG, 2020), the CMI Work Plan (Hydrometrics, 2021a), and the Statement of Basis (USEPA, 2020). Evaluation of CM effectiveness in terms of the groundwater system response is the primary focus of the East Helena Project monitoring program, as outlined in the 2024 CAPMP.

1.3 CORRECTIVE ACTION PERFORMANCE MONITORING PROGRAM

Groundwater and surface water monitoring activities were conducted in accordance with the 2024 Interim CAPMP (Hydrometrics, 2024a) to meet the requirements of the CMI Work Plan (Hydrometrics, 2021a) and the Statement of Basis (USEPA, 2020). The CAPMP is designated as “Interim” since the final CM (slag pile capping) is pending. As described in the CAPMP, the overall objective of the 2024 performance monitoring program was to continue assessment of groundwater quality status and



trends within and downgradient of the Facility, and to evaluate the effectiveness of the CMs and other remedial measures at reducing concentrations and migration of groundwater contaminants. Consistent with previous post-CM monitoring activities conducted from 2017 through 2023, the 2024 program focused on performance monitoring applicable to the CMI phase of a RCRA Corrective Action remediation project including the following objectives:

1. Assessment of sitewide groundwater level trends and groundwater flow directions;
2. Assessment of groundwater quality trends for the COCs arsenic and selenium as well as other key constituents (cadmium, zinc, chloride, and sulfate) at specific wells in Facility source areas and downgradient areas;
3. Assessment of arsenic and selenium plume geometry and stability;
4. Evaluation of residential/public water supply well water quality downgradient of the Facility;
5. Evaluation of surface water flow and quality trends, from upstream of the Facility through the Prickly Pear Creek realignment area, and downstream to Canyon Ferry Road; and
6. Continued evaluation of groundwater chemistry in CAMU area wells.

Assessment of groundwater level trends, groundwater quality trends, and arsenic and selenium plume geometry and stability (objectives (1), (2), and (3) above) are addressed through a remedy performance monitoring data evaluation program, as outlined in the 2024 Interim CAPMP (Hydrometrics, 2024a). This data evaluation program forms the basis of the discussion of 2024 monitoring results in Section 3.3.

Based on previous results of purge method comparison sampling, groundwater monitoring in 2024 was conducted utilizing a low-flow/low-volume purge methodology, replacing the standard three to five well volume purge method. The low-flow/low-volume method has been demonstrated to provide comparable groundwater quality data to the standard method, with significantly lower volumes of purge water requiring disposal, and reduced labor costs. Although not a remedy-related monitoring program objective, comparison sampling of the two purge methods continued in 2024 at selected wells, as outlined in the 2024 CAPMP, to allow additional evaluation of method comparability. The results of the 2024 purge method comparison sampling are discussed in Section 3.3.7 of this report.

1.4 UNFUMED SLAG PROJECT GROUNDWATER MONITORING PROGRAM

Additional groundwater monitoring activities in 2024 were conducted in accordance with the Unfumed Slag Processing and Removal GMP (Hydrometrics, 2021b and 2022). The UFS at the Facility contains economically recoverable amounts of zinc and other non-ferrous metals. Due to the nature of the UFS Project (excavation, crushing, and transport of slag), some short-term impacts to groundwater may occur during operations due to the potential for enhanced contaminant leaching, although the project was designed to minimize any such impacts. In addition, non-UFS Project-related short- and long-term variability in groundwater quality in the vicinity of the slag pile also occurs, due



primarily to seasonal precipitation and infiltration patterns, seasonal changes in Prickly Pear Creek flows and stage, and to the ongoing effects of the CMs.

The primary objective of the UFS GMP is to provide for collection of groundwater data and establish data evaluation procedures to identify any unacceptable UFS Project-related impacts to groundwater quality. The UFS monitoring program was initiated in 2021 to assess potential groundwater quality impacts associated with the processing and removal of UFS from the Facility. The monitoring program continued through March 2024; following suspension of onsite UFS Project activities (slag mining, crushing, and loading), the associated groundwater monitoring program was also suspended.

This document presents a summary of the 2024 CAPMP groundwater and surface water monitoring activities, data, and performance evaluation results, along with the 2024 UFS groundwater monitoring activities and data. The scope of monitoring activities is presented in Section 2 and monitoring results are discussed in Section 3.



2.0 MONITORING SCOPE

The 2024 CAPMP monitoring program included semiannual monitoring at an extensive network of groundwater and surface water locations spanning the Facility and the downgradient contaminant plume areas. The sampling protocol is detailed in the 2024 Interim CAPMP (Hydrometrics, 2024a), and followed established standard operating procedures included in the Project Quality Assurance Project Plan (QAPP; Hydrometrics, 2015a) and the Project Data Management Plan (DMP; Hydrometrics, 2011). The scope of the 2024 monitoring is described below.

2.1 SURFACE WATER MONITORING

The 2024 surface water monitoring program included semiannual surface water elevation or stage measurements, stream flow measurements and water quality sampling in June and October. The semiannual monitoring schedule included eleven monitoring sites (Table 2-1, Figure 2-1), with eight sites located on Prickly Pear Creek and three sites (Trib-1, Trib-1B, and Trib-1D) located on a spring-fed tributary drainage flowing from the southwest through the former Upper and Lower Lake areas on the south end of the Facility to Prickly Pear Creek (Figure 2-1). Surface water elevations were measured in June and October using a survey grade GPS. Elevation surveys were conducted concurrently with site-wide groundwater static water level (SWL) measurements to allow comparison of groundwater and surface water elevation data. Besides informing the estimation of groundwater flow directions and gradients, the resulting data was used to assess potential gaining and losing reaches of Prickly Pear Creek. Water quality monitoring and stream flow measurements were conducted at nine of the eleven surface water sites during both high flow (June) and low flow (October) conditions (Table 2-1).

Tributary monitoring sites have shown highly variable flows and water quality results during past monitoring, particularly during the spring season. Elevated metals concentrations throughout the tributary drainage have been documented through past sampling, resulting in removal of approximately 350 cubic yards of metals-impacted soils by METG in the vicinity of Trib-1B in November 2018. Tributary drainage sampling was conducted in 2024 to further evaluate ongoing water quality trends in response to the 2018 soil removal. As shown in Table 2-1, however, tributary site Trib-1B was dry during the June and October 2024 monitoring events, and site Trib-1D was dry during the October 2024 monitoring event.

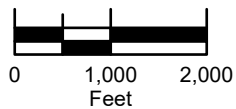
All surface water samples were analyzed for the parameters shown in Table 2-2, including field analysis of pH, specific conductance (SC), dissolved oxygen (DO) and water temperature, and laboratory analysis of common constituents and total recoverable metals by Energy Laboratories in Helena, Montana. All 2024 surface water stage, flow, and water quality results have been entered into the project database and validated for data quality and usability per the project QAPP (Hydrometrics, 2015a). The 2024 validated database is included in Appendix A. Surface water monitoring results for 2024 are discussed in Section 3.1.

Table 2-1. 2024 Surface Water Monitoring Locations and Schedule
2024 Interim CAPM Report - East Helena Facility

Site ID	Northing	Easting	Description	June/October Water Elevation	June/October Flow and Water Quality
PPC-3A	856283.87	1361694.37	Prickly Pear Creek upstream of former smelter site	X	X
PPC-4A	858437.51	1361223.39	Prickly Pear Creek realigned channel upstream of former smelter dam, in former Upper Lake area	X	X
PPC-5A	859568.08	1361450.05	Prickly Pear Creek realigned channel downstream of former smelter dam; near historic site PPC-5	X	X
PPC-7	861473.74	1360743.50	Prickly Pear Creek channel upstream of Highway 12 bridge; between slag pile and Highway 12	X	X
PPC-8	863372.55	1360137.99	Prickly Pear Creek at West Gail Street in East Helena	X	
PPC-36A	864556.11	1358753.31	Prickly Pear Creek approximately 3,500 feet downstream of former smelter site	X	X
PPC-9A	865555.92	1357841.22	Prickly Pear Creek approximately 5,250 feet downstream of former smelter site	X	
SG-16	872677.17	1350559.96	Prickly Pear Creek downstream of Canyon Ferry Road bridge	X	X
Trib-1	857989.72	1360189.58	Tributary drainage at railroad bridge crossing, upstream of site Trib-1B and 2018 soil removal area	X	X
Trib-1B	858476.27	1360181.89	Tributary drainage south of Facility, upstream of site Trib-1D and downstream of 2018 soil removal area	Dry	Dry
Trib-1D	859392.30	1361402.33	Tributary drainage immediately upstream of Prickly Pear Creek confluence	X	Dry

Locations shown on Figure 2-1.

Prickly Pear Creek sites listed in upstream to downstream order.



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**2024 SURFACE WATER
MONITORING LOCATIONS**

FIGURE

2-1

Table 2-2. 2024 Surface Water Sample Analytical Parameter List
2024 Interim CAPM Report - 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	300.0	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
Cadmium (Cd)	200.7/200.8	0.00003
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
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	HSOP-237/-244	NA
Stream Stage/Elevation	HSOP-005	NA
Water Temperature	HSOP-006	0.1 °C
Dissolved Oxygen (DO)		0.01 mg/L
pH		0.01 s.u.
Specific Conductance (SC)		1 µmhos/cm

Notes:

(1) Analytical methods are from the most recent edition of *Standard Methods for the Examination of Water and Wastewater* (SM); *Methods for the Determination of Metals in Environmental Samples*, Supplement I, EPA/600/R-94/111 (May 1994); or *Methods for the Determination of Inorganic Substances in Environmental Samples*, EPA/600/R-93/100 (August 1993).



2.2 2024 GROUNDWATER MONITORING

The 2024 groundwater monitoring program included groundwater level and water quality monitoring at an extensive network of monitoring wells and residential/public water supply wells. The current well network includes 170 monitoring wells with well coverage extending from south (upgradient) of the Facility northward approximately four miles, to about 1,600 feet north of Canyon Ferry Road. Monitoring well depths range from less than 10 feet for some wells located near Prickly Pear Creek, to 247 feet (EH-145D) north of Canyon Ferry Road. The groundwater monitoring network is shown on Exhibit 1 and summarized in Table 2-3.

2.2.1 Groundwater Level Monitoring

Groundwater level monitoring has been a key component of the monitoring program throughout the implementation of CMs due to its relevance to groundwater remediation objectives. As described in Section 1, the objective of the SPHC CM is to lower groundwater levels on the Facility thereby reducing groundwater interaction with, and contaminant leaching from, Facility fill/soils. The groundwater level data also provides information on changing hydraulic gradients and groundwater (and contaminant) flow directions, and provides for development of project-area groundwater potentiometric maps.

Groundwater level measurements were collected at all 170 wells in June and October. All water levels were measured manually with electronic meters with depths to water from the top of the well casing recorded to the nearest 0.01 foot. The depth to water measurements were converted to elevations (relative to mean sea level) using surveyed casing elevations for each well. Water level monitoring events were completed in a single day to provide a snapshot of seasonal groundwater elevation conditions, and were coordinated with the surface water elevation surveys (Section 2.1) to provide more comprehensive water level datasets for the project area. The 2024 water level monitoring schedule is included in Table 2-3 with results presented in Section 3.3.

2.2.2 Groundwater Quality Monitoring

The 2024 Interim CAPMP groundwater monitoring program included planned groundwater quality sampling at 24 monitoring wells in June and 77 wells in October. The groundwater sampling schedule is summarized in Table 2-3 with well locations shown on Exhibit 1. One well (DH-77) could not be sampled in 2024 due to insufficient water for sampling (Table 2-3). In addition, residential and public water supply well sampling was conducted in June and October to monitor the quality of local drinking water sources at 16 residential/public water supply wells (Table 2-4, Exhibit 1). The residential/public water supply well sampling program includes measurement of water levels (where well access permits) and collection of groundwater samples for water quality analyses, with the water quality data provided to the well owners. The COEH public water supply wells (numbers R14, R15, and R16, Table 2-4 and Exhibit 1) are included in the semiannual sampling events.

Table 2-3. 2024 Interim CAPMP Monitoring Well Sampling Schedule

2024 Interim CAPM Report - East Helena Facility

Well ID	Screen Interval (feet bgs)	Unit ⁽¹⁾	MP Elevation	Water Levels (June/October)	Water Quality Monitoring (June)	Water Quality Monitoring (October)
2843 Canyon Ferry	145-165	Valley Fill	Unknown	X	X	X
2853 Canyon Ferry	132-152	Valley Fill	Unknown	X	X	X
ASIW-1	53-73	Upper Aquifer	3915.99	X		
ASIW-2	10-95	Upper Aquifer	3909.13	X		
Dartman	84	Upper Aquifer	3863.03	X	X	X
DH-1	40-50	Tertiary	3910.89	X		
DH-2	55.5-65.5	Upper Aquifer	3936.91	X		
DH-3	44-54	Tertiary	3947.48	X		
DH-4	17-23	Upper Aquifer	3917.26	X		
DH-5	9-17	Upper Aquifer	3921.18	X		
DH-6	15-25	Upper Aquifer	3889.85	X	X	X
DH-7	18.5-28.5	Upper Aquifer	3898.66	X		
DH-8	39-49	Upper Aquifer	3923.38	X		X
DH-9	6.5-11.5	Upper Aquifer	3918.08	X		
DH-10A	5-10	Upper Aquifer	3886.97	X		
DH-13	35-45	Upper Aquifer	3923.91	X		
DH-14	34-46	Upper Aquifer	3916.06	X		
DH-15	41.5-50	Upper Aquifer	3889.82	X	X	X
DH-17	31-41	Upper Aquifer	3917.56	X	X	X
DH-18	55.5-63.5	Deeper System	3924.93	X		
DH-20	21-31	Upper Aquifer	3927.09	X		
DH-22	24-34	Upper Aquifer	3948.63	X		
DH-23	10-20	Upper Aquifer	3931.82	X		
DH-27	19-29	Upper Aquifer	3946.21	X		
DH-30	12-22	Upper Aquifer	3943.24	X		
DH-36	21-31	Upper Aquifer	3920.66	X		
DH-42	24-34	Upper Aquifer	3942.63	X		X
DH-47	5-15	Upper Aquifer	3926.82	X		
DH-52	7-17	Upper Aquifer	3889.18	X	X	X
DH-53	7-17	Upper Aquifer	3892.87	X	X	X
DH-55	83-93	Upper Aquifer	3972.76	X	X	X
DH-56	70-85	Upper Aquifer	3958.17	X	X	X
DH-57	23-28	Upper Aquifer	3929.53	X		

Table 2-3. 2024 Interim CAPMP Monitoring Well Sampling Schedule

2024 Interim CAPM Report - East Helena Facility

Well ID	Screen Interval (feet bgs)	Unit ⁽¹⁾	MP Elevation	Water Levels (June/October)	Water Quality Monitoring (June)	Water Quality Monitoring (October)
DH-58	9-24	Upper Aquifer	3919.33	X		
DH-59	10-25	Upper Aquifer	3937.44	X		
DH-5A	8-18	Upper Aquifer	3921.92	X		
DH-61	20-30	Upper Aquifer	3926.84	X		
DH-62	65-75	Deeper System	3926.95	X		
DH-65	60-70	Upper Aquifer	3945.85	X		
DH-66	38-48	Upper Aquifer	3919.28	X	X	X
DH-67	36-46	Upper Aquifer	3899.77	X		X
DH-68	40-50	Upper Aquifer	3943.28	X		
DH-69	30-40	Upper Aquifer	3934.49	X		X
DH-70	24-30	Upper Aquifer	3933.91	X		
DH-71	25-34	Upper Aquifer	3944.88	X		
DH-72	40-50	Deeper System	3939.67	X		
DH-73	38-48	Upper Aquifer	3918.08	X		
DH-74	118-128	Upper Aquifer	4006.44	X		
DH-75	136-146	Upper Aquifer	4006.54	X		
DH-76	104-124	Upper Aquifer	3994.28	X		
DH-77	38-48	Upper Aquifer	3932.20	X		Dry
DH-78	35-45	Upper Aquifer	3921.12	X		
DH-79	32-42	Upper Aquifer	3928.80	X		X
DH-80	20-30	Upper Aquifer	3942.36	X		X
DH-82	39-49	Upper Aquifer	3908.18	X		
DH-83	49.5-54.5	Upper Aquifer	3922.14	X		
East-PZ-1	14-34	Valley Fill	3911.93	X		
East-PZ-2	29	Valley Fill	3924.58	X		
East-PZ-4	28.00	Valley Fill	3935.66	X		
East-PZ-6	19-26	Tertiary	3943.83	X		
East-PZ-7	28-33	Tertiary	3928.83	X		
EH-50	25-45	Upper Aquifer	3889.39	X		X
EH-51	10-30	Upper Aquifer	3880.09	X		X
EH-52	5-13	Upper Aquifer	3880.50	X		X
EH-53	25-35	Upper Aquifer	3872.82	X		X
EH-54	8-18	Upper Aquifer	3869.66	X		X

Table 2-3. 2024 Interim CAPMP Monitoring Well Sampling Schedule

2024 Interim CAPM Report - East Helena Facility

Well ID	Screen Interval (feet bgs)	Unit ⁽¹⁾	MP Elevation	Water Levels (June/October)	Water Quality Monitoring (June)	Water Quality Monitoring (October)
EH-58	21-31	Upper Aquifer	3888.15	X		X
EH-59 ⁽²⁾	8-18	Upper Aquifer	3876.57	X		X
EH-60	22-28	Upper Aquifer	3888.46	X	X	X
EH-61	36-45	Upper Aquifer	3889.77	X		
EH-62	25-45	Upper Aquifer	3875.07	X		X
EH-63	20-35	Upper Aquifer	3878.32	X		X
EH-65	20-35	Upper Aquifer	3879.96	X		X
EH-66	28.5-38.5	Upper Aquifer	3869.48	X		X
EH-67	27-37	Upper Aquifer	3869.46	X		
EH-68	15-25	Upper Aquifer	3867.60	X		
EH-69	26-36	Upper Aquifer	3869.10	X		X
EH-70	40-50	Upper Aquifer	3863.48	X		X
EH-100	52-60	Upper Aquifer	3889.83	X		X
EH-101	34-45	Upper Aquifer	3879.95	X		X
EH-102	25-35	Upper Aquifer	3880.45	X		X
EH-103	59.5-74.5	Upper Aquifer	3890.54	X	X	X
EH-104	38-48	Upper Aquifer	3887.83	X		X
EH-106	31-46	Upper Aquifer	3882.07	X		X
EH-107	68-78	Upper Aquifer	3880.15	X		X
EH-110	40-55	Upper Aquifer	3884.05	X		X
EH-111	39-49	Upper Aquifer	3876.50	X		X
EH-114 ⁽²⁾	42-52	Upper Aquifer	3878.07	X	X	X
EH-115	39-49	Upper Aquifer	3883.29	X	X	X
EH-117	33-43	Upper Aquifer	3871.33	X		X
EH-119	58-68	Upper Aquifer	3873.75	X		X
EH-120	55-65	Upper Aquifer	3865.78	X	X	X
EH-121	59-69	Upper Aquifer	3869.49	X		X
EH-122	60-65	Upper Aquifer	3868.08	X		
EH-123	50-60	Upper Aquifer	3885.71	X		X
EH-124	64-74	Upper Aquifer	3874.46	X	X	X
EH-125	59-69	Upper Aquifer	3863.22	X		X
EH-126 ⁽²⁾	63-73	Upper Aquifer	3870.00	X	X	X
EH-127	63-73	Upper Aquifer	3860.75	X		

Table 2-3. 2024 Interim CAPMP Monitoring Well Sampling Schedule

2024 Interim CAPM Report - East Helena Facility

Well ID	Screen Interval (feet bgs)	Unit ⁽¹⁾	MP Elevation	Water Levels (June/October)	Water Quality Monitoring (June)	Water Quality Monitoring (October)
EH-128	34-44	Upper Aquifer	3892.17	X		
EH-129	80-90	Upper Aquifer	3870.21	X	X	X
EH-130	68-78	Upper Aquifer	3858.55	X		X
EH-131	74-84	Valley Fill	3834.44	X		
EH-132	70-80	Upper Aquifer	3893.90	X		X
EH-133	85-95	Upper Aquifer	3884.36	X		
EH-134	54-64	Upper Aquifer	3870.21	X	X	X
EH-135	55-65	Upper Aquifer	3852.25	X		X
EH-136	64-74	Valley Fill	3838.59	X		
EH-137	75-85	Valley Fill	3839.66	X		
EH-138	55-85	Valley Fill	3839.70	X	X	X
EH-139	47-57	Valley Fill	3839.78	X	X	X
EH-140	56-86	Valley Fill	3812.08	X		
EH-141 ⁽²⁾	60-90	Valley Fill	3813.32	X	X	X
EH-142	80-120	Valley Fill	3804.68	X		
EH-143	100-125	Valley Fill	3803.37	X	X	X
EH-144D	143.5-168.5	Valley Fill	3778.86	X		
EH-144M	118-128	Valley Fill	3778.95	X		
EH-144S	83-103	Valley Fill	3778.70	X		
EH-145D	211-241	Valley Fill	3789.60	X		
EH-145S	167-187	Valley Fill	3790.09	X		
EH-200	38-48	Tertiary	3953.33	X		
EH-201	99-119	Tertiary	3973.48	X		
EH-202	70-90	Tertiary	3930.56	X		
EH-203	125-145	Tertiary	4003.92	X		
EH-204	55-65	Tertiary	3925.69	X		X
EH-205	24-34	Upper Aquifer	3900.66	X		
EH-206	33-53	Upper Aquifer	3898.10	X		X
EH-208	60-85	Valley Fill	3910.58	X		
EH-209	96-116	Valley Fill	3898.34	X		
EH-210	50-60	Deeper System	3901.19	X		X
EH-211	40-50	Valley Fill	3905.75	X		
EH-212	57-72	Valley Fill	3905.90	X		

Table 2-3. 2024 Interim CAPMP Monitoring Well Sampling Schedule

2024 Interim CAPM Report - East Helena Facility

Well ID	Screen Interval (feet bgs)	Unit ⁽¹⁾	MP Elevation	Water Levels (June/October)	Water Quality Monitoring (June)	Water Quality Monitoring (October)
EHMW-3	80-130	NA	3825.45	X		
EHTW-3	NA	NA	3827.66	X		
IW-01	NA	Upper Aquifer	3888.28	X		
IW-02	NA	Upper Aquifer	3871.08	X		
MW-1	58-68	Tertiary	3953.05	X		X
MW-2	56.0-66.0	Tertiary	3945.97	X		X
MW-3	38.5-48.0	Tertiary	3940.95	X		X
MW-4	54-64	Tertiary	3947.06	X		X
MW-5	55-65	Tertiary	3956.18	X		X
MW-6	30-40	Tertiary/Qal	3938.14	X		X
MW-7	44-57	Qal	3963.67	X		X
MW-8	44.5-64.5	Tertiary	3958.65	X		X
MW-9	50-70	Valley Fill	3959.01	X		X
MW-10	42-62	Valley Fill	3946.28	X		X
MW-11	49.6-69.6	Tertiary	3973.33	X		X
PBTW-1	29-46	Upper Aquifer	3914.59	X		
PBTW-2	30-54	Upper Aquifer	3906.73	X		X
Plant Road Test Well	217-346	Upper Aquifer	3838.72	X		
PPCRPZ-02	<10	Upper Aquifer	3919.76	X		
PRB-1	35-50	Upper Aquifer	3918.37	X		
PRB-2	37-52	Upper Aquifer	3905.34	X		
PRB-3	36-51	Upper Aquifer	3919.19	X		
PZ-36A	<10	Upper Aquifer	3858.96	X		
PZ-36B	<10	Upper Aquifer	3858.75	X		
PZ-36C	20-25	Upper Aquifer	3859.60	X		
PZ-9A	<10	Upper Aquifer	3850.70	X		
PZ-9B	<10	Upper Aquifer	3849.43	X		
SC-1	75-85	Upper Aquifer	3890.42	X		
SDMW-1	25.6-45.6	Upper Aquifer	3925.11	X		X
SDMW-2	22.5-42.5	Upper Aquifer	3928.09	X		
SDMW-3	19-39	Upper Aquifer	3935.14	X		
SDMW-4	19-39	Upper Aquifer	3936.10	X		
SDMW-5	29-49	Upper Aquifer	3929.86	X		X

Table 2-3. 2024 Interim CAPMP Monitoring Well Sampling Schedule

2024 Interim CAPM Report - East Helena Facility

Well ID	Screen Interval (feet bgs)	Unit ⁽¹⁾	MP Elevation	Water Levels (June/October)	Water Quality Monitoring (June)	Water Quality Monitoring (October)
TW-1	25-40	Upper Aquifer	3930.10	X		
TW-2	NA	NA	3931.44	X		
ULM-PZ-1	<10	Upper Aquifer	3924.40	X		
ULTP-1	<10	Upper Aquifer	3919.63	X		
ULTP-2	<10	Upper Aquifer	3921.23	X		

Total # Wells Per Event

170

24

77

NOTES: All monitoring locations shown on Exhibit 1

(1) Unit refers to hydrostratigraphic unit. Upper Aquifer and Deeper System refer to units on plant site and downgradient through Lamping Field. Other wells identified by geologic unit.

(2) Purge method verification samples collected during 2024 monitoring event(s) per 2024 Interim CAPMP.

NA - Not Available

bgs - below ground surface

Table 2-4. 2024 Residential/Public Water Supply Well Sampling Sites and Schedule
2024 Interim CAPM Report - East Helena Facility

Map ID ¹	Northing	Easting	Status
Known Active Wells - Scheduled for Spring and Fall Sampling in 2024			
R1	863425.39	1359501.01	Active
R2	863266.68	1359337.84	Active
R3	863296.03	1360955.74	Active
R4	863053.71	1361184.11	Active
R5	864206.53	1358674.56	Active
R6	866156.57	1356934.48	Active
R7	872346.42	1354330.00	Active
R8	872391.53	1354773.24	Active
R9	872086.41	1355030.70	Active
R10	863376.30	1361815.27	Active
R11	863255.39	1358240.44	Active
R12	861502.42	1362101.41	Active
R13	863233.58	1359840.14	Active
R14	872558.37	1356681.06	Active
R15	871444.75	1356882.84	Active
R16	868437.60	1356673.10	Active
Inactive/Inoperative/Not Located/No Access Wells - No Sampling Scheduled in 2024			
A	862450.60	1359157.38	No Access
B	861861.51	1361212.16	No Access
C	861854.50	1361415.54	No Access
D	863069.96	1361069.38	No Access
E	862259.92	1355055.07	No Access
F	862355.37	1362082.87	No Access
G	861830.00	1362540.24	No Access
H	862864.36	1360861.52	No Well Located
I	863109.81	1359725.42	No Well Located
J	863257.08	1358568.29	No Well Located
K	863278.12	1357979.20	No Well Located
L	863327.86	1360948.64	Pump Inoperative
M	863250.07	1358456.08	Pump Inoperative
N	863264.10	1358105.44	Pump Inoperative
O	863671.87	1362422.81	Pump Inoperative
Background Arsenic Wells Removed from Program in 2024 - No Sampling Scheduled			
BG1	855347.37	1359909.48	Active
BG2	861784.41	1356574.41	Active
BG3	861925.29	1356400.09	Active
BG4	861781.59	1356290.54	Active
Abandoned Wells			
X1	863237.91	1360019.06	Abandoned
X2	863270.75	1359501.67	Abandoned
X3	862873.52	1360767.10	Abandoned
X4	863250.07	1359185.43	Abandoned
X5	863263.27	1359031.01	Abandoned
X6	863256.45	1359904.15	Abandoned
X7	863256.45	1359757.14	Abandoned

NOTES: ⁽¹⁾ See Exhibit 1



Groundwater quality samples collected as part of the 2024 Interim CAPMP were analyzed for the parameters shown in Table 2-5, including field analysis of pH, SC, DO, turbidity, oxidation/reduction potential (ORP), and water temperature, and laboratory analysis of common constituents and trace metals (dissolved at monitoring wells and total and dissolved at residential/water supply wells) by Energy Laboratories in Helena, Montana. All groundwater data collected under the 2024 CAPMP has been entered into the project database and validated for data quality and usability. The validated database is included in Appendix A. Groundwater monitoring results for residential wells are presented in Section 3.2 and monitoring well results are presented in Section 3.3.

2.2.3 Well Purge Method Comparison Sampling

Well purge comparison sampling at selected monitoring wells was conducted in 2024 to further assess the comparability of groundwater quality data collected by the low-flow/low-volume and standard purge methods. Three monitoring wells were sampled using both methods in June 2024, and four wells were sampled using both methods in October 2024 (Table 2-3), covering a range of groundwater arsenic and selenium concentrations, as well as a range of standard purge volumes. Previous comparison sampling conducted during 2022 and 2023 East Helena project sampling activities demonstrated that a low-flow/low-volume purging and sampling method using a Waterra inertial pump generated data comparable to the standard purge submersible pump method (Hydrometrics, 2024b). The representativeness and comparability of the inertial pump and submersible pump methods was also verified in wells monitored as part of the UFS processing and removal project (Hydrometrics, 2021b). The low-flow method was designated as the routine monitoring well sampling method for the East Helena project beginning in 2023, and provides the following advantages compared with the standard purge method:

1. Reduction of well purge water volumes and the amount of containerized purge water requiring storage and disposal by as much as 90%;
2. Use of all dedicated equipment at each well, eliminating the need for pump decontamination, generation of additional water requiring disposal, and the potential for cross-contamination between monitoring locations; and
3. Streamlining the purging and sampling procedure, which reduces the time required for sample collection and associated expenses.

2.2.4 Unfumed Slag Processing and Removal Groundwater Monitoring

The UFS GMP (Hydrometrics, 2021b and 2022) outlines a scope, schedule, and strategy for collection and evaluation of groundwater quality data to assess potential changes in groundwater quality resulting from UFS project activities. In accordance with the UFS GMP, the 2024 UFS project groundwater monitoring network consisted of the wells listed in Table 2-6 and shown on Figure 2-2.

Table 2-5. 2024 Groundwater Sample Analytical Parameter List
2024 Interim CAPM Report - East Helena Facility

Parameter	Analytical Method ⁽¹⁾	Project Required Detection Limit (mg/L)	Montana Groundwater Human Health Standards (mg/L) ⁽²⁾
Physical Parameters			
pH	150.2/SM 4500H-B	0.1 s.u.	NA
Specific Conductance	120.1/SM 2510B	1 µmhos/cm	NA
TDS	SM 2540C	10	NA
TSS	SM 2540D	10	NA
Common Ions			
Alkalinity	SM 2320B	1	NA
Bicarbonate	SM 2320B	1	NA
Sulfate	300.0	1	NA
Chloride	300.0/SM 4500CL-B	1	NA
Bromide	300.0	0.05	NA
Calcium	215.1/200.7	1	NA
Magnesium	242.1/200.7	1	NA
Sodium	273.1/200.7	1	NA
Potassium	258.1/200.7	1	NA
Trace Constituents (Total and/or Dissolved)⁽³⁾⁽⁴⁾			
Antimony (Sb)	200.7/200.8	0.003	0.006
Arsenic (As)	200.8/SM 3114B	0.002	0.01
Cadmium (Cd)	200.7/200.8	0.001	0.005
Copper (Cu)	200.7/200.8	0.001	1.3
Iron (Fe)	200.7/200.8	0.02	NA
Lead (Pb)	200.7/200.8	0.005	0.015
Manganese (Mn)	200.7/200.8	0.01	NA
Mercury (Hg)	245.2/245.1/200.8/SM 3112B	0.001	0.002
Selenium (Se)	200.7/200.8/SM 3114B	0.001	0.05
Thallium (Tl)	200.7/200.8	0.001	0.002
Zinc (Zn)	200.7/200.8	0.01	2
Field Parameters⁽⁵⁾			
Static Water Level	HSOP-110	0.01 ft	NA
Turbidity	HSOP-053	0.1 NTU	NA
Water Temperature	HSOP-006	0.1 °C	NA
Dissolved Oxygen (DO)		0.01 mg/L	NA
pH		0.01 pH standard unit	NA
ORP/Eh		1 mV	NA
Specific Conductance (SC)		1 µmhos/cm	NA

Notes:

(1) Analytical methods are from the most recent edition of Standard Methods for the Examination of Water and Wastewater (SM); Methods for the Determination of Metals in Environmental Samples, Supplement I, EPA/600/R-94/111 (May 1994); or Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93/100 (August 1993).

(2) Standards from Montana Circular DEQ-7 (June 2019 Version). NA = not applicable (no human health standard).

(3) Residential/water supply well samples analyzed for total and dissolved trace constituents; monitoring well samples analyzed for dissolved metals only.

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

(5) Field parameters measured in a flow-through cell in accordance with project SOPs.

Table 2-6. UFS Project 2024 Groundwater Sampling Schedule
2024 Interim CAPM Report - East Helena Facility

Well ID	Screen Interval feet bgs	Unit*	Measuring Point Elevation (ft AMSL)	Well Type
DH-55	83-93	Upper Aquifer	3972.76	Indicator
DH-56	70-85	Upper Aquifer	3958.17	Indicator
DH-6	15-25	Upper Aquifer	3889.85	Sentinel
DH-15	41.5-50	Upper Aquifer	3889.82	Sentinel
DH-52	7-17	Upper Aquifer	3889.18	Sentinel
DH-53	7-17	Upper Aquifer	3892.87	Sentinel
EH-60	22-28	Upper Aquifer	3888.46	Sentinel
EH-61 ⁽¹⁾	36-45	Upper Aquifer	3889.77	Sentinel
EH-103	59.5-74.5	Upper Aquifer	3890.54	Sentinel
EH-51 ⁽²⁾	10-30	Upper Aquifer	3880.09	Tier 2
EH-101 ⁽²⁾	34-45	Upper Aquifer	3879.95	Tier 2
EH-110 ⁽²⁾	40-55	Upper Aquifer	3884.05	Tier 2

NOTES:

Well locations shown on Figure 2-2.

A pre-UFS project groundwater monitoring event was conducted in July 2021.

After slag crushing was initiated, biweekly sampling was conducted in October, November, and December 2021.

In accordance with the UFS GMP, sampling frequency transitioned to monthly beginning in January 2022.

(1) Well EH-61 was added to the monitoring program as a replacement for adjacent well EH-60 to be sampled when EH-60 is dry; no samples were collected at EH-61 in 2024.

(2) Tier 2 wells added to one or more 2024 monitoring events based on trends observed at sentinel wells DH-6 and EH-60.

*Unit refers to hydrostratigraphic unit. Upper Aquifer and Deeper System refer to units on plant site and downgradient through Lamping Field.





A pre-UFS project monitoring event (prior to the commencement of slag crushing²) was conducted in July 2021. Biweekly monitoring of indicator and sentinel wells was conducted in October, November, and December 2021. The UFS project groundwater monitoring frequency was decreased to monthly beginning in January 2022 due to a lack of observed groundwater impacts from the slag processing, and remained on a monthly schedule through March 2024, when the UFS Project and the monitoring program were suspended. In accordance with the UFS GMP, Tier 2 monitoring wells EH-51, EH-101, and EH-110 were added to the monitoring program in 2024, based on water quality results at upgradient sentinel wells DH-55, DH-55, and EH-60.

Groundwater quality samples collected as part of the UFS project were analyzed for the parameters shown in Table 2-7, including field analysis of pH, SC, DO, and water temperature, and laboratory analysis of two primary COCs for slag leaching (dissolved arsenic and selenium), and potential slag pile impact indicator parameters (potassium, magnesium, sulfate, and chloride) by Energy Laboratories in Helena, Montana. All groundwater data collected under the UFS GMP has been entered into the project database and validated for data quality and usability. The validated database is included in Appendix A. Additional details regarding the UFS project groundwater monitoring program are in the UFS GMP (Hydrometrics, 2021b). UFS project groundwater monitoring results are discussed in Section 3.3.6.

2.3 DATA MANAGEMENT AND QUALITY CONTROL

Procedures for CAPMP data review, validation, and reporting are presented and discussed in the East Helena QAPP (Hydrometrics, 2015a), the DMP (Hydrometrics, 2011), the 2024 Interim CAPMP (Hydrometrics, 2023a), and the UFS GMP (Hydrometrics, 2021b). Included in these documents are control limits and criteria for specific types of field and laboratory quality control (QC) samples, data validation and verification methods, potential corrective actions if criteria are not met, and database management procedures. Field QC samples collected for the groundwater monitoring program included deionized (DI) water blanks, equipment rinsate blanks (to verify the effectiveness of equipment decontamination procedures), and field duplicate samples, all collected at a frequency of 5% (1 per 20 field samples) for both monitoring wells and residential wells. Field QC samples for surface water included DI blanks and field duplicate samples, both collected at a frequency of 5% (1 per 20 samples).

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, 2011). All data collected under the 2024 CAPMP program has been reviewed and validated in accordance with these procedures and all valid data has been entered into the East Helena Project water quality database. The 2024 data validation and verification process resulted in qualification of a small percentage of the total results obtained as estimated due to QC sample

² The initial phase of slag crushing occurred from September 2021 to March 2022. Crushing resumed from December 2023 to March 1, 2024.

Table 2-7. UFS Project Groundwater Sample Analytical Parameter List
2024 Interim CAPM Report - East Helena Facility

Parameter	Analytical Method ⁽¹⁾	Project Required Detection Limit (mg/L)	Montana Groundwater Human Health Standards (mg/L) ⁽²⁾
<i>Common Ions</i>			
Sulfate	300.0	1	NA
Chloride	300.0/SM 4500CL-B	1	NA
Magnesium	242.1/200.7	1	NA
Potassium	258.1/200.7	1	NA
<i>Trace Constituents (Total and/or Dissolved) ⁽³⁾⁽⁴⁾</i>			
Arsenic (As)	200.8/SM 3114B	0.002	0.010
Selenium (Se)	200.7/200.8/SM 3114B	0.001	0.050
<i>Field Parameters ⁽⁵⁾</i>			
Static Water Level	HF-SOP-10	0.01 ft	NA
Water Temperature	HF-SOP-20	0.1 °C	NA
Dissolved Oxygen (DO)	HF-SOP-22	0.01 mg/L	NA
pH	HF-SOP-20	0.01 pH standard unit	NA
Specific Conductance (SC)	HF-SOP-79	1 µmhos/cm	NA

Notes:

(1) Analytical methods are from the most recent edition of *Standard Methods for the Examination of Water and Wastewater* (SM); *Methods for the Determination of Metals in Environmental Samples*, Supplement I, EPA/600/R-94/111 (May 1994); or *Methods for the Determination of Inorganic Substances in Environmental Samples*, EPA/600/R-93/100 (August 1993).

(2) Standards from Montana Circular DEQ-7 (June 2019 Version). NA = not applicable (no human health standard).

(3) If sampled, residential/public water supply well samples will be analyzed for both total and dissolved trace constituents; monitoring well samples will be analyzed for dissolved metals only.

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

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



exceedances (e.g., field duplicate control limit exceedances). For the June 2024 data set, 98.3% of the monitoring well results, 99.3% of the surface water results, and 100% of the residential/public water supply well results were accepted without any qualifiers applied. For the October 2024 data set, 100% of the monitoring well results, 99.6% of the surface water results, and 98.5% of the residential/public water supply well results were accepted without any qualifiers applied.

Following data verification and validation, all data collected during 2024 was designated as usable for Interim CAPMP objective purposes with the following exceptions:

- The dissolved metals container associated with the DI blank for the October 2024 residential/public water supply sampling effort was damaged during sample handling, and results for several dissolved metals (copper and iron) were greater than associated total metals in the same blank sample. Therefore, based on professional judgment, the dissolved metals results for the DI blank sample.

Rejected data are not incorporated into the project database.



3.0 2024 WATER RESOURCES MONITORING RESULTS

3.1 SURFACE WATER MONITORING RESULTS

The 2024 surface water monitoring program included measurement of surface water elevations, stream flow rates, and surface water quality sampling (Section 2.1). The surface water elevation and stream flow data was used in conjunction with concurrent groundwater elevation data to develop groundwater potentiometric maps and evaluate groundwater flow directions, to assess groundwater-surface water interactions, and to help delineate gaining and losing segments of Prickly Pear Creek. The surface water quality data were used to document current water quality conditions in the project area.

The total precipitation measured in 2024 at the Helena Regional Airport station (9.81 inches) was lower than the long-term average of 11.31 inches, and was about 20% lower than the 2023 total (12.47 inches)³. The generally drier conditions in 2024 compared to 2023 are exemplified by the June precipitation totals for each of these years; in June 2023 2.97 inches of precipitation was recorded, compared with only 0.95 inches in June 2024. The snowpack in 2024 (measured as snow-water equivalents at a SNOTEL station in Tizer Basin, near the headwaters of Prickly Pear Creek) was at or near the minimum recorded value, much lower than in 2023 when snowpack tracked closely with the median value for the last thirty years⁴. Annual variability in precipitation and associated Prickly Pear Creek stream flow directly impacts Facility and downgradient surface water and groundwater conditions.

3.1.1 Surface Water Elevation and Flow

Stream flow and elevation measurements were recorded in June and October 2024. Stream flow and stream stage data are in Table 3-1 with site locations shown on Figure 2-1. Prickly Pear Creek flows measured in June 2024 ranged from 41.5 to 86.0 cubic feet per second (cfs) (Table 3-1), substantially lower than in May 2023 (173 to 225 cfs). Similarly, October 2024 flows (12.6 to 19.4 cfs) were lower than October 2023 flows (46 to 53 cfs). The lower stream flows in 2024 compared with 2023 reflect the smaller 2024 snowpack and associated runoff, as well as the overall drier conditions and lower precipitation throughout 2024.

Figure 3-1 shows daily average stream flow data for 2011 through 2024 from a United States Geological Survey (USGS) gaging station on Prickly Pear Creek approximately five miles upstream of the Facility. As shown on the hydrograph, 2024 Prickly Pear Creek flows at the gaging station were at or below median flow values throughout most of the year. Flow conditions in 2024 resembled those observed in 2021 (Figure 3-1), another relatively low precipitation year (8.61 inches of total precipitation at the Helena Regional Airport).

³ <https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?mt4055>

⁴ <https://nwcc-apps.sc.egov.usda.gov/awdb/site-plots/POR/WTEQ/MT/Tizer%20Basin.html>



TABLE 3-1. 2024 PRICKLY PEAR CREEK STREAM FLOW AND STAGE MEASUREMENTS

Monitoring Site	Location	Stream Stage – ft AMSL		Stream Flow – cfs	
		6/12/2024	10/8/2024	6/12/2024	10/8/2024
PPC-3A	PPC Upstream of Facility	3927.66	3926.92	81.7	19.4
PPC-4A	PPC Adjacent to Facility	3910.58	3910.21	86	18.8
Trib-1	Tributary drainage at railroad crossing	3918.14	3918.03	0.17 E	0.036
Trib-1B	Tributary drainage south of Facility	Dry	Dry	Dry	Dry
Trib-1D	Tributary site at PPC Confluence	3905.30	Dry	0.002	Dry
PPC-5A	PPC Adjacent to Facility	3902.81	3902.03	82.4	17.9
PPC-7	PPC Downstream Facility Boundary	3882.32	3881.53	83.3	18.9
PPC-8	PPC at West Gail St in East Helena	3868.31	3868.07	NM	NM
PPC-36A	PPC 0.7 mi downstream of Facility	3855.32	3854.77	55.8	12.6
PPC-9A	PPC 1.0 mi downstream of Facility	3845.77	3845.43	NM	NM
SG-16	PPC 2.9 mi downstream of Facility	3766.37	3766.14	41.5	12.6

PPC – Prickly Pear Creek

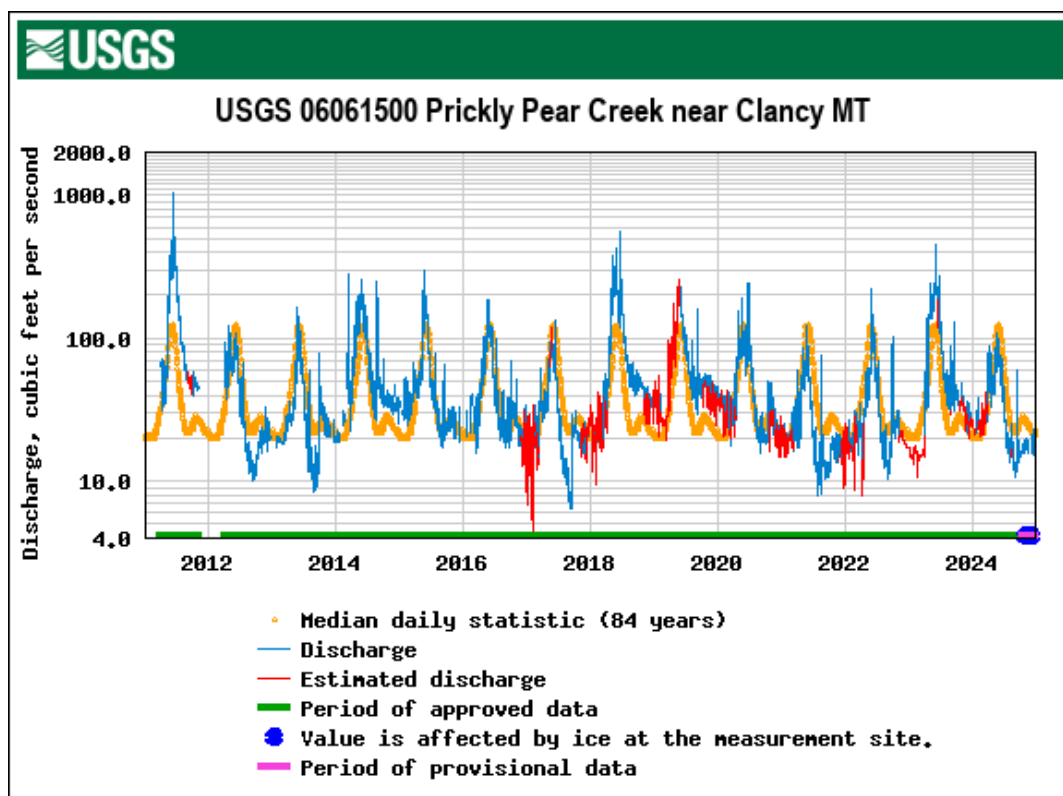
AMSL – Above Mean Sea Level

Sites listed in upstream to downstream order; locations shown on Figure 2-1.

NM – not measured per 2024 CAPMP

E – flow estimated

FIGURE 3-1. 2011 THROUGH 2024 PRICKLY PEAR CREEK FLOW HYDROGRAPH UPSTREAM OF FORMER SMELTER





The data in Table 3-1 indicates that Prickly Pear Creek flow adjacent to the Facility at sites PPC-3A, -4A, -5A, and -7 (Figure 2-1) showed no significant changes from upstream to downstream during either 2024 seasonal monitoring event. Overall, upstream to downstream flow measurements along this reach were all within about 5-8% for both the June and October monitoring events. The 2024 results are consistent with previous flow data, suggesting there is limited net interaction between Prickly Pear Creek and the local groundwater system adjacent to the Facility. Flow rates and trends at sites PPC-4A and PPC-5A, located on the realigned segment of the creek, are similar to those measured in previous years indicating that the realignment project, completed as part of the SPHC CM, has maintained a condition of no significant net flow gains or losses adjacent to the Facility. Downstream of the Facility from PPC-7 to SG-16, the 2024 flow data shows stream flow decreases in a downstream direction of about 40 cfs in June (~50%) and about 6 cfs (~30%) in October, indicating both leakage from the creek to groundwater and the effect of irrigation diversions from the creek; this result is also consistent with historic observations. Although irrigation diversion flows were not measured in 2024, previous comprehensive synoptic flow data accounting for irrigation diversions has shown net leakage to groundwater on the order of 10 to 20 cfs between Highway 12 and Canyon Ferry Road (sites PPC-7 and SG-16, Figure 2-1; Hydrometrics, 2018).

3.1.2 Semiannual Surface Water Quality Results

The 2024 semiannual surface water quality data is summarized in Table 3-2 with the complete 2024 dataset in Appendix A. The data shows Prickly Pear Creek water to be a calcium-bicarbonate type water with slightly alkaline pH and total dissolved solids (TDS) concentrations ranging from 126 to 228 milligrams per liter (mg/L) seasonally. As observed during past monitoring, seasonal concentrations of major ions (calcium, magnesium, sodium, potassium, sulfate) in 2024 were very consistent from upstream of the smelter site (site PPC-3A) to downstream site SG-16 near Canyon Ferry Road, with October low flow concentrations approximately two times higher than the June high flow concentrations. The tributary sites show higher TDS (282 to 306 mg/L) and major ion concentrations than Prickly Pear Creek, with Trib-1 showing a calcium-bicarbonate signature and Trib-1D showing a calcium-bicarbonate-sulfate signature. The stable major ion concentrations are consistent with a lack of groundwater recharge to the creek as indicated by the downstream flow trends.

Total recoverable trace metal concentrations are also relatively low and consistent from upstream to downstream throughout the sampled reach of Prickly Pear Creek (Table 3-2, Appendix A), with antimony, selenium, and thallium below the laboratory reporting limits in all 2024 creek samples. Exceedances of hardness-dependent chronic aquatic life standards (DEQ-7 surface water standards; MDEQ, 2019) in 2024 Prickly Pear Creek samples were limited to total recoverable lead at all sampled sites in June 2024 (Table 3-2), including sites upgradient, within, and downgradient of the Facility. No exceedances were observed for Prickly Pear Creek samples in October 2024. The June 2024 total recoverable lead results show a slight increase in concentration from upgradient of the Facility (0.0047 mg/L at PPC-3A) to the furthest downgradient location (0.0069 mg/L at SG-16). These results suggest

Table 3-2. 2024 Surface Water Quality Monitoring Results
2024 Interim CAPM Report - East Helena Facility

Monitoring Site	Prickly Pear Creek							Tributary Drainage		
	PPC-3A	PPC-4A	PPC-5A	PPC-5A Dup	PPC-7	PPC-36A	SG-16	TRIB-1	TRIB-1B	TRIB-1D
Sample Date	6/12/24							6/12/24		
Field Parameters										
pH (s.u.)	7.94	8.09	8.08	8.08	8.09	8.09	8.09	7.26		7.59
SC (µmhos/cm)	207	206	206	206	207	207	211	370		433
Flow (cfs)	81.7	86	82.4	82.4	83.3	55.8	41.5	0.17E		0.002
Laboratory Analyses										
Total Dissolved Solids	129	137	131	130	126	129	129	306		282
Calcium	23	23	22	21	22	24	25	64		41
Magnesium	6	6	5	5	5	6	6	16		17
Sodium	9	10	10	10	9	10	10	25	Dry	26
Potassium	2	2	2	2	2	2	2	4	No	1
Chloride	4	4	4	4	4	4	5	10	Sample	5
Sulfate	30	30	30	30	30	31	32	53		100
Trace Metals (Total Recoverable)										
Antimony	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005		0.0007
Arsenic	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.011		0.008
Cadmium	0.00020	0.00018	0.00022	0.00022	0.00024	0.00022	0.00029	0.00008		0.00022
Copper	0.003	0.003	0.003	0.003	0.004	0.004	0.005	<0.002		0.006
Iron	0.37	0.37	0.36	0.38	0.40	0.42	0.47	0.33		0.68
Lead	0.0047	0.0048	0.0054	0.0050	0.0059	0.0058	0.0069	0.0054		0.0026
Manganese	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.13		0.58
Mercury	0.000009	0.000008	0.000009	0.000008	0.000009	0.000008	0.000010	0.000018		0.00001
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Zinc	0.043	0.046	0.046	0.046	0.046	0.048	0.050	<0.008		0.014
Monitoring Site	Prickly Pear Creek							Tributary Drainage		
	PPC-3A	PPC-4A	PPC-5A	PPC-7	PPC-36A	SG-16	SG-16 Dup	TRIB-1	TRIB-1B	TRIB-1D
Sample Date	10/8/24							10/8/24		
Field Parameters										
pH (s.u.)	8.32	8.25	8.2	8.08	8.27	8.11	8.12	7.54		
SC (µmhos/cm)	302	302	302	302	303	306	306	452		
Flow (cfs)	19.4	18.8	17.9	18.9	17.2	12.6	12.6	0.036		
Laboratory Analyses										
Total Dissolved Solids	214	205	226	228	227	224	222	321		
Calcium	41	40	40	40	40	40	40	67		
Magnesium	9	9	9	9	9	9	9	17		
Sodium	18	18	18	18	18	18	18	24	Dry	Dry
Potassium	3	3	3	3	3	3	3	4	No	No
Chloride	8	8	8	8	8	8	8	13	Sample	Sample
Sulfate	62	61	62	62	62	62	62	66		
Trace Metals (Total Recoverable)										
Antimony	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0008		
Arsenic	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005		
Cadmium	0.00010	0.00010	0.00011	0.00011	0.00011	0.00011	0.00010	0.00025		
Copper	<0.002	<0.002	<0.002	<0.002	0.002	0.002	0.004	<0.002		
Iron	0.15	0.15	0.17	0.18	0.16	0.14	0.14	0.27		
Lead	0.0016	0.0016	0.0017	0.0019	0.0019	0.0017	0.0018	0.0116		
Manganese	0.03	0.03	0.04	0.04	0.03	0.02	0.02	0.03		
Mercury	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	0.00004		
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Zinc	0.038	0.037	0.036	0.036	0.035	0.032	0.031	<0.008		

All concentrations in mg/L unless otherwise noted.

Concentration exceeds applicable surface water quality standard from DEQ Circular 7 (MDEQ, 2019).

Prickly Pear Creek sites listed in upstream to downstream order.

E - Estimated

Complete 2024 database in Appendix A.



that during the 2024 high flow monitoring event, upstream (non-Facility) contaminant sources were producing the metals load causing the lead standard exceedances. Upstream to downstream trends for other metals in Prickly Pear Creek showed mostly consistent concentrations, with some small increases (e.g., iron during June 2024) or decreases (e.g., zinc during October 2024) apparent for certain constituents. No water quality standard exceedances other than lead were observed in Prickly Pear Creek in 2024. The occurrence of elevated metals concentrations in Prickly Pear Creek upstream of the Facility has been noted in numerous studies, including the watershed total maximum daily load (TMDL) document (USEPA, 2004b). Overall, the 2024 Prickly Pear Creek water quality monitoring results are consistent with past sampling results dating back more than 20 years.

Sampling results from tributary drainage site Trib-1 showed one water quality standard exceedance in June 2024 (surface water human health standard (HHS) for arsenic) and one chronic aquatic life standard exceedance for lead in October 2024 (Table 3-2). No exceedances of water quality standards were observed at site Trib-1D (at the confluence with Prickly Pear Creek) during either of the 2024 seasonal monitoring events (Table 3-2). Tributary site Trib-1B, located between Trib-1 (upstream) and Trib-1D (downstream) was dry during both 2024 monitoring events, so no sample could be collected. As described below, elevated metals concentrations at Trib-1B have been documented through past sampling, leading to the removal of approximately 350 cubic yards of metals-impacted soils in the vicinity of Trib-1B in November 2018 (see Figure 2-1).

Table 3-3 presents a comparison of the post-soil removal (2019-2024) concentrations at tributary drainage site Trib-1D downstream of the soil removal area compared to pre-soil removal (2017-2018) concentrations. Trib-1B was dry during both 2024 monitoring events and is therefore not included in the pre- and post-soil removal comparison in Table 3-3.

At Trib-1D, where the tributary drainage flows into Prickly Pear Creek, decreases in annual average concentrations have been observed since the 2018 soil removal for sulfate and for all metals listed in Table 3-3 with the exception of manganese. The 2024 data for Trib-1D show decreases of 90% or more for average concentrations of cadmium and zinc, and 40% to 70% for arsenic, iron, lead, and sulfate. The tributary drainage consists of a wetland area with both surface and subsurface flow in various reaches, and variability in metals concentrations over time at all tributary sites likely reflects fluctuations in redox conditions, with higher concentrations generally present under more reducing conditions and lower concentrations under oxidizing conditions. Water typically emerges as a spring from the subsurface during a portion of the year (spring high flow conditions) at Trib-1B, then forms a surface water drainage that flows to a large wetland area upstream of Trib-1D. In general, redox conditions may be expected to be more oxidizing (and metals concentrations lower) at Trib-1D than at Trib-1B, although anoxic sediments within the wetland upstream of Trib-1D also impact surface water geochemistry in the tributary drainage. The tributary sites will be included in future monitoring programs to continue the assessment of post-soil removal surface water concentrations in this tributary to Prickly Pear Creek.

TABLE 3-3. TRIBUTARY DRAINAGE CONCENTRATION COMPARISON 2017 - 2024
2024 Interim CAPM Report - East Helena Facility

	Flow	Sulfate	Arsenic	pH	Cadmium	Copper	Iron	Lead	Manganese	Zinc
	(cfs)	mg/L	mg/L	S.U.	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Trib-1D										
2017/18 Average	0.11	223	0.015	8.63	0.00211	0.0072	1.13	0.0081	0.40	0.202
2019 Average	0.056	176	0.008	8.99	0.00020	0.0025	0.72	0.0020	1.02	0.021
2020 Average	0.057	145	0.00867	7.59	0.00025	0.0023	0.74	0.0016	0.85	0.018
2021 Average	0.042	120	0.012	7.85	0.00013	0.002	0.81	0.0058	0.55	0.009
2022 Average	0.026	167	0.007	7.68	0.00008	0.0035	0.34	0.0018	0.13	0.008
2023 Average	0.061	115	0.006	7.65	0.00008	0.005	0.22	0.0009	0.10	0.008
2024 Average ⁽¹⁾	0.002	100	0.008	7.59	0.00022	0.006	0.68	0.0026	0.58	0.014
% Change		-55%	-45%	-12%	-90%	-16%	-40%	-68%	44%	-93%

Metals analyses are total recoverable fraction.

% change calculated from 2017/18 average to 2024 average.

(1) Average represents one sample (site was dry during October 2024 sampling event).



3.2 RESIDENTIAL / PUBLIC WATER SUPPLY SAMPLING RESULTS

Table 3-4 summarizes 2024 residential/public water supply well sample arsenic and selenium concentrations, and identifies State of Montana human health standards (HHSs, equivalent to MCLs) for groundwater (MDEQ, 2019). Complete 2024 analytical results, including both total and dissolved metals concentrations, are included in Appendix A with residential well locations shown on Exhibit 1. Except for iron at selected residential wells, total and dissolved metals concentrations are virtually identical. Total iron concentrations ranged from <0.02 to 0.79 mg/L in 2024, and in many cases total iron concentrations were substantially higher than dissolved iron concentrations (Appendix A). Total copper concentrations ranged from <0.001 to 0.033 mg/L, and total zinc concentrations ranged from <0.01 to 0.02 mg/L. Variable iron concentrations at residential wells (along with copper and zinc) are occasionally observed due to the presence of these metals in domestic water system plumbing, piping, and well construction materials. Other metals concentrations in residential and public water supply wells were largely near or below reporting limits in 2024, with all results for arsenic, cadmium, lead, mercury, and thallium below detection, one detectable total antimony result at 0.003 mg/L, and four detectable total manganese results ranging from 0.01 to 0.23 mg/L (Appendix A).

None of the sampled water supply wells exhibited MCL exceedances for arsenic, selenium or any other sample analytes in 2024 (Table 3-4). Selenium concentrations at well R11 have increased over the last ten years but have stabilized recently and remain below the 0.050 mg/L MCL; dissolved selenium concentrations at this well in 2024 ranged from 0.040 to 0.044 mg/L. As discussed in the 2024 monitoring plan (Hydrometrics, 2024a), four wells previously included in the semiannual monitoring program that are located in areas south (upgradient) or west (cross-gradient) of the Facility and are affected by elevated background (naturally-occurring) arsenic concentrations were removed from the sampling program in 2024 (see Table 2-4 and Exhibit 1). There were no exceedances recorded in 2024 or in previous years at the three COEH municipal water supply wells located north of the Facility (Well IDs R14, R15, and R16 in Table 3-4 and on Exhibit 1).

3.3 GROUNDWATER MONITORING RESULTS AND DATA ANALYSIS

This section presents a summary of current groundwater quality conditions and trends, and the status of the groundwater arsenic and selenium plumes. With completion of the scheduled CMs in 2016 (the final CM, capping the slag pile, is pending) the monitoring program transitioned from a contaminant source area characterization and plume delineation program to a remedy performance monitoring program appropriate to the remediation and CMI phase of a RCRA Corrective Action remediation project. In their *Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action* (USEPA, 2004a), USEPA defines performance monitoring as “the periodic measurement of physical and/or chemical parameters to evaluate whether a remedy is performing as expected.” Additional published USEPA guidance on groundwater remediation completion strategies (USEPA, 2013, 2014a, 2014b) includes discussions of recommended remedy evaluation strategies. Based on these guidance

Table 3-4. Summary of 2024 Residential/Public Water Supply Well Arsenic and Selenium Data

2024 Interim CAPM Report - East Helena Facility

Map Key (see Exhibit 1)	Well Use	# of Samples in 2024	Dissolved Arsenic (mg/L)			Dissolved Selenium (mg/L)		
			Concentration		MCL/HHS Exceedances	Concentration		MCL/HHS Exceedances
			Jun-24	Oct-24		Jun-24	Oct-24	
R1	Drinking/Irrigation	2	<0.002	<0.002	0	<0.001	<0.001	0
R2^	Irrigation	2	<0.002	<0.002	0	<0.001	<0.001	0
R3	Drinking	2	<0.002	<0.002	0	0.008	0.002	0
R4*	Irrigation	3	<0.002	<0.002/<0.002	0	0.002	0.001/0.002	0
R5	Drinking/Irrigation	2	<0.002	<0.002	0	<0.001	<0.001	0
R6	Drinking/Irrigation	3	<0.002	<0.002	0	0.002	0.002	0
R7	Drinking/Irrigation	2	<0.002	<0.002	0	0.001	<0.001	0
R8	Drinking/Irrigation	3	<0.002	<0.002	0	<0.001	<0.001	0
R9	Drinking/Irrigation	2	<0.002	<0.002	0	<0.001	<0.001	0
R10	Irrigation	2	<0.002	<0.002	0	0.001	0.001	0
R11	Drinking/Irrigation	2	<0.002	<0.002	0	0.044	0.040	0
R12*	Drinking/Irrigation	3	<0.002/<0.002	<0.002	0	<0.001/<0.001	<0.001	0
R13	Irrigation	2	<0.002	<0.002	0	<0.001	<0.001	0
R14	Public Water Supply	2	<0.002	<0.002	0	<0.001	<0.001	0
R15	Public Water Supply	2	<0.002	<0.002	0	<0.001	<0.001	0
R16	Public Water Supply	2	<0.002	<0.002	0	<0.001	<0.001	0

All concentrations are dissolved fraction; total metals concentrations included in Appendix A.

^Fall 2024 sample collected in September 2024 prior to seasonal well shutdown

*Locations with two results shown for June 2024 (well R12) and October 2024 (well R4) represent sample/field duplicate results

HHS - Human Health Standard from MDEQ, 2019: arsenic = 0.010 mg/L, selenium = 0.050 mg/L

MCL - Federal maximum contaminant level (equivalent to MDEQ HHS for arsenic and selenium)



documents and the goals and objectives specific to the East Helena Project (Section 1), the 2024 performance monitoring program included two components:

1. Groundwater level and contaminant concentration trend analyses at selected wells in Facility contaminant source areas, and near the leading edges of the arsenic and selenium plumes; and
2. Contaminant plume stability analyses (i.e., are the plumes expanding, contracting or stable).

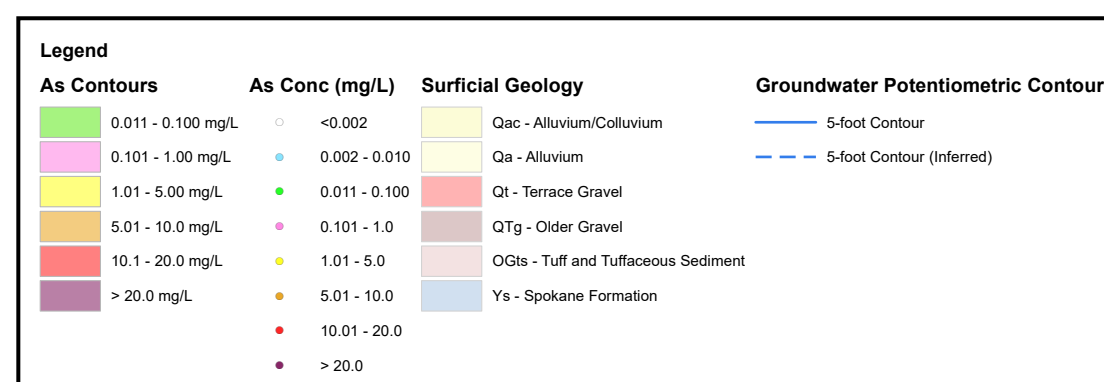
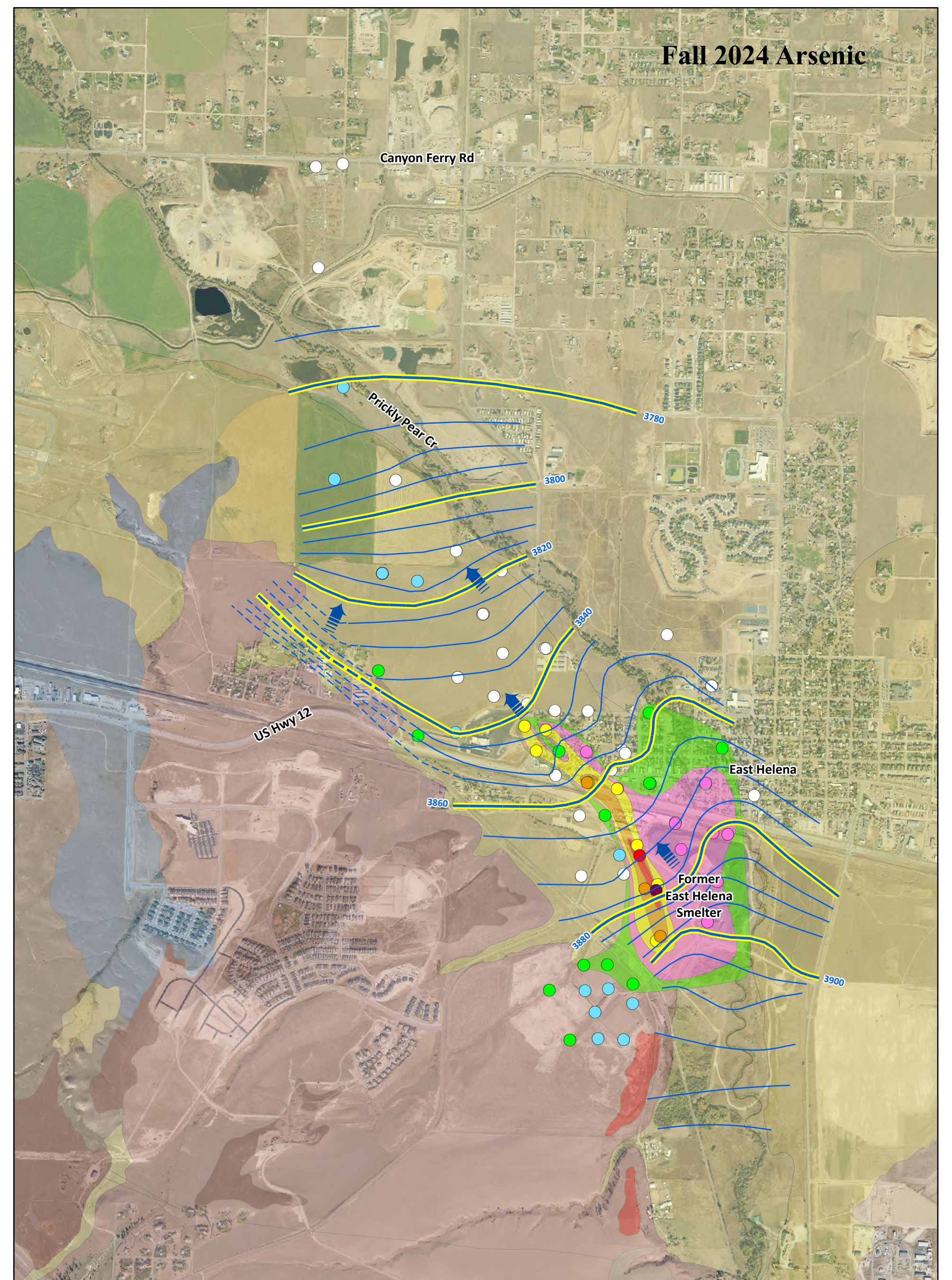
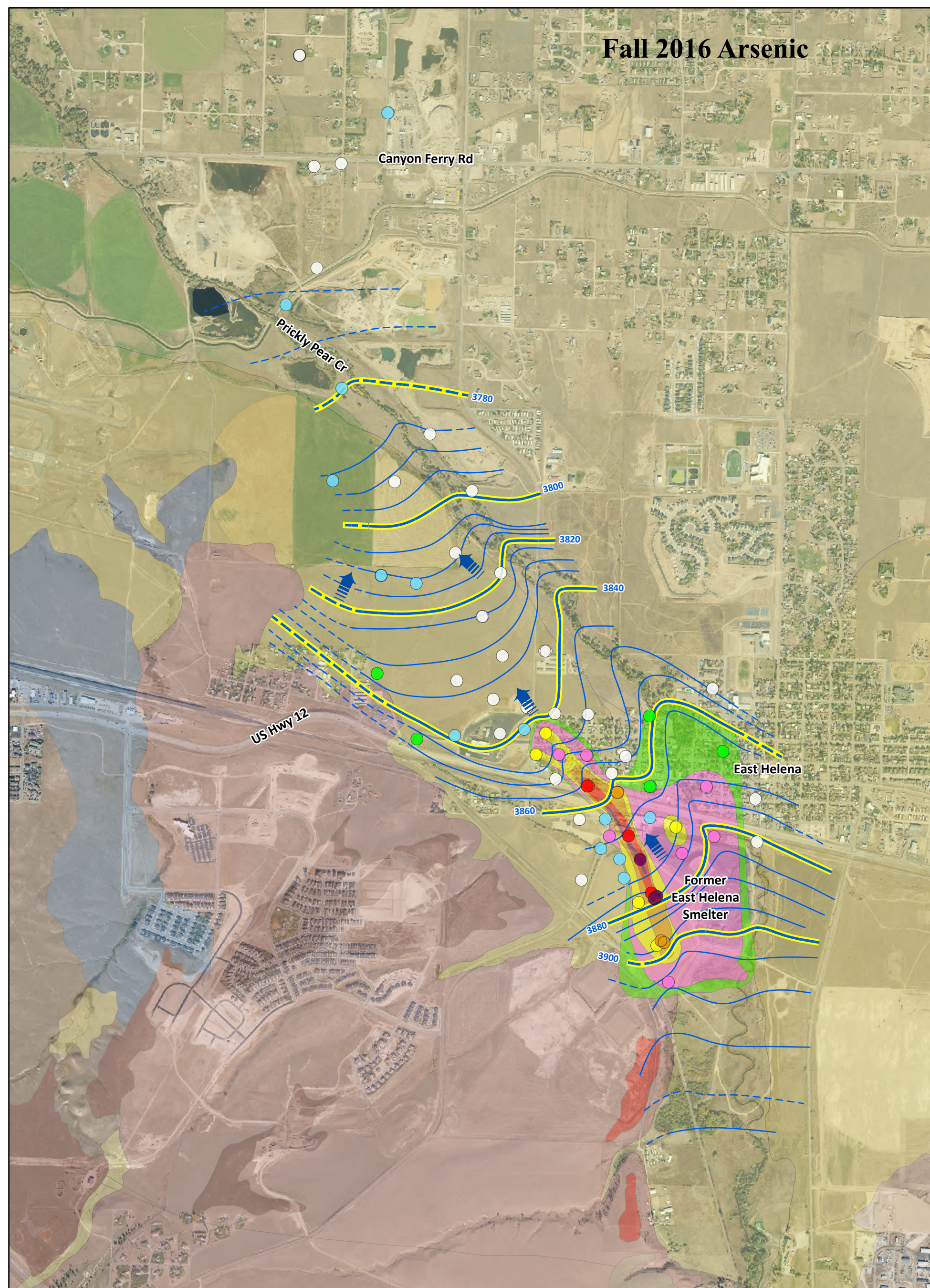
Following is a summary of 2024 groundwater conditions in the Project area, followed by discussions of the performance monitoring components.

3.3.1 General Groundwater Conditions

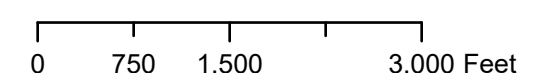
The hydrogeology and geochemistry of the East Helena Facility and Project Area has been described previously in multiple documents including Hydrometrics, 2010, 2015b, and 2016; GSI, 2014; and CH2M, 2018. The shallow alluvial aquifer on the Facility, referred to as the Upper Aquifer, extends from the top of the saturated zone or water table downward to a low permeability Tertiary ash/clay basal layer. On the Facility, post-SPHC groundwater depths vary from less than 10 feet below ground surface (bgs) in the south and near Prickly Pear Creek, to about 50 feet bgs in the northwest portion of the Facility. The basal ash/clay layer slopes to the north with depths ranging from about 20 feet bgs in the southwest portion of the Facility, to more than 70 feet in the northeast portion. As a result, the saturated thickness of the Upper Aquifer ranges from less than 5 feet in the south, to about 10 to 15 feet in the northern portion of the Facility, 5 to 10 feet lower than pre-SPHC conditions. Groundwater also occurs within the ash/clay layer below the Upper Aquifer as isolated or poorly interconnected sandy zones within the finer-grained Tertiary sediments. The contaminated soils/fill and groundwater plumes are largely restricted to the Upper alluvial aquifer due to the confining nature of the basal ash/clay and general upward hydraulic gradient between the two groundwater systems.

As previously noted, the primary groundwater COCs are arsenic and selenium, both of which exceed applicable MCLs in groundwater beneath and downgradient of the Facility. Secondary COCs exceeding MCLs in portions of the Facility, and infrequently if ever in downgradient groundwater, include antimony, cadmium, and zinc. The 2024 arsenic and selenium groundwater plumes are shown on Figures 3-2 and 3-3, respectively, along with the 2016 plumes for comparison to pre-CM conditions.

Groundwater contaminant source areas have been delineated through multiple studies dating back more than two decades, with the two most recent investigations (2014 and 2015 Source Area Investigations (SAIs)) presented in Hydrometrics, 2015b and 2016. Based on the results of prior investigations, historic (i.e., during smelter operations) groundwater contaminant sources include the South Plant Area (Tito Park, former Acid Plant Sediment Drying area, and Upper Ore Storage Area), former Lower Lake, the former Acid Plant settling pond area, former Speiss/Dross Area, the former Lower Ore Storage Area, and the slag pile (Figure 3-4).



NOTE: Arrows show approximate groundwater flow direction

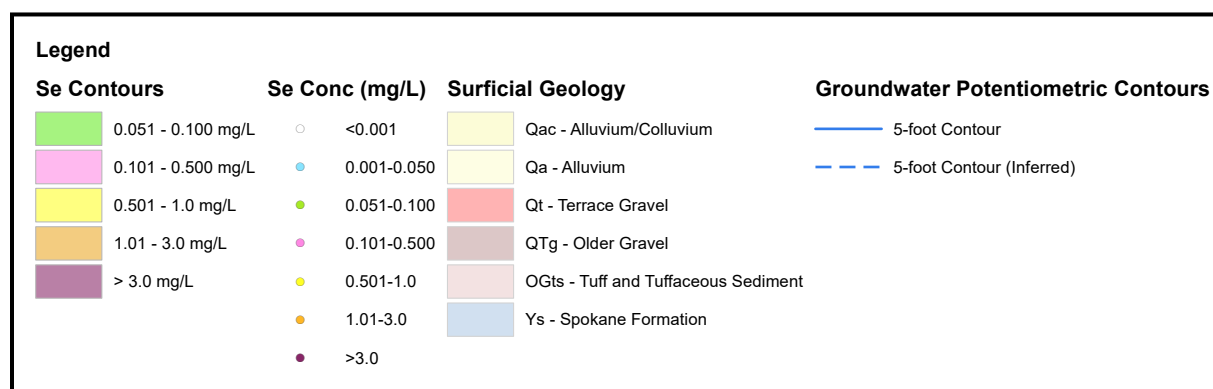
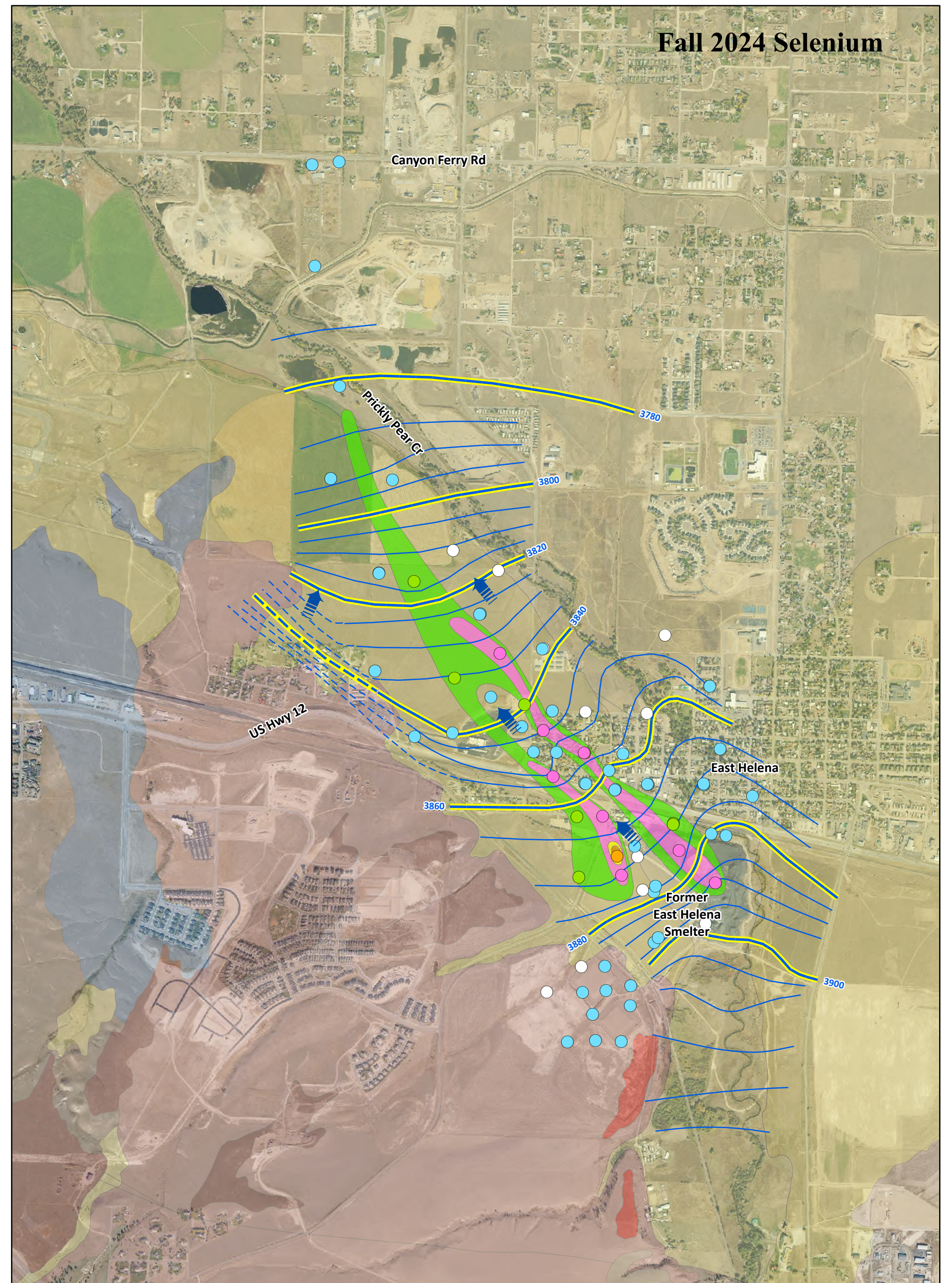
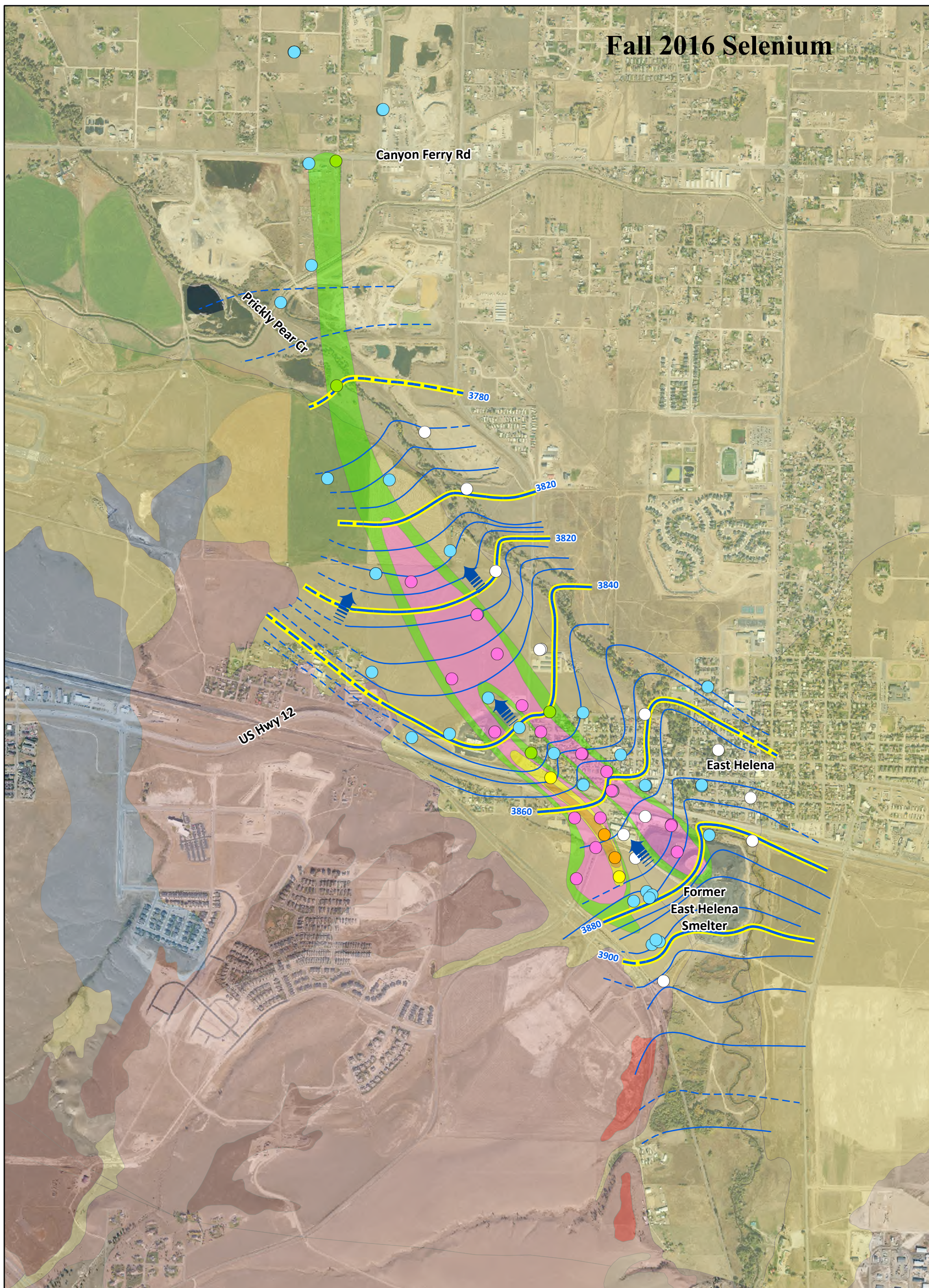


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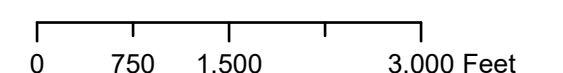
**2016 AND 2024 GROUNDWATER ARSENIC PLUMES AND
POTENTIOMETRIC CONTOURS
EAST HELENA FACILITY**

FIGURE

3-2



NOTE: Arrows show approximate groundwater flow direction

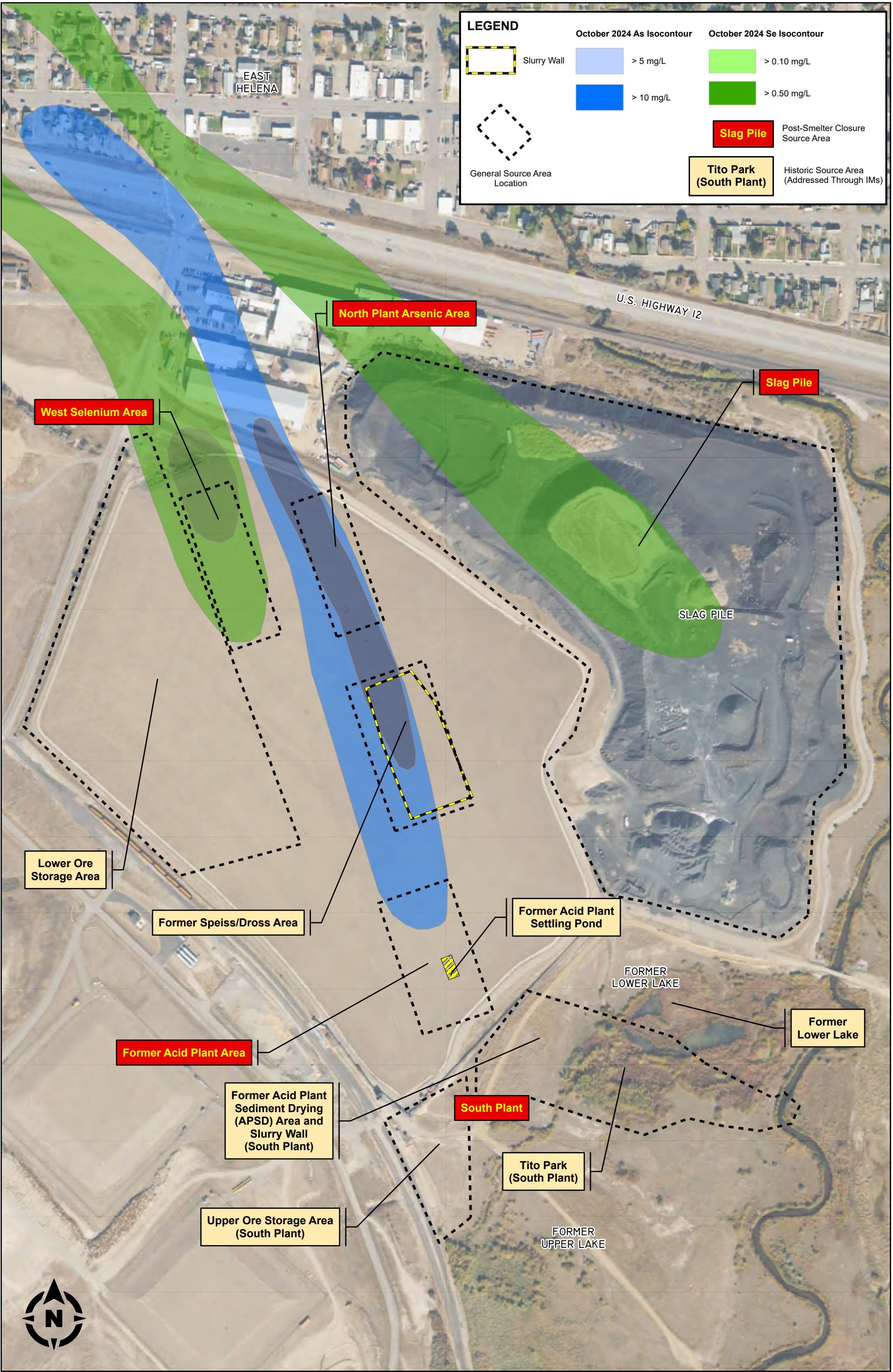


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**2016 AND 2024
GROUNDWATER SELENIUM PLUMES AND
POTENTIOMETRIC CONTOURS
EAST HELENA FACILITY**

FIGURE

3-3



LEGEND

Slurry Wall

General Source Area Location

> 5 mg/L

> 10 mg/L

October 2024 As Isocontour

October 2024 Se Isocontour

> 0.10 mg/L

> 0.50 mg/L

Slag Pile

Post-Smelter Closure Source Area

Tito Park (South Plant)

Historic Source Area (Addressed Through IMs)

Hydrometrics, Inc.

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PERFORMANCE MONITORING REPORT
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HISTORIC AND POST-SMELTER CLOSURE
GROUNDWATER CONTAMINANT
SOURCE AREAS

FIGURE
3-4

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Based on the 2014 and 2015 SAls and other data evaluations conducted as part of the CMS, the primary post-smelter closure contaminant source areas included portions of the South Plant Area, the former Acid Plant settling pond area (both areas where source removal CMs were subsequently implemented), the West Selenium Source Area, the North Plant Arsenic Source Area, and the slag pile. The SPHC, source removal, and ET Cover CMs have been completed to address all source areas with the exception of the slag pile. The planned slag pile remedial action (regrading and capping), to be completed following further UFS removal and reprocessing, is intended to address the slag pile source area by reducing infiltration through the slag and associated leaching of contaminants from the slag to groundwater.

Groundwater chemistry across the East Helena monitoring well network as represented by the 2024 Interim CAPMP monitoring data set is variable, with higher constituent concentrations in the Facility source areas noted above, and progressively decreasing concentrations with downgradient distance. All 2024 groundwater monitoring results are in Appendix A, with all monitoring locations shown on Exhibit 1. Field measured groundwater pH values in 2024 ranged from 5.58 (well EH-60, north of the Facility and Highway 12) to 7.84 (well MW-5, west of the Facility), with an overall average of 7.0, and field SC ranged from 243 $\mu\text{mhos/cm}$ at well MW-7 to 3400 $\mu\text{mhos/cm}$ at slag pile well DH-56. Field DO values in 2024 ranged from 0.06 mg/L at well SDMW-1 to 9.64 mg/L at well MW-11, upgradient of the CAMU cells. In terms of major ion concentrations, the maximum TDS concentration was observed at West Selenium source area well DH-8 (2580 mg/L). The highest potassium (319 mg/L), sodium (392 mg/L), and sulfate (1290 mg/L) concentrations observed in 2024 were at slag pile well DH-56, while the highest calcium (467 mg/L) and chloride (240 mg/L) concentrations were noted at DH-8. West Selenium well DH-66 and well EH-60 also showed chloride concentrations greater than 200 mg/L during 2024. The maximum arsenic concentration observed in 2024 was 20.6 mg/L at well DH-79 in the North Plant Site arsenic source area; the maximum selenium concentration was 1.30 mg/L at well DH-66 in the West Selenium source area.

The configuration and geometry of the current arsenic plume as of October 2024 (Figure 3-2) shows the primary Facility plume extending approximately 0.5 miles northwest of the Facility into the COEH, with a more diffuse (lower concentration) plume extending north of the slag pile. Maximum arsenic concentrations in the 10 to 20 mg/L range occur in the central portion of the Facility downgradient of the Speiss/Dross area slurry wall, referred to as the North Plant Arsenic Source Area (Figures 3-2 and 3-4). In the higher concentration portion of the arsenic plume migrating to the northwest, concentrations greater than 1 mg/L persist across US Highway 12 and through the western portion of East Helena. The current downgradient boundary of the arsenic plume as defined by the 0.01 mg/L (MCL) concentration contour is located along the north and west edges of East Helena (Figure 3-2), and the overall arsenic plume footprint in 2016 and 2024 is nearly identical. The arsenic plume footprint has remained relatively stable since at least 2001 when the Facility was shut down. An area of groundwater south and west of the Facility with arsenic concentrations in the 0.005 to 0.025 mg/L range (Figure 3-2) is believed to be derived primarily from groundwater interactions with naturally-occurring arsenic-bearing Tertiary-age volcanoclastic sediments.



The selenium plume for October 2024 (Figure 3-3) extends offsite significantly further than the arsenic plume, due primarily to a lower rate of geochemical attenuation (adsorption or coprecipitation) and the associated relatively conservative transport behavior of selenium, with the 0.05 mg/L (MCL) selenium plume extending approximately 1.5 to 2 miles northwest of the Facility. Comparison of the 2016 and 2024 selenium plumes on Figure 3-3 shows that the downgradient 0.05 mg/L plume extent is approximately 4,000 feet shorter based on 2024 data (downgradient plume edge south of Prickly Pear Creek) compared with 2016 data (downgradient plume edge approximately coincident with Canyon Ferry Road). Selenium concentrations within the plume core have decreased as well (i.e., compare the reduction in area of the pink 0.1 to 0.5 mg/L contour and yellow 0.5 to 1.0 mg/L contour from 2016 to 2024 on Figure 3-3). The primary current groundwater selenium sources are the West Selenium Source Area (west lobe) and the slag pile (east lobe) (Figure 3-4), with the slag pile being the larger of the two remaining sources.

3.3.2 Groundwater Level and Concentration Trends

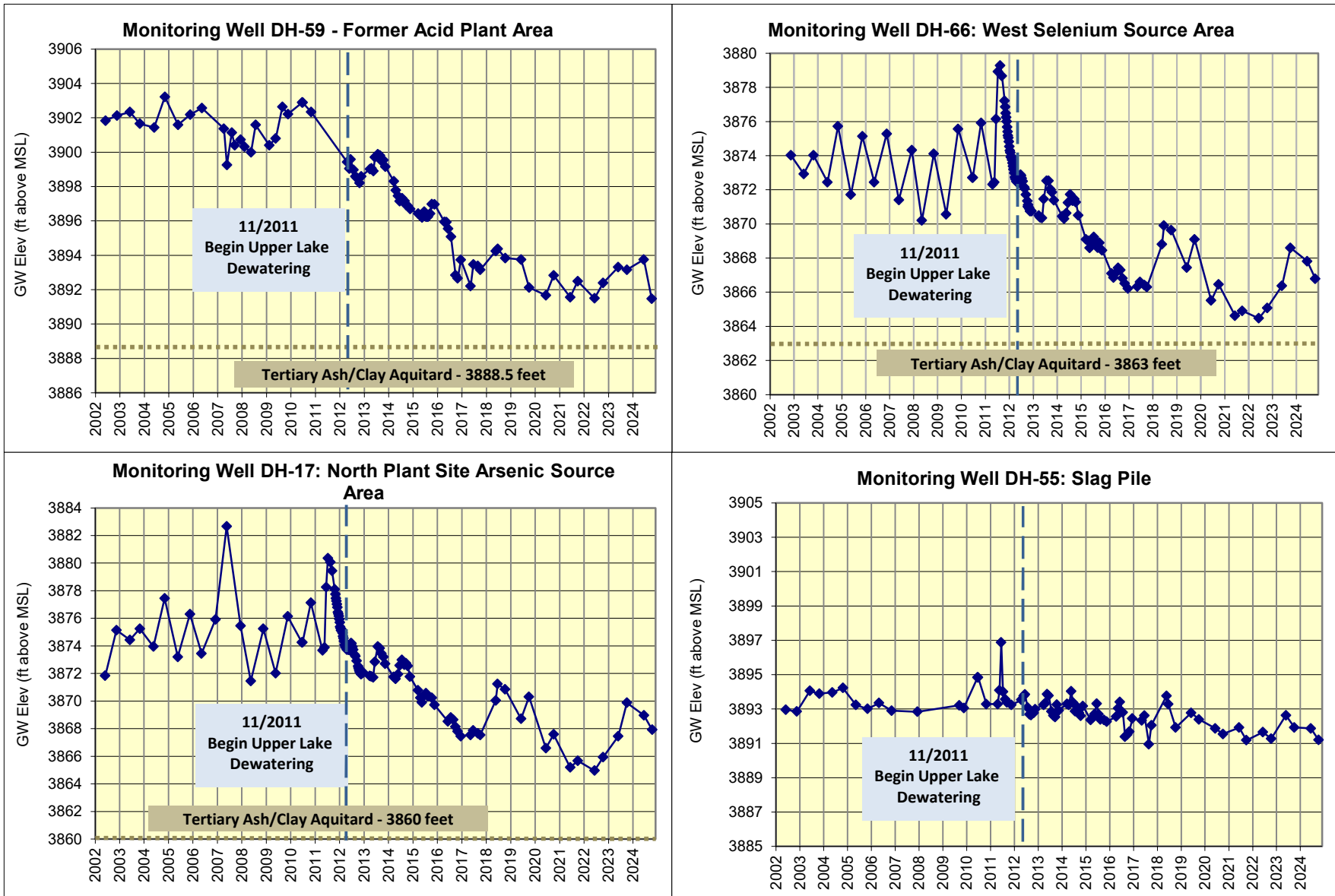
As discussed above in Section 3.1, the 2024 precipitation total in the Project area (9.81 inches) was about 20% lower than the 2023 total of 12.47 inches, and similar to the drier conditions experienced in 2020 (9.87 inches) and 2021 (8.61 inches). The 2024 snowpack in the Prickly Pear Creek headwaters was also near or at historic minimum values during the first half of the year (Section 3.1). The 2024 precipitation trends resulted in generally decreasing groundwater levels throughout the East Helena project area, following the increases observed in 2023. Despite the groundwater level decreases, only one well scheduled for sampling in 2024 could not be sampled due to insufficient water for obtaining a sample (DH-77 in October 2024; see Table 2-3).

3.3.2.1 Groundwater Level Trends

Groundwater level trends on the Facility are of particular interest since reducing groundwater levels is a critical component of the corrective measures. As previously noted, the main objective of the SPHC CM is to reduce groundwater levels on the Facility, thereby reducing groundwater interaction with contaminated soils/fill and associated contaminant leaching to groundwater.

Appendix B includes the 2024 manual groundwater level measurements from the project area. In 2024, manual water level measurements or dry conditions were recorded at 170 monitoring wells; eight wells were dry during both the June and October monitoring events including: DH-9, DH-22, DH-23, DH-57, DH-61, DH-71, EH-128, and PZ-9A; three wells (DH-36, PZ-36B, PZ-36C) were dry during the October monitoring event only.

Figure 3-5 includes groundwater hydrographs illustrating groundwater level trends for various portions of the Facility. Groundwater levels over most of the Facility have decreased since 2012 in response to the SPHC CM and other CM-related activities. Groundwater levels in the Acid Plant Area, illustrated by well DH-59, have declined by 8 to 10 feet from pre-2012 levels, prior to SPHC CM



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**GROUNDWATER LEVEL HYDROGRAPHS
FROM FACILITY SOURCE AREA
MONITORING WELLS**

FIGURE

3-5



initiation, through 2024. The hydrograph for well DH-66 shows that water levels in the West Selenium Source Area declined 8 to 10 feet from 2012 through 2022, followed by an increase of about 3 feet from 2022 through 2023 and a subsequent decrease of about 2 feet in 2024, for a net decrease of about 7 to 9 feet. In the North Plant Site Arsenic Source Area (well DH-17), water levels show a trend similar to the West Selenium Source area, declining about 9 feet through 2022, followed by an increase of about 4 feet from 2022 through 2023 and a subsequent decrease of about 2 feet in 2024, for a net decrease of about 7 feet (Figure 3-5). The hydrographs for all three of these source area locations (DH-59, DH-66, and DH-17) show the combined effects of the SPHC CM and the more transitory effects of variable annual precipitation and snowmelt and associated groundwater recharge. The higher precipitation and snowpack in 2018, 2019, and 2023 led to increased groundwater levels in those years. Relatively dry conditions in 2020, 2021, and 2024, conversely, resulted in groundwater elevation decreases.

Compared with the changes in Acid Plant, West Selenium, and North Plant Arsenic source areas, water levels beneath the slag pile (well DH-55), have shown relatively minor fluctuations (about 1 to 2 feet) in response to the SPHC CM and precipitation patterns (Figure 3-5). Groundwater levels in the eastern portion of the Facility (i.e., beneath the slag pile), are largely controlled by the relatively constant Prickly Pear Creek stage while water levels at the other locations were historically heavily influenced by the former Upper Lake, which was drained as part of the SPHC CM.

The CM-induced groundwater level declines have resulted in the desaturation of some of the most contaminated Facility soils/fill, thereby reducing groundwater interactions with and potential contaminant leaching from these soils. The Figure 3-5 hydrographs include the elevation of the Tertiary ash/clay layer representing the base of the plume-bearing Upper Aquifer at each location⁵. As of 2024, in the former Acid Plant area groundwater elevations have decreased from about 3,901 feet above mean sea level (AMSL) to about 3,892 feet with the ash/clay layer at about 3,889 feet. This represents a decrease in saturated thickness from 12 feet to 3 feet in this source area. The reduced saturated thickness, assuming a relatively consistent hydraulic gradient over that time, represents an approximate 75% reduction in the groundwater flux through the former Acid Plant area contaminated soils/fill. Using similar comparisons for average 2024 water levels in the West Selenium Source Area (well DH-66) and North Plant Arsenic Source Area (DH-17) yields reductions in the saturated thickness and groundwater flux of about 66% and 45%, respectively, for these areas. Decreasing groundwater levels due to the SPHC CM have led to an overall reduction in groundwater flux through the contaminant source areas and desaturation of the most highly contaminated soils/fill, and a corresponding reduction in the groundwater contaminant load leaving the Facility, thereby reducing downgradient groundwater loads and concentrations. During wetter years such as 2018-2019 and 2023, groundwater levels can increase due to increased upgradient recharge (as seen on Figure 3-5),

⁵ Drilling has not penetrated to sufficient depths to delineate the ash/clay layer elevation beneath the slag pile (well DH-55 hydrograph).



partially counteracting the effects of the SPHC and temporarily resaturating some portion of the contaminated soils/fill, although the overall trend in groundwater elevations from pre- to post-SPHC remains downward.

Figure 3-6 summarizes groundwater elevation changes throughout the project area since initiation of the CMs in 2011. Water level changes from pre-SPHC conditions (2002-2010 averages) since the inception of the CMs compared to the 2019, 2022, 2023, and 2024 data sets are shown on Figure 3-6, demonstrating both the effects of the CMs and a rough correlation with the shorter-term effects of annual precipitation variability. The relatively high precipitation totals in 2018 and 2019 (two-year average of 14.7 inches) contributed to an overall average groundwater level change of -3.6 feet for the 2019 comparison. The effects of lower precipitation observed in 2020, 2021 and 2022 (three-year average of 10.0 inches) is reflected in the larger decrease for 2022, an average change of -6.6 feet. Finally, the higher precipitation total in 2023 (12.47 inches) corresponds to an overall average change of -3.9 feet, while the lower 2024 precipitation total of 9.81 inches corresponds to a slightly larger average decrease of -4.1 feet (Figure 3-6).

Groundwater level declines observed in the plant area are principally due to elimination of former Upper and Lower Lakes and lowering of Prickly Pear Creek as part of the SPHC CM; in the western portion of Lamping Field the declines are primarily a response to decommissioning of Wilson Ditch, formerly a significant seasonal source of groundwater recharge (Figure 3-6). Water level fluctuations in the northernmost wells are a function of both precipitation/recharge patterns and other non-project related land use practices such as groundwater pumping and irrigation schedules. Figure 3-6 also shows the relatively small water level declines (1 to 4 feet) observed in the eastern portion of the slag pile, and similar small declines or slight water level increases near Prickly Pear Creek north of the Facility in East Helena. This last observation exemplifies the influence of the creek on local groundwater flow and plume migration patterns with the most significant groundwater quality impacts from the Facility primarily restricted to areas west of the creek. Modest decreases or (in many cases) water level increases over time have also been observed at most of the wells to the west of the Facility, completed in Tertiary sediments.

3.3.2.2 Groundwater Concentration Trends

Remediation phase performance evaluation trend analyses currently focus on the primary COCs at the Facility (arsenic and selenium), as well as the indicator geochemical parameters sulfate and chloride, along with groundwater levels. Monitoring wells from three primary areas of interest are included in the concentration trend analysis: (1) the Facility source areas, including the Acid Plant area, slag pile area, West Selenium area, and North Plant Site Arsenic area; (2) wells defining the downgradient extent of the arsenic plume; and (3) wells defining the downgradient extent of the



selenium plume. Wells selected for concentration trend analyses are listed in Table 3-5 and are shown on Figure 3-7. Trends have been segregated into the two periods prior to and following the initial implementation of CMs in late 2011 including:

1. RCRA Facility Investigation (RFI) period (2002-October 2011); and
2. RCRA Corrective Measure (CM) implementation period (November 2011-2024).

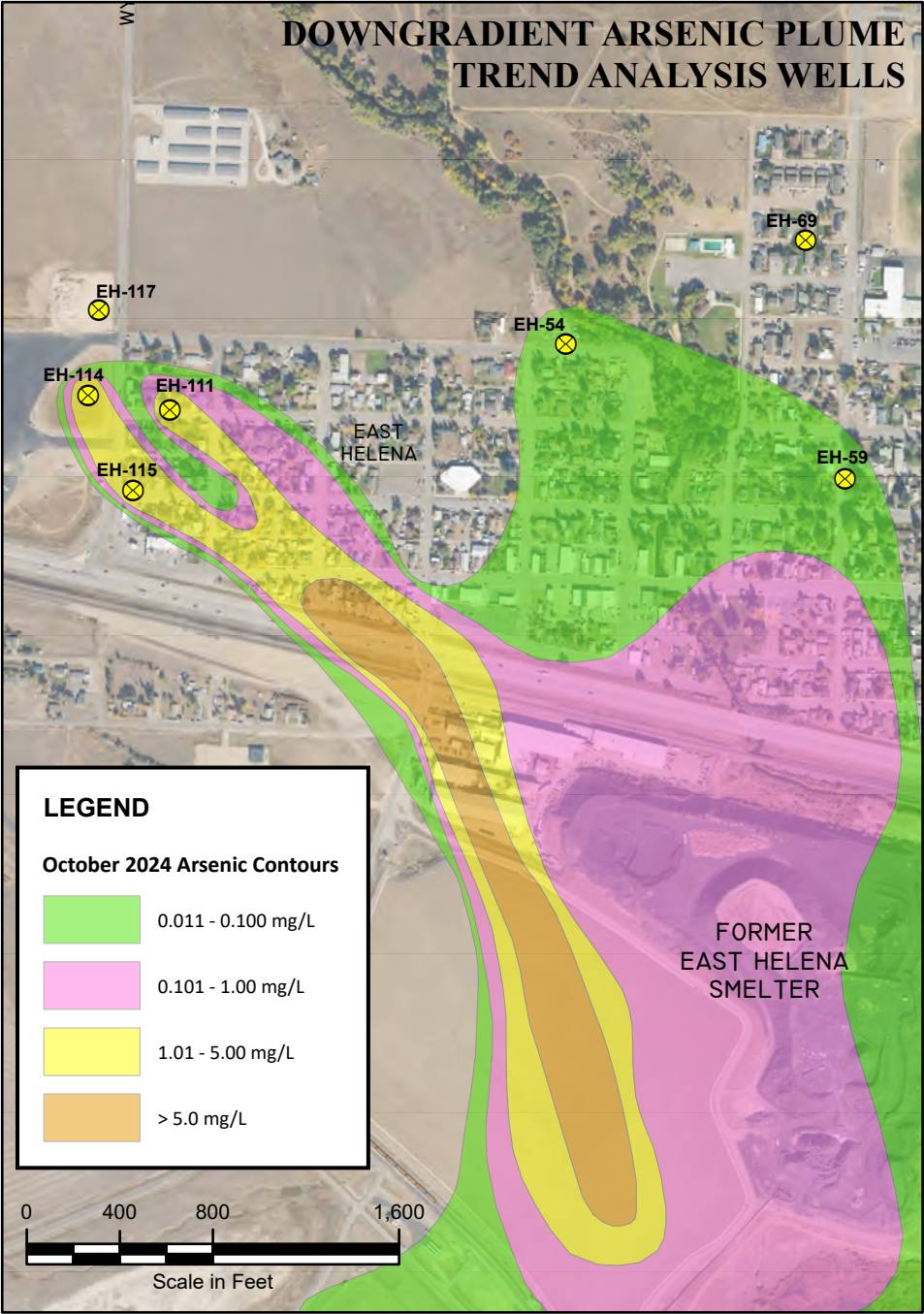
The complete set of arsenic and selenium trend plots for the trend analysis wells are shown on Figures 3-8 (arsenic trends) and 3-9 (selenium trends), with additional constituent graphs (chloride and sulfate) included in Appendix C. Appendix D includes COC (arsenic and selenium) trend plots for a larger set of wells throughout the Facility and downgradient plume monitoring areas. Based on the trend plots shown on Figures 3-8 and 3-9 and presented in Appendices C and D, concentration trends through 2024 are summarized below. Arsenic and selenium trends and observations are discussed in order from the Facility source areas, through the near downgradient arsenic and selenium plume areas, to the furthest downgradient (selenium plume) area north of Lamping Field. All concentration trend monitoring wells discussed below are completed in the Upper Aquifer.

Arsenic Trends

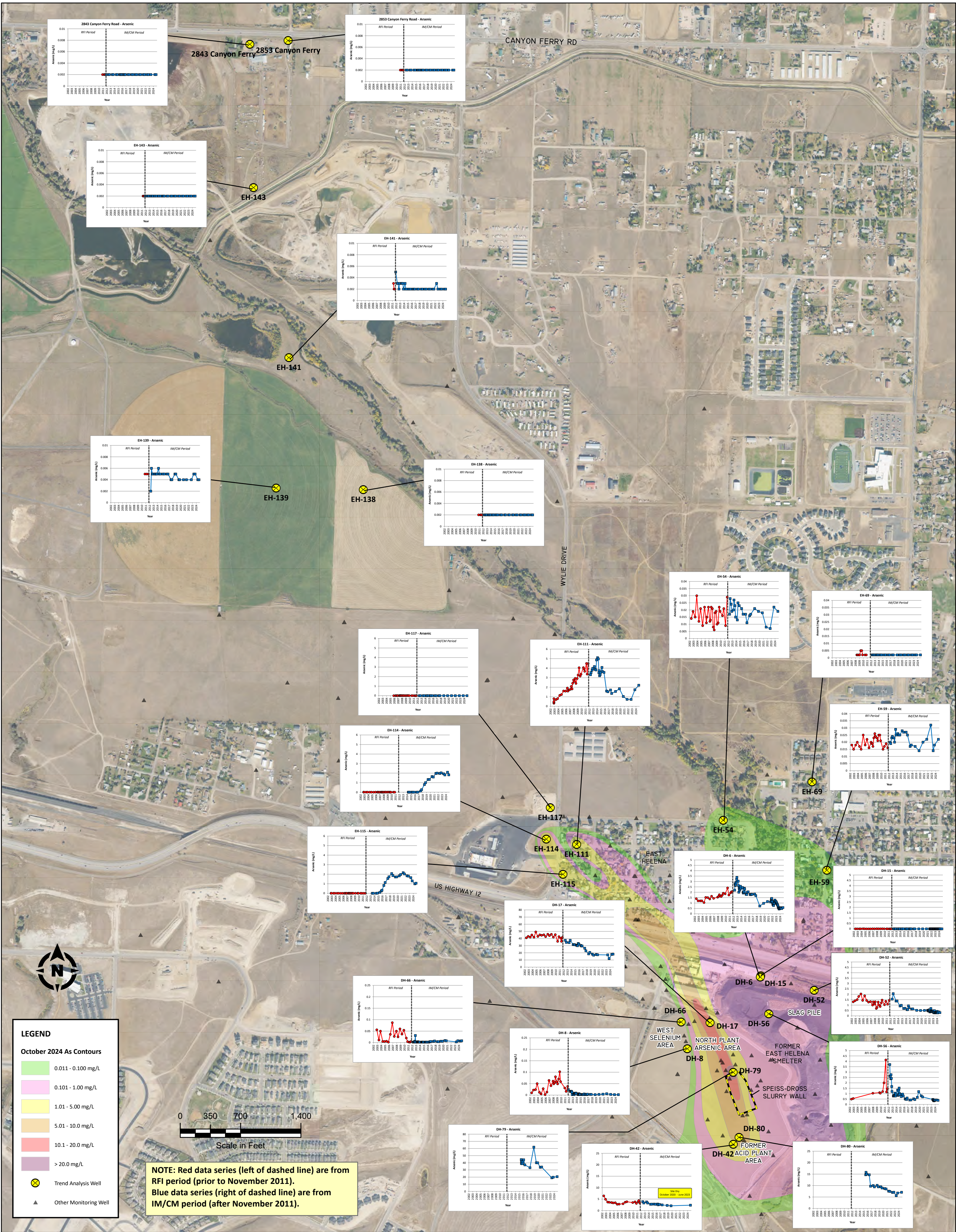
- In the Former Acid Plant area, arsenic concentrations have decreased at well DH-42 during both the 2002 to 2011 RFI phase (after plant shutdown), as well as the subsequent post-2012 CM phase (Figure 3-8). This well had insufficient water for sampling from 2020-2023, due to low water levels driven by lower than normal precipitation and the SPHC CM. Available data for DH-42 shows that arsenic decreased from 3.89 mg/L in June 2012 to 2.33 mg/L in October 2024. Monitoring well DH-80, completed in 2015 to document the water quality response to the acid plant area soil removal CM showed a significant decrease in arsenic concentrations following the 2016 removal action, from about 15 mg/L to 10 mg/L, and has subsequently decreased slowly to 7.06 mg/L in October 2024 (Figure 3-8). Sulfate concentrations have also decreased at well DH-80 concurrently with arsenic (Appendix C).
- Arsenic concentrations at slag pile area wells DH-6, DH-15, DH-52, and DH-56 were either stable or increased during the RFI phase and have decreased during the CM phase (Figure 3-8). For example, the arsenic concentration at DH-6 decreased from a maximum of 3.38 mg/L in November 2012 to 0.575 mg/L as of October 2024, an 83% reduction. At well DH-52, arsenic has decreased from 2.06 mg/L in September 2012 to 0.300 mg/L in October 2024, an 85% reduction. DH-56 arsenic concentrations have decreased from 3.7 to 0.378 mg/L arsenic from 2012 to 2024 (89% reduction). Arsenic concentrations at well DH-15 have been below detection throughout the RFI and CM periods (Figure 3-8).

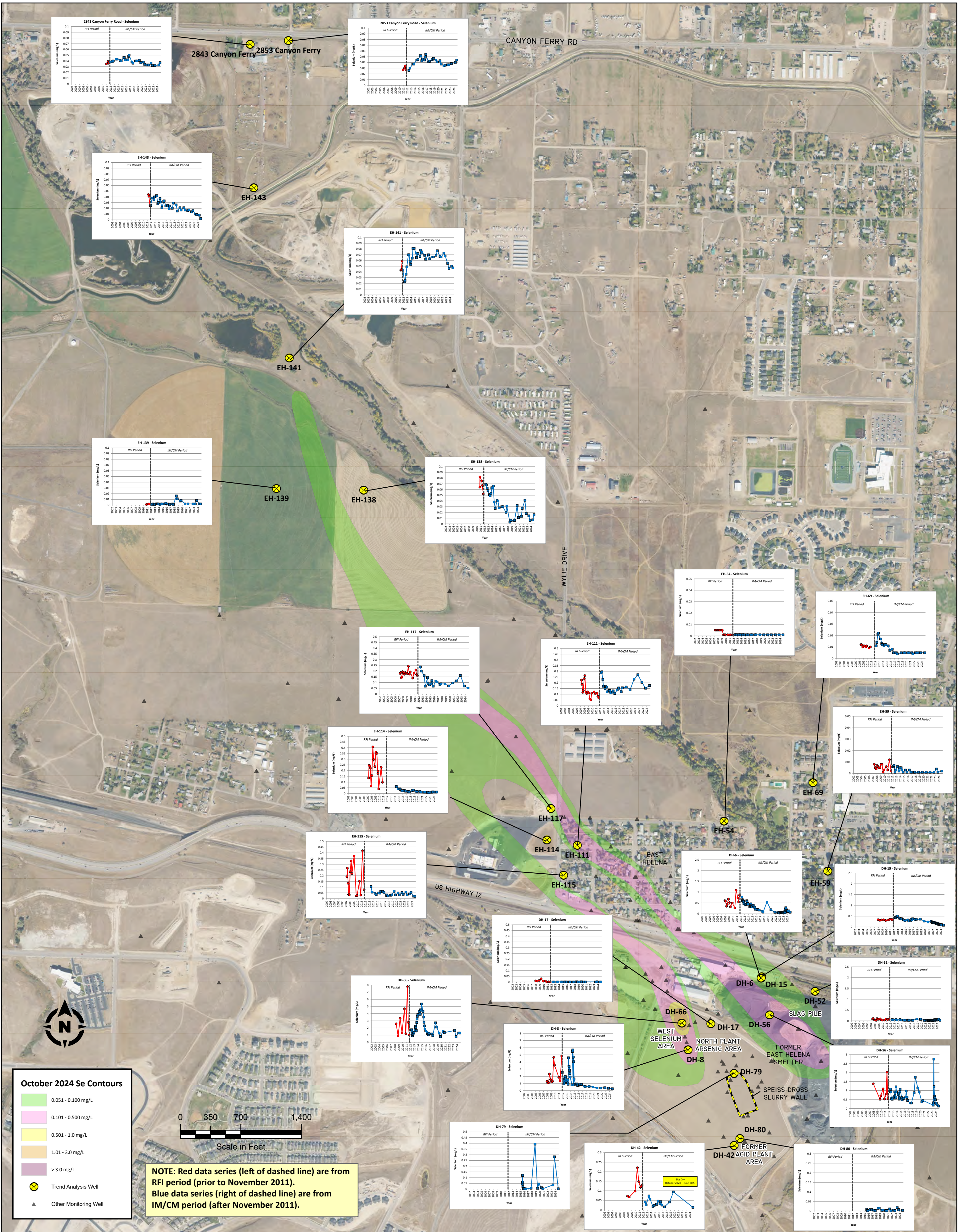
Table 3-5. 2024 Concentration Trend Analysis Monitoring Wells
2024 Interim CAPM Report - East Helena Facility

Well	Target Area
DH-42	Acid Plant
DH-80	Acid Plant
DH-17	North Plant Arsenic
DH-79	North Plant Arsenic
DH-6	Slag Pile
DH-15	Slag Pile
DH-52	Slag Pile
DH-56	Slag Pile
DH-66	West Selenium
DH-8	West Selenium
2843 Canyon Ferry Road	Downgradient Selenium Plume
2853 Canyon Ferry Road	Downgradient Selenium Plume
EH-138	Downgradient Selenium Plume
EH-139	Downgradient Selenium Plume
EH-141	Downgradient Selenium Plume
EH-143	Downgradient Selenium Plume
EH-54	Downgradient Arsenic Plume
EH-59	Downgradient Arsenic Plume
EH-69	Downgradient Arsenic Plume
EH-111	Downgradient Arsenic Plume
EH-114	Downgradient Arsenic Plume
EH-115	Downgradient Arsenic Plume
EH-117	Downgradient Arsenic Plume



Updated by: mwalker 3/4/2025 4:06 PM
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- Arsenic concentrations in West Selenium source area wells DH-66 and DH-8 have historically been relatively low (0.1 mg/L or lower) and decreased to consistently below the 0.010 mg/L arsenic MCL after 2011 (Figure 3-8). Arsenic concentrations at wells DH-8 and DH-66 ranged from <0.002 to 0.008 mg/L in 2024.
- Arsenic concentrations at North Plant Arsenic well DH-17 in 2024 were 17.8 to 18.1 mg/L (Figure 3-8), similar to recent post-CM levels. Overall, arsenic concentrations at DH-17 in 2024 show about a 60% decrease from the RFI phase concentrations of 40 to 50 mg/L (Figure 3-8). Chloride and sulfate concentrations at DH-17 have shown concurrent decreasing concentrations with arsenic (Appendix C). The arsenic concentration at well DH-79, located immediately north (downgradient) of the Speiss/Dross slurry wall, remained near the minimum value observed at this well to date in 2024 (Figure 3-8). The 2024 concentration of 20.6 mg/L is about one-third of the maximum value of 61.9 mg/L arsenic reported at DH-79 in October 2018.
- Well EH-111, near the leading edge of the primary arsenic plume migrating off-site (with maximum arsenic concentrations in the 5 mg/L range), has shown a significant overall decrease from 2015 through 2024 after steadily increasing through the RFI period, although concentrations rebounded somewhat in 2023 and 2024 from the minimum value observed in October 2022 (Figure 3-8). The October 2024 arsenic concentration at EH-111 (2.21 mg/L) is approximately 57% lower than the maximum concentration of 5.1 mg/L in February 2014. Sulfate concentrations at EH-111 have increased in the IM/CM period while chloride concentrations remain lower than in the RFI period (Appendix C), which may suggest increasing influence from sulfate-rich slag pile area groundwater on water quality at EH-111.
- Water quality trends at wells EH-114 and EH-115 (south and west of EH-111) show evidence of a westward arsenic plume shift during the CM period. Prior to 2011, arsenic concentrations were below detect (Figure 3-8) and selenium, sulfate, and chloride concentrations were highly variable (Figure 3-9 and Appendix C) as these wells received seasonal influxes of water from the West Selenium source area. Since 2016, arsenic concentrations have increased significantly at both wells and selenium concentrations have decreased to near or below the 0.05 mg/L MCL, while sulfate concentrations have increased (Appendix C). These trends are attributable to the lack of seasonal recharge and altered flow direction, and possibly altered geochemical conditions (elimination of a seasonal influx of oxidizing recharge water), due to the decommissioning of Wilson Ditch in 2012. The increasing arsenic trends at wells EH-114 and EH-115 also contrast with the decreasing arsenic trends in wells to the east, including EH-111 (discussed above), EH-65, and EH-60 (see trend plots in Appendix D), as the primary arsenic plume has shifted toward EH-114 and EH-115 and away from EH-111, EH-65, and EH-60. The arsenic concentration at EH-114 has recently stabilized, and concentrations at EH-115 have recently decreased to around 1 mg/L after peaking near 2 mg/L from 2018 to 2021 (Figure 3-8). October 2024 arsenic concentrations were 1.82 mg/L at EH-114 and 1.06 mg/L at EH-115.



- In the eastern, lower concentration portion of the downgradient arsenic plume, October 2024 arsenic concentrations were 0.019 and 0.022 mg/L at EH-54 and EH-59, respectively, and below reporting limits (<0.002 mg/L) at EH-69 (Figure 3-8). The 2024 arsenic concentrations were consistent with previously reported data for these wells.
- Arsenic concentrations in the furthest downgradient trend analysis area (wells EH-138, EH-139, EH-141, EH-143, and 2843 and 2853 Canyon Ferry Road) area are well outside of the arsenic plume emanating from the Facility, and are consistently low, ranging from <0.002 to 0.006 mg/L, less than the 0.01 mg/L MCL, and showing no trends over time (Figure 3-8).

Selenium Trends

- Selenium trends at Former Acid Plant well DH-42 have been variable (Figure 3-9), but overall concentrations have been lower during the CM period (0.013 to 0.094 mg/L) compared with the RFI period (0.067 to 0.221 mg/L). The October 2024 selenium concentration of 0.013 mg/L at DH-42 is the minimum value observed to date. Selenium concentrations at DH-80 have remained consistently below the 0.05 mg/L MCL, ranging from 0.001 to 0.018 mg/L since the well was installed.
- Selenium concentrations at slag pile wells DH-6 and DH-15 have decreased during the CM period through 2024 apart from temporary increases in 2018 and again in 2023 at DH-6 (Figure 3-9). These temporary increases are believed to be associated at least in part with above average precipitation driving increased infiltration and leaching of selenium from the slag pile. The peak selenium concentration of 1.09 mg/L at DH-6 in October 2010 decreased to 0.069 mg/L as of October 2024, a decrease of 93%. At DH-15, the peak concentration of 0.50 mg/L (November 2012) has decreased to 0.077 mg/L as of October 2024, the minimum concentration observed to date and a decrease of about 84%. The temporary precipitation-driven selenium increases noted for well DH-6 are even more apparent for well DH-56. The selenium concentration at DH-56 increased rapidly in 2023 to 2.75 mg/L in July 2023, and subsequently decreased just as rapidly to a value of 0.495 mg/L in December 2023, with a continued decrease to 0.137 mg/L in October 2024 (Figure 3-9). The October 2024 selenium result at DH-56 is the minimum value observed at this well to date. Additional discussion of slag pile area water quality related to the UFS project groundwater monitoring program is in Section 3.3.6.
- Selenium concentrations at West Selenium area wells DH-8 and DH-66 were highly variable historically during the RFI period, ranging from approximately 1 to nearly 8 mg/L. After CM implementation began in 2011, selenium concentrations increased consistently at DH-66 through 2014, possibly due to construction activities, reaching a post-RFI phase maximum concentration of 5.36 mg/L in November 2014 (Figure 3-9). Subsequently, selenium concentrations decreased to a minimum concentration of 0.784 mg/L in October 2023, increasing slightly to 1.29 mg/L as of October 2024. The October 2024 concentration represents a decrease of about 83% from the period of record maximum of 7.78 mg/L observed in September 2011. The October 2024 selenium concentration at source area well



DH-8, 0.276 mg/L, is the minimum concentration recorded to date and about 95% lower than the maximum concentration of 5.7 mg/L recorded in July 2014.

- Selenium concentrations remained low at North Plant Arsenic Area wells DH-17 and DH-79 in 2024, ranging from <0.001 to 0.003 mg/L. Selenium concentrations at DH-79 have been variable over time with an overall range of 0.002 to 0.392 mg/L (Figure 3-9). These fluctuations may be potentially related to variable water levels driven partly by precipitation; the higher selenium concentrations at DH-79 in 2018 and 2023 are approximately coincident with the short-term water level increases in the North Plant Site arsenic area observed in 2018 and 2023 (see well DH-17 hydrograph on Figure 3-5).
- The selenium concentration range at EH-111 in the RFI period (0.050 to 0.263 mg/L) is slightly lower than CM period concentrations (0.170 to 0.296 mg/L). Although no strong overall trend in selenium concentration is apparent at EH-111 since 2002, an increasing selenium trend was observed at EH-111 from 2019 through 2021, followed by a decrease through 2023 and 2024 (Figure 3-9). A similar selenium trend occurs at well EH-117, downgradient of EH-111; the October 2024 selenium concentration at EH-117 of 0.052 mg/L was the minimum observed to date, and represents a 78% decrease from the maximum concentration of 0.242 mg/L from 2009. As noted previously, sulfate concentrations at EH-111 have increased during the CM period, while chloride stabilized near 40 mg/L (Appendix C). The overall water quality trends at EH-111 (and EH-117) suggest a potential increasing influence from the slag pile (a high sulfate source with ongoing selenium loading to groundwater) in the CM period, evidence of a westward plume shift in this area.
- As noted above, selenium concentrations have decreased to near or below the 0.05 mg/L MCL at EH-114 and EH-115, concurrent with an arsenic concentration increase (Figures 3-8 and 3-9). The arsenic and selenium trends at EH-114, EH-115, EH-111, and EH-65 (Appendix D) all indicate westward shifting of the arsenic and selenium plumes, with arsenic concentrations increasing at EH-114 and EH-115 and decreasing at EH-111 and EH-65, and selenium concentrations showing inverse trends to arsenic.
- Selenium concentrations at EH-59 and EH-69 in the eastern part of East Helena have both decreased during the CM period while groundwater quality at EH-54 has remained relatively consistent (Figure 3-9). In 2024, selenium concentrations at EH-54, EH-59, and EH-69 ranged from <0.001 to 0.005 mg/L.
- At well EH-139 on the west side of the downgradient selenium plume, typical selenium concentrations are low, in the <0.001 to 0.003 mg/L range. Selenium concentrations in 2024 were 0.002 mg/L during both semiannual monitoring events. Slight increases to 0.016 mg/L in 2018, then again to 0.008 mg/L in 2023 (Figure 3-9) may be attributed to a westward plume shift that is more pronounced during wetter years, when leakage from Prickly Pear Creek can shift flow directions to the west.
- At well EH-138, located along the east side of the selenium plume between the plume boundary and East Helena municipal well #3, selenium has decreased from a range of 0.052 to 0.082 mg/L in 2010-2011 (immediately after well installation), to a range of 0.007 to 0.016



mg/L in 2024. Selenium concentrations decreased consistently at EH-138 from 2012 through 2018, but have since shown seasonally variable and relatively abrupt increases and decreases in concentration (Figure 3-9). These trends are likely due to slight shifts in groundwater flow and plume migration directions in response to hydrologic conditions.

- At the other wells defining the downgradient selenium plume (2843 and 2853 Canyon Ferry Road wells, EH-141, EH-143), selenium concentrations have generally shown slight to moderate overall decreasing trends over the last 5 to 8 years (Figure 3-9), accompanied by similar trends in the indicator parameters chloride and sulfate (Appendix C). At 2853 Canyon Ferry Road, selenium concentrations have recently increased from 0.034 mg/L in June 2021 to 0.044 mg/L in October 2024, remaining just below the 0.05 mg/L MCL. The October 2024 selenium concentration at EH-143 (0.002 mg/L) was the lowest concentration observed to date at this well, over 95% lower than the 2011 maximum concentration of 0.044 mg/L. At EH-141, 2024 selenium concentrations ranged from 0.047 to 0.050 mg/L, equal to or below the 0.05 mg/L groundwater standard. The October 2024 concentration of 0.047 mg/L selenium at EH-141 represents a 41% decrease overall from the maximum selenium concentration of 0.081 mg/L reported at this well in 2014.

Wells 2843 and 2853 Canyon Ferry Road are former private water supply wells that have been incorporated into the East Helena project monitoring program. These wells have historically defined the furthest downgradient occurrence of selenium concentrations above the 0.05 mg/L MCL. When the wells were still in service and being pumped regularly, samples were collected from hose attachments or hydrants; after the wells were taken out of service, a pump contractor was retained to install a submersible pump capable of purging large volumes (400+ gallons) at high rates to provide adequate purge volumes since the wells were not completed as monitoring wells, but as water supply wells with typical slotted steel casing completion. As described in the 2023 Interim CAMP Report (Hydrometrics, 2024b), these two wells were sampled using different methods: (1) the pump contractor and a high volume purge in June 2023; and (2) the Waterra low-flow/low-volume method in October 2023, after manually installing 2-inch PVC well screen and blank casing in both wells. The 2023 monitoring results showed geochemical anomalies in the October 2023 samples compared with previous samples collected using high purge rates and volumes (including June 2023), indicating that the Waterra low-flow method did not provide representative samples for these wells. As discussed in the 2023 Interim CAMP Report (Hydrometrics, 2024a), 2023 monitoring results indicated the following:

- Localized reducing conditions at these former water supply wells, possibly related to aging of the steel well casing, were indicated by the lower volume samples obtained in October 2023, based on the significant decreases in DO and ORP from June to October. Higher purge volumes draw in more oxidized water representative of overall aquifer conditions.
- Large decreases in bicarbonate, calcium, and sulfate concentrations from June to October 2023 and geochemical saturation calculations indicate that calcite was near saturation in the



June samples and slightly oversaturated in the October samples, implying potential calcite precipitation occurring in October, as well as possible sulfate reduction to sulfide.

- Concentrations changes in some major ions (decreases in calcium, sulfate, bicarbonate) but not others (chloride, bromide, sodium) suggested that dilution was not responsible for the observed changes between June and October, but that a chemical reaction is occurring.
- The combination of localized reducing conditions and calcite/sulfide precipitation could both act to artificially reduce selenium concentrations, as selenium is less mobile under reducing conditions and can also coprecipitate with calcite.

Based on these results, the 2843 and 2853 Canyon Ferry Road wells were sampled using the high-volume purge method in June and October 2024 to provide samples representative of aquifer conditions. Measurement of field parameters and collection of samples for potential laboratory analysis was conducted during the beginning, middle, and end of the high-volume purging process during 2024 sampling to further evaluate the apparent changes in geochemistry with increasing purge volume suggested by the 2023 results. The 2024 sampling results were comparable to the 2023 results, with the initial (low purge volume) samples showing low DO and ORP values indicating reducing geochemical conditions, and later (full purge volume) samples showing higher DO and ORP values indicating more oxidizing conditions. Laboratory samples submitted during 2024 also showed chemistry differences consistent with the 2023 observations outlined above. Therefore, the 2023 and 2024 results both confirm that lower purge volume/low-flow sampling at these wells does not provide representative samples. Future samples from these key wells will continue to be collected using a high-volume/high purge rate sampling method to ensure data comparability and representativeness.

Overall, visual review of the arsenic and selenium concentration trends shown on Figures 3-8 and 3-9 and in Appendix D show predominantly decreasing COC trends at most source area wells and a mixture of decreasing and stable trends at downgradient (off-site) wells during the post-2011 CM period. The slight to moderate decreasing selenium concentration trends exhibited at most downgradient wells, and the concurrent decreasing arsenic trends at EH-111, EH-65, and EH-60 and increasing trends at EH-114 and EH-115 are due to a combination of (1) a slight westward shift in the contaminant plume geometry, along with (2) an overall decrease in groundwater contaminant loads migrating off the Facility, given the overall decreases in saturated thickness and contaminant concentrations. Based on these trends and the 2024 monitoring results at wells along the downgradient end of the selenium plume, the extent of the selenium plume defined by the 2024 data has receded by approximately 4,000 feet compared with 2016 (see Figure 3-3). Note, however, that as of October 2024, the difference in selenium concentration between well EH-141 south of Prickly Pear Creek (0.047 mg/L) and well 2853 Canyon Ferry Road about 4,000 feet downgradient of EH-141 (0.044 mg/L) is relatively small (Figure 3-9); therefore, minor changes in selenium concentration at either or both of these wells will significantly affect the location of the downgradient 0.05 mg/L selenium contour.



3.3.3 Contaminant Plume Stability

Another component of the East Helena groundwater remedy performance evaluation is plume stability analysis for the primary groundwater COCs arsenic and selenium. While contaminant concentration trends at individual wells within and downgradient of the primary source areas on the Facility may show varying trends (increasing, decreasing, or stable), particularly during the initial phase of remedy monitoring following completion of CMs, evaluation of plume stability allows an additional comprehensive assessment of plume characteristics, including any changes over time in metrics such as total plume area (as defined by the 0.01 mg/L boundary for arsenic and 0.05 mg/L boundary for selenium), average plume concentration, and plume concentration centroid location.

The calculation methods for arsenic and selenium plume stability are based on methods outlined in Ricker (2008). This method was originally developed as a tool to evaluate the stabilization of contaminated groundwater migration, in accordance with the requirements of Government Performance and Results Act Environmental Indicator (EI) RCRIS Code CA 750 (Migration of Contaminated Groundwater Under Control). The evaluation procedure involves the following steps:

1. Define the areas for which plume characteristics will be calculated. As in previous years, for the purposes of performance evaluation monitoring described in the 2024 CAPMP, arsenic and selenium plume areas on the former operating areas of the Facility (“Facility plume stability”), and in the downgradient plume areas in the COEH, Lamping Field, and north to Canyon Ferry Road were selected, to allow integration of results from multiple monitoring points into a single calculated measure of plume characteristics. The arsenic and selenium plume stability evaluation areas are shown on Figure 3-10. Separate plume stability calculations are performed for selenium and arsenic in the Facility area and in the downgradient plume areas, to independently evaluate the plume characteristic responses to CMs in the Facility source areas and the downgradient migration areas.
2. Select a representative set of monitoring wells from the monitoring well network with sufficient spatial distribution to define the extent of the contaminant plume within the plume stability evaluation areas over multiple years. The selected well sets for the plume stability analyses are shown on Figure 3-10 and summarized in Table 3-6. The selected off-site well set for selenium covers a greater area than the off-site well set for arsenic, since the plume configurations are different.
3. For each well, calculate an annual average concentration of the COC. Below detect values were replaced with the detection limit for calculation of averages.
4. Generate a grid file of interpolated concentration values within the given plume stability area for an individual monitoring year and contaminant, using kriging and spatial analysis software such as Surfer® by Golden Software. As suggested in Ricker (2008), grid files were generated on log-transformed concentration data (for smoother interpolation), then transformed back to original concentration units prior to further calculations.

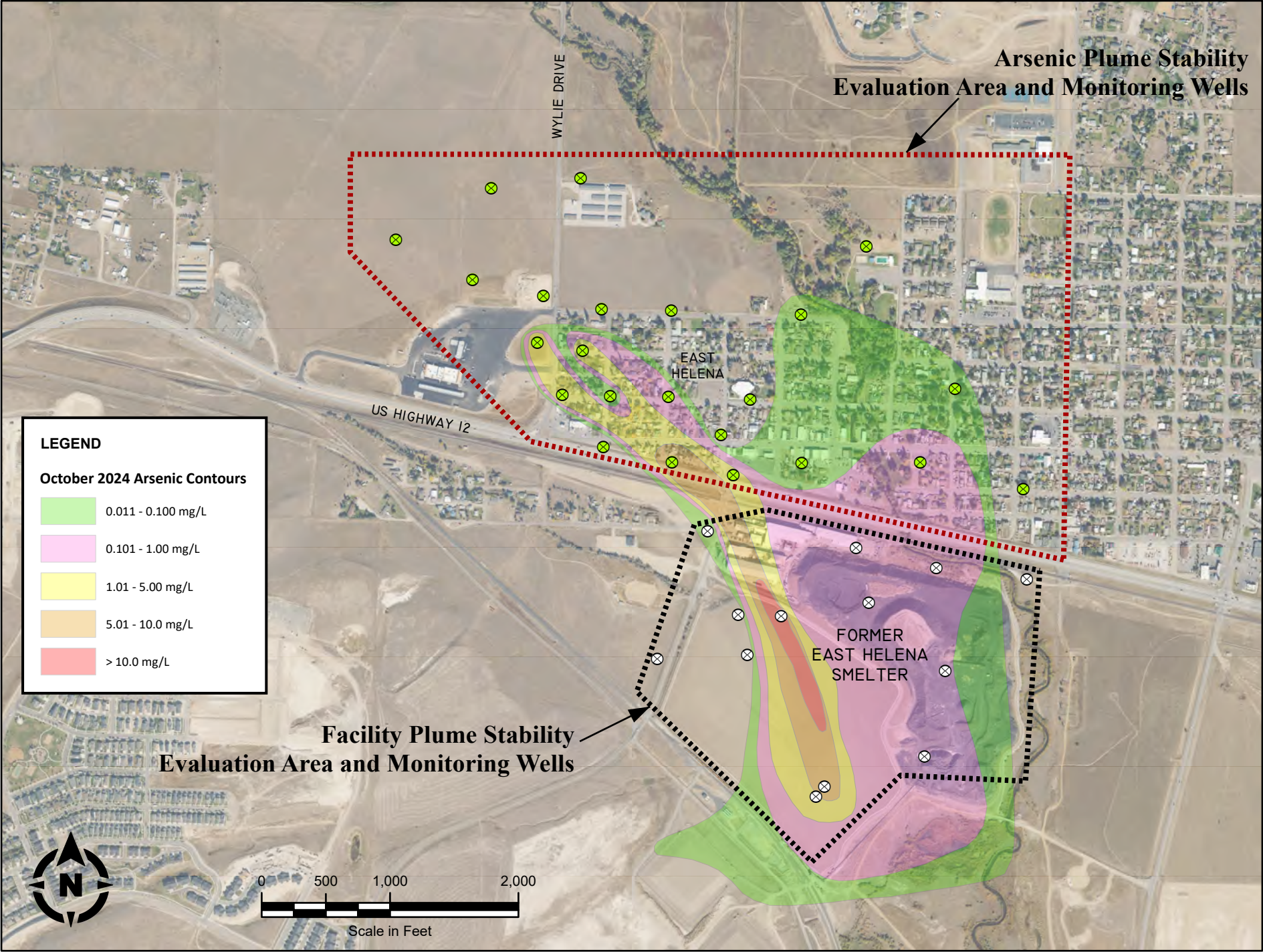
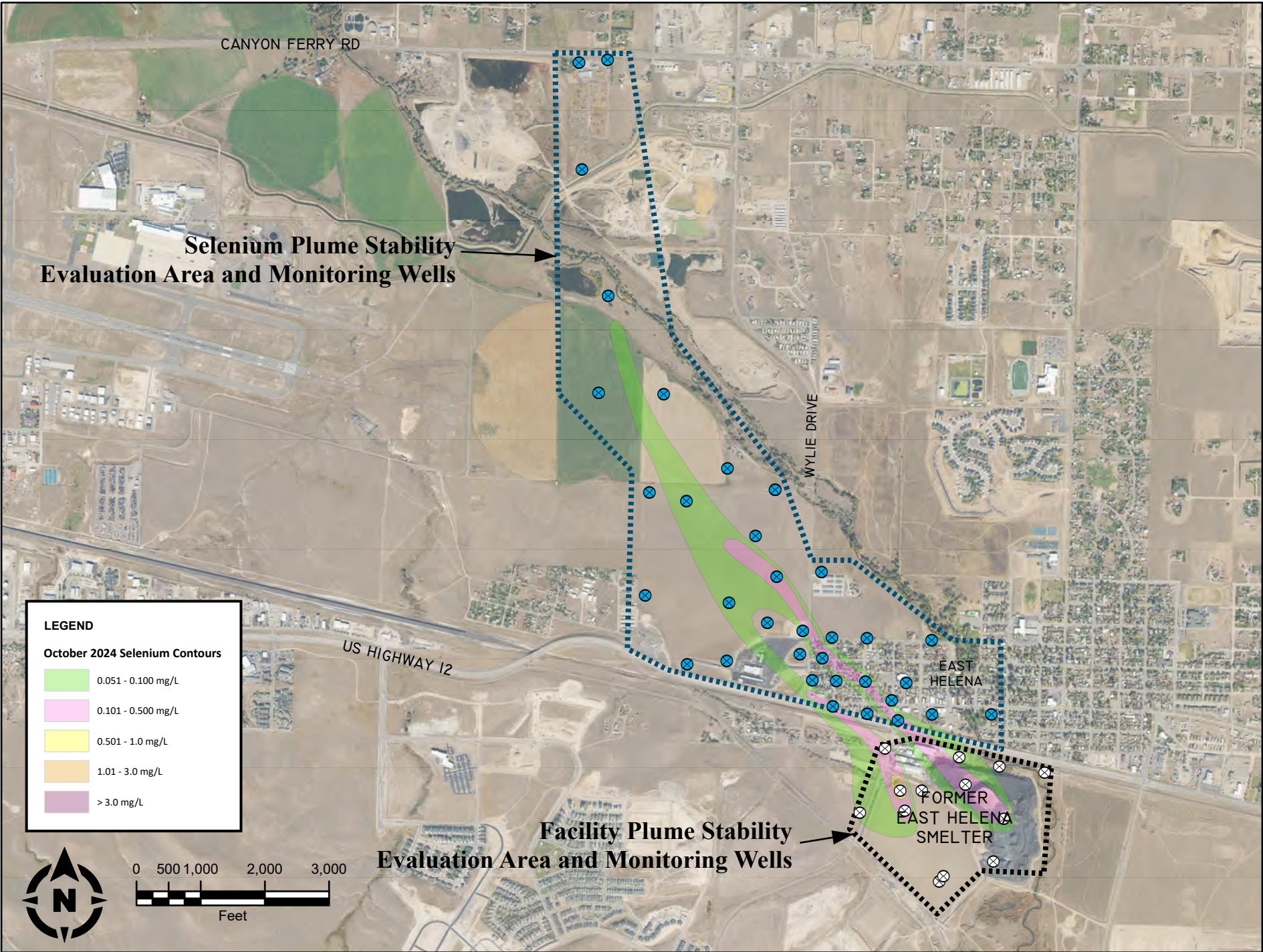


Table 3-6. 2024 Plume Stability Analysis Monitoring Wells
2024 Interim CAPM Report - East Helena Facility

Arsenic Plume Stability Analysis Wells		Selenium Plume Stability Analysis Wells		Facility Plume Stability Analysis Wells	
Well/Well Set*		Well/Well Set*		Well/Well Set*	
EH-104		EH-104		DH-6/15	
EH-106		EH-106		DH-7**	
EH-110		EH-110		DH-8	
EH-111		EH-111		DH-17	
EH-114		EH-114		DH-42	
EH-115		EH-115		DH-52	
EH-117		EH-117		DH-55	
EH-119		EH-119		DH-56	
EH-120		EH-120		DH-66	
EH-124		EH-123		DH-67	
EH-50/100		EH-124		DH-69	
EH-51/101		EH-126		DH-80	
EH-52/102		EH-129/134		EH-204	
EH-53		EH-132			
EH-54		EH-135			
EH-57A		EH-206			
EH-58		EH-50/100			
EH-59		EH-51/101			
EH-60/61/103		EH-52/102			
EH-62		EH-53			
EH-63		EH-54			
EH-65/107		EH-57A			
EH-66/121		EH-60/61/103			
EH-69		EH-62			
		EH-63			
		EH-65/107			
		EH-66/121			
		EH-70/125			
		EH-130			
		EH-135			
		EH-138			
		EH-139			
		EH-141			
		EH-143			
		2843 Canyon Ferry			
		2853 Canyon Ferry			

NOTES:

*Data from well sets (paired wells) are combined to yield a single overall average concentration for a given monitoring year for plume stability calculations.

**Well DH-7 is not sampled; data from nearby well EH-58 (700' north) is used to approximate the concentration at DH-7 for plume stability calculations.



5. Use the grid file to calculate various average plume metrics for the monitoring year, including:
 - a. Plume area;
 - b. Average plume concentration; and
 - c. Plume centroid of concentration.

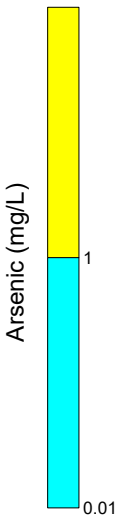
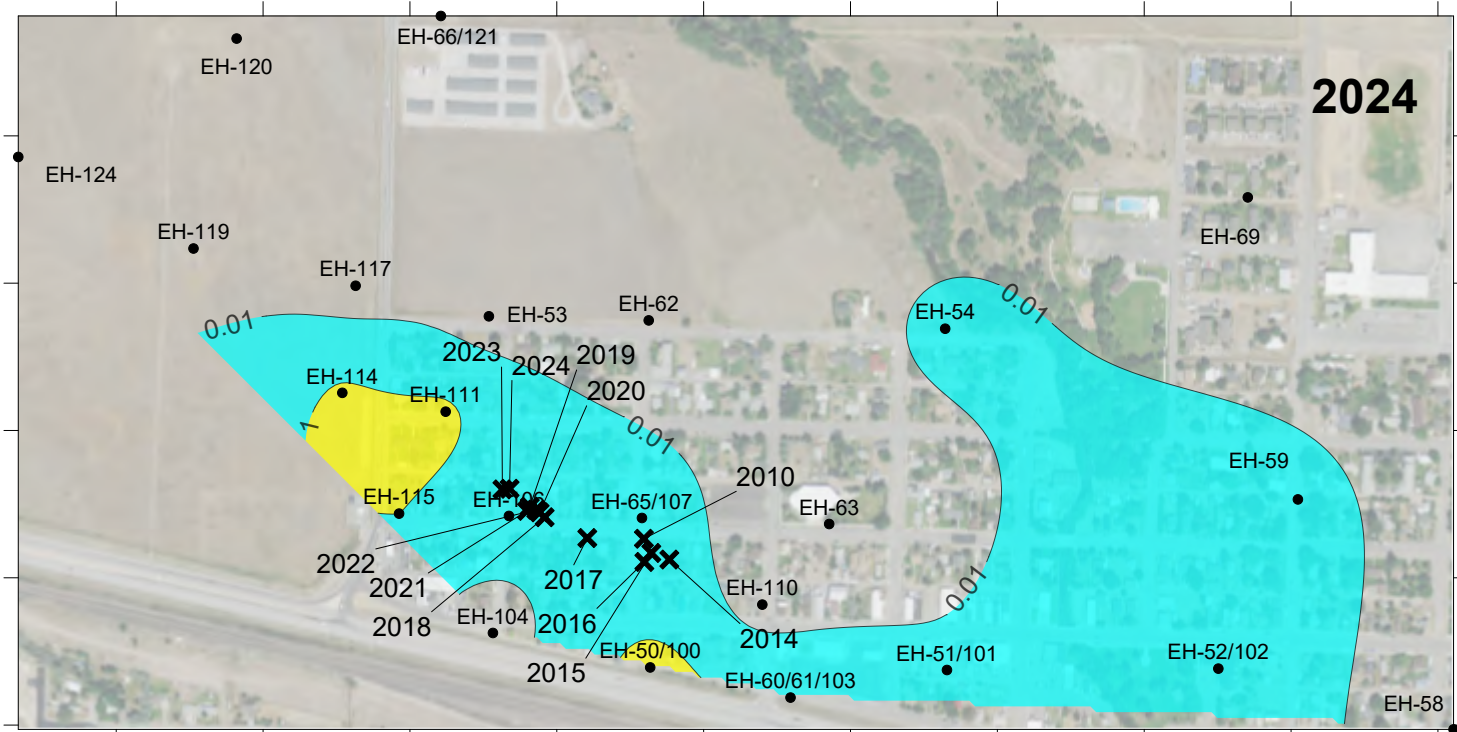
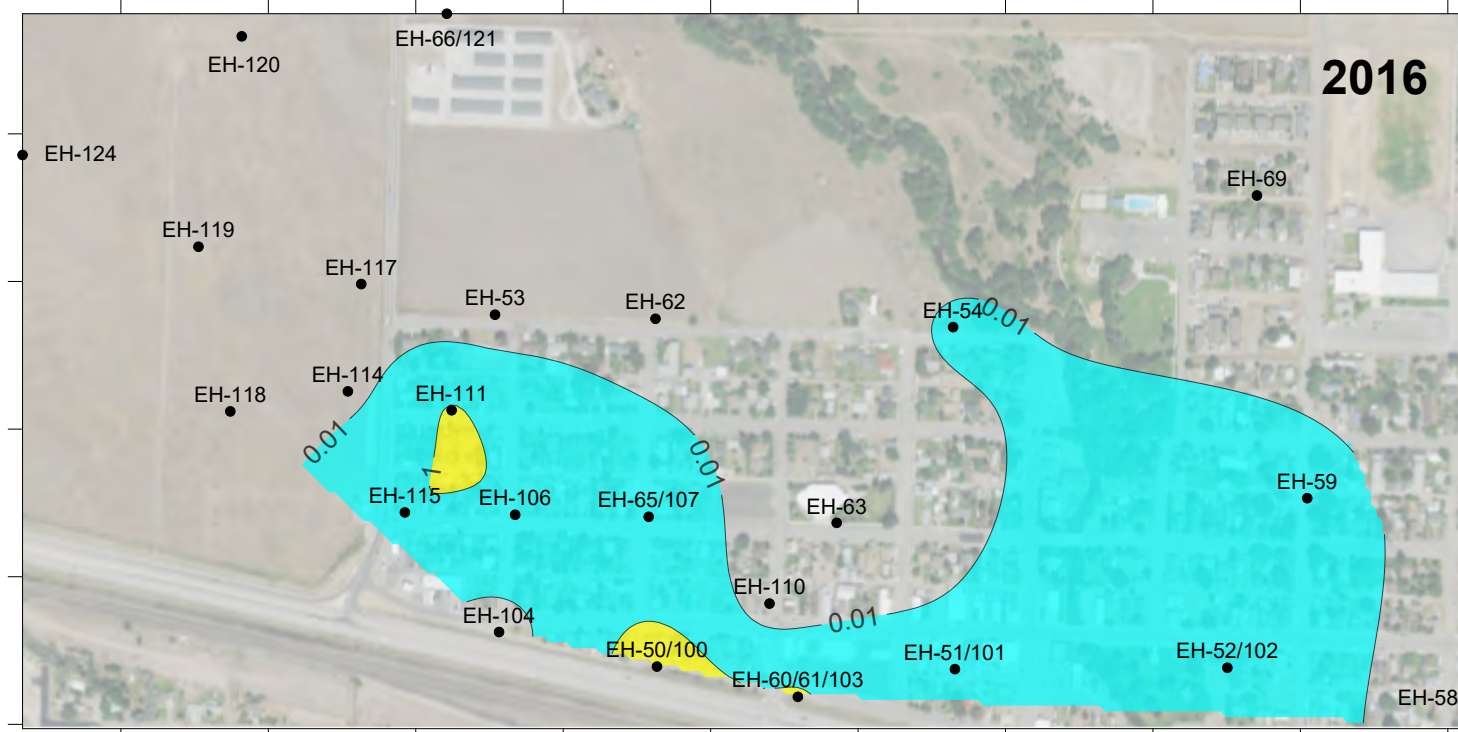
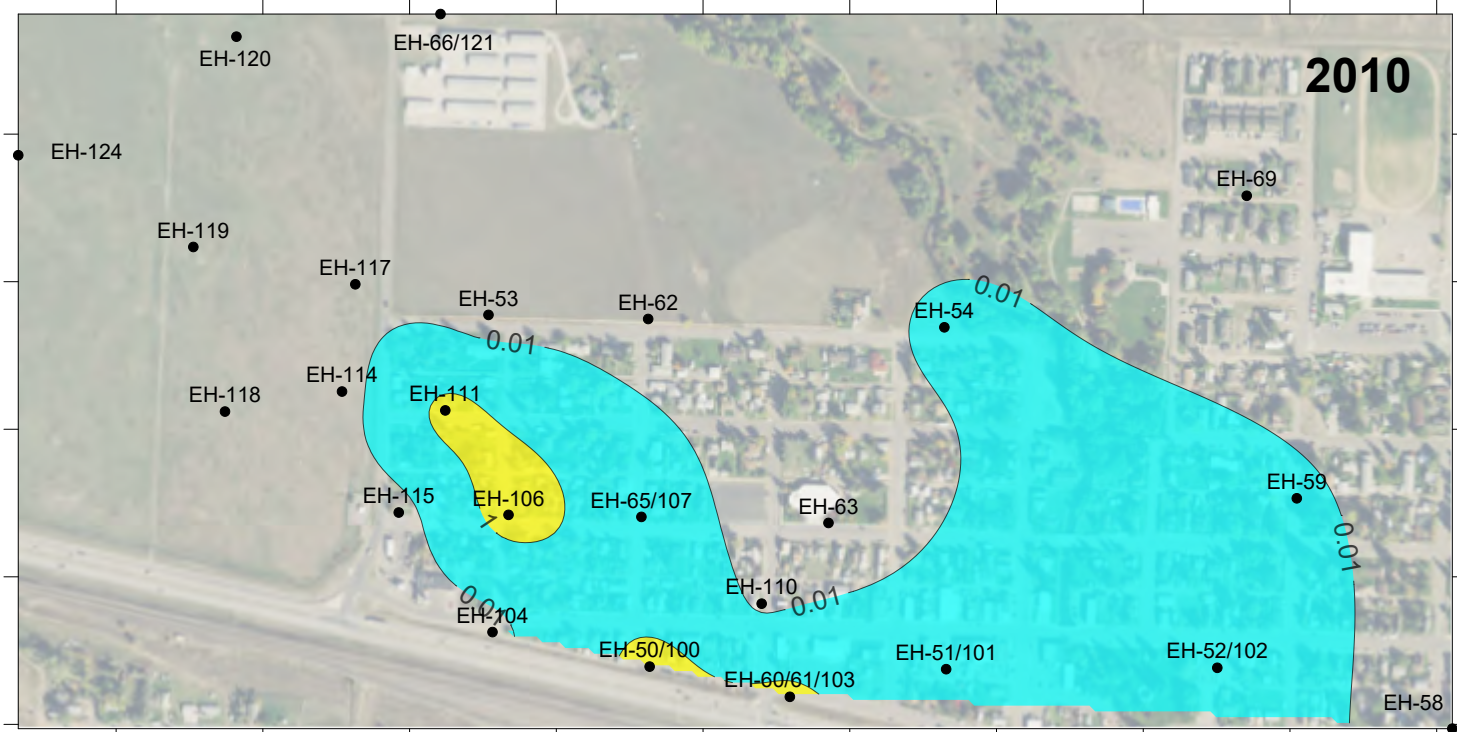
Calculated values can be compared over time to determine any trends in total plume area or average plume concentration. In addition, Ricker (2008) notes that for shrinking plumes, the plume centroid of concentration (or mass) should recede toward the source over time; if the plume is transient (migrating away from the source) or expanding, the centroid of concentration will show migration downgradient away from the source. Therefore, by observing concentration centroids over time, plume stability (expanding, stable, shrinking, or transient) can be evaluated.

Off-site (downgradient) arsenic plume stability metrics are discussed in Section 3.3.3.1, and off-site selenium plume metrics are discussed in Section 3.3.3.2. Facility (source area) plume stability calculations and metrics are presented in Section 3.3.3.3.

3.3.3.1 Downgradient Arsenic Plume Stability Results

Arsenic plume stability analysis results for the area downgradient of the Facility are summarized on Figure 3-11, including tabulated results for 2010 (representing conditions prior to implementation of CMs), 2016 (following completion of all CMs except for the slag pile cap), and 2021 through 2024. Software-generated arsenic contours are shown for 2010, 2016, and 2024. The overall plume area with arsenic concentrations above the 0.01 mg/L groundwater standard has remained virtually unchanged from 2010 to 2016 to 2024 (66, 64, and 66 acres, respectively). Average arsenic concentrations within the 0.01 mg/L contour have declined overall from 0.203 mg/L in 2010 to a range of 0.167 to 0.188 mg/L during subsequent years. The locations of the calculated plume centroids show a distinctive westward shift from 2010 through 2024, with the westward shift decreasing since 2018 (Figure 3-11). This shift is responsible for the increasing concentrations at wells EH-114 and EH-115 on the western margin of the plume discussed above, as well as decreases in concentration at historically elevated arsenic concentration wells further to the east such as EH-111, EH-65, EH-100, and EH-60 (see trend plots in Appendix D).

The arsenic plume stability metrics suggest that the downgradient arsenic plume is relatively stable with a westward shift in the plume centroid over time attributable to the decommissioning of Wilson Ditch and associated loss of a recharge source west of the plumes (Section 3.3.2.1). The stability in downgradient plume area and concentrations is not unexpected. As noted in previous studies (Hydrometrics, 2016), although Facility arsenic concentrations have decreased significantly since inception of the CM program in 2010 (see Section 3.3.3.3), downgradient concentrations are not expected to decrease significantly in the immediate future due to the release of adsorbed arsenic from downgradient soils. By decreasing the Facility concentrations and arsenic loading to downgradient soils, however, the completed CMs are intended to prevent future significant



Year	Arsenic Plume Area Exceeding 0.01 mg/L (acres)	Average Arsenic Concentration Within 0.01 mg/L Contour (mg/L)
2010	66	0.203
2016	64	0.167
2021	57	0.186
2022	59	0.172
2023	65	0.188
2024	66	0.180

NOTES:
 X = calculated plume centroid for given year
 Plume stability metrics calculated using method of Ricker (2008)
 Concentration isocontours generated by Surfer Version 13



advancement of the downgradient arsenic plume, to reduce concentrations within the 0.01 mg/L plume footprint, and to eventually diminish the downgradient plume extent. The arsenic plume stability results are generally consistent with observations based on preparation of hand-drawn arsenic isocontour maps. The arsenic contour maps shown on Figure 3-2, and the software-generated 0.01 mg/L arsenic contours shown on Figure 3-11 illustrate the stability in overall plume area, along with the recent shift to the west in the higher concentration western portion of the arsenic plume.

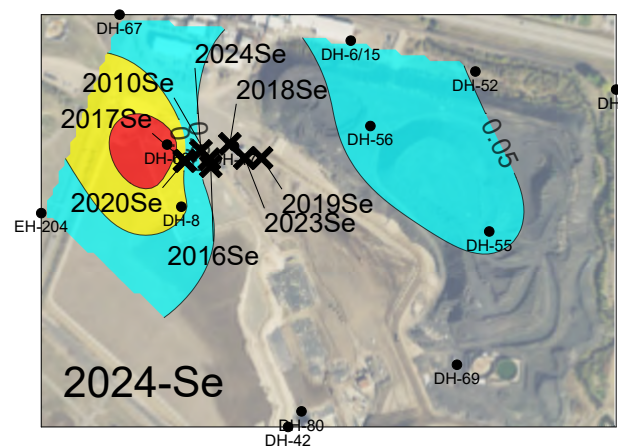
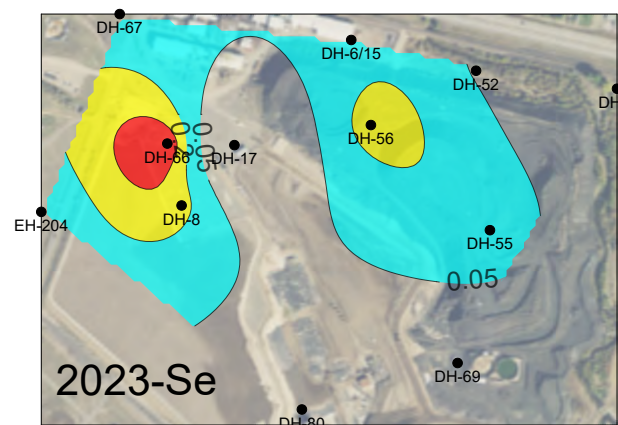
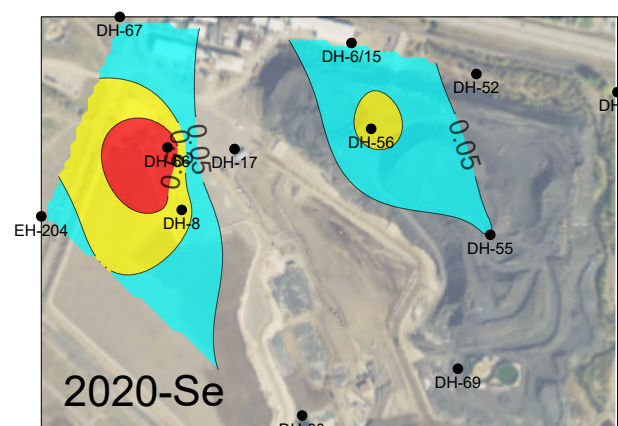
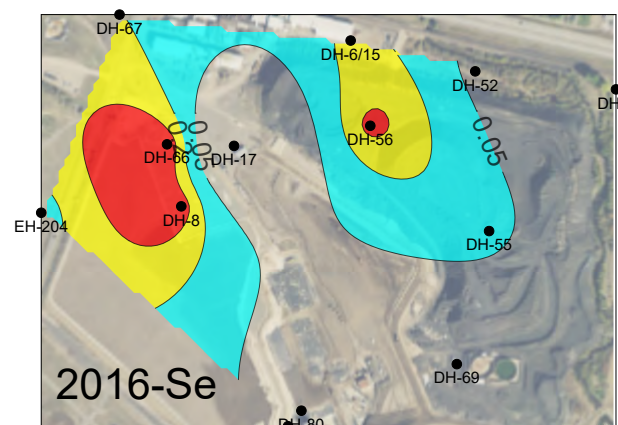
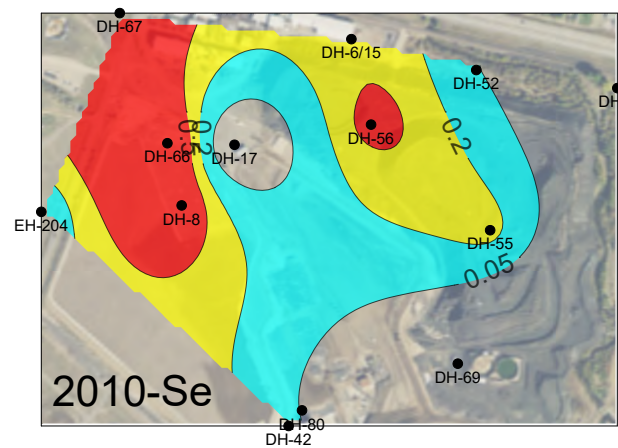
3.3.3.2 Downgradient Selenium Plume Stability Results

Off-site selenium plume metrics including the area from Highway 12 north to Canyon Ferry Road have been calculated for 2010-2011, 2016, and 2021 through 2024, based on data availability for wells within this area, with the selenium plume stability analysis results summarized on Figure 3-12. The overall Surfer-calculated plume area with selenium concentrations above the 0.05 mg/L groundwater standard increased from 2010-2011 (75 acres) to 2016 (125 acres), along with the average concentration within the plume area (0.111 mg/L in 2010-2011 and 0.126 mg/L in 2016). This increase is likely attributable primarily to the consistent increase in selenium concentrations at upgradient West Selenium source area well DH-66 from 2013 through 2015, possibly due to remediation construction activities in the area at that time (see Figure 3-9). Since 2016, however, significant selenium concentration decreases have been observed in the upgradient West Selenium source area, and the downgradient selenium plume area above 0.05 mg/L and the average concentration within the 0.05 mg/L plume contour have also consistently decreased, with calculated values of 27 acres and 0.066 mg/L in 2024. The 2024 calculated plume metrics represent decreases of about 70% in plume area and about 47% in average plume concentration from the 2016 values. The plume centroid location for selenium moved downgradient from 2010-2011 to 2016, and has since remained stable through 2024.

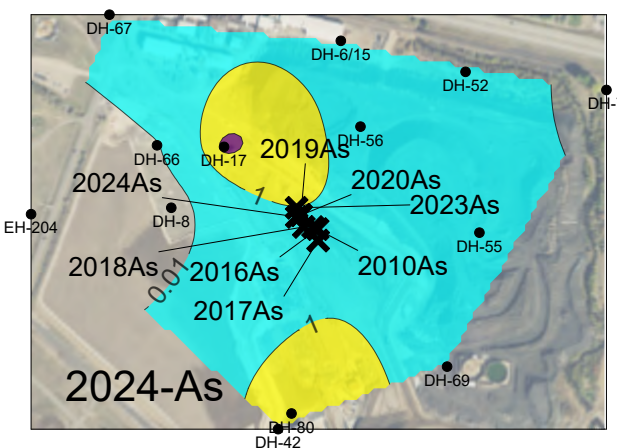
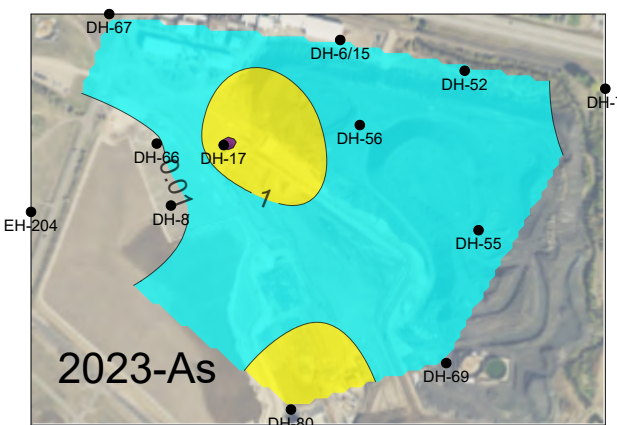
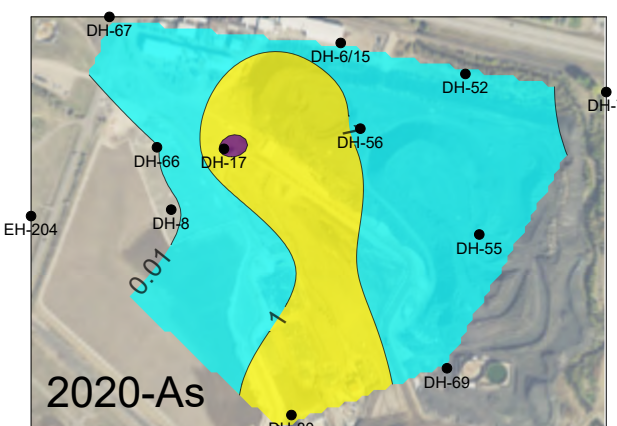
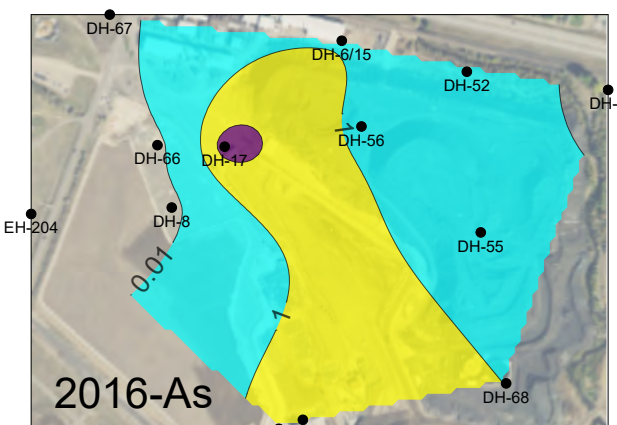
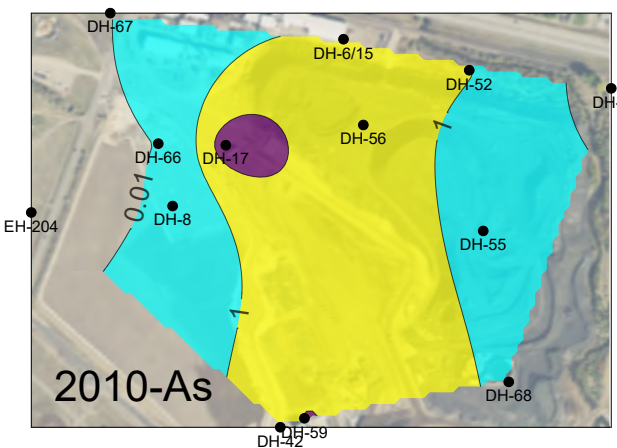
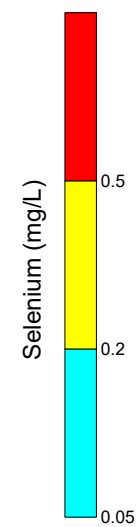
Also shown in Figure 3-12 is an apparent fragmentation of the plume between the Facility and Lamping Field, based on software-generated contours. While the software-generated contours and the calculated areas presented on Figure 3-12 based on the software kriging algorithm understate the overall true area of the plume (i.e., by not connecting the “islands” of 0.05 mg/L exceedances), they do accurately reflect the decreasing selenium concentrations since 2016 in the southern portion of the plume stability area and the associated plume contraction, also visible on the hand-drawn plume maps shown on Figure 3-3. Overall, the downgradient selenium plume metrics shown in Figure 3-12 suggest the plume is receding. The retraction of the downgradient 0.05 mg/L plume extent by approximately 4,000 feet from 2016 to 2024 (Section 3.3.2.2) and the decrease in average plume selenium concentration over the same period indicate a receding plume.

3.3.3.3 Facility Arsenic and Selenium Plume Stability Results

Figure 3-13 summarizes calculated 2024 Facility plume stability metrics for both selenium and arsenic, along with results for 2010, 2016, 2020, and 2023. As noted on Figure 3-13, about 30% of the wells



Year	Selenium Plume Area Exceeding 0.05 mg/L (acres)	Average Selenium Concentration Within 0.05 mg/L Contour (mg/L)
2010	67	0.451
2016	48	0.270
2020	33	0.220
2021-2022	NC*	NC*
2023	46	0.177
2024	35	0.180



Year	Arsenic Plume Area Exceeding 0.01 mg/L (acres)	Average Arsenic Concentration Within 0.01 mg/L Contour (mg/L)
2010	82	2.25
2016	77	1.29
2020	72	1.04
2021-2022	NC*	NC*
2023	69	0.68
2024	70	0.78



*NC = not calculated in 2021 - 2022 due to dry conditions in >30% of wells in plant site stability well set

Software-generated contours are shown on each plot

X = calculated plume centroid for given year

Plume stability metrics calculated using method of Ricker (2008)



used to calculate Facility plume stability metrics were dry in both 2021 and 2022 due to water level decreases driven by the SPHC CM and local precipitation and recharge patterns, therefore, updated plume stability metrics were not calculated for those years.

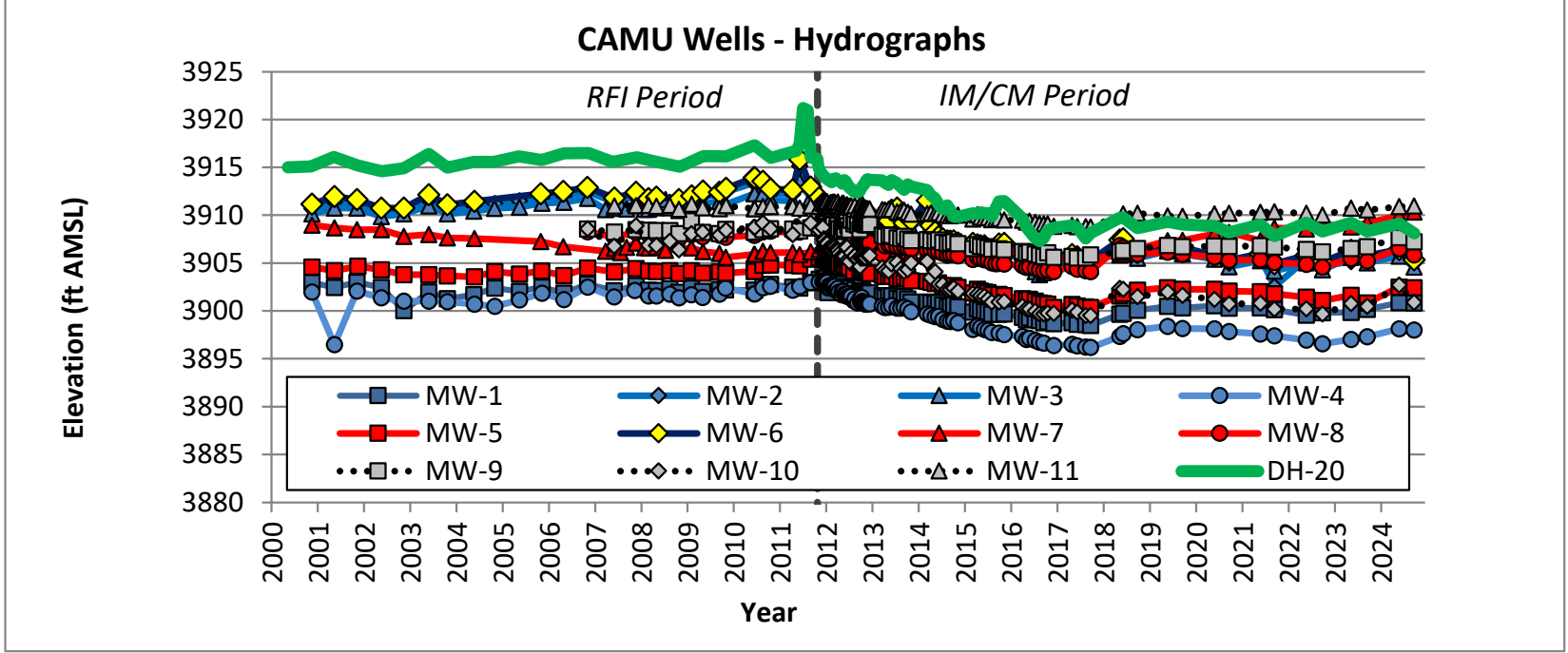
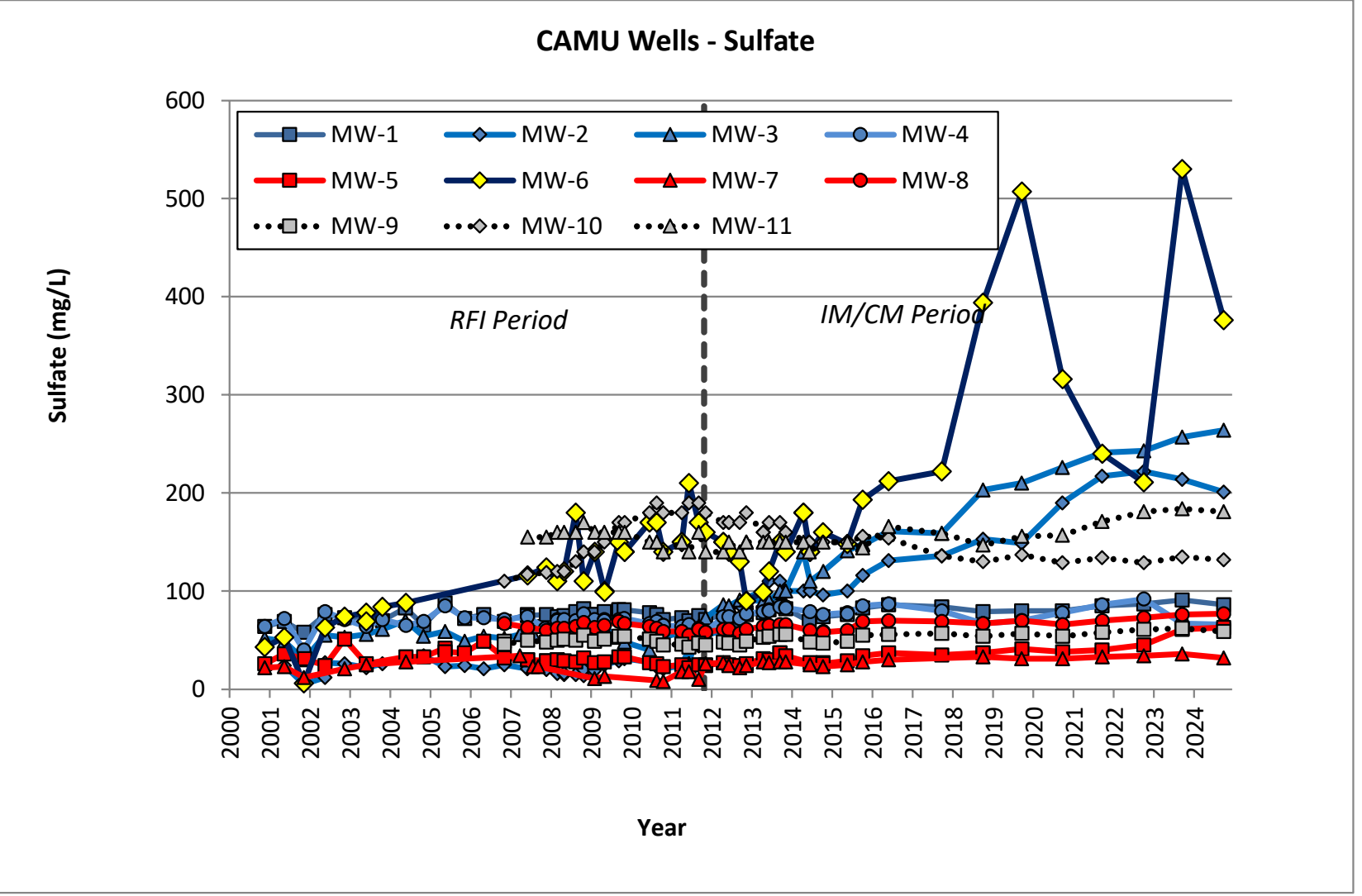
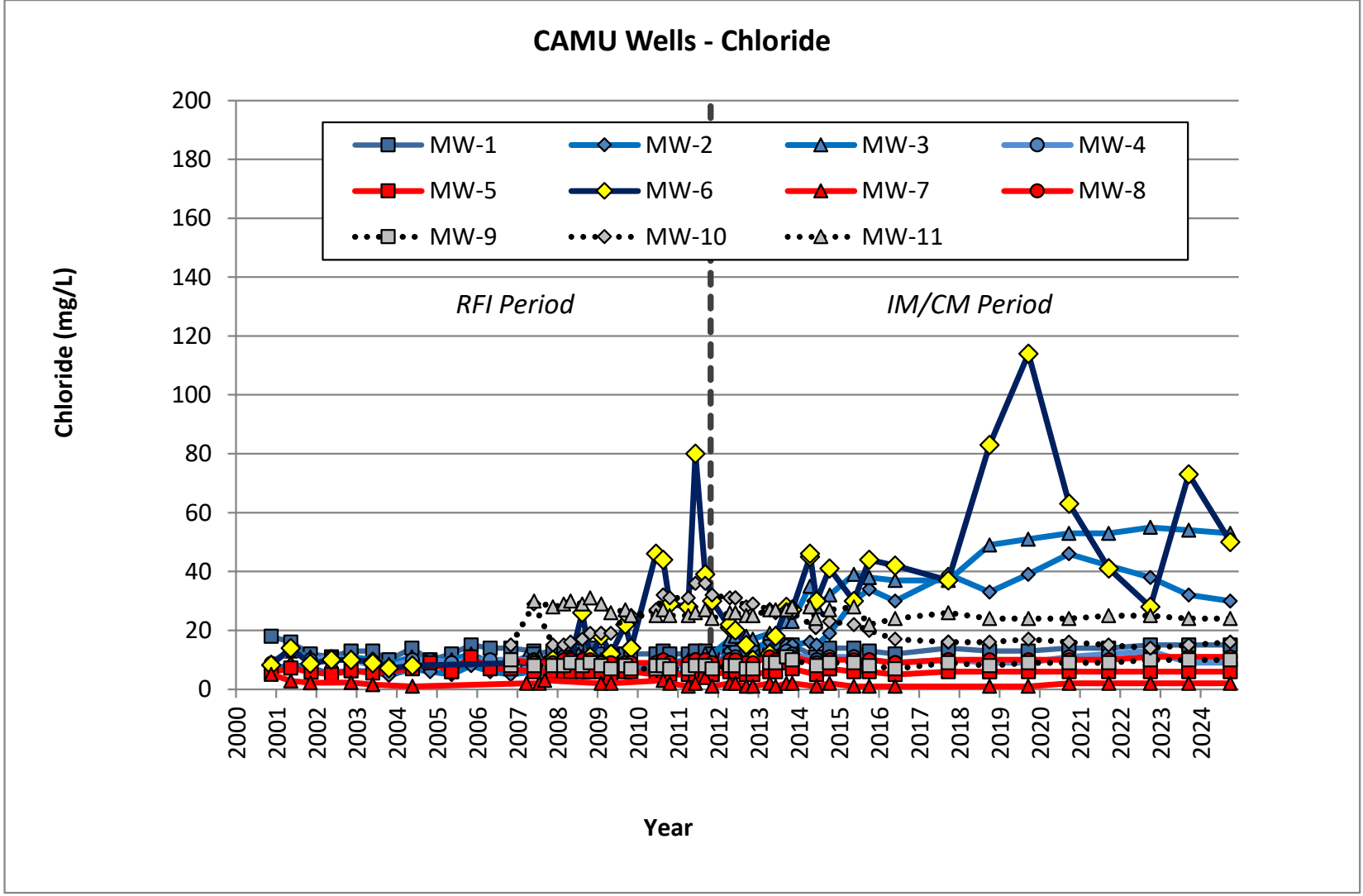
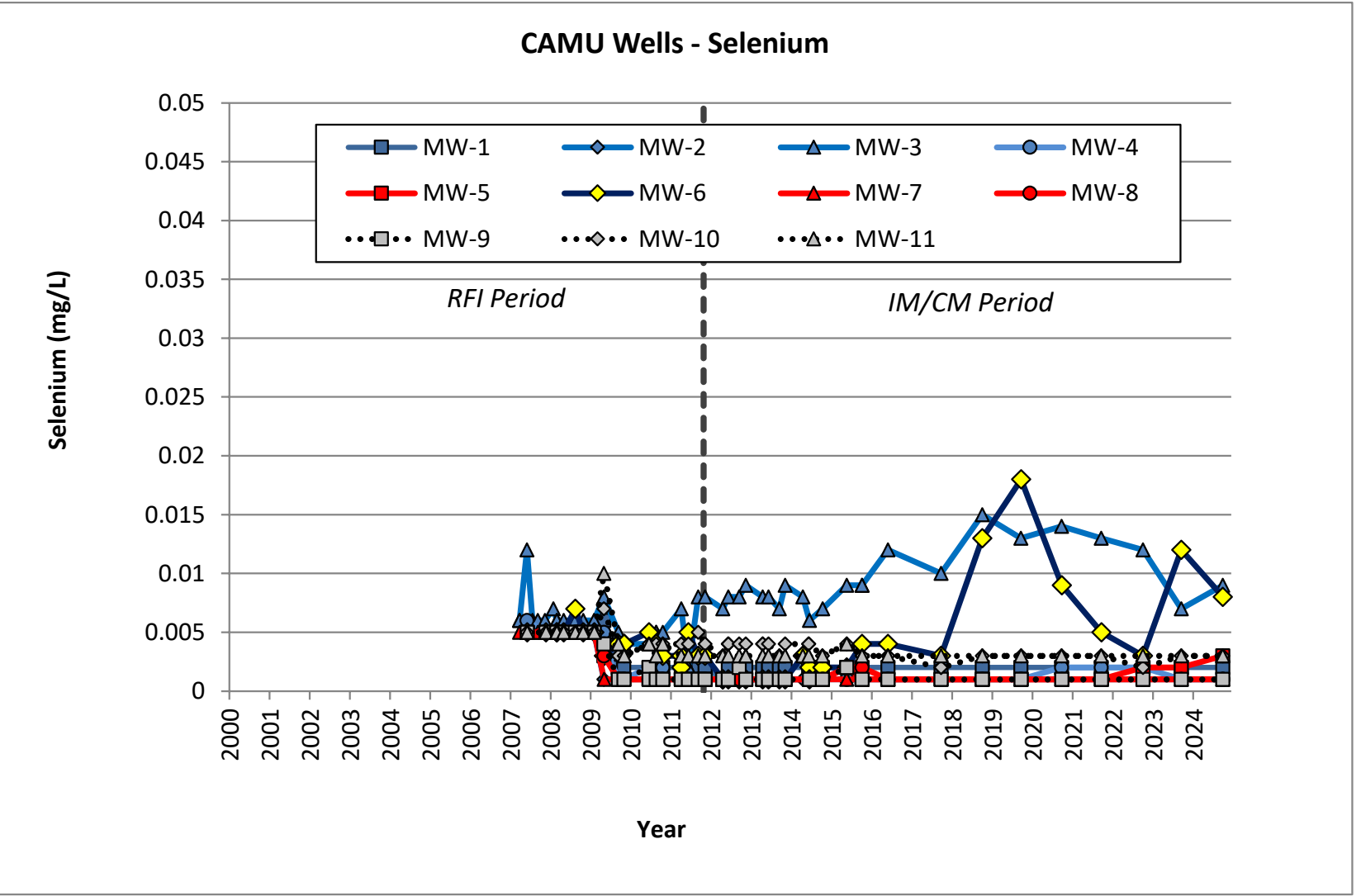
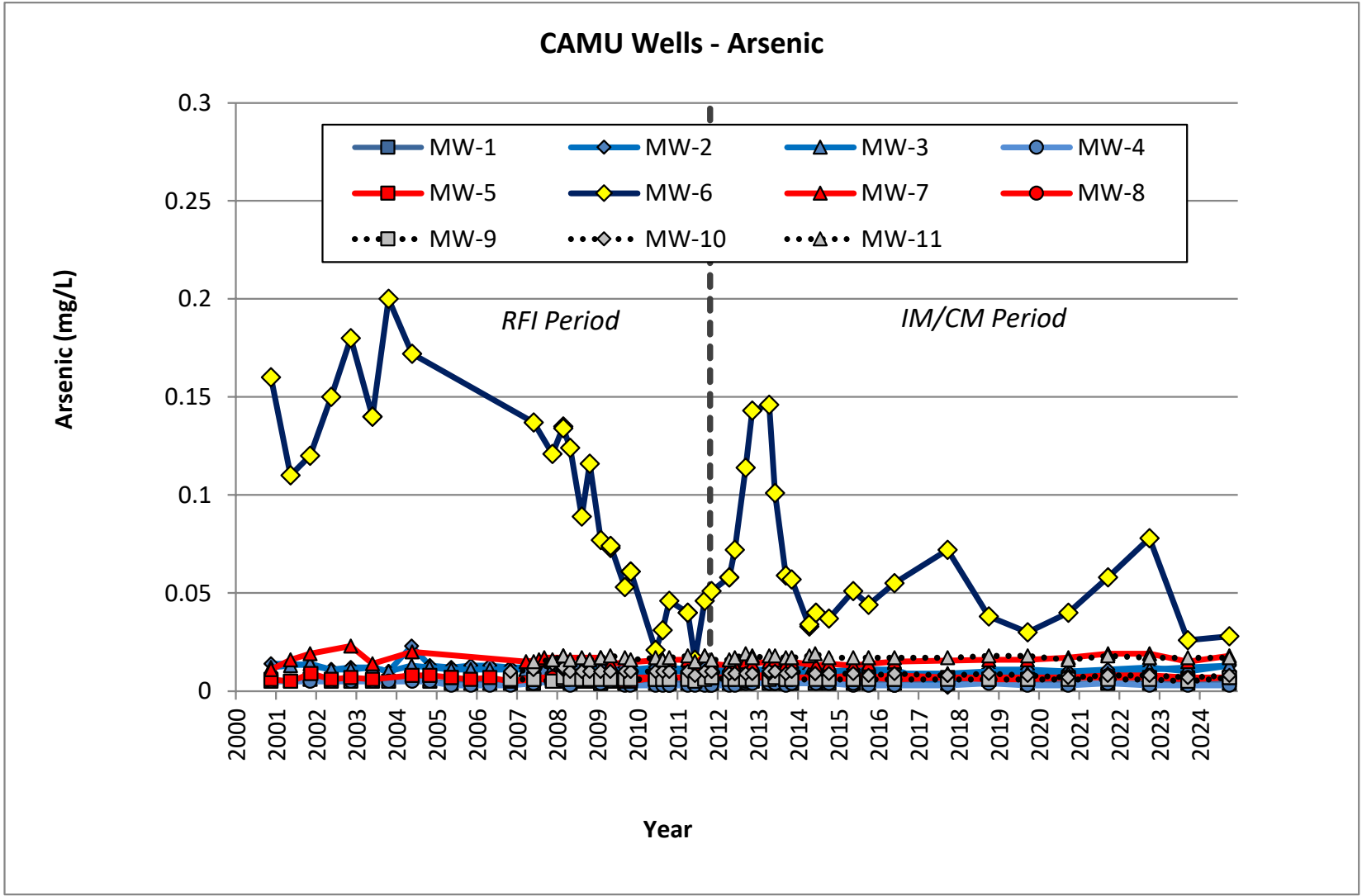
Plume stability results for 2010 through 2024 have shown a reduction in selenium plume area from 67 to 35 acres, and a reduction in the arsenic plume area of 82 to 70 acres. Average concentrations have decreased by approximately 60% for selenium (from 0.451 to 0.180 mg/L), and 65% for arsenic (from 2.25 to 0.78 mg/L) from 2010 to 2024. These trends reflect the generally decreasing concentration trends for arsenic and selenium observed in most Facility source areas (Section 3.3.2.2, Appendices C and D). The locations of the calculated arsenic plume centroids were virtually unchanged from 2010 to 2024, while the selenium plume centroid has shifted to the east and back to the west over time. The periodic eastward shifts in the selenium plume centroid during certain years are due to greater relative influence from the slag pile source area (particularly during wetter years when infiltration and leaching from the slag increase concentrations in groundwater beneath the slag pile), while West Selenium source area concentrations continue to decrease overall. The slag pile is scheduled to be regraded and partially capped to address this ongoing source.

As evidenced by the Facility source area water level trends discussed in Section 3.3.2.1, the saturated thickness of the contaminated shallow aquifer has also decreased by about 45 to 75% on the Facility, resulting in decreased mass flux of arsenic and selenium migrating off-site. Over time, the decreasing source area concentration trends and declining water levels should lead to further decreases in the downgradient arsenic and selenium plume concentrations and extents, although that process is expected to take much longer for arsenic than for selenium due to the greater attenuation affinity and slower migration rate for arsenic.

3.3.4 CAMU Area Monitoring Results

An additional objective of the 2024 performance monitoring program is to continue to evaluate groundwater quality in the vicinity of the two RCRA landfills, the CAMUs, located immediately southwest of the Facility (Figure 1-1). The CAMU groundwater monitoring network includes 11 monitoring wells ranging from 40 to 72 feet deep. All 11 wells were sampled in October 2024 to document current groundwater quality. Trend plots for arsenic, selenium, chloride, and sulfate at the CAMU wells through October 2024 are shown on Figure 3-14, and complete analytical results are in Appendix A.

The 2024 CAMU monitoring results are consistent with previous monitoring results. For example, arsenic concentrations at all CAMU wells except well MW-6 ranged from 0.003 to 0.018 mg/L in 2024, compared with a range of 0.003 to 0.017 mg/L in 2023 and the groundwater MCL of 0.01 mg/L. The arsenic concentrations in CAMU wells are consistent with previous observations (see Figure 3-14) and attributable primarily to naturally occurring groundwater arsenic derived from the Tertiary volcanoclastic sediments in this area. Arsenic concentrations at well MW-6 have been higher than



*Well locations shown on Exhibit 1
Well DH-20 on hydrograph represents groundwater elevation in south plant area





other wells since the beginning of the monitoring record (Figure 3-14), suggesting some Facility influence on groundwater quality. Periodic increases in sulfate and chloride concentration at MW-6 support this conclusion (Figure 3-14); sulfate and chloride trends at MW-2 and MW-3 also indicate that Facility-impacted groundwater affects water quality at these two wells.

The October 2024 arsenic concentration at MW-6 was 0.028 mg/L, below the period of record average at MW-6 of 0.081 mg/L and near the lower end of the historic range of 0.016 to 0.200 mg/L. Selenium concentrations at all CAMU monitoring wells were all below the 0.05 mg/L MCL in October 2023, ranging from <0.001 to 0.009 mg/L. Selenium concentrations at wells MW-3 and MW-6 increased in 2015-2019, potentially due to groundwater level and flow direction affects from the SPHC CM increasing the influence of south plant site groundwater at these wells, but have declined overall in the last several years. Selenium concentrations at MW-6 peaked at 0.018 mg/L in 2019, and has ranged from 0.003 to 0.012 mg/L in subsequent years. At MW-3, selenium peaked in 2018 at 0.015 mg/L and was reported at 0.009 mg/L in October 2024.

As shown on Figure 3-14, arsenic and selenium concentrations have shown inverse trends at well MW-6 over the last six years, with higher arsenic concentrations associated with lower selenium concentrations, and vice versa. Since arsenic is more mobile under lower redox conditions, and selenium is more mobile under oxidizing conditions, these trends could reflect variations in groundwater redox status. Changes in groundwater concentrations of manganese, another redox sensitive constituent, appear to support this hypothesis. Occurrences of higher arsenic concentrations at MW-6 (e.g., 0.078 mg/L in 2022) have been associated with higher manganese concentrations as well (2.68 mg/L in 2022); both these constituents are more mobile under low redox conditions. In contrast, occurrences of higher selenium concentrations (e.g., 0.018 mg/L in 2019 and 0.012 mg/L in 2023) have been associated with lower manganese concentrations (0.70 mg/L in 2019 and 0.04 mg/L in 2023), and selenium is more mobile and manganese less mobile under oxidizing conditions.

All other metals were near or less than analytical detection limits in all 2024 CAMU well samples, including parameters that have been documented at elevated concentrations in Facility soils, fill, and/or groundwater. All 2024 CAMU well results were below detection limits for antimony, cadmium, lead, mercury, thallium, and zinc (Appendix A). Overall, it appears that the observed localized arsenic and selenium concentration trends in certain CAMU wells may be redox driven, with changes in redox conditions attributable to variable influence from Facility groundwater and fluctuating annual precipitation and recharge conditions.

3.3.5 Zinc and Cadmium Concentrations and Trends

Although arsenic and selenium are the primary groundwater COCs for the former East Helena Smelter Site, the Interim CAPMP program parameter suite includes other parameters that have been detected at elevated concentrations in Facility groundwater in the past, or that may be associated with metal smelting operations (Table 2-5). As discussed in previous annual monitoring reports, both zinc and cadmium have persisted at elevated groundwater concentrations in certain areas of the former smelter, with concentrations of both constituents showing increasing trends in recent years at some

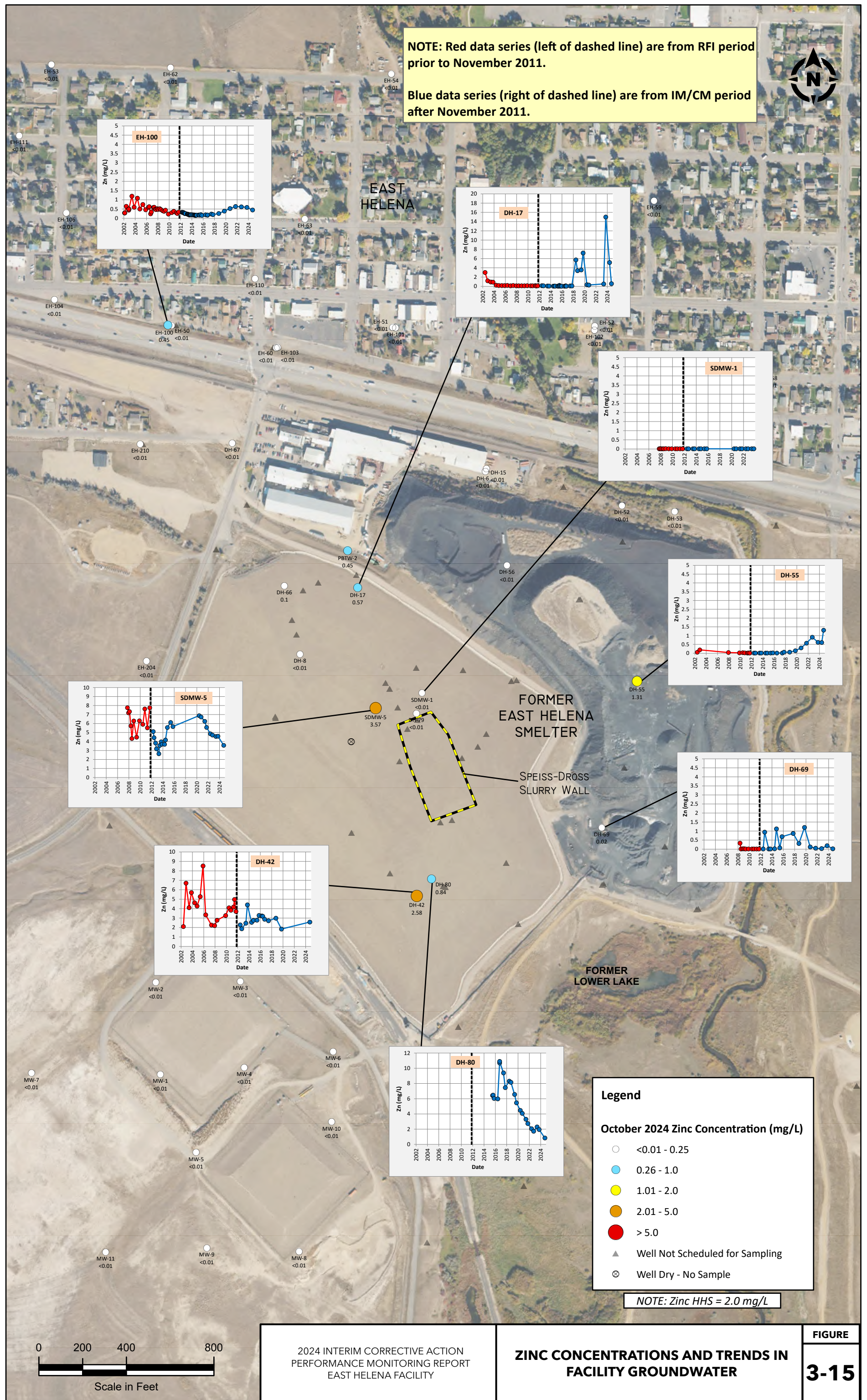


wells. Variations in zinc and cadmium concentrations across the Facility are closely related to historic source areas and to local pH and redox conditions. The mobility of zinc and cadmium in groundwater is sensitive to relatively minor changes in pH, with increased solubility and decreased adsorption occurring as pH decreases. While both zinc and cadmium exist in only one oxidation state under normal environmental conditions (Zn^{2+} and Cd^{2+}), changing redox conditions nevertheless impact their mobility through (1) affecting the formation and dissolution of iron and manganese oxides, which adsorb metals including zinc and cadmium, and (2) creating sulfate reducing conditions, which can lead to precipitation as stable zinc or cadmium sulfide. Seven wells included in the 2024 Interim CAPMP monitoring program (DH-17, DH-66, DH-77, DH-80, EH-100, SDMW-1, and SDMW-5) were sampled in part to provide additional information on the current distribution of zinc and cadmium in site groundwater, as well as updated concentration trends for both zinc and cadmium.

Zinc

Groundwater zinc concentrations beneath process areas during the pre-2001 operational period of the smelter occasionally reached concentrations above 50 mg/L, with a few samples over 100 mg/L. These concentrations largely occurred in wells within and around the former Acid Plant, and were associated with releases of acidic water from the process water circuit and contaminated Acid Plant sludges, and with low groundwater pH values ($\text{pH} < 5.0$). Downgradient of the Acid Plant, groundwater showed maximum concentrations above 30 mg/L prior to the 2001 smelter shutdown. Following the smelter shutdown, however, zinc concentrations decreased, and although isolated areas of higher concentrations have remained, maximum observed concentrations are much lower than during the operational period. The 2024 data in Appendix A show elevated zinc concentrations above the 2.0 mg/L groundwater HHS at three former plant site monitoring wells (DH-17, DH-42, and SDMW-5), and lower concentrations from 0.10 to 1.31 mg/L at wells DH-55, DH-66, DH-69, DH-80, EH-100, and PBTW-2; all of the remaining 2024 groundwater samples from both on and off-site monitoring wells and residential wells had zinc concentrations from < 0.01 to 0.05 mg/L.

Figure 3-15 shows October 2024 zinc concentrations along with updated temporal trends from 2002 (post-plant shutdown) through 2024 for selected wells. As shown on Figure 3-15, zinc concentrations at monitoring well DH-17, located in the North Plant Arsenic Source Area, showed an abrupt increase from typical values of less than 0.1 mg/L to 5.72 mg/L in June 2018, in October 2019 to 7.21 mg/L, and again in October 2023 to 15 mg/L. In 2024, zinc concentrations at DH-17 decreased to 5.15 mg/L in June and 0.57 mg/L in October. The recent slight increase in zinc concentration at downgradient well EH-100 from about 0.2 mg/L in 2018 to 0.6 mg/L in 2021 was likely influenced by the short-term increase at upgradient well DH-17. As of October 2024, the zinc concentration at EH-100 had decreased to 0.45 mg/L. At well DH-80 in the former Acid Plant area and downgradient of the 2016 soil removal CM, the October 2024 zinc concentration of 0.84 mg/L is the minimum recorded to date at this well, and concentrations have decreased consistently at this well from the 2016 maximum of about 11 mg/L.





At slag pile well DH-69, zinc concentrations have been variable during the CM period, with occasional excursions above 1 mg/L and intermittently lower concentrations (Figure 3-15). Zinc concentrations decreased from 1.2 to 0.03 mg/L from October 2019 to October 2022 at well DH-69, and have remained relatively low since that time, with an October 2024 result of 0.02 mg/L. Slag pile well DH-55 has shown increasing zinc concentrations over the last four years; the October 2024 concentration of 1.31 mg/L is the maximum observed to date, and is similar to the higher concentrations observed at upgradient slag well DH-69 in the past. Slag area wells downgradient of DH-55 (DH-56, DH-52, DH-53) have not shown any impacts to date from the recent zinc increase at well DH-55. Wells DH-77 (2.51 mg/L zinc in October 2020) and SDMW-5 (3.57 mg/L zinc in October 2024), downgradient of the former Acid Plant area and adjacent to the Speiss-Dross area, have consistently exhibited zinc concentrations above 2 mg/L and as high as nearly 8 mg/L. Zinc concentrations at SDMW-5 have been decreasing since about 2020 (Figure 3-15), and well DH-77 has been dry since October 2021.

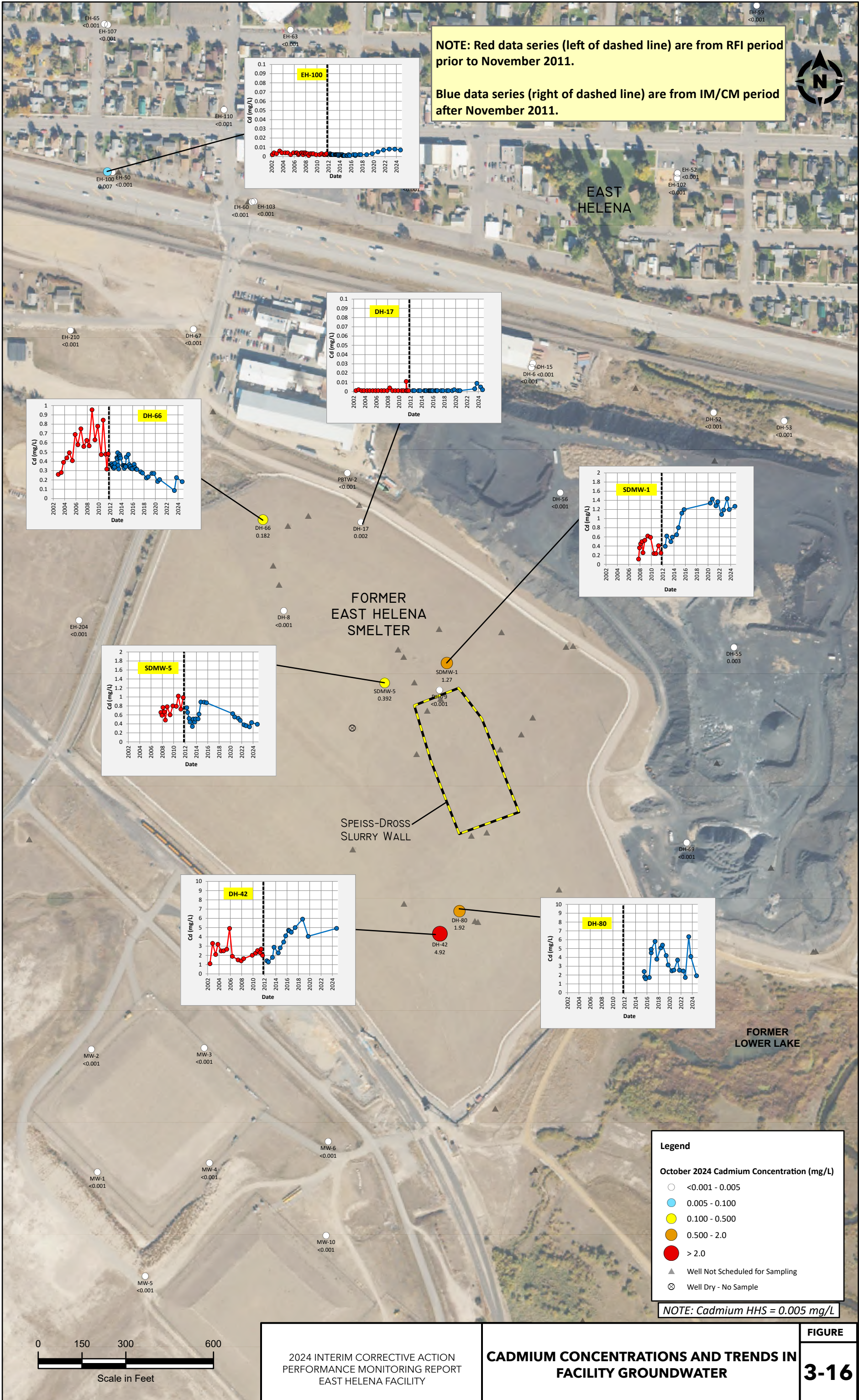
Zinc concentrations above the HHS of 2.0 mg/L occurred frequently at well DH-17 prior to 2003, with concentrations as high as 8.2 mg/L in the late 1980s. Concentrations decreased significantly after the 2001 smelter shutdown. The higher zinc concentrations at DH-17 observed sporadically since 2018 are likely attributable to the higher groundwater levels during those years, and/or varying geochemical conditions related to fluctuations in groundwater recharge. For example, in 2023, the zinc concentration at DH-17 increased from 0.51 mg/L in May to 15 mg/L in October; this abrupt increase was accompanied by a pH decrease from 7.08 in May to 6.49 in October. In 2024, zinc concentrations at DH-17 decreased to 5.15 mg/L in June (with a pH of 6.65) and 0.57 mg/L in October (pH of 6.91). Changes in pH therefore appear to be associated with changes in zinc concentration in the vicinity of DH-17; in general, lower pH conditions can lead to decreased adsorption and higher groundwater concentrations, and higher pH conditions favor adsorption to aquifer solids and lower groundwater concentrations. Zinc will continue to be monitored at Facility and off-site wells to evaluate trends in the higher concentration areas of the Facility, as well as any effects on downgradient groundwater quality.

Cadmium

Similar to zinc, cadmium concentrations in Facility groundwater were historically elevated in the former Acid Plant area, due to process water releases, contaminated sediments, and low pH values, with concentrations often above 10 mg/L and periodically above 20 mg/L in area monitoring wells during smelter operations. Migration of cadmium downgradient, however, was historically more limited than that of zinc. For example, well EH-100 (maximum zinc concentration of 1.2 mg/L) has shown a maximum cadmium concentration of 0.008 mg/L. As with zinc, following the 2001 smelter shutdown cadmium concentrations decreased, with isolated areas of higher concentrations remaining at present (Figure 3-16). The 2024 groundwater monitoring data in Appendix A show cadmium concentrations above 1.0 mg/L at three wells (DH-42, DH-80 and SDMW-1), concentrations above 0.1 mg/L at two additional wells (DH-66 and SDMW-5), and concentrations from 0.001 to 0.007

NOTE: Red data series (left of dashed line) are from RFI period prior to November 2011.

Blue data series (right of dashed line) are from IM/CM period after November 2011.



Legend

October 2024 Cadmium Concentration (mg/L)

- <0.001 - 0.005
- 0.005 - 0.100
- 0.100 - 0.500
- 0.500 - 2.0
- > 2.0

- Well Not Scheduled for Sampling
- Well Dry - No Sample

NOTE: Cadmium HHS = 0.005 mg/L

2024 INTERIM CORRECTIVE ACTION
PERFORMANCE MONITORING REPORT
EAST HELENA FACILITY

CADMIUM CONCENTRATIONS AND TRENDS IN
FACILITY GROUNDWATER

FIGURE

3-16



mg/L at DH-17, DH-55, and EH-100 (of these wells, only EH-100 exceeded the 0.005 mg/L MCL). All the remaining 2024 groundwater samples from both on and off-site monitoring wells and residential wells showed no detectable cadmium (<0.001 mg/L).

Figure 3-16 presents updated cadmium concentration trends through October 2024 for selected wells, and the most recent cadmium concentration observed at each well. The highest cadmium concentrations in Facility groundwater occur in and downgradient of the former Acid Plant area at wells DH-42 (4.92 mg/L in October 2024), DH-80 (1.92 mg/L in October 2024) and DH-77 (dry in 2024; 3.16 mg/L in 2020), with slightly lower concentrations in the Speiss-Dross area at wells SDMW-1 (1.27 mg/L) and SDMW-5 (0.392 mg/L) in October 2024) (Figure 3-16). This area is generally coincident with the area of elevated zinc concentrations, with the exception of well DH-17, where cadmium concentrations have remained relatively low (<0.001 to 0.009 mg/L) even during the periods of increased zinc concentrations in 2018-2019 and 2023 discussed above. Cadmium concentration trends since 2011 on the Facility indicate decreasing trends at wells DH-66 and SDMW-5, increasing trends at DH-42 and SDMW-1, and variable concentrations but no clear long-term trend at DH-80 (Figure 3-16).

Zinc and cadmium concentrations and migration patterns in groundwater beneath the Facility are a combined function of historic plant processes and source areas, changes in water levels and flow patterns, and/or pH and redox conditions, as described previously. Elevated zinc and cadmium concentrations largely co-occur with elevated concentrations of the primary groundwater COCs arsenic and selenium. Despite the persistent elevated zinc and cadmium groundwater concentrations in certain areas of the Facility, no off-site migration at concentrations above the groundwater HHS of 2.0 mg/L is currently indicated for zinc, and exceedances for cadmium (MCL of 0.005 mg/L) are limited to EH-100 north of the Facility (0.007 mg/L). Future groundwater monitoring will continue to include collection and evaluation of zinc and cadmium data, to assess any changes in concentration distributions and trends.

3.3.6 Unfumed Slag Groundwater Monitoring Results

The results of the UFS project groundwater monitoring conducted through 2024 are tabulated in Appendix E. UFS project monitoring locations are shown on Figure 2-2. Trend plots for the key COCs (arsenic and selenium) and potential slag leaching indicator parameters (sulfate, chloride, potassium, and magnesium) at UFS project monitoring wells from 2012-2024 are in Figures 3-17 through 3-22. The start of UFS project slag crushing is noted on Figures 3-17 through 3-22 as a vertical red line. As described in the UFS GMP (Hydrometrics, 2021b), statistical upper simultaneous limits (USLs) for each well and laboratory constituent were calculated using ProUCL software, based on pre-UFS project data from 2012 through 2020. The USLs are intended to provide a statistically-based upper limit on the expected range of values for each well, calculated from observations for the post-CM, pre-UFS project period. Sampling was initiated on July 29, 2021 with a pre-slag crushing monitoring event; the first post-crushing biweekly monitoring event was conducted on October 1, 2021. Sampling frequency

Figure 3-17. Unfumed Slag Well Arsenic Trends
2024 Interim Corrective Action Monitoring Report
East Helena Facility

NOTE: Vertical red line delineates
start of UFS slag crushing operations

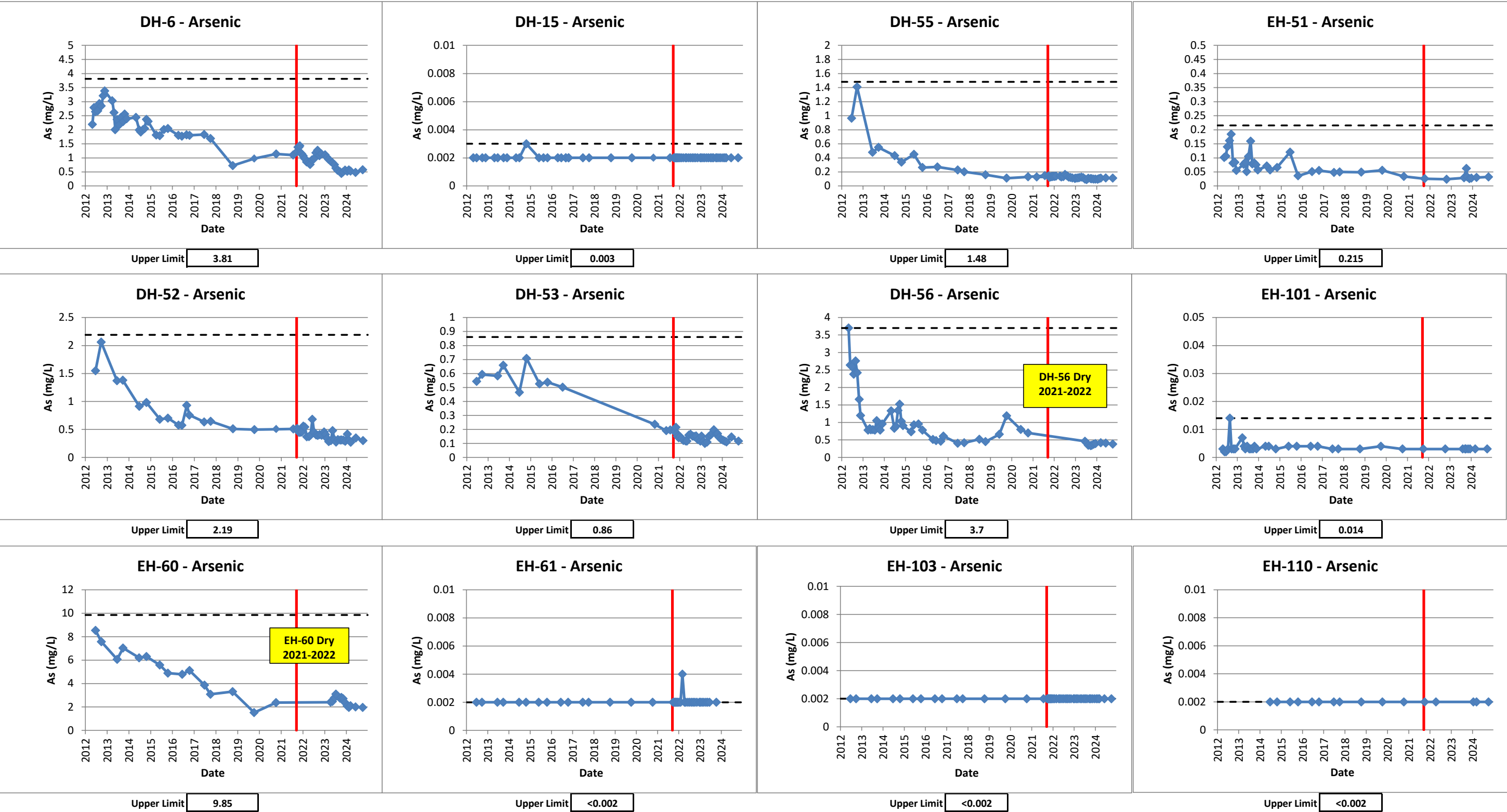


Figure 3-18. Unfumed Slag Well Selenium Trends
2024 Interim Corrective Action Monitoring Report
East Helena Facility

NOTE: Vertical red line delineates
start of UFS slag crushing operations

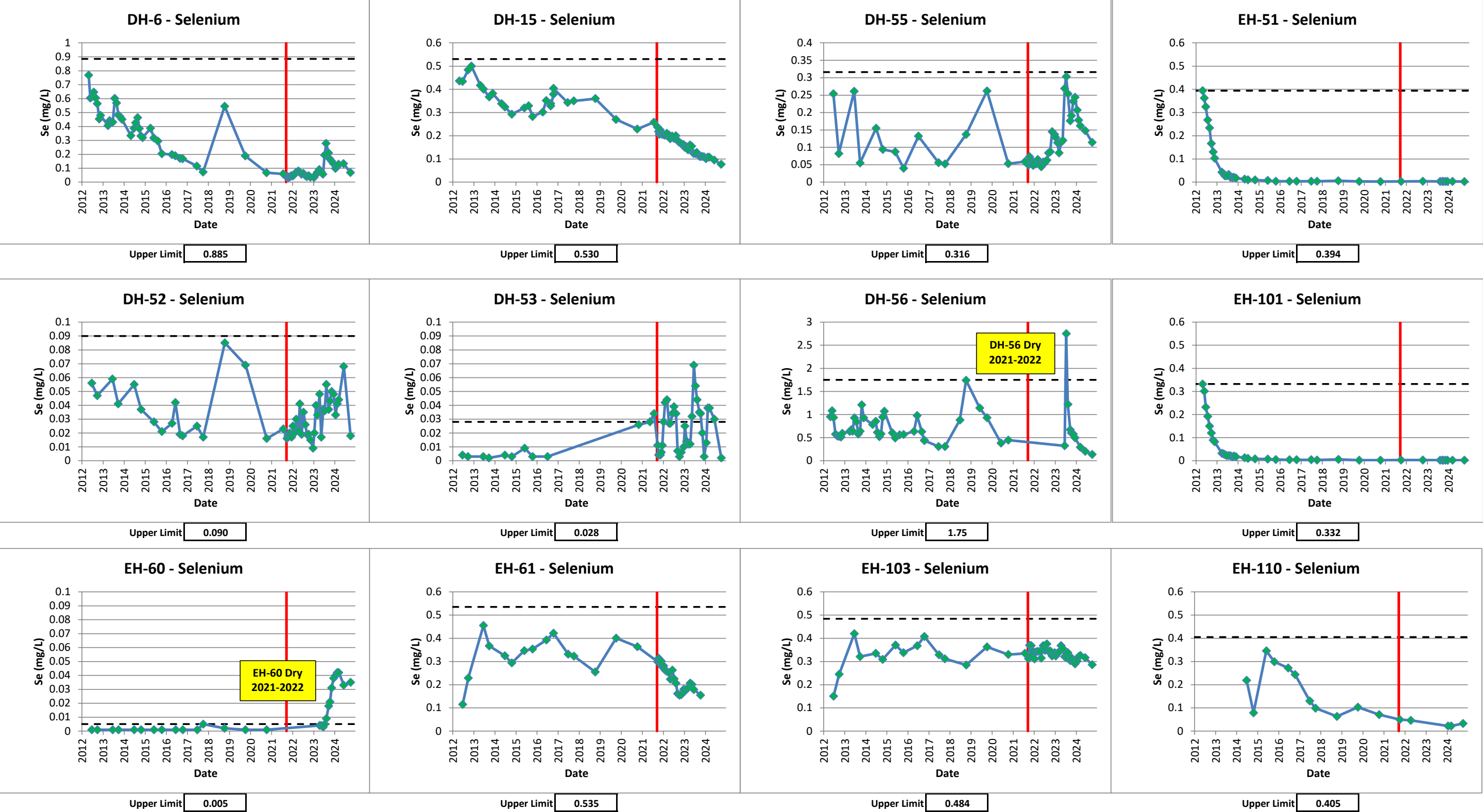


Figure 3-19. Unfumed Slag Well Sulfate Trends
2024 Interim Corrective Action Monitoring Report
East Helena Facility

NOTE: Vertical red line delineates
start of UFS slag crushing operations

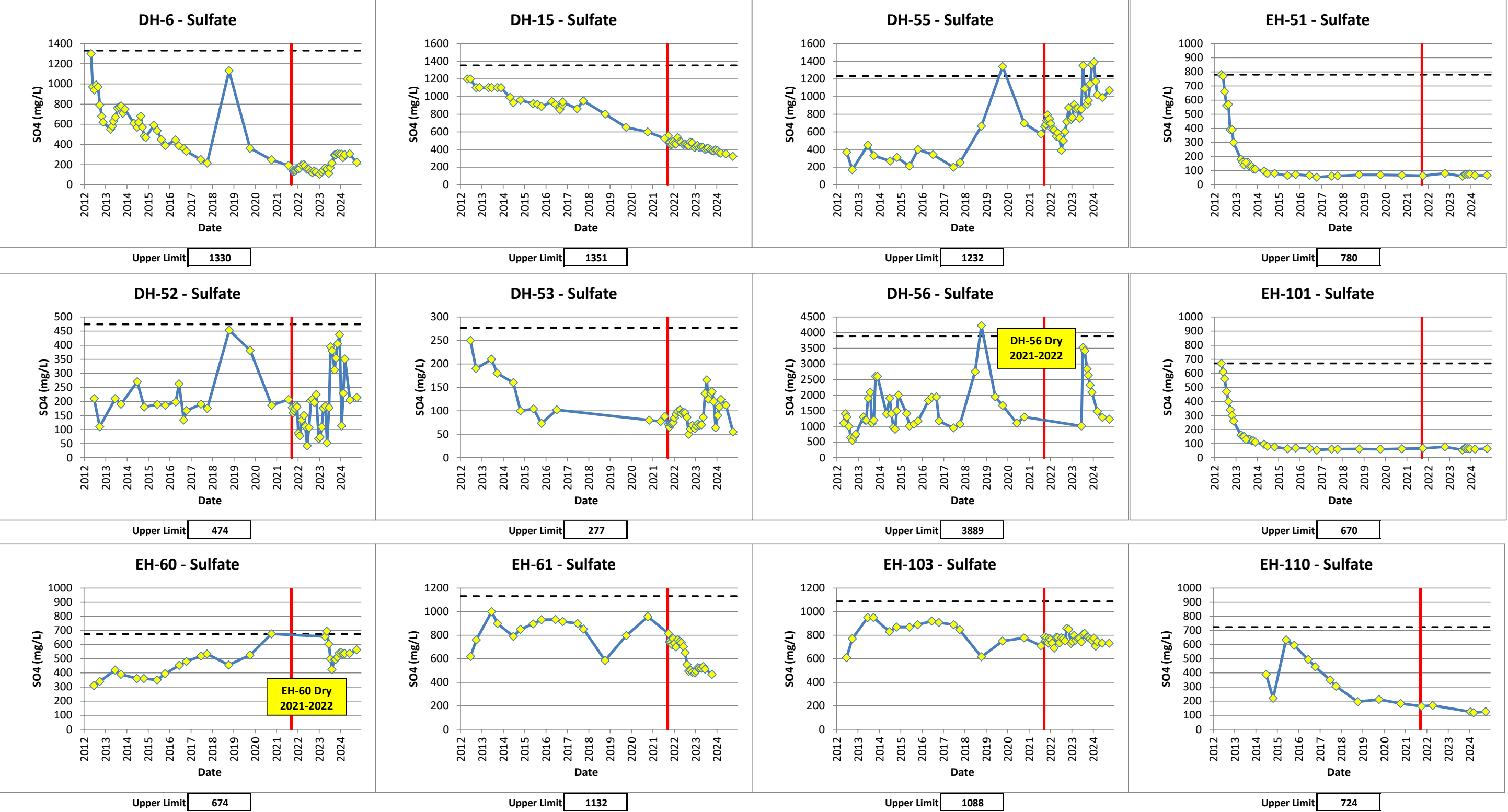


Figure 3-20. Unfumed Slag Well Chloride Trends
2024 Interim Corrective Action Monitoring Report
East Helena Facility

NOTE: Vertical red line delineates
start of UFS slag crushing operations

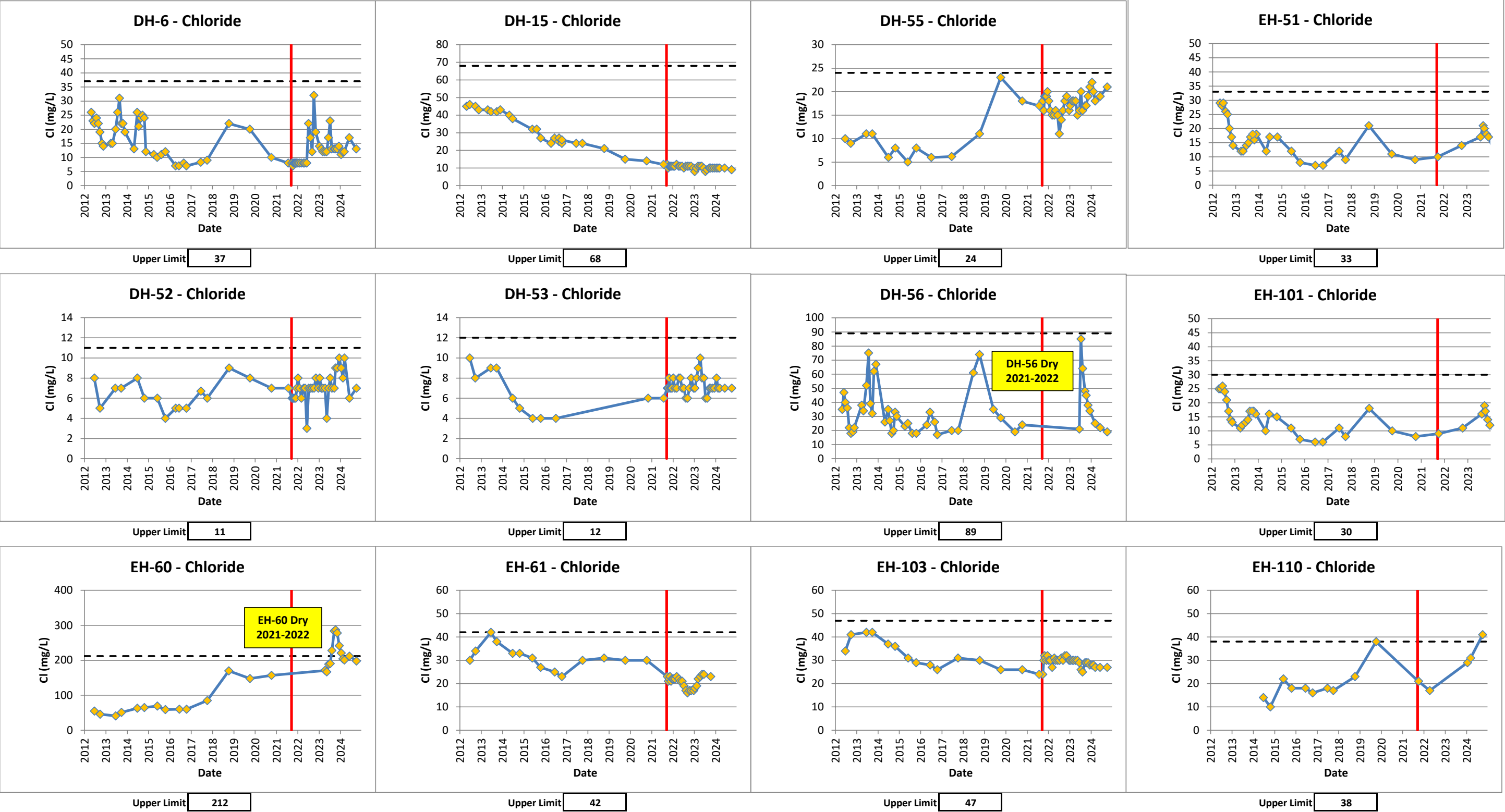


Figure 3-21. Unfumed Slag Well Potassium Trends
2024 Interim Corrective Action Monitoring Report
East Helena Facility

NOTE: Vertical red line delineates
start of UFS slag crushing operations

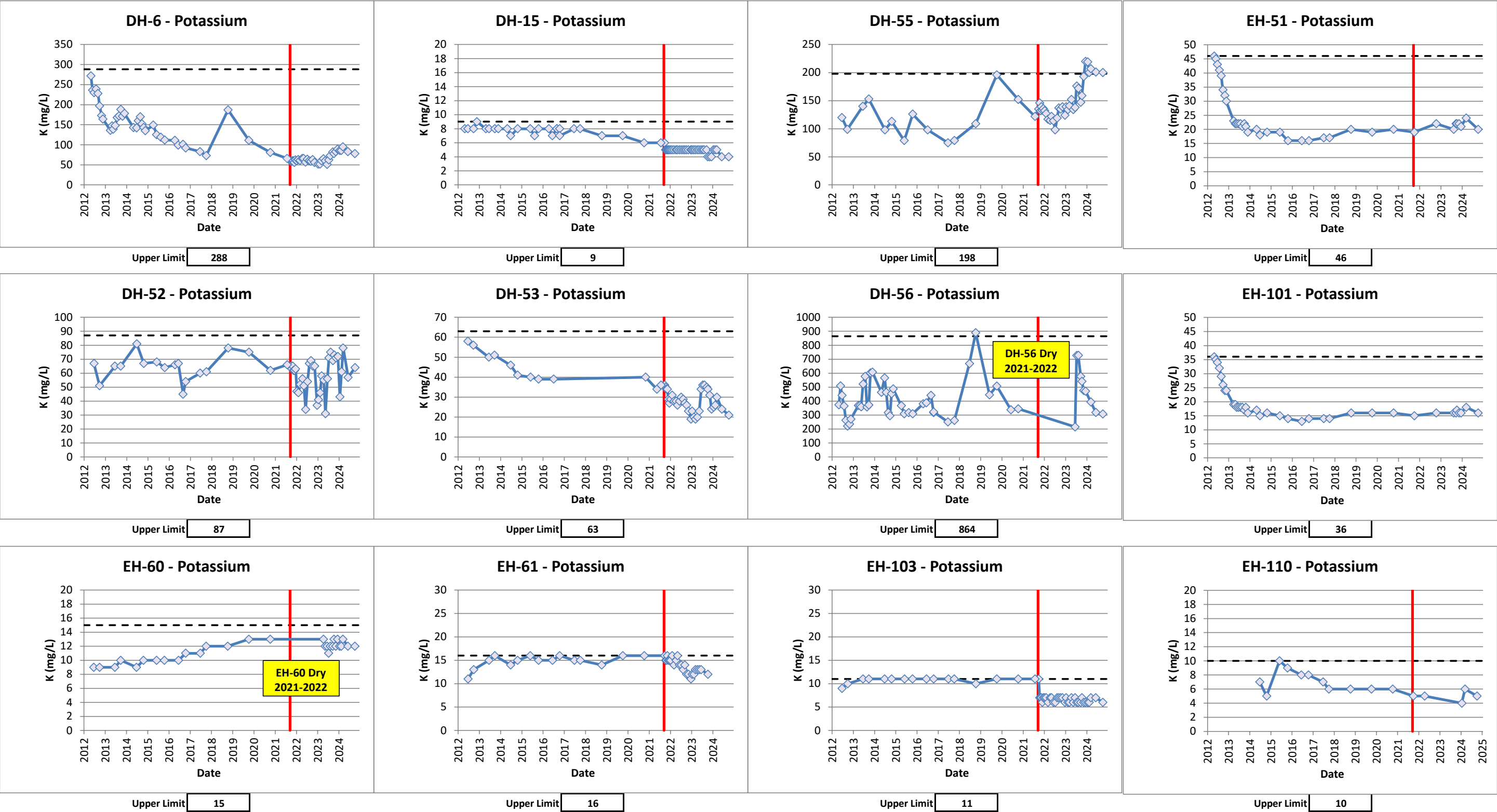
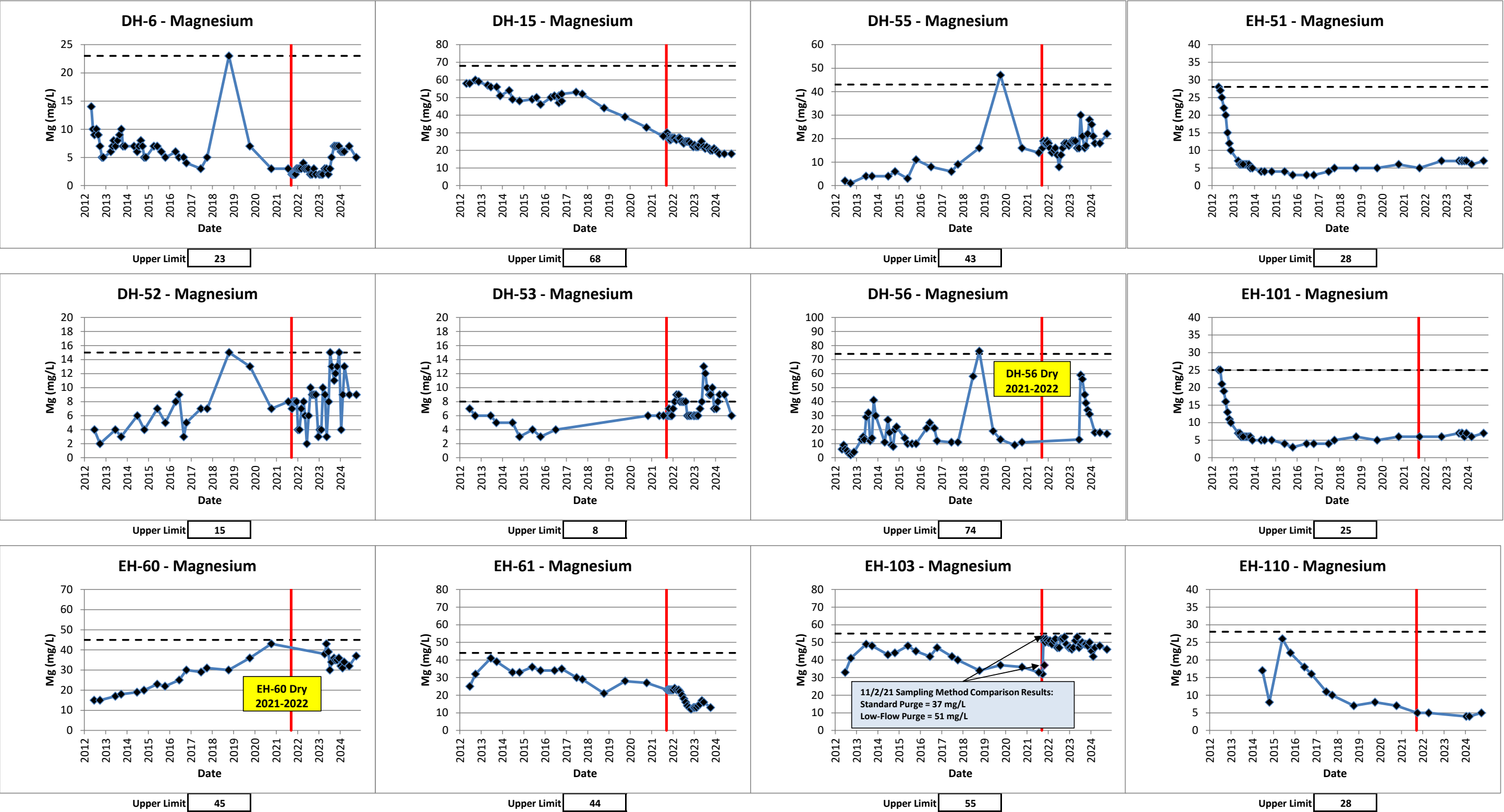


Figure 3-22. Unfumed Slag Well Magnesium Trends
2024 Interim Corrective Action Monitoring Report
East Helena Facility

NOTE: Vertical red line delineates
start of UFS slag crushing operations





for the project transitioned to monthly in 2022, based on the overall consistency of the biweekly sampling results and in accordance with the UFS GMP. Monthly sampling continued through March 2024, when the UFS project and associated groundwater monitoring was suspended. Most of the wells included in the UFS monitoring program, however, have been and continue to be sampled as part of the Interim CAPM program sampling discussed above in Section 3.3, and the trends shown in Figures 3-17 through 3-22 include the data collected under the Interim CAPM program as well as the UFS program in 2024.

The primary COCs arsenic and selenium and potential slag leaching/processing indicator parameters sulfate, chloride, potassium, and magnesium have shown some variability in concentrations during the post-slag crushing monitoring period, but have largely remained within the range of pre-slag crushing concentrations and below calculated USLs, with trend plots showing continuations of the trends apparent prior to the initiation of the slag recovery project (Figures 3-17 through 3-22; Appendix E). Occasional USL exceedances have been observed, however, as discussed below.

- Arsenic concentrations have remained below calculated USLs throughout the slag monitoring project, and at many locations were near the minimum concentrations observed in the comparison period as of October 2024 (Figure 3-17).
- Selenium concentrations periodically trended above the USL at well DH-53. However, the October 2024 selenium concentration at DH-53 was 0.002 mg/L, just above the 0.001 mg/L detection limit. The low selenium concentration at DH-53 in October 2024 was similar to lower concentrations observed during fall and/or early winter months during the UFS sampling program: from 0.004 to 0.007 mg/L in October through December 2021, 0.003 to 0.007 mg/L from September through November 2022, and 0.003 to 0.013 mg/L in December 2023 and January 2024 (Figure 3-18). Wells DH-53 and DH-52 are both located near Prickly Pear Creek and variability in groundwater quality at these wells is likely related to changes in creek levels, along with local groundwater levels and flow directions due to freezing and thawing cycles, seasonal runoff, and local precipitation. The patterns in selenium USL exceedances and subsequent decreases at DH-53 are likely attributable to short-term increases in selenium leaching from the slag pile occurring during higher precipitation periods (i.e., spring and early summer), along with trends at upgradient well DH-55 and the creek influences noted above.
- At well DH-56, the selenium concentration increased rapidly in 2023 from 0.323 mg/L in June 2023 to 2.75 mg/L in July 2023 (Appendix E, Figure 3-18), exceeding the USL; concentrations subsequently decreased through October 2024 to 0.137 mg/L, the lowest concentration observed to date at this well. The temporary increase is also attributed to a seasonal increase in slag leaching during the relatively high precipitation period of spring 2023.
- Selenium concentrations at well EH-60 have increased from 0.004 mg/L to 0.035 mg/L as of October 2024 (Appendix E, Figure 3-18). Chloride at EH-60 also exceeded the USL from August 2023 through January 2024 (Figure 3-20). The selenium trend at EH-60 is potentially related to the precipitation and infiltration-related selenium increases at well DH-56 upgradient of



EH-60 (see discussion above). However, other water chemistry results at EH-60 are not consistent with a current slag pile leaching source. For example, the recent chloride concentrations at EH-60 (200-250 mg/L) are substantially higher than at slag pile indicator wells DH-55 and DH-56 (typically <50 mg/L) which have shown historic, pre-slag processing water quality impacts from slag leaching. In addition, the common unfumed slag leaching constituents potassium and sulfate, which are highly elevated at DH-55 and DH-56 (200 to 300 mg/L potassium and 1000 to 1200 mg/L sulfate in October 2024), are much lower at EH-60 (12 mg/L potassium and 564 mg/L sulfate in October 2024), and have not shown increasing trends concurrent with the EH-60 selenium concentration increase (Figures 3-19 and 3-21). Therefore, indicator parameter water quality suggests the selenium trend at EH-60 may be attributable to a source unrelated to the slag pile. Note that selenium concentrations in deeper groundwater near EH-60 have historically been higher than in the shallow groundwater intercepted by this well. Deeper well EH-103, adjacent to EH-60, showed a selenium concentration of 0.286 mg/L in October 2024, and the selenium USL for EH-103 is 0.484 mg/L. A slight decreasing selenium trend is currently apparent at EH-103 (Figure 3-18).

- Potassium and sulfate USL exceedances at well DH-55 were also noted during several monitoring events in 2023 and 2024 (Appendix E, Figures 3-19 and 3-21). Selenium concentrations generally increased as well at DH-55 in 2023, reaching a maximum of 0.303 mg/L in July 2023, before decreasing consistently through 2024 to 0.114 mg/L in October (Figure 3-18). Selenium, sulfate, and potassium are all key indicators of slag leaching, and the 2023 trends in these constituents indicated an increase in slag leaching near DH-55, likely driven by precipitation and infiltration.
- Tier 2 wells EH-51, EH-101, and EH-110 (see Figure 2-2) were added to the slag monitoring program in 2023 and 2024, to assess any downgradient effects of the concentration changes noted during 2023 and 2024 at upgradient indicator wells DH-55, DH-56, and EH-60. Concentrations of all slag monitoring parameters at the Tier 2 wells remained below USLs in 2023 and 2024 (Figures 3-17 through 3-22), with the exception of chloride at well EH-110 in October 2024 (41 mg/L), which slightly exceeded the 38 mg/L USL. Arsenic and selenium concentrations at EH-51, EH-101, and EH-110 have generally decreased since 2012, and as of October 2024 remained at or near minimum values for the 2012-2024 period.

Overall, the UFS project groundwater monitoring results obtained through 2024 have indicated some short-term changes in concentration, but no unacceptable water quality impacts. As noted above, for this project “unacceptable impacts” are defined as changes resulting in exceedances of one or more of the human health water quality standards listed in Circular DEQ-7 (MDEQ, 2019) in downgradient residential or public water supply wells. Variability in water quality has been observed at a few of the monitoring wells, as discussed above, in many cases likely due to increased slag leaching following periods of higher precipitation and associated infiltration through the slag pile; however, no systematic longer-term increases in COCs or indicator parameter concentrations above USLs have been apparent to date.



3.3.7 2024 CAPMP Well Purge Comparison Sampling Results

As outlined in the 2024 Interim CAPMP (Hydrometrics, 2024a) and described above in Section 2.2.3, well purge method comparison sampling was conducted in 2024 to continue assessment of the comparability of groundwater quality data collected by low-flow/low-volume purging using a Waterra inertial pump versus the standard three- to five-well volume purge method. The low-flow/low-volume purge method was adopted in 2023 as the routine method for well sampling after several years of comparison sampling, in order to reduce project costs by decreasing the volume of sampling-derived water requiring handling and disposal, as well as requiring less time and equipment than the standard three- to five-volume purge method. Based on the purge volumes collected at the paired sampling locations in 2024, the total volume of groundwater purged using the low-flow method was more than 90% lower than the total volume purged using the standard purge method during both the June and October 2024 monitoring events.

Three wells were sampled using both purge methods during the June 2024 sampling, and four wells were sampled using both methods during the October sampling (Table 2-3). For the comparison sampling locations, low-flow/low-volume samples were collected first, followed by standard purge samples. Complete analytical results for the 2024 purge method comparison sampling are tabulated in Appendix F. To facilitate evaluation, each paired set of sample results was compared using criteria typically applied to field duplicate samples. Relative percent difference (RPD) values were calculated when both results were greater than or equal to 5 times the laboratory reporting limit, with a target of $\leq 20\%$ RPD indicating good agreement. When one or both results were less than 5 times the laboratory reporting limit, an absolute difference of $\pm$ the reporting limit was used as the target. Non-detect values were replaced with the detection limit for purge method comparison purposes.

The purge method comparison sampling results in Appendix F indicate generally good agreement between results obtained using the low-flow/low-volume purge method and the standard purge method. For field parameters, multiple sample pairs showed RPD values exceeding the 20% threshold for DO and/or turbidity, with one sample also exceeding 20% RPD for SC. These results are consistent with previous comparison sampling (Hydrometrics, 2024b). Based on the results in Appendix F, the Waterra low-flow/low-volume method tended to generate slightly higher suspended solids concentrations (turbidity) than the standard submersible pump method during purging in some (but not all) wells. Absolute differences in DO for the sample pairs showing RPDs $> 20\%$ were typically with the 1 to 2 mg/L range. Paired pH, water temperature, ORP/E_H, and (with one exception) SC values all agreed to within the duplicate RPD criteria (Appendix F).

For laboratory analytical parameters, exceedances of the duplicate sample criteria were observed for several physical parameters and major constituents in the June and October samples from well EH-126, dissolved iron and manganese in the June 2024 sample from EH-59, and TSS in the June 2024 sample from EH-114 (Appendix F). The iron and manganese RPD exceedances occurred at relatively low concentrations with one of the results near reporting limits (0.14 and 0.02 mg/L iron, and 0.05 and 0.30 mg/L manganese). The TSS RPD exceedance for well EH-114 in October 2024 (294 mg/L in



the Waterra sample and <10 mg/L in the submersible pump sample) demonstrates the tendency of the Waterra method to generate higher turbidity samples in certain wells. Despite the difference in TSS, other parameters in the paired sample from EH-114 all showed good agreement, within the duplicate RPD criteria.

At well EH-126, RPD exceedances were noted for laboratory SC, TDS, calcium, sodium, potassium, sulfate, and bromide in June 2024 and for TDS, sulfate, sodium, and bromide in October 2024 (Appendix F). During both events, the higher concentrations in the paired samples were observed in the submersible pump sample collected with a higher volume and purge rate. The RPDs exceeding the 20% criteria for the EH-126 sample pair laboratory parameters ranged from 22.4% to 49.3%. Despite the differences in major ion concentrations, the EH-126 sample comparisons showed good agreement for the COCs arsenic and selenium, along with other trace metals. In June 2024, paired arsenic concentrations were 0.003 and <0.002 mg/L, and paired selenium concentrations were 0.108 and 0.112 mg/L; in October 2024, paired arsenic concentrations were 0.003 and 0.002 mg/L and paired selenium concentrations were 0.076 and 0.084 mg/L. As discussed in the 2023 Interim CAPM Report (Hydrometrics, 2024b), a higher purge rate method would be expected to draw water from a greater distance away from the well, compared to the low-volume/low purge rate method. For wells located near a plume boundary or in an area where relatively large differences in groundwater concentration occur over relatively short distances, the high purge rate method may have the potential to yield a sample that is less representative of the water quality at the specific well location, and more of an “average” representing a larger spatial area. In this case, the lower purge rate and volume Waterra method would provide a more accurate and representative sample.

None of the paired samples collected in 2024 showed evidence of significant bias toward higher or lower COC (arsenic and selenium) concentrations in low-flow/low-volume samples compared with standard purge samples. With the exceptions discussed above, all other paired results from the two methods for laboratory constituents were within the duplicate sample criteria, including dissolved metals, common indicator parameters such as chloride and sulfate, and major cations calcium, magnesium, sodium, and potassium. Observed differences in field parameters (turbidity, DO) and some physical parameters and major ions at selected locations did not translate into any systematic or significant differences in concentrations of other physical parameters, major ions, or dissolved metals. The low-flow/low-volume Waterra purge method will continue to be used as the routine sampling method for sampling East Helena project wells.



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APPENDIX A

**2024 SURFACE WATER
AND GROUNDWATER DATABASE**



APPENDIX A1

2024 MONITORING WELL WATER QUALITY DATABASE

Station ID	Sample Date	Depth To Water (ft)	Field Parameters							General Chemistry					Major Cations			
			pH (s.u.)	SC (µmhos/cm)	Diss O ₂ (mg/L)	ORP (mV)	E _H (mV)	Turbidity (NTU)	Water Temp (°C)	Lab pH (s.u.)	Lab SC (µmhos/cm)	Total Alkalinity as CaCO3	Total Suspended Solids	Total Dissolved Solids	Calcium	Magnesium	Sodium	Potassium
2843 Canyon Ferry Rd	6/13/2024	30.18	7.41	590	4.78	-9	212	37 J	10.4	7.4	585	130	27 J	396	69	16	30	4
2843 Canyon Ferry Rd	10/8/2024	29.26	7.19	610	5.22	-18	202	16.0	10.1	7.4	608	130	10 U	392	68	16	30	4
2853 Canyon Ferry Rd	6/13/2024	31.43	7.31	637	4.54	59	280	2.2	10.8	7.3	629	130	10 UJ	425	73	16	30	4
2853 Canyon Ferry Rd	10/8/2024	30.40	7.15	653	5.02	41	262	0.9	10.1	7.3	652	130	10 U	418	76	18	31	4
DARTMAN WELL	6/13/2024	26.34	7.10	345	1.38	-4	218	3.8	9.2	7.2	345	95	10 UJ	224	40	9	16	3
DARTMAN WELL	10/10/2024	28.79	6.84	314	2.65	26	248	5.7	9.3	7.0	322	90	10 U	196	36	8	14	3
DH-6	6/13/2024	21.16	7.09	1065	3.35	13	234	5.1	10.0	7.4	1040	150	10 UJ	691	41	7	115	83
DH-6	10/11/2024	22.58	7.25	870	2.89	215	436	9.9	10.5	7.4	881	150	26	554	30	5	96	78
DH-8	10/15/2024	51.86	7.26	3225	4.35	164	382	66.6	13.3	7.4	3200	320	83	2580	467	106	164	16
DH-15	6/13/2024	18.65	6.88	969	0.14	-20	201	4.3	10.5	7.2	950	130	10 UJ	682	81	18	90	4
DH-15	10/11/2024	20.01	7.04	914	0.19	225	446	5.2	9.9	7.2	921	130	10 U	635	81	18	88	4
DH-17	6/13/2024	48.59	6.65	1463	0.99	34	253	17.0	12.2	7.0	1450	300	92	1010	78	19	204	24
DH-17	10/15/2024	49.64	6.91	1446	0.51	27	245	29.8	13.7	7.1	1460	310	40	989	86	20	201	29
DH-42	10/15/2024	49.65	6.87	829	2.07	101	318	7.1	14.8	7.1	841	250	17	575	106	27	29	6
DH-42 (Dup)	10/15/2024	49.65	6.87	830	2.06	101	318	7.1	14.8	7.1	840	250	13	570	107	27	29	7
DH-52	6/13/2024	7.29	7.05	774	0.85	83	305	3.9	8.7	7.3	772	140	10 UJ	499	49	9	60	57
DH-52 (Dup)	6/13/2024	7.29	7.05	774	0.82	83	305	3.9	8.7	7.3	771	140	10 UJ	507	53	9	63	60
DH-52	10/11/2024	8.61	6.98	761	0.27	227	447	8.1	11.1	7.2	763	140	10 U	511	54	9	51	64
DH-53	6/13/2024	10.09	6.88	520	0.81	75	296	5.0	8.2	7.2	522	130	17 J	334	50	9	20	24
DH-53	10/11/2024	11.58	6.96	369	0.22	215	434	9.9	12.8	7.2	371	110	15	244	36	6	16	21
DH-55	6/13/2024	80.91	7.21	2538	3.39	11	232	5.9	9.9	7.4	2400	170	10 UJ	1770	106	18	284	201
DH-55	10/11/2024	81.58	7.31	2528	3.15	199	421	10.7	8.7	7.4	2560	170	10 U	1870	126	22	291	200
DH-56	6/13/2024	83.70	7.45	3400	4.29	17	236	67.0	12.3	7.7	3250	250	19 J	2360	95	18	392	319
DH-56	10/11/2024	85.16	7.66	3089	4.02	188	408	12.4	11.3	7.8	3120	240	10 U	2160	86	17	381	308
DH-66	6/13/2024	51.47	6.60	2587	4.09	69	289	16.0	11.5	6.8	2560	220	12 J	2200	375	102	74	9
DH-66	10/15/2024	52.49	6.68	2465	4.77	213	433	64.9	11.5	6.8	2440	200	56	1940	360	96	72	9
DH-67	10/15/2024	36.13	6.57	1238	4.90	249	469	257	11.6	6.6	1270	190	343	895	126	42	90	6
DH-69	10/11/2024	36.09	7.00	805	0.33	-153	67	151	11.7	7.0	763	220	84	516	74	13	57	6
DH-77	10/15/2024	54.08	No Sample - Insufficient Water															
DH-79	10/15/2024	55.35	7.50	1769	4.21	3	220	77.9	14.0	7.5	1750	350	26	1190	48	18	305	17
DH-80	10/16/2024	50.00	5.92	670	2.84	111	331	293	10.9	6.2	702	100	145	455	73	20	34	6
EH-50	10/10/2024	29.98	6.44	1598	3.45	238	458	8.4	11.3	6.5	1600	190	12	1150	106	34	201	8
EH-51	10/10/2024	17.57	7.00	392	4.80	181	401	2.1	11.4	7.1	395	90	10 U	275	34	7	24	20
EH-52	10/10/2024	8.91	6.74	395	2.42	188	405	6.0	14.7	6.9	396	110	10 U	241	39	9	19	18
EH-53	10/11/2024	30.00	7.05	556	8.92	230	450	3.8	11.4	7.2	564	160	10 U	352	42	13	58	4
EH-54	10/11/2024	9.94	6.88	334	3.88	238	457	1.4	13.1	7.1	338	100	10 U	226	36	8	16	3
EH-58	10/11/2024	15.21	6.79	415	2.20	216	435	5.7	12.6	6.9	420	120	10 U	261	50	12	18	4
EH-59 (Low-Flow)	10/8/2024	8.99	7.07	429	3.45	-20	199	6.6	12.1	7.0	424	140	10 U	261	48	11	21	8
EH-59 (3 Vol Purge)	10/8/2024	9.00	6.97	424	2.26	-17	202	2.0	12.9	7.0	424	140	10 U	269	47	11	21	9
EH-60	6/13/2024	24.70	5.58	1880	4.87	35	253	42.0	13.9	5.9	1830	59	23 J	1260	103	32	217	12
EH-60	10/10/2024	25.78	5.80	1840	2.45	231	450	23.2	12.4	6.0	1850	95	22	1250	121	37	215	12
EH-62	10/11/2024	27.78	6.98	402	5.48	226	446	2.4	10.7	7.1	405	110	10 U	263	47	11	17	4
EH-63	10/10/2024	22.82	6.79	375	6.42	198	417	6.5	13.0	7.1	406	100	10 U	269	45	10	18	5
EH-65	10/10/2024	28.14	6.44	1278	0.78	171	390	11.1	12.4	6.7	1380	140	10 U	971	98	26	159	9
EH-66	10/11/2024	30.13	7.36	412	8.84	204	424	36.2	10.7	7.4	414	130	102	276	51	13	16	3
EH-69	10/15/2024	19.81	6.84	489	5.66	251	471	13.6	11.0	7.0	492	130	21	303	52	12	30	5
EH-70	10/9/2024	36.45	7.08	713	8.71	95	315	7.7	11.4	7.2	683	120	15	439	49	16	68	4

Station ID	Sample Date	Depth To Water (ft)	Field Parameters							General Chemistry					Major Cations			
			pH (s.u.)	SC (µmhos/cm)	Diss O ₂ (mg/L)	ORP (mV)	E _H (mV)	Turbidity (NTU)	Water Temp (°C)	Lab pH (s.u.)	Lab SC (µmhos/cm)	Total Alkalinity as CaCO3	Total Suspended Solids	Total Dissolved Solids	Calcium	Magnesium	Sodium	Potassium
EH-100	10/10/2024	30.44	6.75	1778	1.57	220	440	22.4	11.6	6.8	1790	210	49	1310	131	44	200	13
EH-101	10/10/2024	17.83	7.02	362	4.18	174	394	8.4	11.6	7.1	363	88	25	220	34	7	20	16
EH-102	10/10/2024	10.11	6.91	401	2.58	159	378	3.5	12.4	7.0	401	98	10 U	266	34	7	33	9
EH-103	6/11/2024	26.95	6.78	1640	0.41	156	375	1.8	12.8	6.9	1630	150	10 UJ	1320	204	48	102	7
EH-103	10/10/2024	27.94	6.83	1604	0.78	195	414	4.1	11.9	6.9	1600	140	10 U	1310	212	46	95	6
EH-104	10/10/2024	37.14	6.72	1237	5.28	194	413	16.4	11.9	6.9	1340	200	13	960	139	36	98	6
EH-106	10/10/2024	31.08	6.49	1433	4.32	197	416	13.9	12.1	6.7	1580	170	16	1160	138	33	165	6
EH-106 (Dup)	10/10/2024	31.08	6.49	1434	4.33	197	416	13.9	12.1	6.7	1580	160	16	1150	140	33	165	6
EH-107	10/10/2024	24.38	6.79	926	2.36	185	403	7.2	14.3	7.0	1010	150	23	670	70	16	119	5
EH-110	10/11/2024	23.18	7.21	713	3.57	224	443	88.2	12.0	7.3	715	150	108	452	25	5	114	5
EH-111	10/10/2024	31.60	6.66	1584	0.77	187	406	10.5	12.3	6.8	1720	160	14	1240	125	33	202	10
EH-114 (Low-Flow)	6/12/2024	34.13	6.42	1913	8.70	191	409	5.7	12.1	6.6	1900	160	13	1460	145	44	230	10
EH-114 (3 Vol Purge)	6/12/2024	34.13	6.42	1874	NM	183	402	3.4	12.2	6.6	1850	160	10 U	1390	143	43	219	9
EH-114 (Low Flow)	10/8/2024	34.83	6.70	1860	1.99	122	341	14.6	12.1	6.6	1870	160	294	1420	144	42	214	9
EH-114 (3 Vol Purge)	10/8/2024	34.83	6.57	1839	4.57	123	343	2.2	11.8	6.6	1840	160	10 U	1370	144	42	209	9
EH-115	6/13/2024	36.34	6.39	1488	1.87	-55	163	29.0	14.1	6.7	1470	200	19 J	1060	124	36	143	7
EH-115	10/10/2024	37.22	6.44	1411	0.49	183	402	14.0	11.9	6.7	1530	200	24	1060	123	36	151	7
EH-117	10/9/2024	30.41	6.73	991	9.03	125	344	4.4	12.6	6.9	1160	170	10 U	776	78	21	137	6
EH-119	10/9/2024	35.44	6.55	1711	1.69	155	374	3.3	12.2	6.7	1700	170	10 U	1240	147	41	181	7
EH-120	6/11/2024	30.43	6.77	901	2.67	153	373	12.0	11.5	7.0	893	130	35 J	609	74	18	94	4
EH-120	10/9/2024	32.23	6.83	1036	2.01	128	347	8.6	12.5	6.9	1050	140	39	717	99	22	97	5
EH-121	10/11/2024	30.57	7.05	302	4.19	184	405	3.2	10.6	7.2	305	88	10 U	193	34	8	14	3
EH-123	10/9/2024	44.71	7.16	718	7.63	153	371	5.4	13.5	7.3	714	180	14	458	76	19	42	8
EH-124	6/11/2024	38.27	6.92	1313	2.89	142	362	11.1	11.1	7.1	1310	230	15 J	926	143	44	81	7
EH-124	10/9/2024	38.70	7.16	1147	5.63	109	328	9.7	12.1	7.1	1190	230	66	778	131	37	63	7
EH-125	10/9/2024	36.99	7.06	391	6.52	122	341	4.2	11.9	7.2	396	100	10 U	240	31	8	33	3
EH-126 (Low-Flow)	6/12/2024	56.72	7.23	997	7.71	192	412	9.8	11.8	7.4	998	200	11	712	95	44	55	3
EH-126 (3 Vol Purge)	6/12/2024	56.72	6.95	1257	4.42	178	398	3.3	11.7	7.1	1240	190	11	939	119	43	91	5
EH-126 (Low-Flow)	10/8/2024	56.11	7.60	915	6.86	95	314	9.7	12.5	7.4	914	200	14	628	93	42	46	4
EH-126 (3 Vol Purge)	10/8/2024	56.11	7.22	1096	6.00	99	319	2.8	11.6	7.2	1110	190	15	797	108	41	75	5
EH-129	6/11/2024	57.91	7.24	633	5.59	156	375	19.0	12.5	7.5	630	160	29	429	61	21	37	7
EH-129	10/9/2024	56.82	7.43	610	6.64	176	396	4.3	11.4	7.4	622	160	10 U	405	62	20	35	7
EH-130	10/9/2024	46.98	6.93	312	6.13	169	389	6.2	11.0	7.2	311	85	11	180	33	8	14	2
EH-130 (Dup)	10/9/2024	46.98	6.93	310	6.12	169	389	6.2	11.0	7.2	308	86	16	180	33	8	15	2
EH-132	10/9/2024	60.64	7.34	706	5.60	101	319	9.4	14.0	7.4	710	140	10 U	486	72	22	38	9
EH-134	6/11/2024	57.98	7.34	482	5.66	116	335	9.1	12.4	7.6	485	150	10 U	333	48	15	26	6
EH-134 (Dup)	6/11/2024	57.98	7.34	481	5.64	116	335	9.1	12.4	7.6	484	140	10 U	324	48	15	26	6
EH-134	10/9/2024	56.81	7.53	481	5.95	162	381	6.1	11.9	7.6	489	150	10	319	49	14	24	6
EH-135	10/9/2024	31.57	7.06	298	3.24	170	391	8.9	9.5	7.1	303	84	10 U	181	36	8	13	2
EH-138	6/11/2024	47.42	7.03	434	7.00	170	391	5.3	9.9	7.3	443	120	22	287	38	12	35	3
EH-138	10/9/2024	46.18	7.06	516	8.07	204	425	2.8	10.3	7.2	512	130	19	304	48	13	34	3
EH-139	6/11/2024	54.12	7.19	673	7.11	144	365	4.9	10.0	7.5	675	210	42	450	60	27	40	9
EH-139	10/9/2024	51.54	7.48	774	9.47	153	374	5.6	10.3	7.5	768	360	12	477	74	32	38	10

Station ID	Sample Date	Depth To Water (ft)	Field Parameters							General Chemistry					Major Cations			
			pH (s.u.)	SC (µmhos/cm)	Diss O ₂ (mg/L)	ORP (mV)	E _H (mV)	Turbidity (NTU)	Water Temp (°C)	Lab pH (s.u.)	Lab SC (µmhos/cm)	Total Alkalinity as CaCO3	Total Suspended Solids	Total Dissolved Solids	Calcium	Magnesium	Sodium	Potassium
EH-141 (Low-Flow)	6/12/2024	33.41	7.11	783	4.75	233	454	19.0	10.4	7.3	774	160	10 U	552	81	23	48	6
EH-141 (3 Vol Purge)	6/12/2024	33.41	7.05	782	4.95	197	417	1.8	11.0	7.3	773	160	10 U	552	76	22	47	6
EH-141 (Low-Flow)	10/8/2024	37.55	7.57	782	6.20	85	306	2.8	10.1	7.3	790	160	10 U	552	83	23	50	7
EH-141 (3 Vol Purge)	10/8/2024	37.55	7.32	793	7.64	93	313	0.9	10.8	7.3	790	160	11	550	82	23	50	7
EH-143	6/11/2024	34.55	6.99	407	6.29	170	392	7.8	9.2	7.3	414	110	10	256	40	12	25	3
EH-143	10/9/2024	33.93	7.07	367	7.73	215	436	7.6	10.5	7.2	360	110	136	211	37	10	19	3
EH-204	10/11/2024	56.40	7.09	1700	2.96	91	311	21.6	11.6	7.3	1700	260	18	1340	233	55	73	11
EH-204 (Dup)	10/11/2024	56.40	7.09	1701	2.96	91	311	21.6	11.6	7.2	1710	260	17	1330	234	55	73	11
EH-206	10/9/2024	48.65	7.47	738	6.98	149	367	6.1	13.6	7.6	758	210	10 U	462	94	24	20	10
EH-210	10/15/2024	38.00	7.36	883	7.19	250	470	79.1	11.7	7.4	909	140	139	637	109	25	42	9
MW-1	10/16/2024	51.86	7.30	436	7.18	99	319	68.1	11.5	7.5	461	120	193	318	52	11	26	5
MW-2	10/16/2024	40.92	6.97	870	0.50	28	248	3.0	11.1	7.1	916	250	10 U	625	135	30	26	7
MW-3	10/16/2024	36.33	6.95	1026	1.03	96	316	3.5	11.2	7.1	1080	250	10 U	763	157	36	30	7
MW-4	10/16/2024	48.78	7.16	444	8.31	94	314	57.1	10.8	7.4	469	160	126	329	55	12	27	6
MW-5	10/16/2024	53.56	7.84	451	7.64	125	343	2.7	13.8	7.9	430	150	10 U	290	44	10	28	5
MW-6	10/16/2024	32.74	7.00	1255	1.83	87	307	8.7	11.7	7.1	1280	250	10 U	952	190	43	34	7
MW-7	10/16/2024	52.82	7.47	243	7.21	87	306	104.0	12.8	7.7	254	87	76	205	21	7	20	5
MW-8	10/16/2024	52.59	7.52	489	6.86	128	346	9.9	13.9	7.5	481	150	41	344	49	10	25	6
MW-9	10/16/2024	51.11	7.60	449	8.23	111	331	10.8	10.8	7.6	445	160	25	311	49	11	27	5
MW-10	10/16/2024	44.20	7.46	743	5.52	208	428	6.0	11.4	7.5	747	250	25	498	86	22	37	8
MW-11	10/16/2024	62.09	7.75	678	9.64	73	293	3.7	10.7	7.7	677	110	10 U	471	51	12	61	10
PBTW-2	10/15/2024	39.61	6.71	1220	0.25	2	220	17.0	13.0	6.8	1230	250	18	852	115	23	122	19
SDMW-1	10/16/2024	52.24	6.90	1381	0.06	56	275	51.6	11.5	7.0	1390	270	56	952	113	22	146	30
SDMW-5	10/16/2024	55.27	6.00	644	0.26	42	262	72.4	11.3	6.2	646	85	38	401	35	11	40	18

NOTES: All concentrations in mg/L except as indicated.
U = value below reporting limit
NM = not measured
J = QC criterion exceeded (estimated value with bias direction not indicated)
J- = QC criterion exceeded (estimated value with potential low bias)
J+ = QC criterion exceeded (estimated value with potential high bias)
UJ = QC criterion exceeded (estimated value below reporting limit)

Station ID	Sample Date	Anions				Dissolved (D) Metals										
		Bicarbonate	Chloride	Sulfate	Bromide	Sb (D)	As (D)	Cd (D)	Cu (D)	Fe (D)	Pb (D)	Mn (D)	Hg (D)	Se (D)	Tl (D)	Zn (D)
2843 Canyon Ferry Rd	6/13/2024	160	15	142	0.52	0.003 U	0.002 U	0.001 U	0.001 U	0.14	0.005 U	0.02	0.001 U	0.033	0.001 U	0.01 U
2843 Canyon Ferry Rd	10/8/2024	160	15	154	0.55	0.003 U	0.002 U	0.001 U	0.001 U	0.14	0.005 U	0.01	0.001 U	0.037	0.001 U	0.02
2853 Canyon Ferry Rd	6/13/2024	160	16	164	0.61	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.040	0.001 U	0.01 U
2853 Canyon Ferry Rd	10/8/2024	160	16	173	0.62	0.003 U	0.002 U	0.001 U	0.001 U	0.02	0.005 U	0.01 U	0.001 U	0.044	0.001 U	0.02
DARTMAN WELL	6/13/2024	120	4	68	0.1	0.003 U	0.002 U	0.001 U	0.001 U	0.2	0.005 U	0.02	0.001 U	0.001	0.001 U	0.01 U
DARTMAN WELL	10/10/2024	110	6	59	0.05 U	0.003 U	0.002 U	0.001 U	0.001 U	0.16	0.005 U	0.02	0.001 U	0.001 U	0.001 U	0.01 U
DH-6	6/13/2024	180	17	306	0.23	0.029	0.483	0.001 U	0.011	0.02 U	0.005 U	0.01 U	0.001 U	0.133	0.001 U	0.01 U
DH-6	10/11/2024	180	13	222	0.17	0.034	0.575	0.001 U	0.025	0.02 U	0.005 U	0.01 U	0.001 U	0.069	0.001 U	0.01 U
DH-8	10/15/2024	390	240	1250	18.6	0.003 U	0.002 U	0.001 U	0.002	0.02 U	0.005 U	0.01 U	0.001 U	0.276	0.002	0.01 U
DH-15	6/13/2024	160	10	350	0.27	0.003 U	0.002 U	0.001 U	0.009	0.02 U	0.005 U	0.01	0.001 U	0.095	0.001 U	0.01 U
DH-15	10/11/2024	160	9	322	0.26	0.003 U	0.002 U	0.001 U	0.006	0.02 U	0.005 U	0.01	0.001 U	0.077	0.001 U	0.01 U
DH-17	6/13/2024	370	21	413	1.69	0.003 U	17.8	0.005	0.005	0.05	0.005 U	2.01	0.001 U	0.001	0.001	5.15
DH-17	10/15/2024	380	22	419	1.8	0.003 U	18.1	0.002	0.002	0.07	0.005 U	2.5	0.001 U	0.001 U	0.001 U	0.57
DH-42	10/15/2024	300	13	184	0.34	0.003 U	2.33	4.92	0.005	0.02 U	0.005 U	5.48	0.001 U	0.013	0.005	2.58
DH-42 (Dup)	10/15/2024	300	13	182	0.34	0.003 U	2.31	5.18	0.005	0.02 U	0.005 U	5.43	0.001 U	0.013	0.005	2.56
DH-52	6/13/2024	170	6	205	0.08	0.023	0.347	0.001 U	0.003	0.02 U	0.005 U	0.01	0.001 U	0.068	0.001 U	0.01 U
DH-52 (Dup)	6/13/2024	170	6	209	0.08	0.023	0.35	0.001 U	0.002	0.02	0.005 U	0.02	0.001 U	0.068	0.001 U	0.01 U
DH-52	10/11/2024	170	7	214	0.14	0.023	0.3	0.001 U	0.003	0.02 U	0.005 U	0.02	0.001 U	0.018	0.001 U	0.01 U
DH-53	6/13/2024	160	7	112	0.05 U	0.007	0.146	0.001 U	0.002	0.1	0.005 U	2.77	0.001 U	0.030	0.001 U	0.01 U
DH-53	10/11/2024	130	7	55	0.05 U	0.008	0.117	0.001 U	0.002	0.02 U	0.005 U	1.84	0.001 U	0.002	0.001 U	0.01 U
DH-55	6/13/2024	210	19	988	0.66	0.024	0.113	0.001	0.004	0.02 U	0.005 U	0.35	0.001 U	0.148	0.012	0.61
DH-55	10/11/2024	210	21	1070	0.79	0.023	0.11	0.003	0.004	0.02 U	0.005 U	0.24	0.001 U	0.114	0.012	1.31
DH-56	6/13/2024	310	22	1290	0.96	0.023	0.407	0.001 U	0.004	0.15	0.005 U	0.01 U	0.001 U	0.204	0.001 U	0.01 U
DH-56	10/11/2024	290	19	1230	1.00	0.022	0.378	0.001 U	0.003	0.02 U	0.005 U	0.01 U	0.001 U	0.137	0.001 U	0.01 U
DH-66	6/13/2024	270	213	915	16.2	0.003 U	0.007	0.193	0.003	0.02 U	0.005 U	0.01 U	0.001	1.30	0.001 U	0.1
DH-66	10/15/2024	250	211	850	16.8	0.003 U	0.008	0.182	0.003	0.02 U	0.005 U	0.01 U	0.001	1.29	0.001 U	0.1
DH-67	10/15/2024	240	51	383	2.27	0.003 U	0.048	0.001 U	0.002	0.02 U	0.005 U	0.01	0.001 U	0.134	0.001 U	0.01 U
DH-69	10/11/2024	270	10	162	0.13	0.003 U	0.288	0.001 U	0.001 U	19.2	0.005 U	5.62	0.001 U	0.001 U	0.001 U	0.02
DH-77	10/15/2024	No Sample - Insufficient Water														
DH-79	10/15/2024	420	34	500	2.06	0.003 U	20.6	0.001 U	0.001 U	0.06	0.005 U	3.59	0.001 U	0.003	0.001 U	0.01 U
DH-80	10/16/2024	120	11	231	0.19	0.003 U	7.06	1.92	0.003	0.49	0.005 U	2.35	0.001 U	0.003	0.131	0.84
EH-50	10/10/2024	230	55	544	1.29	0.003 U	5	0.001 U	0.002	0.02 U	0.005 U	0.06	0.001 U	0.007	0.001 U	0.01 U
EH-51	10/10/2024	110	16	68	0.05 U	0.003 U	0.032	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.002	0.001 U	0.01 U
EH-52	10/10/2024	140	12	59	0.05 U	0.013	0.242	0.001 U	0.009	0.07	0.005 U	0.01	0.001 U	0.004	0.001 U	0.01 U
EH-53	10/11/2024	190	17	96	0.10	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.009	0.001 U	0.01 U
EH-54	10/11/2024	120	7	57	0.05 U	0.003 U	0.019	0.001 U	0.001	0.02 U	0.005 U	0.01 U	0.001 U	0.001 U	0.001 U	0.01 U
EH-58	10/11/2024	150	14	67	0.05 U	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.002	0.001 U	0.01 U
EH-59 (Low-Flow)	10/8/2024	170	7	66	0.05 U	0.005	0.02	0.001 U	0.001 U	0.14	0.005 U	0.05	0.001 U	0.002	0.001 U	0.01 U
EH-59 (3 Vol Purge)	10/8/2024	170	7	65	0.05 U	0.008	0.02	0.001 U	0.001	0.02	0.005 U	0.3	0.001 U	0.002	0.001 U	0.01 U
EH-60	6/13/2024	71	212	537	0.85	0.003 U	2.01	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.033	0.001 U	0.01 U
EH-60	10/10/2024	120	198	564	0.92	0.003 U	1.96	0.001 U	0.001 U	0.02 U	0.005 U	0.01	0.001 U	0.035	0.001 U	0.01 U
EH-62	10/11/2024	140	14	66	0.05 U	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.001 U	0.001 U	0.01 U
EH-63	10/10/2024	130	15	65	0.05 U	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.001	0.001 U	0.01 U
EH-65	10/10/2024	170	49	455	0.52	0.003 U	0.176	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.117	0.001 U	0.01 U
EH-66	10/11/2024	160	6	58	0.05 U	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.002	0.001 U	0.01 U
EH-69	10/15/2024	160	18	83	0.06	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.005	0.001 U	0.01 U
EH-70	10/9/2024	150	17	177	0.38	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.030	0.001 U	0.01 U

Station ID	Sample Date	Anions				Dissolved (D) Metals										
		Bicarbonate	Chloride	Sulfate	Bromide	Sb (D)	As (D)	Cd (D)	Cu (D)	Fe (D)	Pb (D)	Mn (D)	Hg (D)	Se (D)	Tl (D)	Zn (D)
EH-100	10/10/2024	260	28	694	1.71	0.003 U	5.39	0.007	0.004	0.02 U	0.005 U	14.8	0.001 U	0.004	0.001 U	0.45
EH-101	10/10/2024	110	14	64	0.05 U	0.003 U	0.003	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.002	0.001 U	0.01 U
EH-102	10/10/2024	120	16	73	0.05 U	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.007	0.001 U	0.01 U
EH-103	6/11/2024	180	27	732	2.24	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.317	0.001 U	0.01 U
EH-103	10/10/2024	180	27	732	2.45	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.286	0.001 U	0.01 U
EH-104	10/10/2024	250	67	376	2.5	0.003 U	0.002 U	0.001 U	0.001	0.02 U	0.005 U	0.01 U	0.001 U	0.112	0.001 U	0.01 U
EH-106	10/10/2024	200	47	587	1.46	0.003 U	0.044	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.009	0.001 U	0.01 U
EH-106 (Dup)	10/10/2024	200	47	587	1.46	0.003 U	0.044	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.009	0.001 U	0.01 U
EH-107	10/10/2024	180	29	294	0.25	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.21	0.001 U	0.082	0.001 U	0.01 U
EH-110	10/11/2024	190	41	126	0.12	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.033	0.001 U	0.01 U
EH-111	10/10/2024	190	30	698	1.4	0.003 U	2.21	0.001 U	0.001	0.02 U	0.005 U	8.92	0.001 U	0.176	0.001 U	0.01 U
EH-114 (Low-Flow)	6/12/2024	200	35	816	1.67	0.003 U	2.09	0.001 U	0.001	0.02 U	0.005 U	0.01 U	0.001 U	0.014	0.001 U	0.01 U
EH-114 (3 Vol Purge)	6/12/2024	200	36	789	1.61	0.003 U	1.86	0.001 U	0.001	0.02 U	0.005 U	0.01 U	0.001 U	0.015	0.001 U	0.01 U
EH-114 (Low Flow)	10/8/2024	190	36	796	1.78	0.003 U	1.82	0.001 U	0.002	0.02 U	0.005 U	0.01 U	0.001 U	0.014	0.001 U	0.01 U
EH-114 (3 Vol Purge)	10/8/2024	200	37	774	1.74	0.003 U	1.61	0.001 U	0.001	0.02 U	0.005 U	0.01 U	0.001 U	0.014	0.001 U	0.01 U
EH-115	6/13/2024	250	67	479	1.43	0.003 U	0.992	0.001 U	0.001	0.02 U	0.005 U	0.01 U	0.001 U	0.021	0.001 U	0.01 U
EH-115	10/10/2024	250	54	505	1.64	0.003 U	1.06	0.001 U	0.001	0.02 U	0.005 U	0.01 U	0.001 U	0.019	0.001 U	0.01 U
EH-117	10/9/2024	210	50	315	1.23	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.052	0.001 U	0.01 U
EH-119	10/9/2024	210	37	700	1.81	0.003 U	0.002 U	0.001 U	0.001	0.02 U	0.005 U	0.01 U	0.001 U	0.022	0.001 U	0.01 U
EH-120	6/11/2024	160	22	278	0.61	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.085	0.001 U	0.01 U
EH-120	10/9/2024	170	27	363	0.75	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.126	0.001 U	0.01 U
EH-121	10/11/2024	110	7	53	0.05 U	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.001 U	0.001 U	0.01 U
EH-123	10/9/2024	210	37	133	0.28	0.003 U	0.005	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.003	0.001 U	0.01 U
EH-124	6/11/2024	280	54	396	1.56	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.067	0.001 U	0.01 U
EH-124	10/9/2024	280	73	282	1.44	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.079	0.001 U	0.01 U
EH-125	10/9/2024	130	10	70	0.05	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.003	0.001 U	0.01 U
EH-126 (Low-Flow)	6/12/2024	250	34	268	0.91	0.003 U	0.003	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.108	0.001 U	0.01 U
EH-126 (3 Vol Purge)	6/12/2024	230	32	433	1.29	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.112	0.001 U	0.01 U
EH-126 (Low-Flow)	10/8/2024	250	33	227	0.79	0.003 U	0.003	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.076	0.001 U	0.01 U
EH-126 (3 Vol Purge)	10/8/2024	240	33	348	1.19	0.003 U	0.002	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.084	0.001 U	0.01 U
EH-129	6/11/2024	200	19	127	0.39	0.003 U	0.005	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.025	0.001 U	0.01 U
EH-129	10/9/2024	200	19	122	0.38	0.003 U	0.005	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.021	0.001 U	0.01 U
EH-130	10/9/2024	100	6	55	0.05 U	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.001 U	0.001 U	0.01 U
EH-130 (Dup)	10/9/2024	100	6	55	0.05 U	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.001 U	0.001 U	0.01 U
EH-132	10/9/2024	170	30	159	0.84	0.003 U	0.019	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.003	0.001 U	0.01 U
EH-134	6/11/2024	180	14	77	0.14	0.003 U	0.005	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.003	0.001 U	0.01 U
EH-134 (Dup)	6/11/2024	180	14	77	0.14	0.003 U	0.005	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.003	0.001 U	0.01 U
EH-134	10/9/2024	180	14	77	0.15	0.003 U	0.004	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.003	0.001 U	0.01 U
EH-135	10/9/2024	100	7	53	0.05 U	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.001 U	0.001 U	0.01 U
EH-138	6/11/2024	150	9	79	0.10	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.007	0.001 U	0.01 U
EH-138	10/9/2024	160	12	105	0.25	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.016	0.001 U	0.01 U
EH-139	6/11/2024	260	15	115	0.10	0.003 U	0.004	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.002	0.001 U	0.01 U
EH-139	10/9/2024	430	13	105	0.09	0.003 U	0.004	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.002	0.001 U	0.01 U

Station ID	Sample Date	Anions				Dissolved (D) Metals										
		Bicarbonate	Chloride	Sulfate	Bromide	Sb (D)	As (D)	Cd (D)	Cu (D)	Fe (D)	Pb (D)	Mn (D)	Hg (D)	Se (D)	Tl (D)	Zn (D)
EH-141 (Low-Flow)	6/12/2024	190	19	202	0.70	0.003 U	0.002	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.050	0.001 U	0.01 U
EH-141 (3 Vol Purge)	6/12/2024	190	19	202	0.70	0.003 U	0.002	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.052	0.001 U	0.01 U
EH-141 (Low-Flow)	10/8/2024	200	20	210	0.74	0.003 U	0.002	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.047	0.001 U	0.01 U
EH-141 (3 Vol Purge)	10/8/2024	200	20	212	0.75	0.003 U	0.002	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.047	0.001 U	0.01 U
EH-143	6/11/2024	140	8	76	0.11	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.008	0.001 U	0.01 U
EH-143	10/9/2024	130	7	58	0.05 U	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.002	0.001 U	0.01 U
EH-204	10/11/2024	310	70	593	1.66	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.054	0.001 U	0.01 U
EH-204 (Dup)	10/11/2024	320	70	587	1.66	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.050	0.001 U	0.01 U
EH-206	10/9/2024	260	68	76	0.15	0.003 U	0.024	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.002	0.001 U	0.01 U
EH-210	10/15/2024	170	35	274	3.23	0.003 U	0.002 U	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.091	0.001 U	0.01 U
MW-1	10/16/2024	140	15	86	0.15	0.003 U	0.004	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.002	0.001 U	0.01 U
MW-2	10/16/2024	310	30	199	0.21	0.003 U	0.013	0.001 U	0.001 U	0.02 U	0.005 U	0.48	0.001 U	0.001 U	0.001 U	0.01 U
MW-3	10/16/2024	300	53	264	0.36	0.003 U	0.013	0.001 U	0.002	0.02 U	0.005 U	0.07	0.001 U	0.009	0.001 U	0.01 U
MW-4	10/16/2024	200	9	66	0.07	0.003 U	0.003	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.001	0.001 U	0.01 U
MW-5	10/16/2024	180	6	63	0.06	0.003 U	0.007	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.003	0.001 U	0.01 U
MW-6	10/16/2024	300	50	376	0.32	0.003 U	0.028	0.001 U	0.001 U	0.02 U	0.005 U	0.18	0.001 U	0.008	0.001 U	0.01 U
MW-7	10/16/2024	110	2	32	0.05 U	0.003 U	0.018	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.001 U	0.001 U	0.01 U
MW-8	10/16/2024	190	11	77	0.08	0.003 U	0.007	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.001	0.001 U	0.01 U
MW-9	10/16/2024	190	10	59	0.07	0.003 U	0.007	0.001 U	0.001 U	0.06	0.005 U	0.01	0.001 U	0.001	0.001 U	0.01 U
MW-10	10/16/2024	300	16	132	0.12	0.003 U	0.008	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.003	0.001 U	0.01 U
MW-11	10/16/2024	140	24	181	0.23	0.003 U	0.017	0.001 U	0.001 U	0.02 U	0.005 U	0.01 U	0.001 U	0.003	0.001 U	0.01 U
PBTW-2	10/15/2024	300	22	375	1.62	0.003 U	2.55	0.001 U	0.002	0.23	0.005 U	2.11	0.001 U	0.027	0.001 U	0.45
SDMW-1	10/16/2024	320	25	428	1.94	0.012	2.62	1.27	0.001 U	0.05	0.005 U	3.47	0.001 U	0.003	0.001 U	0.01 U
SDMW-5	10/16/2024	100	12	203	0.48	0.003 U	9.05	0.392	0.009	6.09	0.005 U	2.86	0.001 U	0.001 U	0.044	3.57

NOTES: All concentrations in mg/L except as indicated.
U = value below reporting limit
NM = not measured
J = QC criterion exceeded (estimated value with low/high bias not indicated)
J- = QC criterion exceeded (estimated value with potential low bias)
J+ = QC criterion exceeded (estimated value with potential high bias)
UJ = QC criterion exceeded (estimated value below reporting limit)

Station ID	Sample Date	Depth To Water (ft)	Field Parameters				General Chemistry				Dissolved (D) Metals	
			pH (s.u.)	SC (μmhos/cm)	Diss O ₂ (mg/L)	Water Temp (°C)	Magnesium	Potassium	Chloride	Sulfate	As (D)	Se (D)
DH-6	1/23/2024	21.80	7.21	995	2.39	8.7	6	86	11	303	0.520	0.099
DH-6	2/20/2024	22.32	7.26	976	6.51	8.1	6	86	12	268	0.568	0.109
DH-6	3/19/2024	22.08	7.08	1035	3.06	8.7	6	95	12	299	0.529	0.128
DH-6 (Dup)	3/19/2024	22.08	7.08	1035	3.05	8.7	6	98	12	299	0.533	0.126
DH-15	1/23/2024	19.20	7.04	1006	0.16	9.0	20	5	10	389	<0.002	0.101
DH-15	2/20/2024	19.74	7.05	1008	0.19	8.8	19	5	10	363	<0.002	0.107
DH-15	3/19/2024	19.50	6.93	1003	0.16	9.2	18	5	10	358	<0.002	0.107
DH-52	1/23/2024	6.50	7.24	508	6.73	6.5	4	43	9	113	0.417	0.033
DH-52	2/20/2024	8.05	7.12	812	1.42	6.2	9	61	8	229	0.306	0.041
DH-52	3/19/2024	7.93	7.03	1055	0.84	7.5	13	78	10	351	0.270	0.044
DH-53	1/23/2024	9.01	7.07	435	4.00	7.3	7	25	8	90	0.122	0.013
DH-53	2/20/2024	10.81	7.05	504	0.53	6.8	8	26	7	108	0.116	0.038
DH-53	3/19/2024	10.64	6.99	546	1.74	7.3	9	30	7	124	0.111	0.038
DH-55	1/23/2024	81.00	7.28	3037	0.42	7.5	26	219	22	1390	0.096	0.207
DH-55	2/20/2024	81.09	7.36	2795	0.91	7.3	21	200	20	1170	0.105	0.178
DH-55 (Dup)	2/20/2024	81.09	7.36	2796	0.92	7.3	20	202	20	1190	0.108	0.179
DH-55	3/19/2024	80.99	7.31	2550	0.50	8.8	18	207	18	1020	0.112	0.162
DH-56	1/23/2024	No Access - Well Frozen										
DH-56	2/20/2024	No Access - Well Frozen										
DH-56	3/19/2024	84.48	7.60	3644	2.91	11.5	18	393	25	1480	0.419	0.293
EH-51	3/19/2024	17.11	6.81	395	6.80	8.6	6	24	12	66	0.030	0.003
EH-101	3/19/2024	17.40	6.81	352	2.43	8.5	6	18	9	60	0.003	0.002
EH-60	1/23/2024	25.49	5.70	1859	3.10	8.6	32	12	221	545	2.090	0.040
EH-60	2/20/2024	25.53	5.76	1869	2.53	8.9	31	12	204	536	1.960	0.042
EH-60	3/19/2024	24.95	5.69	1873	2.29	10.7	34	13	201	538	2.110	0.042
EH-103	1/23/2024	27.81	6.81	1670	0.28	9.8	45	6	28	776	<0.002	0.302
EH-103	2/20/2024	27.81	6.83	1679	0.92	10.3	42	6	28	707	<0.002	0.321
EH-103	3/19/2024	27.13	6.76	1688	0.10	11.2	47	7	27	744	<0.002	0.326
EH-110	1/23/2024	22.98	7.13	656	3.70	11.1	4	4	29	125	<0.002	0.022
EH-110 (Dup)	1/23/2024	22.98	7.13	655	3.63	11.1	4	5	29	125	<0.002	0.020
EH-110	2/20/2024	No Access - Well Buried										
EH-110	3/19/2024	22.40	7.04	663	3.79	10.8	4	6	31	119	<0.002	0.022

All concentrations in mg/L except as indicated.



APPENDIX A2

2024 RESIDENTIAL WELL WATER QUALITY DATABASE

			Field Parameters							General Chemistry					Major Ions							
Map Key (see Exhibit 1)	Sample Date	Depth To Water (ft)	pH (s.u.)	SC (µmhos/cm)	Diss O ₂ (mg/L)	ORP (mV)	E _H (mV)	Turbidity (NTU)	Water Temp (°C)	Lab pH (s.u.)	Lab SC (µmhos/cm)	Total Alkalinity as CaCO3	Total Suspended Solids	Total Dissolved Solids	Calcium	Magnesium	Sodium	Potassium	Bicarbonate	Chloride	Sulfate	Bromide
R1	6/12/2024		6.99	333	4.04	111	332	0.5	10.2	7.1	335	97	10 U	213	40	9	14	3	120	9	53	0.05 U
R1	10/10/2024		6.79	328	3.54	119	340	1.2	9.4	7.1	330	99	10 U	199	40	9	15	3	120	7	53	0.05 U
R2	6/12/2024		7.10	342	3.43	150	371	0.9	10.2	7.2	340	94	10 U	216	37	9	14	3	110	8	60	0.05 U
R2	9/16/2024		7.13	332	4.66	188	409	0.47	10.0	7.2	330	90	10 U	215	37	9	16	3	110	8	58	0.05 U
R3	6/11/2024		6.86	620	2.82	153	373	0.3	11.0	7.0	610	120	10 U	372	66	14	24	15	150	50	96	0.16
R3	10/9/2024		6.61	560	0.29	149	367	0.75	14.6	7.0	563	140	10 U	340	59	13	28	17	160	15	123	0.05 U
R4	6/11/2024		7.01	386	3.03	82	303	0.6	10.6	7.5	378	100	10 U	237	38	9	28	3	130	8	68	0.07
R4	10/9/2024		6.78	372	3.46	69	289	0.9	10.3	7.7	377	100	10 U	227	35	8	30	3	120	8	69	0.07
R4 (Dup)	10/9/2024		6.78	372	3.42	69	289	0.92	10.3	7.6	377	100	10 U	220	35	8	30	3	120	8	69	0.07
R5	6/12/2024		7.15	305	4.15	90	311	0.9	9.5	7.1	304	86	10 U	182	34	8	13	3	100	7	53	0.05 U
R5	10/9/2024		6.86	303	6.40	82	304	3.86	9.6	7.2	305	84	10 U	184	35	8	14	3	100	7	54	0.05 U
R6	6/12/2024		7.20	412	4.04	156	377	0.1	9.5	7.2	411	110	10 U	276	48	11	15	4	130	6	87	0.12
R6	10/9/2024		7.00	423	5.08	136	357	0.89	9.5	7.3	428	110	10 U	285	51	12	17	5	130	6	94	0.18
R7	6/13/2024	31.42	7.30	326	5.67	70	291	1.5	10.5	7.3	328	94	10 U	202	37	9	15	3	110	7	56	0.05 U
R7	10/8/2024	30.32	7.07	323	5.99	67	287	1.41	10.3	7.4	331	92	10 U	197	36	8	16	3	110	7	57	0.05 U
R8	6/13/2024	34.72	7.21	309	3.94	84	304	0.4	10.8	7.2	313	89	10 U	201	35	8	13	3	110	6	55	0.05 U
R8	10/8/2024		7.01	295	4.44	76	297	0.76	10.4	7.3	302	86	10 U	177	34	8	13	3	100	6	51	0.05 U
R9	6/12/2024		7.26	276	0.34	146	366	0.2	11.7	7.3	275	87	10 U	159	32	8	12	3	110	6	39	0.05 U
R9	10/8/2024	33.71	6.99	272	1.57	69	288	0.6	12.0	7.3	273	82	10 U	160	30	7	13	3	100	6	41	0.05 U
R10	6/11/2024		6.95	391	3.37	85	305	2.1	11.3	7.1	384	110	10 U	244	43	10	15	3	130	10	62	0.08
R10	10/8/2024		6.78	382	4.30	74	294	2.82	11.2	7.2	376	110	10 U	232	44	10	15	3	130	10	60	0.08
R11	6/12/2024		6.98	783	1.76	178	397	1.2	12.0	7.0	776	130	10 U	555	102	23	25	6	150	22	232	2.5
R11	10/9/2024		6.85	763	2.19	143	362	1.34	12.0	7.2	765	130	10 U	519	101	22	24	6	150	22	229	2.6
R12	6/11/2024	19.08	7.38	341	3.64	194	415	0.3	10.3	7.4	333	96	10 U	202	37	9	14	2	120	6	58	0.05 U
R12 (Dup)	6/11/2024	19.08	7.38	340	3.59	193	414	0.4	10.4	7.4	334	97	10 U	207	39	9	14	3	120	6	58	0.05 U
R12	10/10/2024	19.90	7.13	327	5.67	136	357	1.11	10.0	7.4	330	97	10 U	196	38	9	15	3	120	6	56	0.05 U
R13	6/12/2024	12.90	7.07	337	5.80	144	365	0.4	9.6	7.1	335	89	10 U	217	37	9	13	3	110	9	59	0.05 U
R13	10/10/2024	14.35	6.81	311	3.63	102	324	1.59	8.8	7.1	313	94	10 U	186	35	8	14	3	110	7	49	0.05 U
R14	6/11/2024		7.19	330	5.39	159	379	0.5	11.8	7.4	321	95	10 U	195	37	9	14	3	120	9	47	0.05 U
R14	10/9/2024		6.86	310	7.55	148	368	1.34	10.9	7.3	318	90	10 U	196	36	9	15	3	110	8	51	0.05 U
R15	6/11/2024		7.14	318	8.52	142	363	0.5	9.7	7.3	307	91	10 U	196	35	8	12	3	110	7	49	0.05 U
R15	10/9/2024		6.90	298	8.90	131	352	0.93	10.0	7.3	306	89	10 U	180	34	8	14	3	110	7	50	0.05 U
R16	6/11/2024		7.11	306	6.22	151	373	0.3	9.0	7.1	301	86	10 U	193	33	8	13	3	100	6	51	0.05 U
R16	10/9/2024		6.82	292	8.78	149	371	0.61	9.2	7.2	302	85	10 U	181	34	8	14	3	100	7	51	0.05 U

NOTES: All concentrations in mg/L except as indicated.

U = value below reporting limit

Locations shown on Exhibit 1

		Dissolved (D) and Total (T) Metals																					
Map Key (see Exhibit 1)	Sample Date	Sb (D)	Sb (T)	As (D)	As (T)	Cd (D)	Cd (T)	Cu (D)	Cu (T)	Fe (D)	Fe (T)	Pb (D)	Pb (T)	Mn (D)	Mn (T)	Hg (D)	Hg (T)	Se (D)	Se (T)	Tl (D)	Tl (T)	Zn (D)	Zn (T)
R1	6/12/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.011	0.012	0.03	0.07	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R1	10/10/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.01	0.010	0.02 U	0.05	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R2	6/12/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001	0.02 U	0.04	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R2	9/16/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001	0.001 U	0.02 U	0.02 U	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R3	6/11/2024	0.003	0.003	0.002 U	0.002 U	0.001 U	0.001 U	0.031	0.033	0.02 U	0.02 U	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.008	0.007	0.001 U	0.001 U	0.02	0.02
R3	10/9/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.024	0.026	0.02 U	0.02 U	0.005 U	0.005 U	0.23	0.23	0.001 U	0.001 U	0.002	0.002	0.001 U	0.001 U	0.01 U	0.01 U
R4	6/11/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.02	0.07	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.002	0.002	0.001 U	0.001 U	0.01 U	0.01 U
R4	10/9/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.02	0.04	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001	0.002	0.001 U	0.001 U	0.01 U	0.01 U
R4 (Dup)	10/9/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.02	0.04	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.002	0.002	0.001 U	0.001 U	0.01 U	0.01 U
R5	6/12/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.02 U	0.07	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01	0.01
R5	10/9/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.02	0.36	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.02	0.02
R6	6/12/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.002	0.001	0.02 U	0.02 U	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.002	0.002	0.001 U	0.001 U	0.01 U	0.01 U
R6	10/9/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.002	0.002	0.02 U	0.02 U	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.002	0.002	0.001 U	0.001 U	0.01 U	0.01 U
R7	6/13/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001	0.002	0.02 U	0.17	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R7	10/8/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001	0.001 U	0.02 U	0.21	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U	0.001 U	0.01 U	0.01 U
R8	6/13/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001	0.002	0.02 U	0.02 U	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R8	10/8/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.02 U	0.09	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R9	6/12/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.002	0.001 U	0.02 U	0.02	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R9	10/8/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.02 U	0.03	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R10	6/11/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.005	0.008	0.04	0.42	0.005 U	0.005 U	0.02	0.02	0.001 U	0.001 U	0.001	0.001	0.001 U	0.001 U	0.01	0.01
R10	10/8/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.003	0.009	0.20	0.79	0.005 U	0.005 U	0.07	0.07	0.001 U	0.001 U	0.001	0.001	0.001 U	0.001 U	0.02	0.02
R11	6/12/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.002	0.003	0.02 U	0.07	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.044	0.043	0.001 U	0.001 U	0.02	0.02
R11	10/9/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.004	0.004	0.02 U	0.07	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.040	0.041	0.001 U	0.001 U	0.01	0.01
R12	6/11/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.010	0.010	0.02 U	0.02	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R12 (Dup)	6/11/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.010	0.010	0.02 U	0.02	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R12	10/10/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.010	0.010	0.02 U	0.03	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R13	6/12/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001	0.02 U	0.22	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01
R13	10/10/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.003	0.002	0.06	0.44	0.005 U	0.005 U	0.01 U	0.01	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.02	0.02
R14	6/11/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.002	0.02 U	0.02 U	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R14	10/9/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.02 U	0.02 U	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R15	6/11/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.02 U	0.02 U	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R15	10/9/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.02 U	0.02 U	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01 U	0.01 U
R16	6/11/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001	0.003	0.02 U	0.02 U	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01	0.01
R16	10/9/2024	0.003 U	0.003 U	0.002 U	0.002 U	0.001 U	0.001 U	0.002	0.002	0.02 U	0.02 U	0.005 U	0.005 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.01	0.01

NOTES: All concentrations in mg/L except as indicated.
U = value below reporting limit
Locations shown on Exhibit 1



APPENDIX A3

2024 SURFACE

WATER QUALITY DATABASE

2024 Surface Water Quality Database -- East Helena Facility

Station ID	Sample Date	Water Elevation (ft AMSL)*	Field pH (s.u.)	Field SC (µmhos/cm)	Diss O2 (mg/L)	Water Temp (°C)	Flow (cfs)	Lab pH (s.u.)	Lab SC (µmhos/cm)	Total Alkalinity as CaCO3	Total Dissolved Solids	Total Suspended Solids	Ca (TR)	Mg (TR)	Na (TR)	K (TR)
PPC-3A	6/12/2024	3927.66	7.94	207	8.34	15.2	81.7	8.0	208	64	129	10 U	23	6	9	2
PPC-3A	10/8/2024	3926.92	8.32	302	9.74	11.8	19.4	8.2	358	100	214	10 U	41	9	18	3
PPC-4A	6/12/2024	3910.58	8.09	206	8.50	14.4	86	8.0	208	64	137	10 U	23	6	10	2
PPC-4A	10/8/2024	3910.21	8.25	302	10.00	11.5	18.8	8.3	358	100	205	10 U	40	9	18	3
PPC-5A	6/12/2024	3902.81	8.08	206	8.54	13.9	82.4	8.0	208	64	131	10 U	22	5	10	2
PPC-5A	6/12/2024	3902.81	8.08	206	8.55	13.9	82.4	8.0	209	64	130	10 U	21	5	10	2
PPC-5A	10/8/2024	3902.03	8.20	302	10.24	10.6	17.9	8.2	359	100	226	10 U	40	9	18	3
PPC-7	6/12/2024	3882.32	8.09	207	8.41	13.3	83.3	8.0	209	64	126	11	22	5	9	2
PPC-7	10/8/2024	3881.53	8.08	302	10.51	9.6	18.9	8.3	360	110	228	10 U	40	9	18	3
PPC-8	6/12/2024	3868.31	Elevation Measurement Only - No Water Quality Sampling													
PPC-8	10/8/2024	3868.07	Elevation Measurement Only - No Water Quality Sampling													
PPC-36A	6/12/2024	3855.34	8.09	207	8.57	12.7	55.8	8.0	210	65	129	11	24	6	10	2
PPC-36A	10/8/2024	3854.77	8.27	303	10.58	8.2	17.2	8.2	360	110	227	10 U	40	9	18	3
PPC-9A	6/12/2024	3845.77	Elevation Measurement Only - No Water Quality Sampling													
PPC-9A	10/8/2024	3845.43	Elevation Measurement Only - No Water Quality Sampling													
SG-16	6/12/2024	3766.37	8.09	211	8.64	12.6	41.5	8.0	215	65	129	11	25	6	10	2
SG-16	10/8/2024	3766.14	8.11	306	10.79	7.6	12.6	8.2	363	100	224	10 U	40	9	18	3
SG-16	10/8/2024	3766.14	8.12	306	10.79	7.6	12.6	8.2	362	100	222	10 U	40	9	18	3
Trib-1	6/12/2024	3918.14	7.26	370 J-	2.25	18.8	0.17 J	7.4	508	200	306	10 U	64	16	25	4
Trib-1	10/8/2024	3918.03	7.54	452	5.98	10.8	0.036	7.6	535	190	321	10 U	67	17	24	4
Trib-1B	6/12/2024	Site Dry - No Sample														
Trib-1B	10/8/2024	Site Dry - No Sample														
Trib-1D	6/12/2024	3905.30	7.59	433	4.98	19.8	0.002	7.7	431	110	282	10 U	41	17	26	1 U
Trib-1D	10/8/2024	Site Dry - No Sample														

NOTES: All concentrations in mg/L except as indicated
(TR) = total recoverable
U = value below reporting limit
J = estimated value; J- = estimated value with potential low bias; J+ = estimated value with potential high bias
*Elevations measured in conjunction with groundwater static water levels on 6/10/2024 and 10/7/2024

2024 Surface Water Quality Database -- East Helena Facility

Station ID	Sample Date	HCO3	Cl	SO4	Sb (TR)	As (TR)	Cd (TR)	Cu (TR)	Fe (TR)	Pb (TR)	Mn (TR)	Hg (TR)	Se (TR)	Tl (TR)	Zn (TR)
PPC-3A	6/12/2024	78	4	30	0.0005 U	0.004	0.00020	0.003	0.37	0.0047	0.04	0.000009	0.001 U	0.0002 U	0.043
PPC-3A	10/8/2024	130	8	62	0.0005 U	0.005	0.00010	0.002 U	0.15	0.0016	0.03	0.000005 U	0.001 U	0.0002 U	0.038
PPC-4A	6/12/2024	78	4	30	0.0005 U	0.004	0.00018	0.003	0.37	0.0048	0.04	0.000008	0.001 U	0.0002 U	0.046
PPC-4A	10/8/2024	120	8	61	0.0005 U	0.005	0.00010	0.002 U	0.15	0.0016	0.03	0.000005 U	0.001 U	0.0002 U	0.037
PPC-5A	6/12/2024	78	4	30	0.0005 U	0.004	0.00022	0.003	0.36	0.0054	0.04	0.000009	0.001 U	0.0002 U	0.046
PPC-5A	6/12/2024	77	4	30	0.0005 U	0.004	0.00022	0.003	0.38	0.0050	0.04	0.000008	0.001 U	0.0002 U	0.046
PPC-5A	10/8/2024	130	8	62	0.0005 U	0.005	0.00011	0.002 U	0.17	0.0017	0.04	0.000005 U	0.001 U	0.0002 U	0.036
PPC-7	6/12/2024	78	4	30	0.0005 U	0.004	0.00024	0.004	0.40	0.0059	0.05	0.000009	0.001 U	0.0002 U	0.046
PPC-7	10/8/2024	130	8	62	0.0005 U	0.005	0.00011	0.002 U	0.18	0.0019	0.04	0.000005 U	0.001 U	0.0002 U	0.036
PPC-8	6/12/2024														
PPC-8	10/8/2024														
PPC-36A	6/12/2024	79	4	31	0.0005 U	0.004	0.00022	0.004	0.42	0.0058	0.05	0.000008	0.001 U	0.0002 U	0.048
PPC-36A	10/8/2024	130	8	62	0.0005 U	0.005	0.00011	0.002	0.16	0.0019	0.03	0.000005 U	0.001 U	0.0002 U	0.035
PPC-9A	6/12/2024														
PPC-9A	10/8/2024														
SG-16	6/12/2024	79	5	32	0.0005 U	0.004	0.00029	0.005	0.47	0.0069	0.05	0.00001	0.001 U	0.0002 U	0.050
SG-16	10/8/2024	130	8	62	0.0005 U	0.005	0.00011	0.002	0.14	0.0017	0.02	0.000005 U	0.001 U	0.0002 U	0.032
SG-16	10/8/2024	120	8	62	0.0005 U	0.005	0.00010	0.004	0.14	0.0018	0.02	0.000005 U	0.001 U	0.0002 U	0.031
Trib-1	6/12/2024	240	10	53	0.0005	0.011	0.00008	0.002 U	0.33	0.0054	0.13	0.000018	0.001 U	0.0002 U	0.008 U
Trib-1	10/8/2024	230	13	66	0.0008	0.005	0.00025	0.002 U	0.27	0.0116	0.03	0.00004 J+	0.001 U	0.0002 U	0.008 U
Trib-1B	6/12/2024	Site Dry - No Sample													
Trib-1B	10/8/2024	Site Dry - No Sample													
Trib-1D	6/12/2024	130	5	100	0.0007	0.008	0.00022	0.006	0.68	0.0026	0.58	0.000010	0.001 U	0.0002 U	0.014
Trib-1D	10/8/2024	Site Dry - No Sample													

NOTES: All concentrations in mg/L except as indicated
(TR) = total recoverable
U = value below reporting limit
J = estimated value; J- = estimated value with potential low bias; J+ = estimated value with potential high bias



APPENDIX B

2024 GROUNDWATER ELEVATION DATA

**2024 PROJECT-WIDE GROUNDWATER LEVEL MEASUREMENTS
EAST HELENA PROJECT**

Page 1 of 4

		Depth to Water		Groundwater Elevation	
SiteID	MP Elevation	Jun-24	Oct-24	Jun-24	Oct-24
2843 Canyon Ferry	Not Available	30.47	29.19	Not Calculated	Not Calculated
2853 Canyon Ferry	Not Available	31.62	30.4	Not Calculated	Not Calculated
ASIW-1	3915.99	18.47	19.98	3897.52	3896.01
ASIW-2	3909.13	37.72	36.78	3871.41	3872.35
Dartman	3863.03	26.34	28.59	3836.69	3834.44
DH-1	3910.89	42.88	43.62	3868.01	3867.27
DH-2	3936.91	60.92	61.32	3875.99	3875.59
DH-3	3947.48	30.66	31.74	3916.82	3915.74
DH-4	3917.26	14.62	15.08	3902.64	3902.18
DH-5	3921.18	17.8	18.22	3903.38	3902.96
DH-6	3892.32	21.09	22.46	3871.23	3869.86
DH-7	3898.66	17.35	18.2	3881.31	3880.46
DH-8	3923.38	51.52	51.81	3871.86	3871.57
DH-9	3918.08	DRY	DRY	DRY	DRY
DH-10A	3886.97	8.83	10.89	3878.14	3876.08
DH-13	3923.91	51.32	52.15	3872.59	3871.76
DH-14	3916.06	13.68	14.23	3902.38	3901.83
DH-15	3889.82	18.65	19.84	3871.17	3869.98
DH-17	3917.56	48.58	49.59	3868.98	3867.97
DH-18	3924.93	49.29	49.7	3875.64	3875.23
DH-20	3927.09	17.96	18.99	3909.13	3908.10
DH-22	3948.63	DRY	DRY	DRY	DRY
DH-23	3931.82	DRY	DRY	DRY	DRY
DH-27	3946.21	55.42	55.79	3890.79	3890.42
DH-30	3943.24	51.31	52.07	3891.93	3891.17
DH-36	3920.66	45.91	DRY	3874.75	DRY
DH-42	3942.63	48.75	49.68	3893.88	3892.95
DH-47	3926.82	20.43	21.97	3906.39	3904.85
DH-52	3889.18	7.16	8.61	3882.02	3880.57
DH-53	3892.87	9.96	11.58	3882.91	3881.29
DH-55	3972.76	80.89	81.56	3891.87	3891.20
DH-56	3958.17	83.71	85.12	3874.46	3873.05
DH-57	3929.53	DRY	DRY	DRY	DRY
DH-58	3919.33	43.79	44.8	3875.54	3874.53
DH-59	3937.44	43.69	45.97	3893.75	3891.47
DH-5A	3921.92	18.38	19.01	3903.54	3902.91
DH-61	3926.84	DRY	DRY	DRY	DRY
DH-62	3926.95	56.41	56.5	3870.54	3870.45
DH-65	3945.85	63.67	65.17	3882.18	3880.68
DH-66	3919.28	51.47	52.39	3867.81	3866.89
DH-67	3899.77	35.09	36.04	3864.68	3863.73
DH-68	3943.28	44.97	45.4	3898.31	3897.88
DH-69	3934.45	35.7	36.08	3898.75	3898.37

**2024 PROJECT-WIDE GROUNDWATER LEVEL MEASUREMENTS
EAST HELENA PROJECT**

Page 2 of 4

		Depth to Water		Groundwater Elevation	
SiteID	MP Elevation	Jun-24	Oct-24	Jun-24	Oct-24
DH-70	3933.91	33.46	33.92	3900.45	3899.99
DH-71	3944.88	DRY	DRY	DRY	DRY
DH-72	3939.67	43.52	44.34	3896.15	3895.33
DH-73	3918.08	39.71	40.78	3878.37	3877.30
DH-74	4006.44	124.39	126.09	3882.05	3880.35
DH-75	4006.54	124.85	126.48	3881.69	3880.06
DH-76	3973.10	77.68	78.1	3895.42	3895.00
DH-77	3932.20	53.88	54.1	3878.32	3878.10
DH-78	3921.12	52.43	52.93	3868.69	3868.19
DH-79	3928.80	54.51	55.34	3874.29	3873.46
DH-80	3942.36	49.09	50.01	3893.27	3892.35
DH-82	3908.18	42.83	43.28	3865.35	3864.90
DH-83	3922.14	52.04	52.5	3870.10	3869.64
East-PZ-1	3911.93	25.73	26.44	3886.20	3885.49
East-PZ-2	3924.58	25.26	26.13	3899.32	3898.45
East-PZ-4	3935.66	20.17	20.73	3915.49	3914.93
East-PZ-6	3943.83	21.97	22.66	3921.86	3921.17
East-PZ-7	3928.83	18.91	19.38	3909.92	3909.45
EH-50	3889.39	29.02	29.89	3860.37	3859.50
EH-51	3880.09	16.41	17.45	3863.68	3862.64
EH-52	3880.50	7.83	8.79	3872.67	3871.71
EH-53	3872.82	28.65	29.9	3844.17	3842.92
EH-54	3869.66	8.22	9.85	3861.44	3859.81
EH-58	3888.15	14.46	15.07	3873.69	3873.08
EH-59	3876.57	8.24	8.94	3868.33	3867.63
EH-60	3888.46	24.65	26.66	3863.81	3861.80
EH-61	3889.77	26.39	27.3	3863.38	3862.47
EH-62	3875.07	25.31	27.68	3849.76	3847.39
EH-63	3878.32	21.16	22.62	3857.16	3855.70
EH-65	3879.96	26.39	28.01	3853.57	3851.95
EH-66	3869.48	27.07	30.15	3842.41	3839.33
EH-67	3869.46	23.95	27.37	3845.51	3842.09
EH-68	3867.60	10.01	11.15	3857.59	3856.45
EH-69	3869.10	19.37	19.39	3849.73	3849.71
EH-70	3863.48	34.47	36.44	3829.01	3827.04
EH-100	3889.83	29.54	30.35	3860.29	3859.48
EH-101	3879.95	16.63	17.1	3863.32	3862.85
EH-102	3880.45	9.26	10.00	3871.19	3870.45
EH-103	3890.54	27.01	27.92	3863.53	3862.62
EH-104	3887.83	36.32	37.06	3851.51	3850.77
EH-106	3882.07	30.19	30.99	3851.88	3851.08
EH-107	3880.15	23.03	24.16	3857.12	3855.99
EH-110	3884.05	22.21	23.1	3861.84	3860.95
EH-111	3876.50	30.76	31.53	3845.74	3844.97

**2024 PROJECT-WIDE GROUNDWATER LEVEL MEASUREMENTS
EAST HELENA PROJECT**

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		Depth to Water		Groundwater Elevation	
SiteID	MP Elevation	Jun-24	Oct-24	Jun-24	Oct-24
EH-114	3878.07	34.16	34.87	3843.91	3843.20
EH-115	3883.29	36.44	37.18	3846.85	3846.11
EH-117	3871.33	29.19	31.41	3842.14	3839.92
EH-119	3873.75	34.79	35.42	3838.96	3838.33
EH-120	3865.78	30.47	32.15	3835.31	3833.63
EH-121	3869.49	27.57	30.58	3841.92	3838.91
EH-122	3868.08	23.35	26.69	3844.73	3841.39
EH-123	3885.71	44.38	45.74	3841.33	3839.97
EH-124	3874.46	38.24	38.72	3836.22	3835.74
EH-125	3863.22	35.15	36.96	3828.07	3826.26
EH-126	3870.00	56.73	56.12	3813.27	3813.88
EH-127	3860.75	28.22	32	3832.53	3828.75
EH-128	3892.17	DRY	DRY	DRY	DRY
EH-129	3870.21	57.99	56.68	3812.22	3813.53
EH-130	3858.55	46.4	46.9	3812.15	3811.65
EH-131	3834.44	34.83	35.4	3799.61	3799.04
EH-132	3893.90	60.73	60.64	3833.17	3833.26
EH-133	3884.36	57.31	57.01	3827.05	3827.35
EH-134	3870.21	58.03	56.69	3812.18	3813.52
EH-135	3852.25	28.78	31.48	3823.47	3820.77
EH-136	3838.59	30.66	32.69	3807.93	3805.90
EH-137	3839.66	36.85	38.88	3802.81	3800.78
EH-138	3839.70	47.52	46.08	3792.18	3793.62
EH-139	3839.78	54.23	51.48	3785.55	3788.30
EH-140	3812.08	26.05	25.38	3786.03	3786.70
EH-141	3813.32	33.66	32.52	3779.66	3780.80
EH-142	3804.68	34.03	32.95	3770.65	3771.73
EH-143	3803.37	34.65	33.71	3768.72	3769.66
EH-144D	3778.86	24.09	22.4	3754.77	3756.46
EH-144M	3778.95	26.84	24.9	3752.11	3754.05
EH-144S	3778.70	28.51	26.34	3750.19	3752.36
EH-145D	3789.60	31.18	29.81	3758.42	3759.79
EH-145S	3790.09	32.16	30.92	3757.93	3759.17
EH-200	3953.33	27.75	28.18	3925.58	3925.15
EH-201	3973.48	74.68	73.74	3898.80	3899.74
EH-202	3930.56	64.78	64.67	3865.78	3865.89
EH-203	4003.92	100.82	100.63	3903.10	3903.29
EH-204	3925.69	56.5	56.4	3869.19	3869.29
EH-205	3900.66	35.42	36.19	3865.24	3864.47
EH-206	3898.10	48.62	48.7	3849.48	3849.40
EH-208	3910.58	54.36	54.53	3856.22	3856.05
EH-209	3898.34	39.5	40.4	3858.84	3857.94
EH-210	3901.19	37.36	37.9	3863.83	3863.29
EH-211	3905.75	49.63	49.66	3856.12	3856.09

**2024 PROJECT-WIDE GROUNDWATER LEVEL MEASUREMENTS
EAST HELENA PROJECT**

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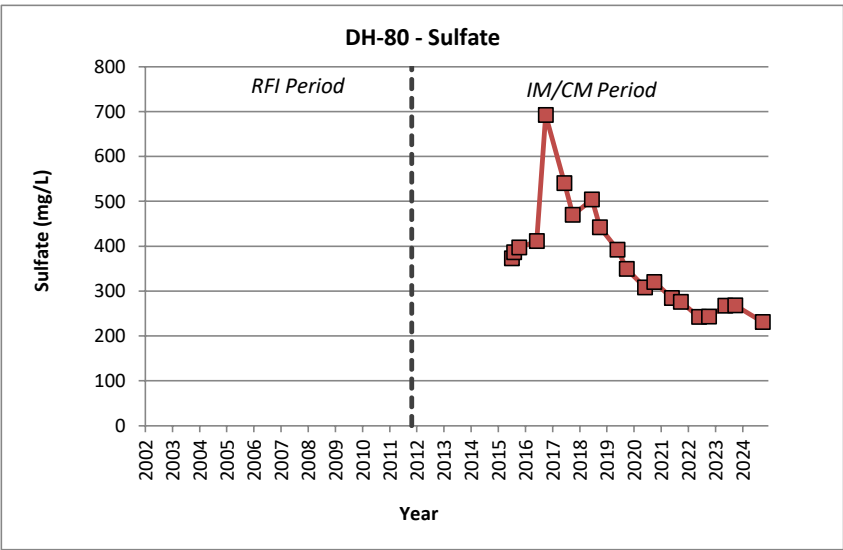
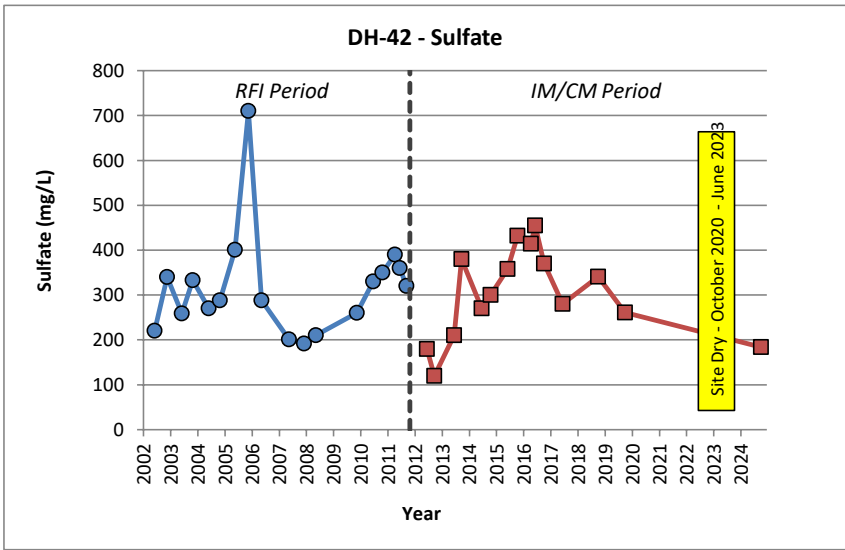
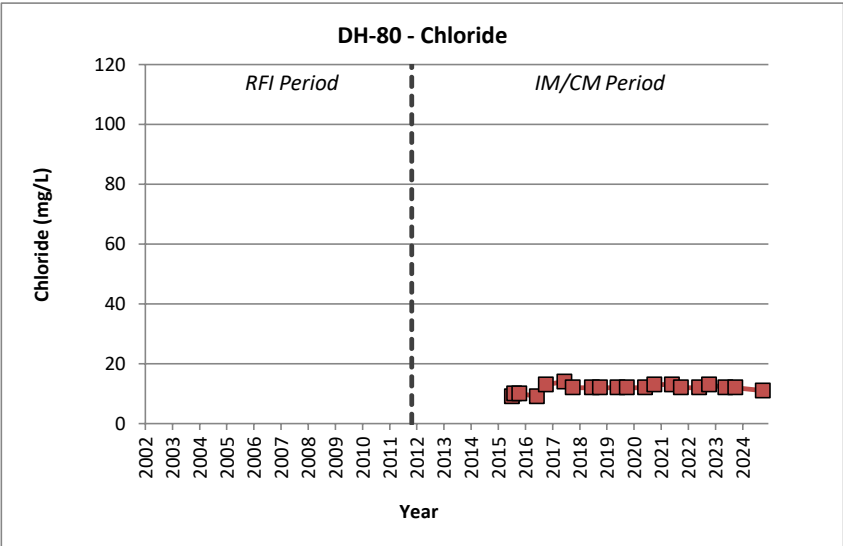
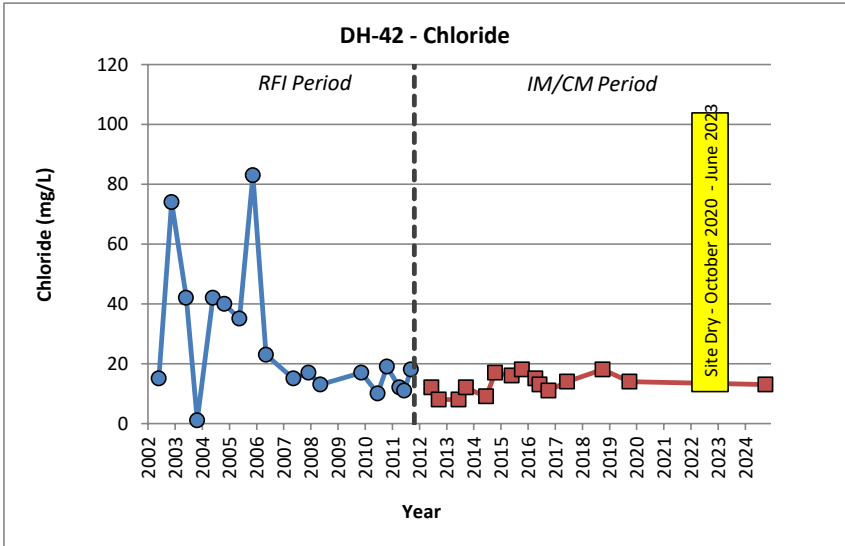
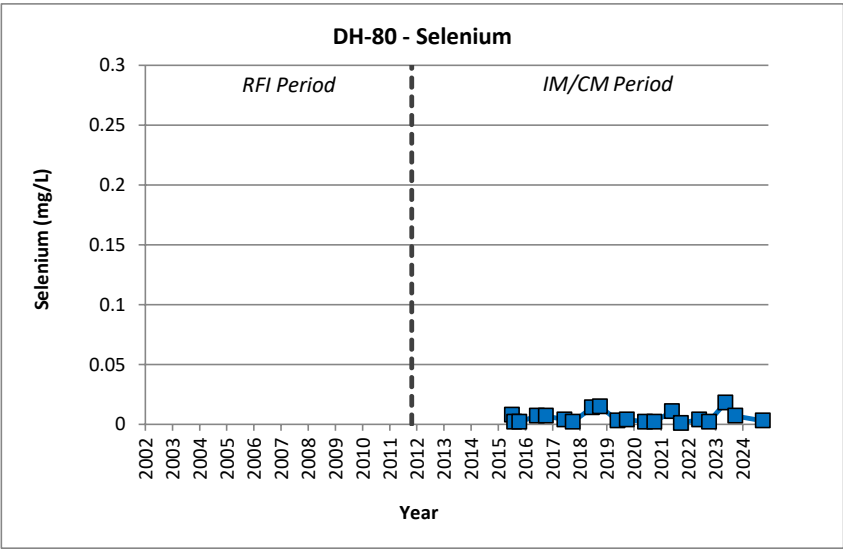
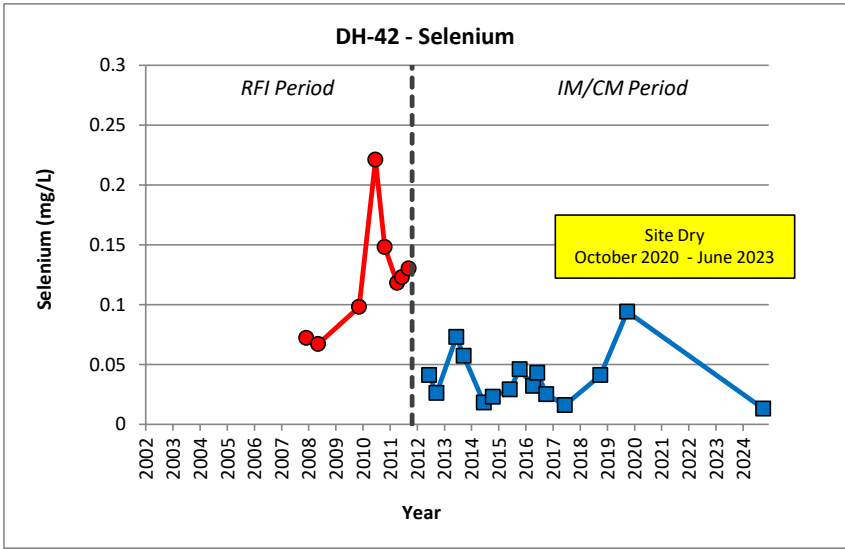
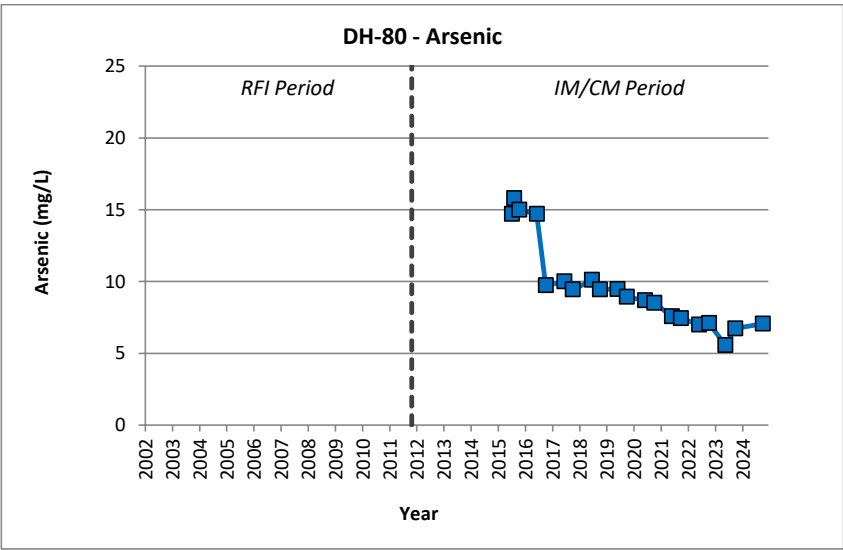
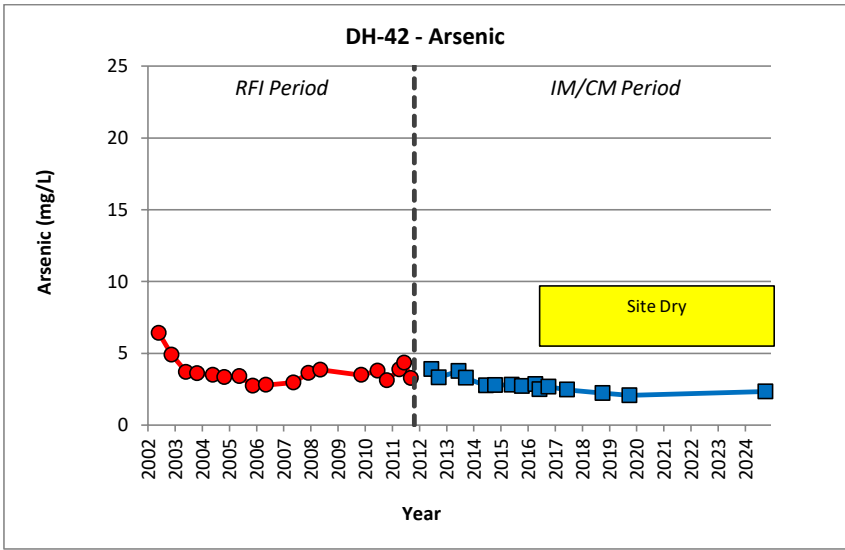
		Depth to Water		Groundwater Elevation	
SiteID	MP Elevation	Jun-24	Oct-24	Jun-24	Oct-24
EH-212	3905.90	49.81	49.82	3856.09	3856.08
EHMW-3	3825.45	44.65	43.96	3780.80	3781.49
EHTW-3	3827.66	46.1	45.16	3781.56	3782.50
IW-01	3888.28	65.95	65.66	3822.33	3822.62
IW-02	3871.08	52.1	51.6	3818.98	3819.48
MW-1	3953.05	52.19	52.23	3900.86	3900.82
MW-2	3945.97	39.95	40.99	3906.02	3904.98
MW-3	3940.95	35.24	36.37	3905.71	3904.58
MW-4	3947.06	48.93	49.06	3898.13	3898.00
MW-5	3956.18	53.7	53.78	3902.48	3902.40
MW-6	3938.14	31.72	32.8	3906.42	3905.34
MW-7	3963.67	53.72	53.35	3909.95	3910.32
MW-8	3958.65	52.17	52.81	3906.48	3905.84
MW-9	3959.01	51.36	51.8	3907.65	3907.21
MW-10	3946.28	43.59	45.4	3902.69	3900.88
MW-11	3973.33	62.44	62.36	3910.89	3910.97
PBTW-1	3914.59	45.84	46.89	3868.75	3867.70
PBTW-2	3906.73	38.53	39.54	3868.20	3867.19
Plant Road Test Well	3838.72	58.19	57.95	3780.53	3780.77
PPCRPZ-02	3919.76	7.41	8.43	3912.35	3911.33
PRB-1	3918.37	49.96	50.95	3868.41	3867.42
PRB-2	3905.34	36.41	37.47	3868.93	3867.87
PRB-3	3919.19	50.9	51.82	3868.29	3867.37
PZ-36A	3858.96	10.93	14.69	3848.03	3844.27
PZ-36B	3858.75	9.86	DRY	3848.89	DRY
PZ-36C	3859.60	9.94	DRY	3849.66	DRY
PZ-9A	3850.70	DRY	DRY	DRY	DRY
PZ-9B	3849.43	12.31	14.09	3837.12	3835.34
SC-1	3890.42	32.37	32.96	3858.05	3857.46
SDMW-1	3925.11	51.3	52.17	3873.81	3872.94
SDMW-2	3928.09	53.89	54.59	3874.20	3873.50
SDMW-3	3935.14	53.19	53.69	3881.95	3881.45
SDMW-4	3936.10	51.63	52.04	3884.47	3884.06
SDMW-5	3929.86	54.66	55.25	3875.20	3874.61
TW-1	3930.10	51.7	52.22	3878.40	3877.88
TW-2	3931.44	53.26	53.72	3878.18	3877.72
ULM-PZ-1	3924.40	5.56	6.11	3918.84	3918.29
ULTP-1	3919.63	5.08	6.68	3914.55	3912.95
ULTP-2	3921.23	5.44	8.12	3915.79	3913.11

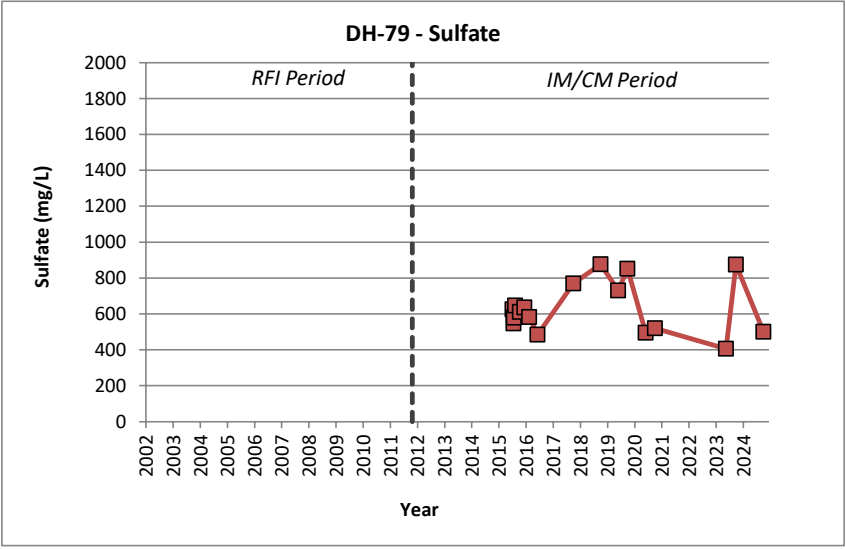
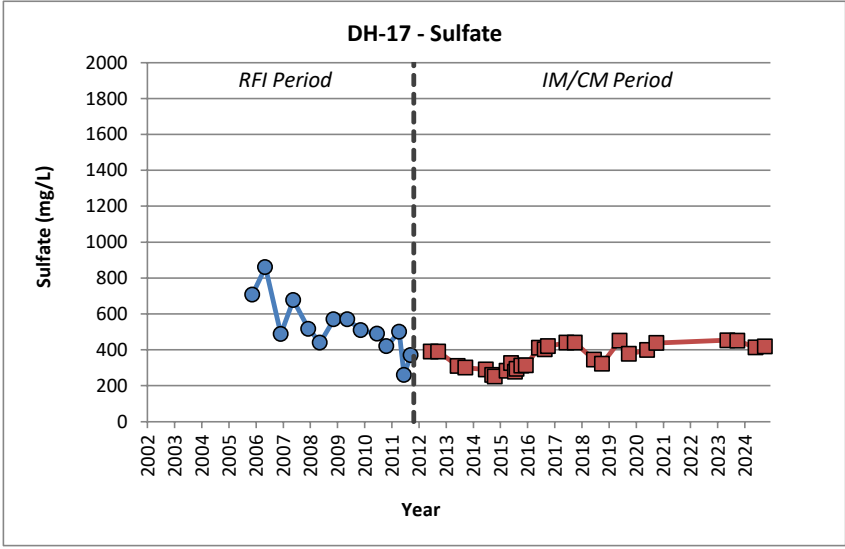
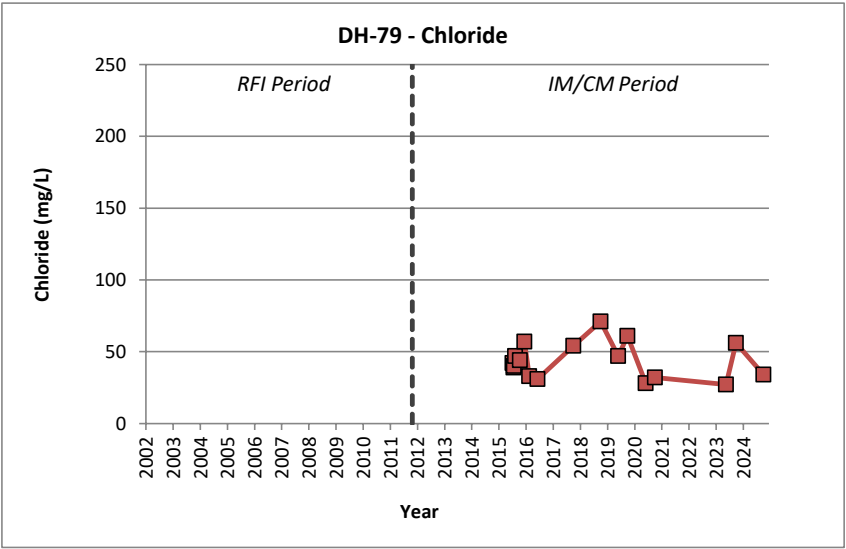
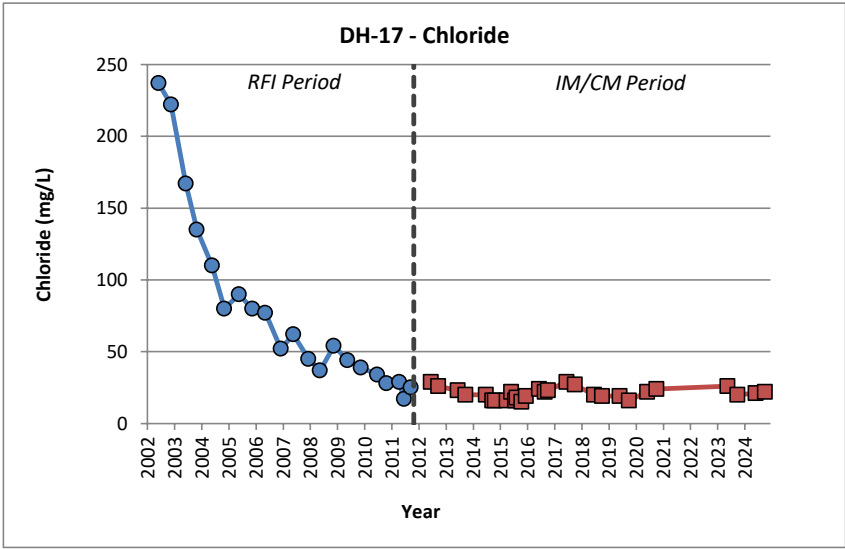
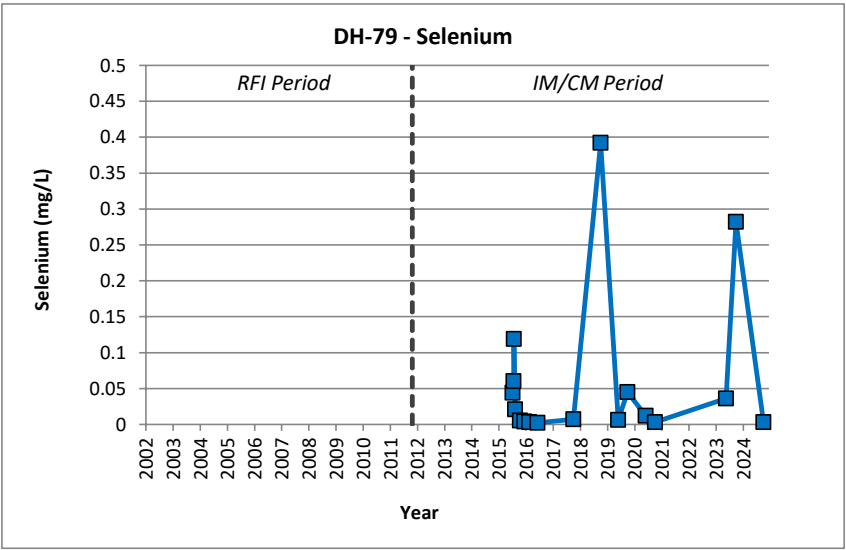
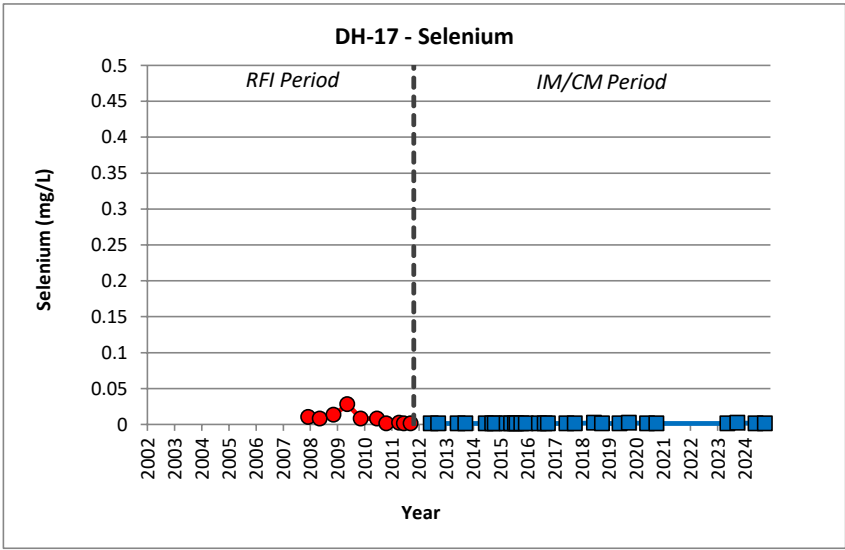
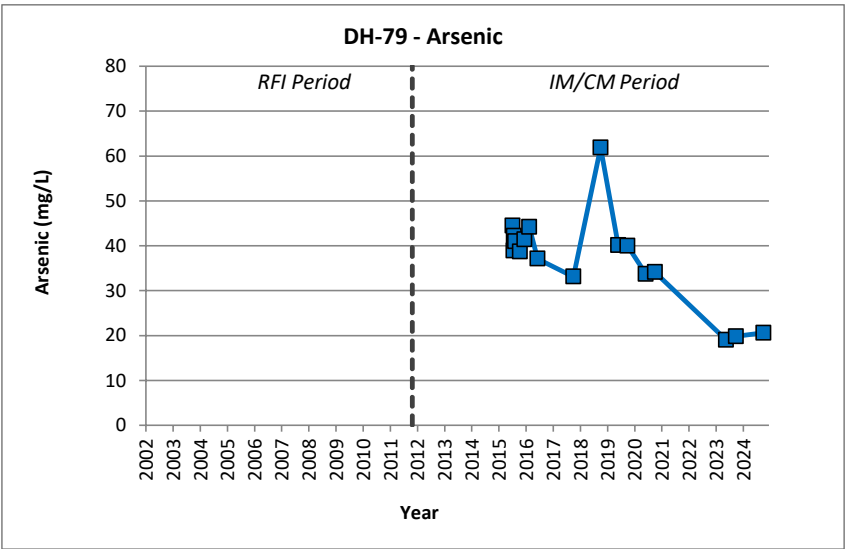
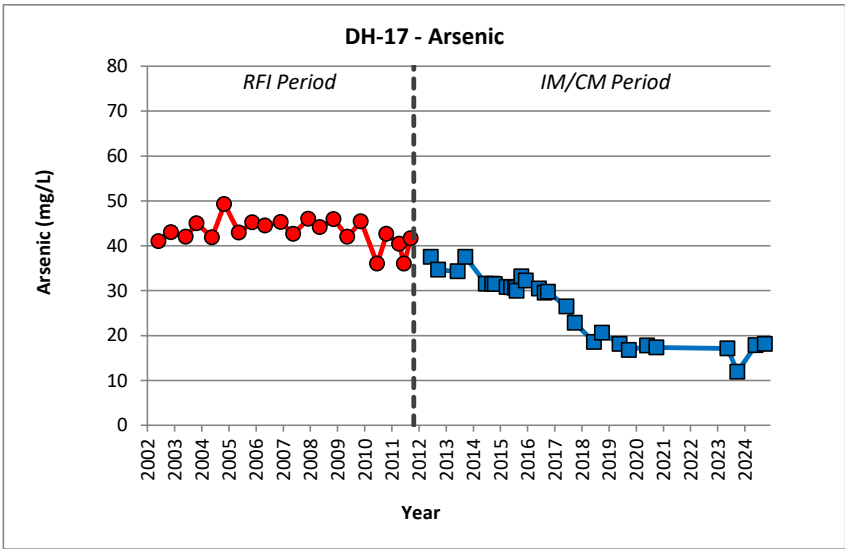
All measurements in feet; elevations relative to mean sea level.

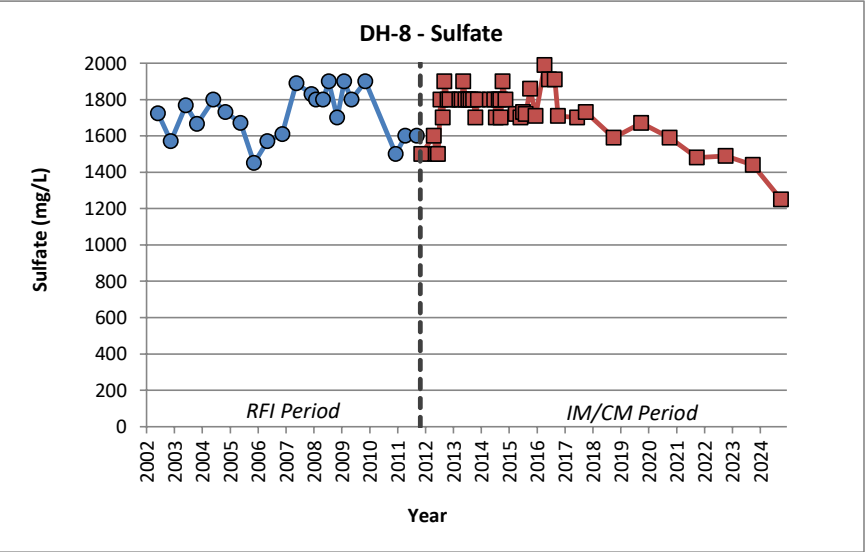
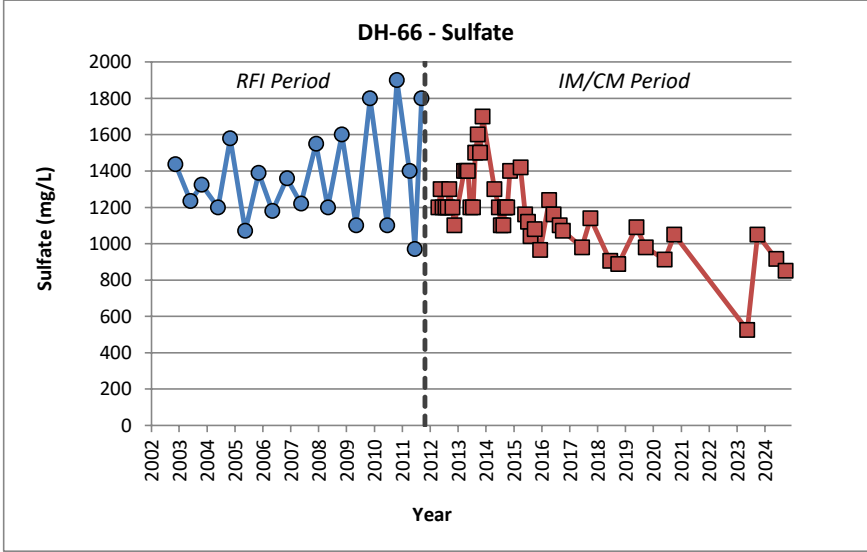
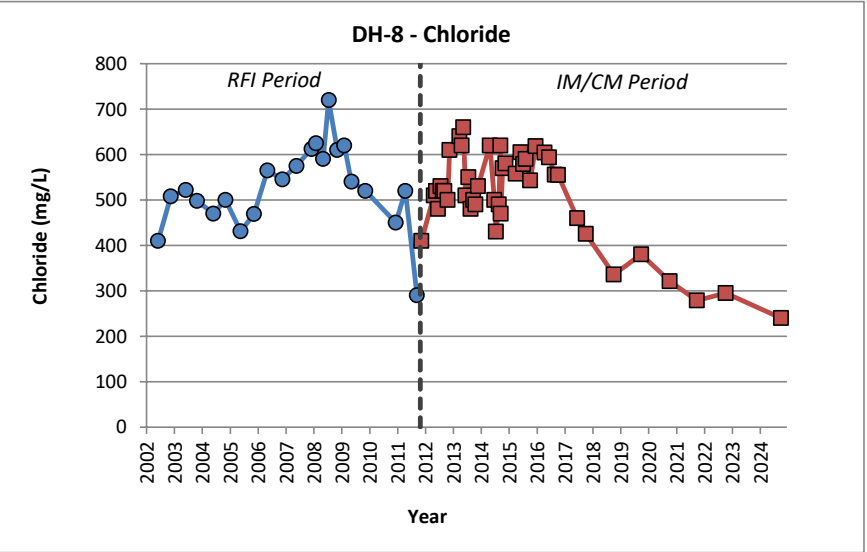
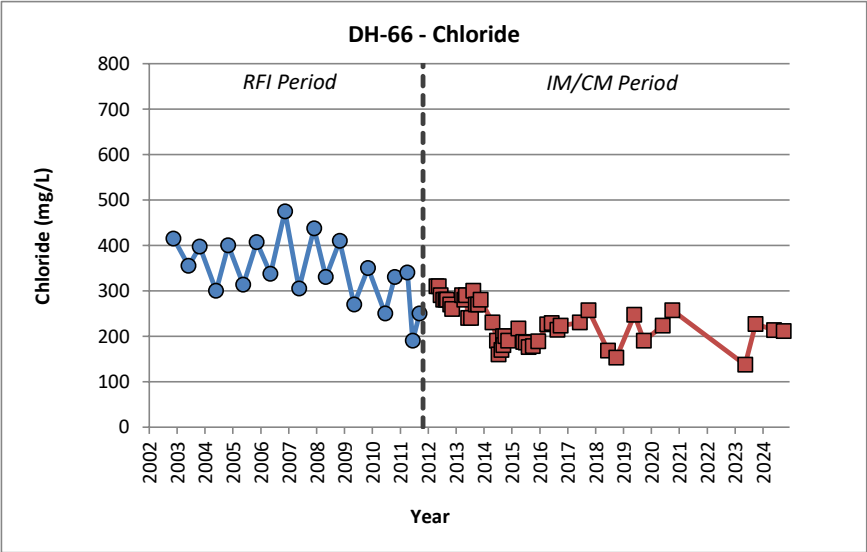
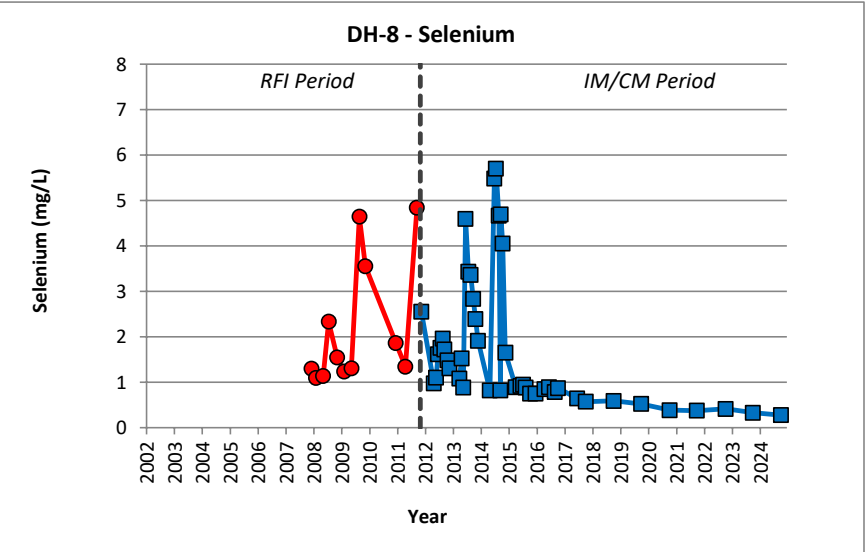
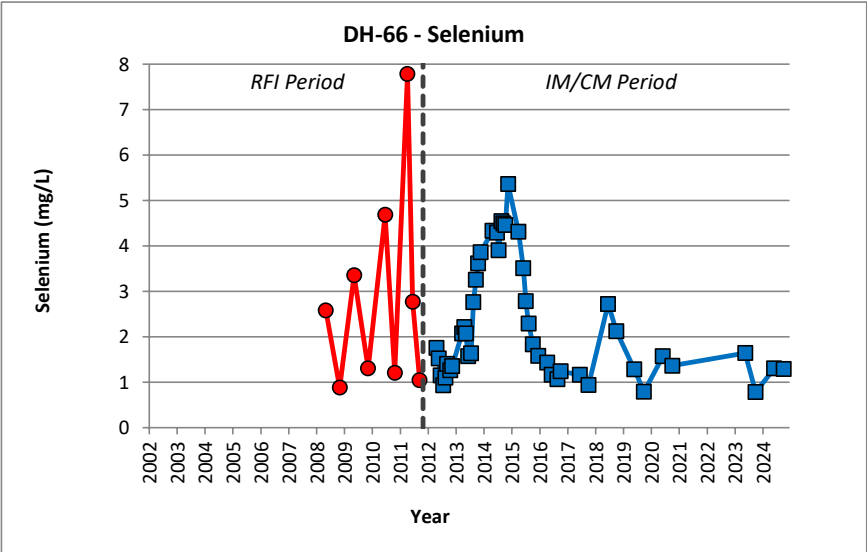
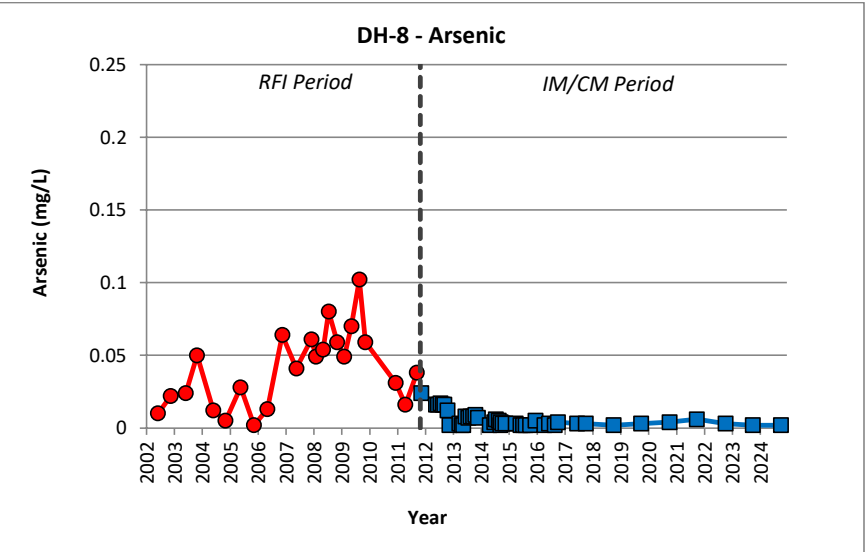
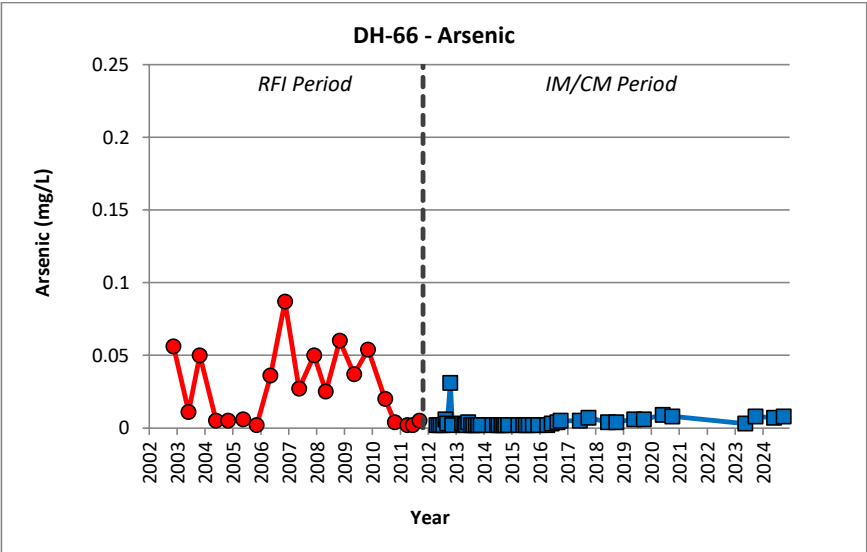


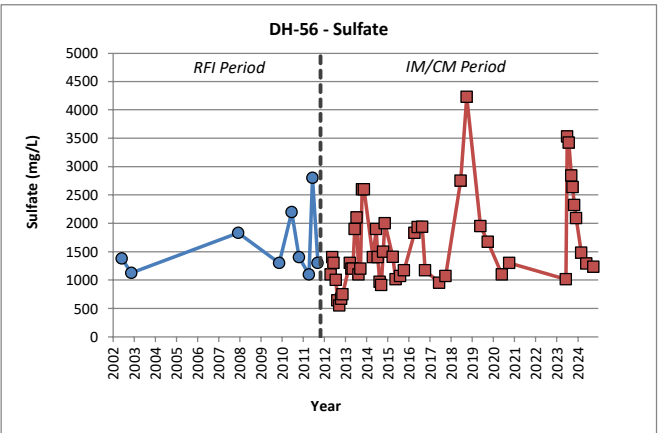
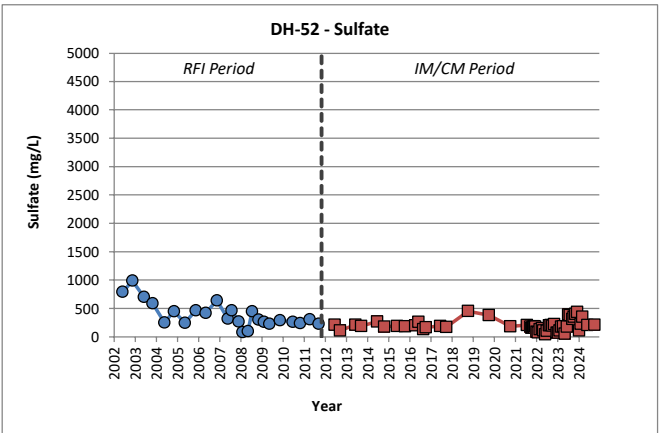
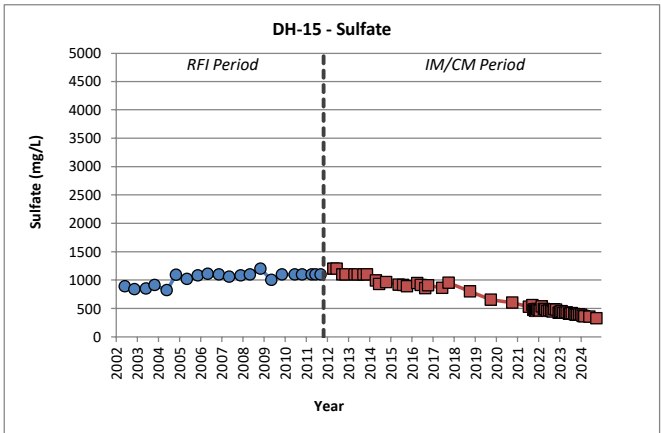
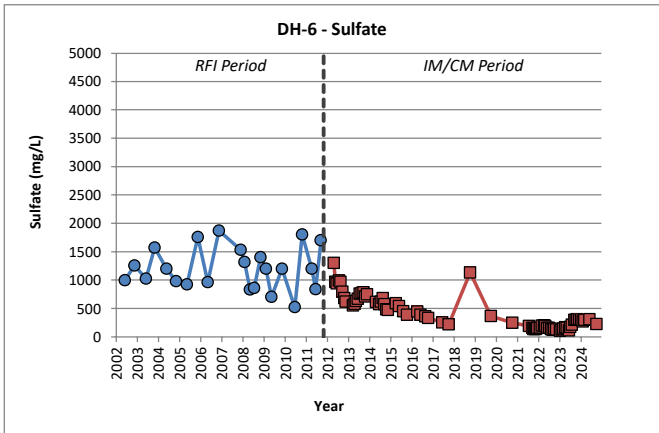
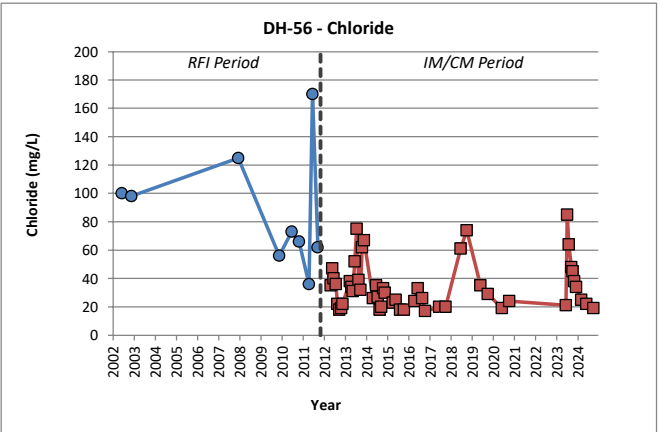
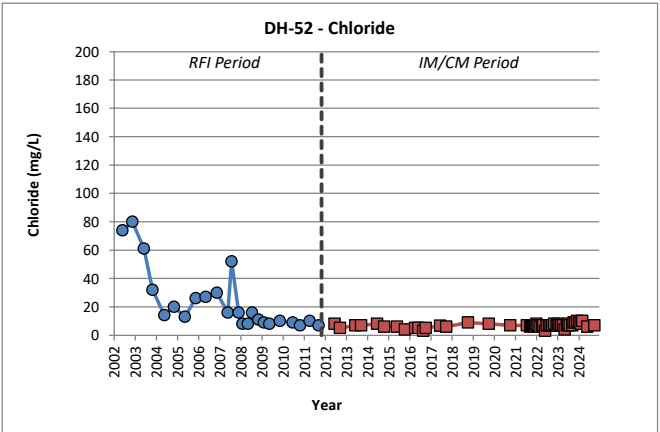
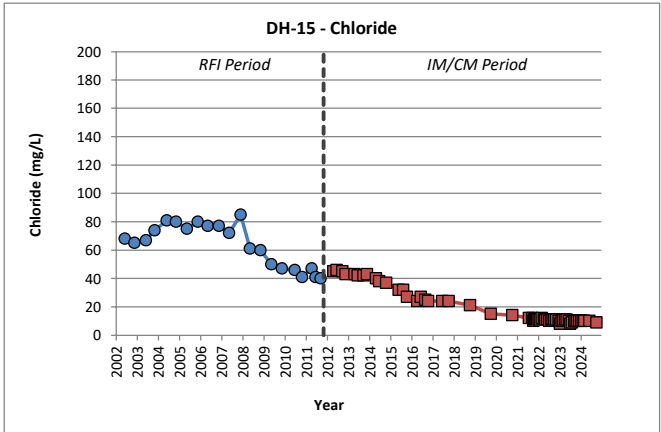
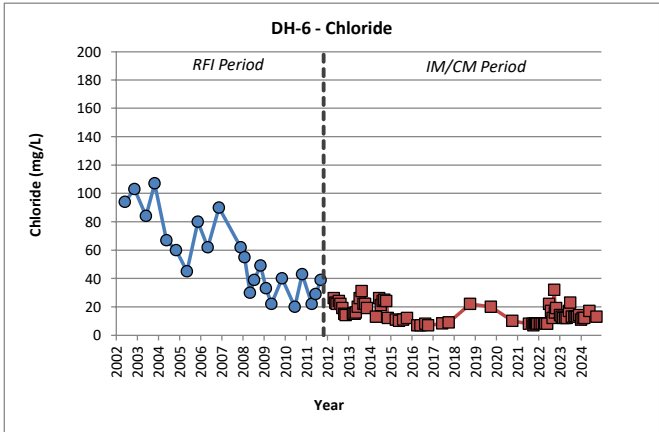
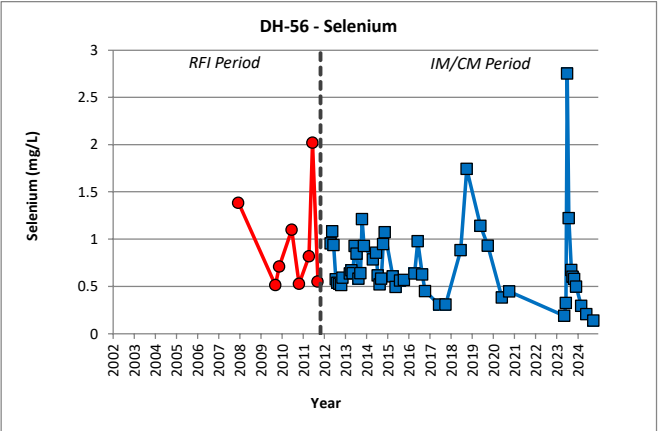
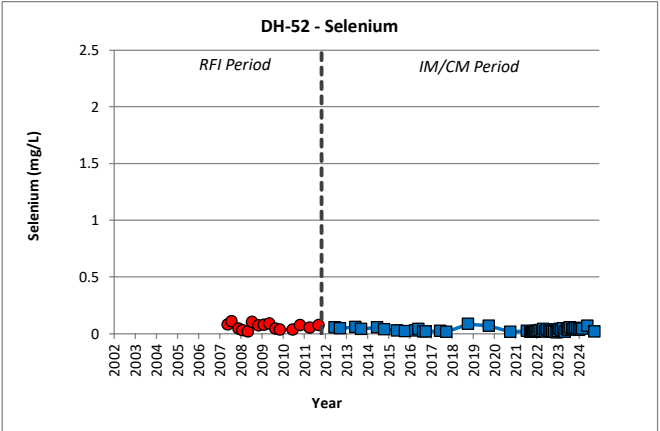
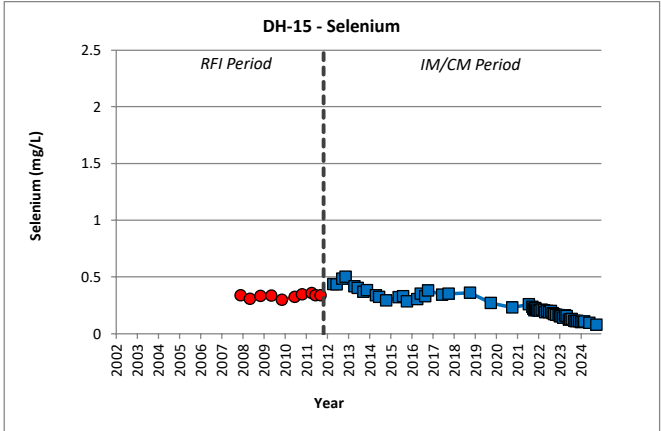
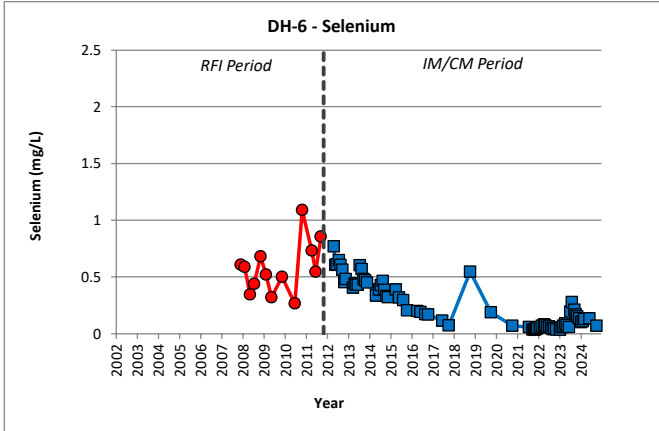
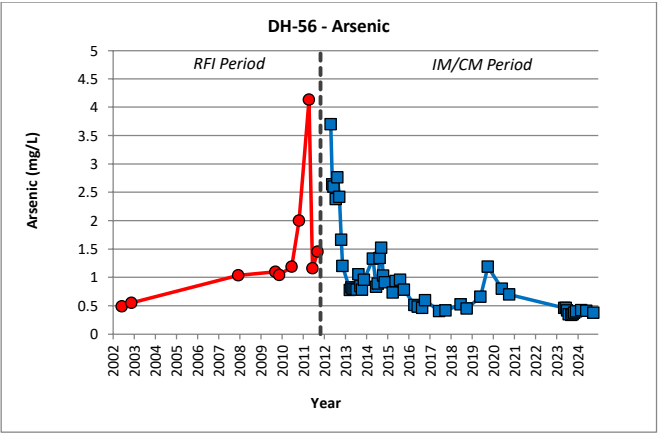
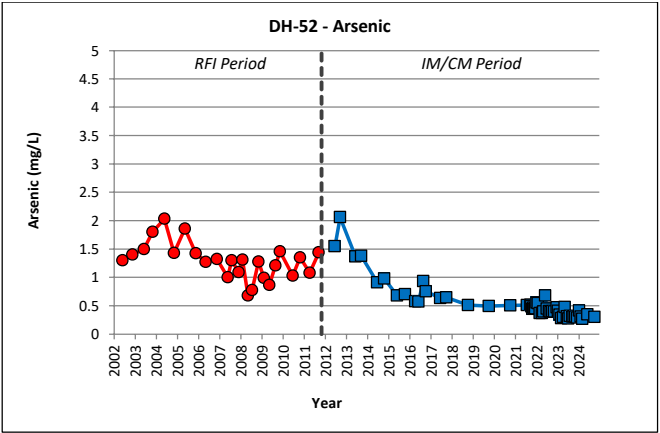
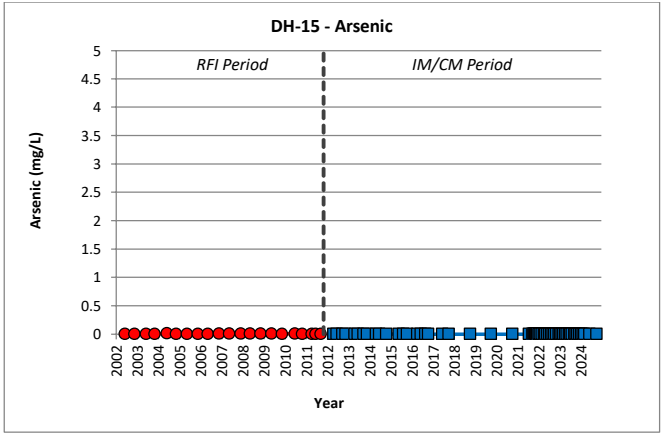
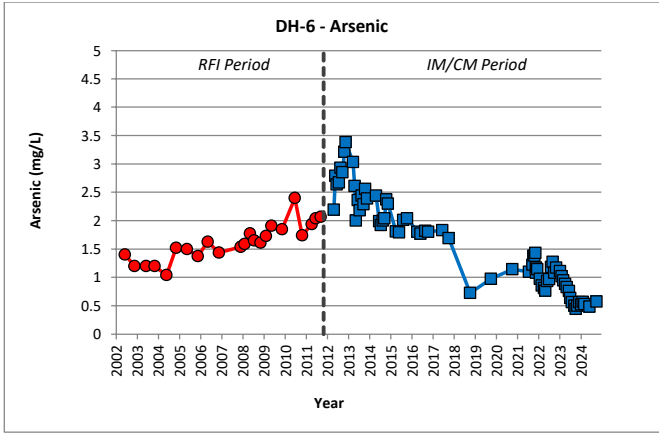
APPENDIX C

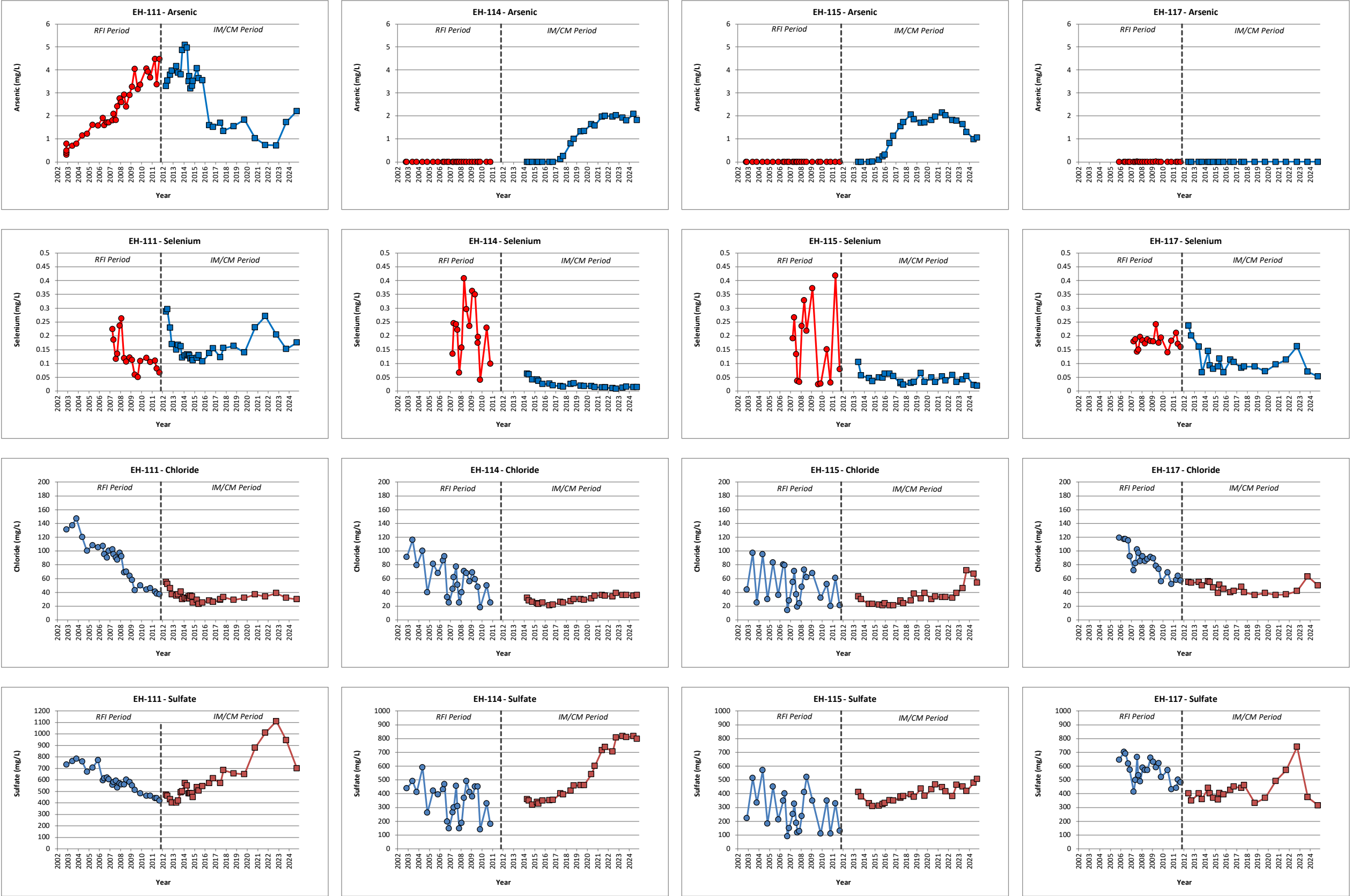
SITE-WIDE GROUNDWATER CONCENTRATION TREND GRAPHS

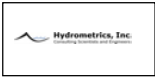
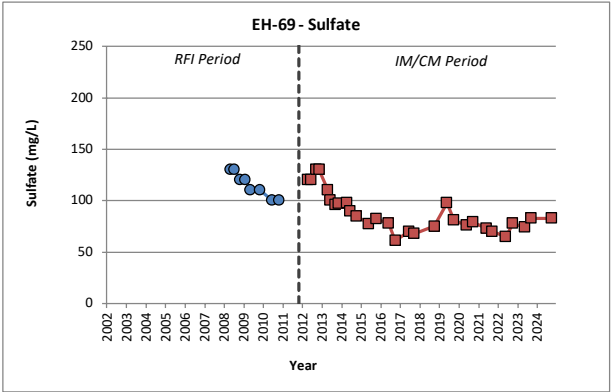
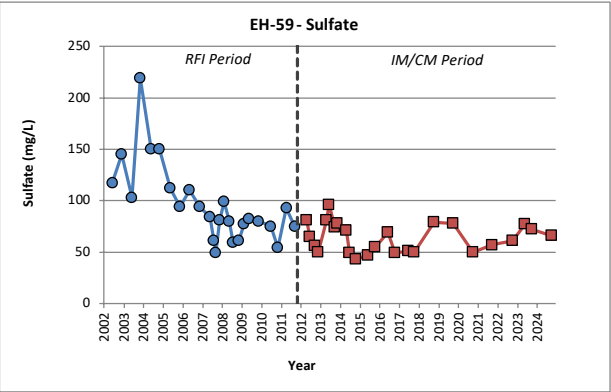
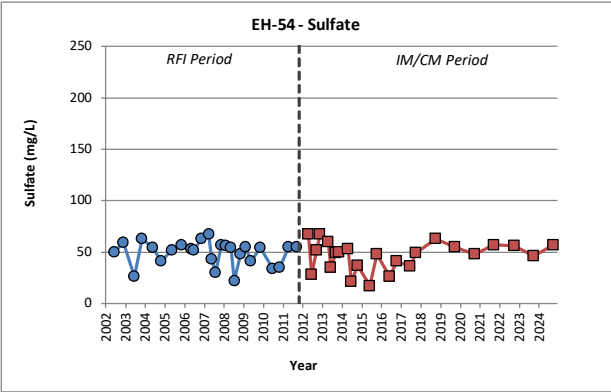
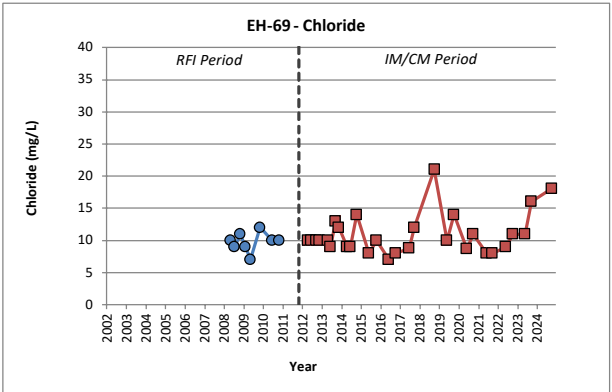
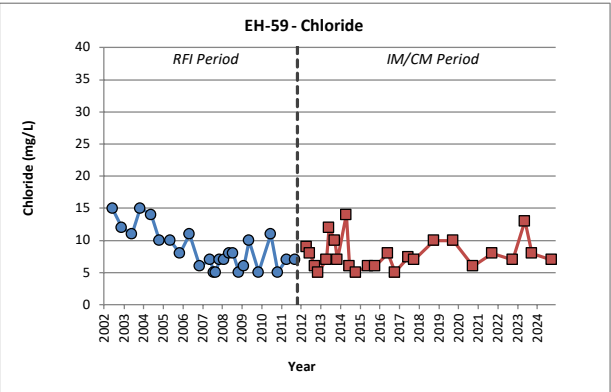
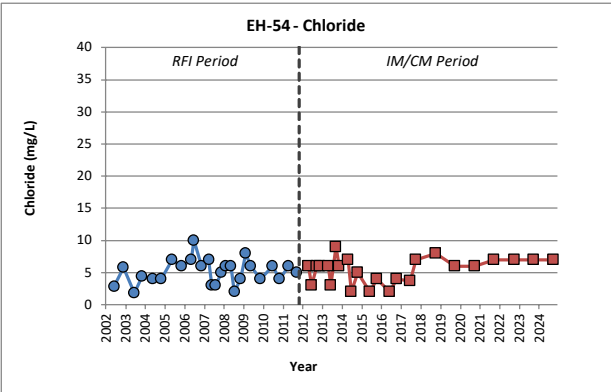
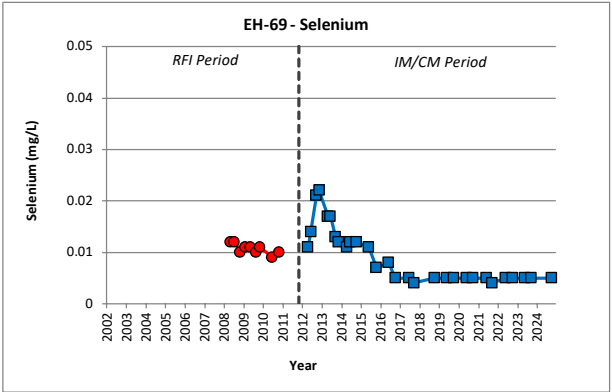
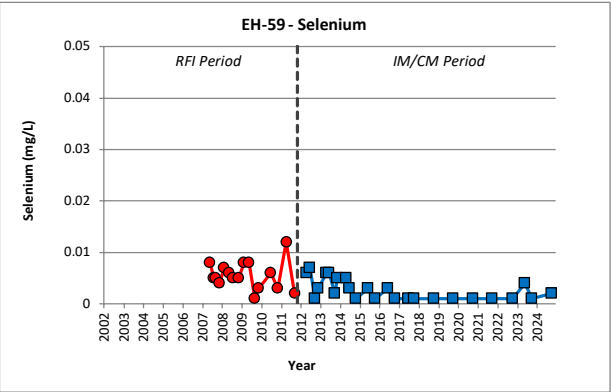
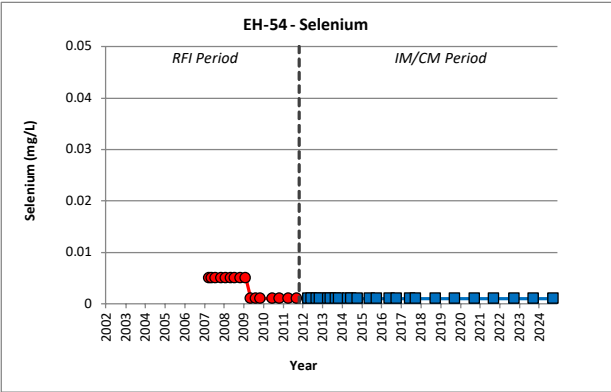
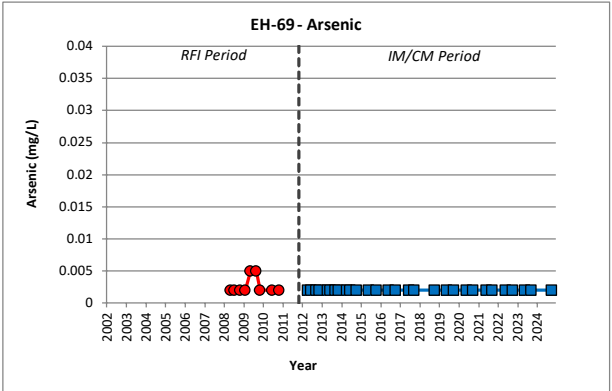
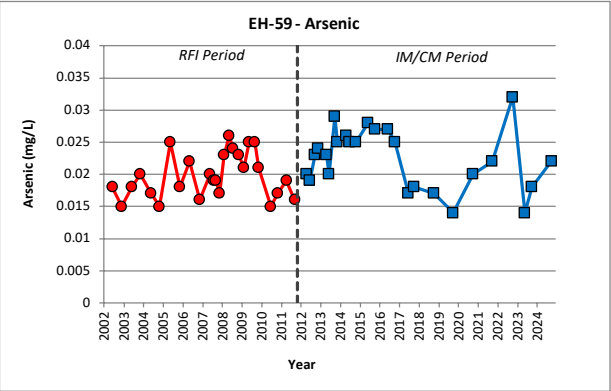
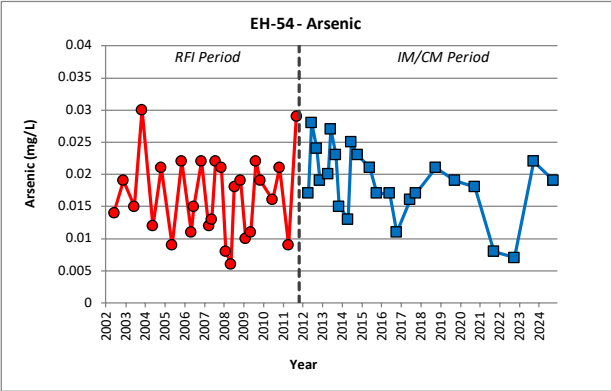


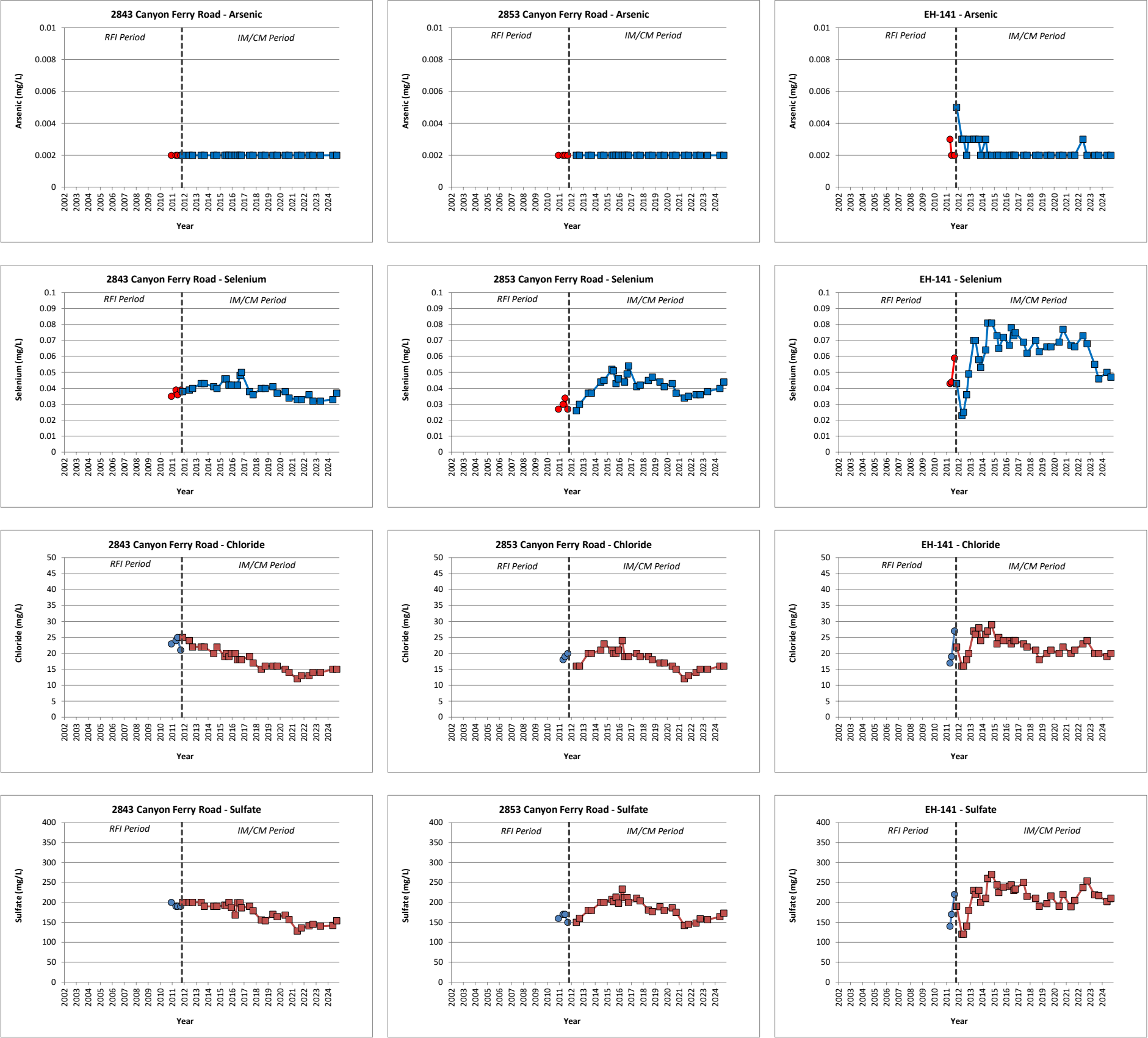










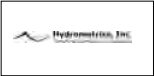
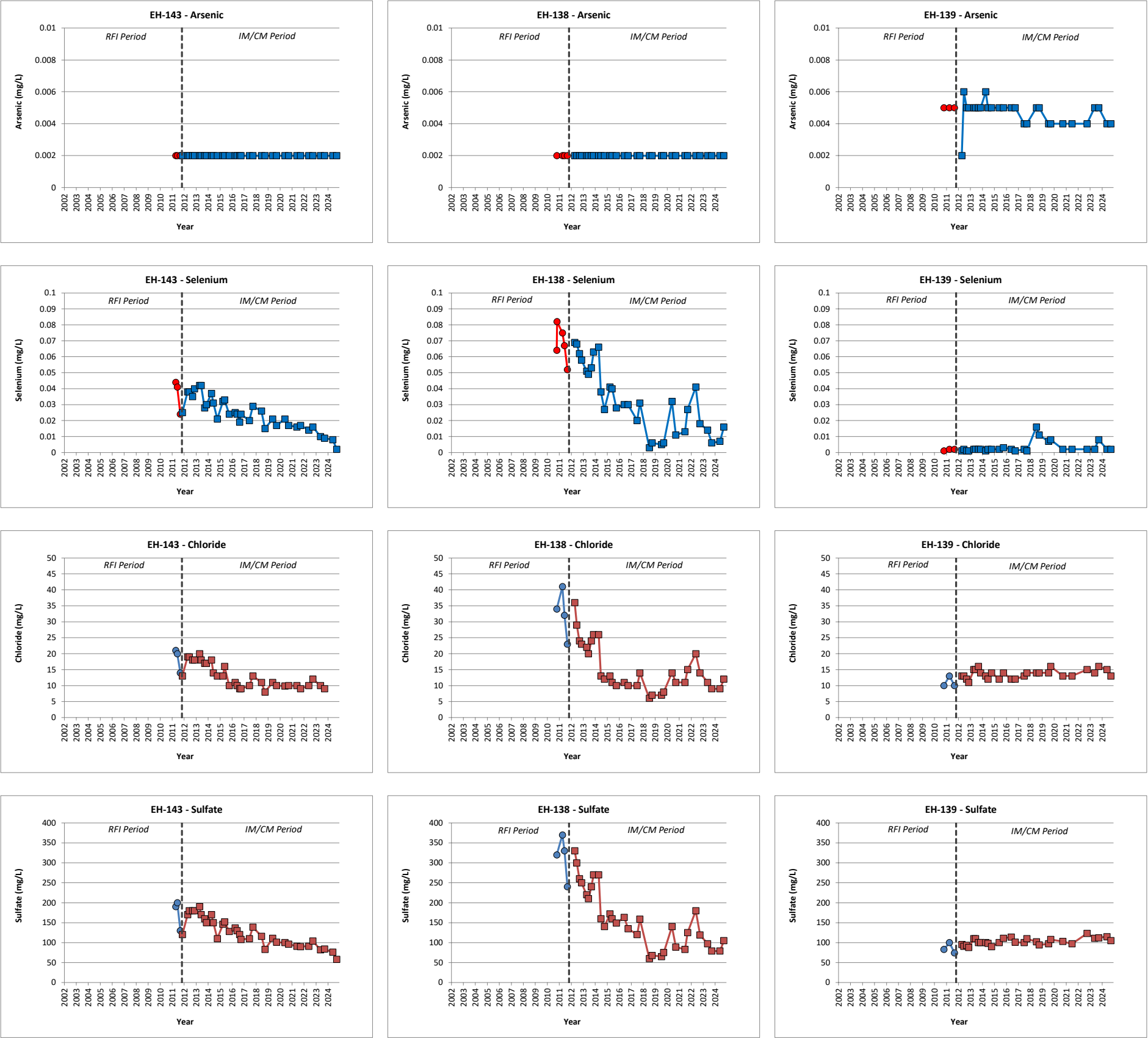


2024 INTERIM CORRECTIVE ACTION
PERFORMANCE MONITORING REPORT
EAST HELENA FACILITY

DOWNGRADIENT SELENIUM PLUME AREA
GROUNDWATER QUALITY TRENDS

FIGURE

C-6



2024 INTERIM CORRECTIVE ACTION
PERFORMANCE MONITORING REPORT
EAST HELENA FACILITY

DOWNGRADIENT SELENIUM PLUME AREA
GROUNDWATER QUALITY TRENDS

FIGURE

C-6



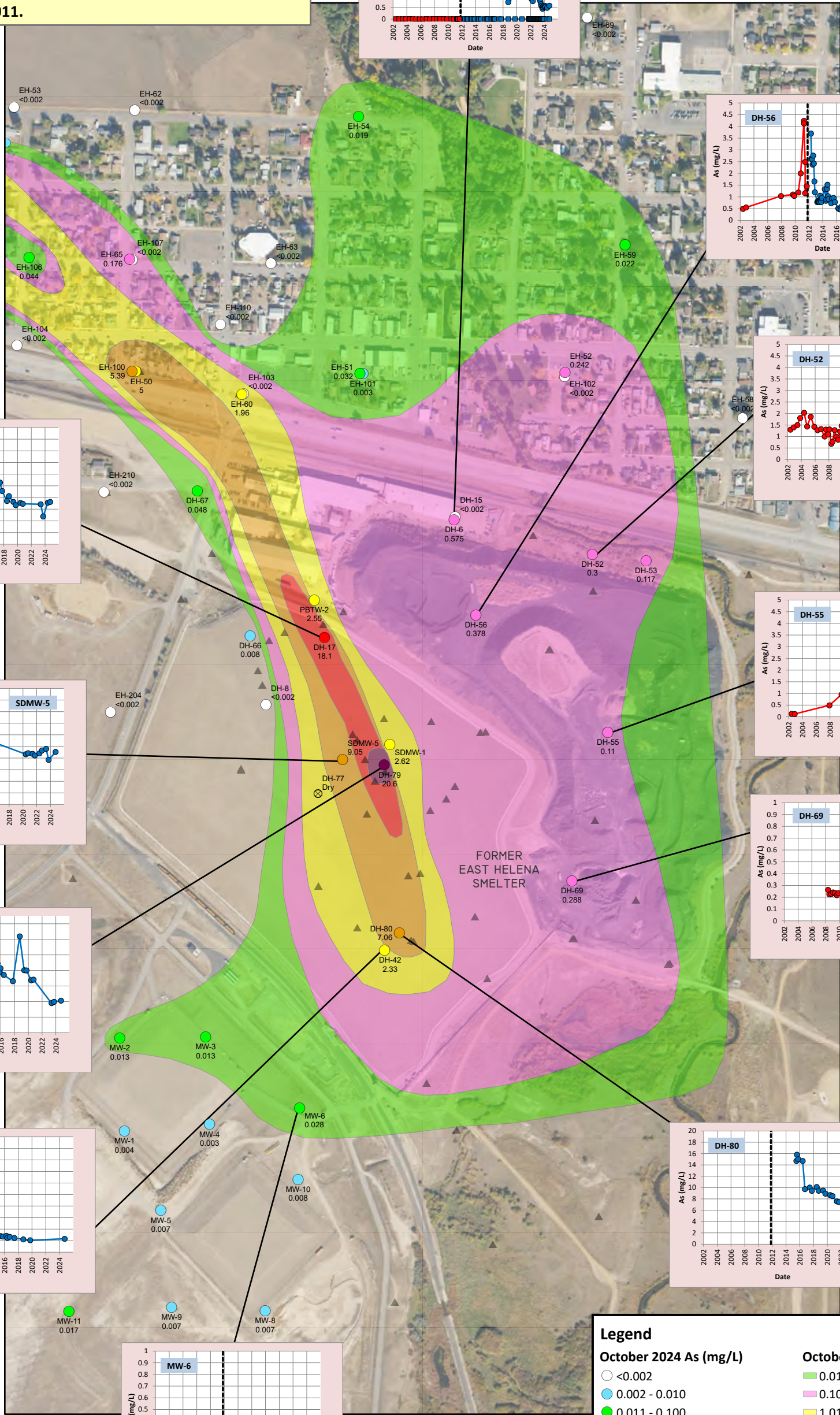
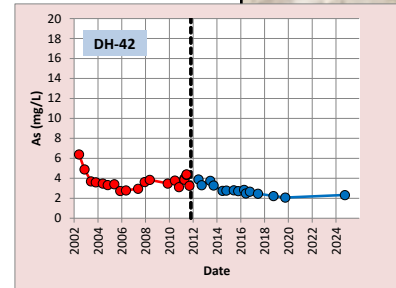
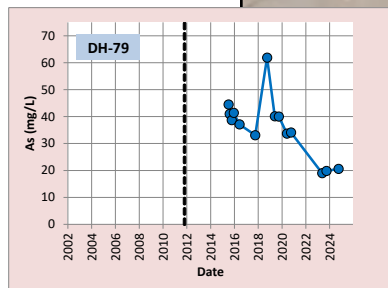
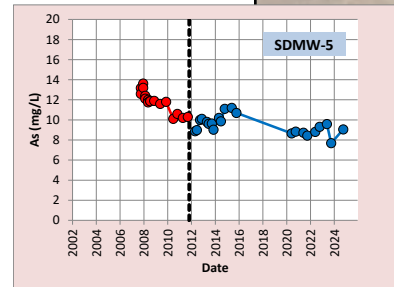
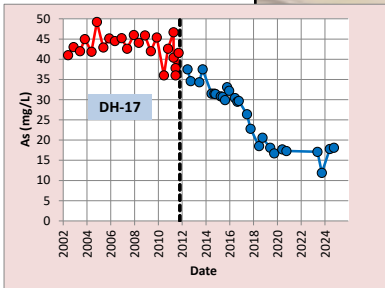
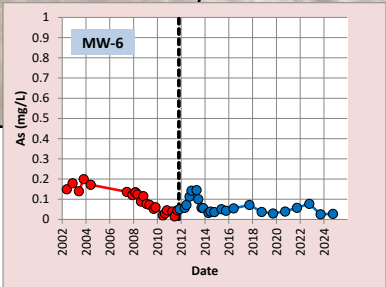
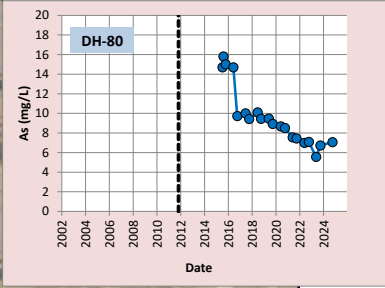
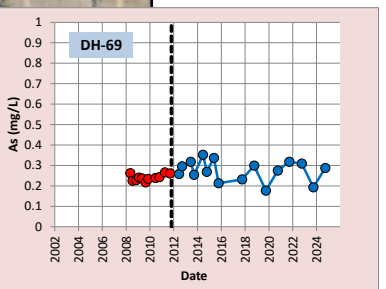
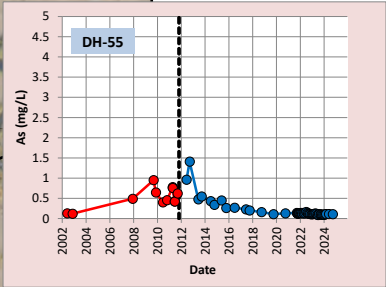
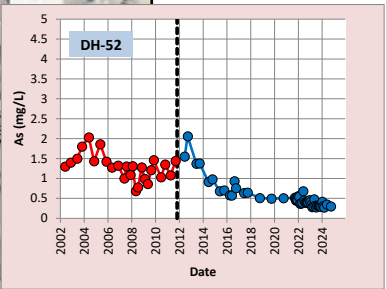
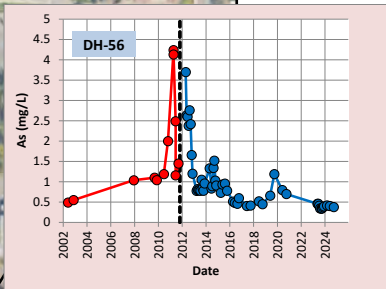
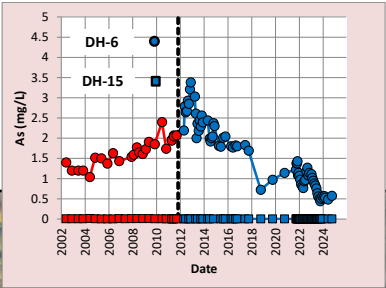
APPENDIX D

ARSENIC AND SELENIUM

TREND PLOT MAPS

NOTE: Red data series (left of dashed line) are from RFI period prior to November 2011.

Blue data series (right of dashed line) are from IM/CM period after November 2011.



Legend

October 2024 As (mg/L)

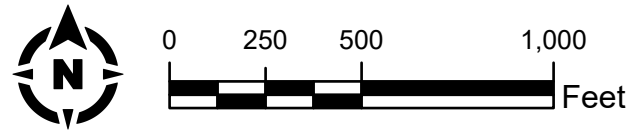
- <0.002
- 0.002 - 0.010
- 0.011 - 0.100
- 0.101 - 1.0
- 1.01 - 5.0
- 5.01 - 10.0
- 10.01 - 20.0
- > 20.0

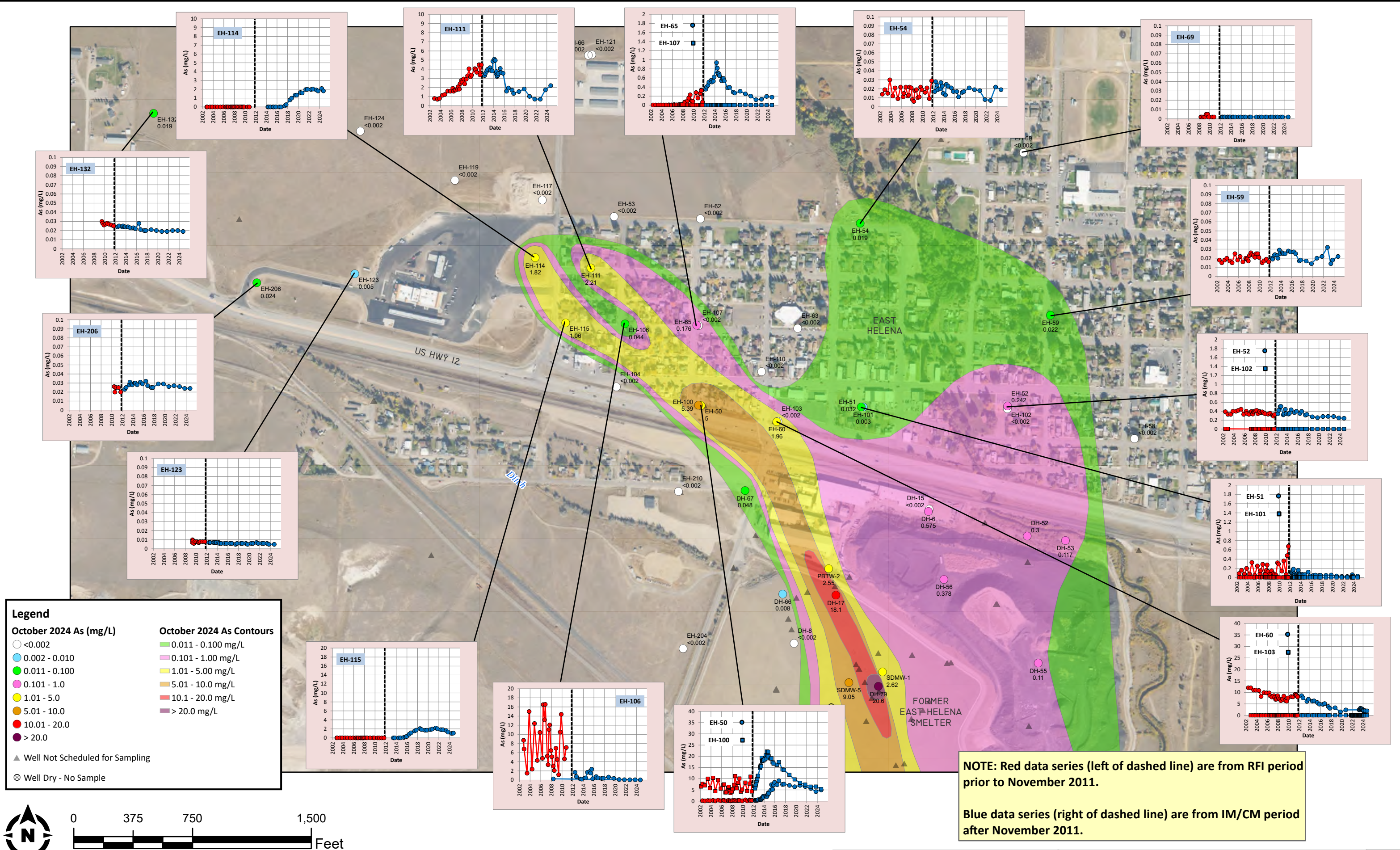
October 2024 As Contours

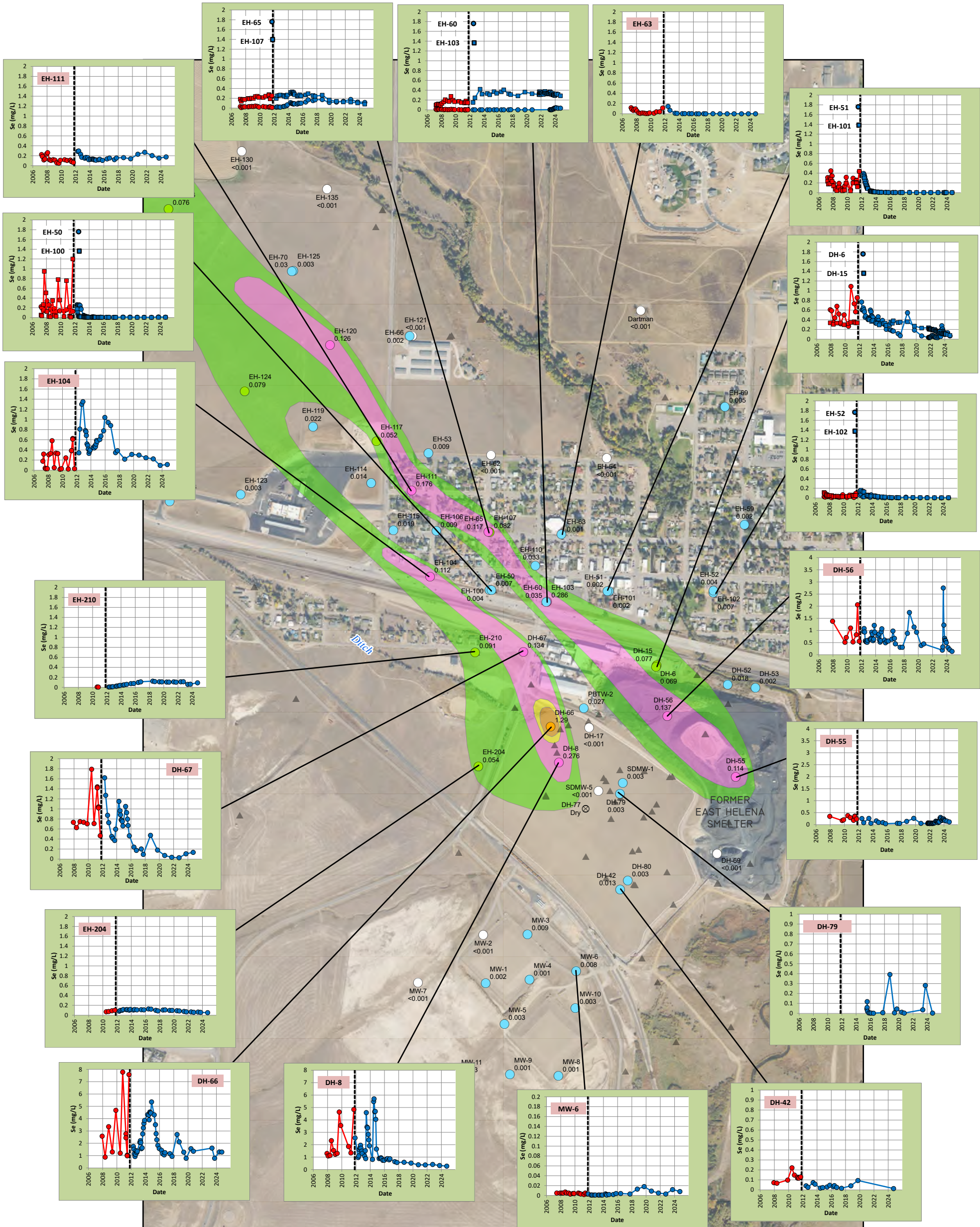
- 0.011 - 0.100 mg/L
- 0.101 - 1.00 mg/L
- 1.01 - 5.00 mg/L
- 5.01 - 10.0 mg/L
- 10.1 - 20.0 mg/L
- > 20.0 mg/L

▲ Well Not Scheduled for Sampling

⊗ Well Dry - No Sample

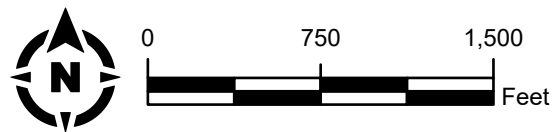






NOTE: Red data series (left of dashed line) are from RFI period prior to November 2011.

Blue data series (right of dashed line) are from IM/CM period after November 2011.



Hydrometrics, Inc.

Updated by: mwalker 2/26/2025 9:32 AM
G:\PROJECT\10022\WQUpdates\Plume-Trend Maps\Plume-Trend Maps.aprx [Figure1; Plant_Area_Se_Plume_and_Trends]

2024 INTERIM CORRECTIVE ACTION
PERFORMANCE MONITORING REPORT
EAST HELENA FACILITY

**SELENIUM TRENDS THROUGH OCTOBER 2024
PLANT AREA WELLS**

**FIGURE
D-3**



APPENDIX E

UNFUMED SLAG WELL

DATA TABLE

Appendix E - Unfumed Slag Indicator, Sentinel, and Tier 2 Well Data Table
2021-2024

Site	Sample Date	Purge Method	SWL (ft bmp)	pH (s.u.)	SC (µmhos/cm)	Dissolved O2 (mg/L)	Temperature (°C)	Arsenic (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)
DH-6	7/29/2021 (Pre-Crushing)	Standard	22.07	7.47	786	2.55	9.9	1.1	0.059	192	8	66	3
DH-6	10/1/2021	Standard	22.04	7.61	656	2.14	10.4	1.22	0.036	153	8	59	2
DH-6	10/18/2021	Low-Flow	22.36	7.58	655	2.90	10.9	1.38	0.038	133	7	59	2
DH-6	11/3/2021	Low-Flow	22.63	7.54	644	4.61	10.1	1.38	0.033	141	8	60	2
DH-6	11/17/2021	Low-Flow	22.97	7.60	651	3.83	9.7	1.43	0.037	135	8	60	2
DH-6	12/2/2021	Low-Flow	23.23	7.57	654	3.60	10.5	1.17	0.041	142	8	56	2
DH-6	12/2/2021	Standard	23.23	7.52	656	2.56	10.7	1.08	0.043	142	8	54	2
DH-6	12/21/2021	Low-Flow	23.45	7.66	697	3.82	9.6	1.14	0.046	158	8	62	3
DH-6	1/12/2022	Low-Flow	23.25	7.57	687	3.39	9.4	1.07	0.044	158	8	60	3
DH-6	2/7/2022	Low-Flow	23.42	7.56	721	3.37	9.2	0.975	0.054	162	8	63	3
DH-6	3/11/2022	Low-Flow	23.76	7.66	708	3.86	8.2	0.854	0.070	196	8	61	3
DH-6	4/18/2022	Low-Flow	23.88	7.68	720	3.93	9.5	0.809	0.080	203	8	66	4
DH-6	5/11/2022	Low-Flow	23.72	7.35	775	4.49	11.4	0.767	0.073	188	8	66	3
DH-6	6/13/2022	Low-Flow	22.80	7.62	678	4.50	10.1	0.933	0.057	153	8	57	3
DH-6	7/14/2022	Low-Flow	21.29	7.46	754	4.59	11.0	0.966	0.063	153	22	64	3
DH-6	8/16/2022	Low-Flow	21.46	7.30	658	5.15	13.5	1.18	0.049	133	17	60	2
DH-6	9/14/2022	Low-Flow	21.77	7.57	597	4.08	10.7	1.27	0.039	119	12	59	2
DH-6	10/13/2022	Low-Flow	21.20	7.48	706	4.30	10.8	1.08	0.046	136	32	63	3
DH-6	11/15/2022	Low-Flow	21.60	7.45	612	3.59	9.6	1.14	0.036	128	19	56	2
DH-6	12/27/2022	No Sample - Surface Leakage into Wellhead due to Plowed Snow and Ice - Placed Temporary Extended Casing											
DH-6	1/18/2023	Low-Flow	21.90	7.33	560	3.85	9.2	1.11	0.033	104	14	52	2
DH-6	2/16/2023	Low-Flow	22.35	7.53	612	3.79	9.0	1.02	0.054	128	13	52	2
DH-6	3/16/2023	Low-Flow	22.64	7.22	630	4.61	8.7	0.946	0.070	145	12	60	2
DH-6	4/20/2023	Low-Flow	22.46	7.32	750	3.93	8.0	0.881	0.090	166	12	65	3
DH-6	5/19/2023	Low-Flow	20.95	7.31	692	4.08	9.3	0.829	0.075	155	12	60	3
DH-6	6/22/2023	Low-Flow	18.38	7.28	588	5.05	10.1	0.757	0.057	113	17	51	2
DH-6	7/19/2023	Low-Flow	19.90	7.24	759	**	10.4	0.637	0.194	170	23	62	3
DH-6	8/15/2023	Low-Flow	20.35	7.17	1228	5.46	11.9	0.559	0.278	214	13	73	5
DH-6	9/26/2023	Low-Flow	19.84	7.26	1000	4.06	14.7	0.502	0.210	294	13	82	7
DH-6	10/17/2023	Low-Flow	20.56	7.23	1011	3.30	11.9	0.442	0.168	296	13	78	7
DH-6	11/16/2023	Low-Flow	21.15	7.14	1051	3.37	9.9	0.500	0.152	308	13	83	7
DH-6	12/19/2023	Low-Flow	22.17	7.11	1045	3.48	9.5	0.562	0.134	304	14	89	7
DH-6	1/23/2024	Low-Flow	21.80	7.21	995	2.39	8.7	0.520	0.099	303	11	86	6
DH-6	2/20/2024	Low-Flow	22.32	7.26	976	6.51	8.1	0.568	0.109	268	12	86	6
DH-6	3/19/2024	Low-Flow	22.08	7.08	1035	3.06	8.7	0.529	0.128	299	12	95	6
DH-6	6/13/2024	Low-Flow	21.16	7.09	1065	3.35	10.0	0.483	0.133	306	17	83	7
DH-6	10/11/2024	Low-Flow	22.58	7.25	870	2.89	10.5	0.575	0.069	222	13	78	5
DH-6	95% USL		--	--	--	--	--	3.81	0.885	1330	37	288	23

Appendix E - Unfumed Slag Indicator, Sentinel, and Tier 2 Well Data Table
2021-2024

Site	Sample Date	Purge Method	SWL (ft bmp)	pH (s.u.)	SC (µmhos/cm)	Dissolved O2 (mg/L)	Temperature (°C)	Arsenic (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)
DH-15	7/29/2021 (Pre-Crushing)	Standard	22.08	7.00	1324	0.03	11.2	<0.002	0.258	525	12	6	28
DH-15	10/1/2021	Standard	22.10	7.05	1311	0.04	11.0	<0.002	0.237	554	12	6	30
DH-15	10/18/2021	Low-Flow	22.37	7.14	1231	0.58	10.5	<0.002	0.218	471	10	5	28
DH-15	11/3/2021	Low-Flow	22.63	7.00	1211	0.59	9.5	<0.002	0.206	480	11	5	27
DH-15	11/17/2021	Low-Flow	22.98	6.99	1223	0.16	9.2	<0.002	0.225	453	11	5	26
DH-15	12/2/2021	Low-Flow	23.25	6.99	1200	0.22	10.1	<0.002	0.209	459	11	5	26
DH-15	12/21/2021	Low-Flow	23.44	7.12	1226	0.22	9.2	<0.002	0.206	487	11	5	27
DH-15	1/12/2022	Low-Flow	23.24	7.08	1204	0.24	8.8	<0.002	0.205	469	11	5	27
DH-15	2/7/2022	Low-Flow	23.35	7.06	1228	0.19	9.2	<0.002	0.202	460	11	5	27
DH-15	3/11/2022	Low-Flow	23.73	7.23	1132	0.49	8.5	<0.002	0.210	535	12	5	26
DH-15	4/18/2022	Low-Flow	23.89	7.33	1103	0.39	9.5	<0.002	0.204	488	11	5	27
DH-15	5/11/2022	Low-Flow	23.70	6.92	1201	0.59	10.3	<0.002	0.187	484	11	5	27
DH-15	6/13/2022	Low-Flow	22.75	7.08	1196	0.53	9.8	<0.002	0.198	457	11	5	25
DH-15	7/14/2022	Low-Flow	21.34	7.11	1146	0.35	10.8	<0.002	0.188	458	10	5	24
DH-15	8/16/2022	Low-Flow	21.46	7.13	1136	0.46	12.5	<0.002	0.200	452	11	5	25
DH-15	9/14/2022	Low-Flow	21.77	7.10	1151	0.25	10.8	<0.002	0.180	442	11	5	25
DH-15	10/13/2022	Low-Flow	21.21	7.11	1131	0.31	10.1	<0.002	0.172	483	11	5	25
DH-15	11/15/2022	Low-Flow	21.57	7.11	1135	0.37	8.6	<0.002	0.166	475	11	5	24
DH-15	12/27/2022	Low-Flow	20.56	7.04	1104	0.35	9.1	<0.002	0.162	420	10	5	22
DH-15	1/18/2023	Low-Flow	20.85	6.99	1099	0.30	8.9	<0.002	0.150	437	8	5	23
DH-15	2/16/2023	Low-Flow	21.30	7.14	1109	0.52	7.9	<0.002	0.153	448	10	5	22
DH-15	3/16/2023	Low-Flow	21.70	6.95	1051	2.54	8.0	<0.002	0.139	423	11	5	22
DH-15	4/20/2023	Low-Flow	21.39	7.03	1125	0.36	8.3	<0.002	0.160	427	11	5	23
DH-15	5/19/2023	Low-Flow	19.81	7.00	1100	0.12	9.8	<0.002	0.155	426	11	5	25
DH-15	6/22/2023	Low-Flow	17.27	6.97	1056	0.18	9.9	<0.002	0.124	402	10	5	22
DH-15	7/19/2023	Low-Flow	17.35	6.96	1051	**	10.5	<0.002	0.123	408	8	5	21
DH-15	8/15/2023	Low-Flow	17.73	6.96	1110	0.62	11.8	<0.002	0.128	416	9	5	22
DH-15	9/26/2023	Low-Flow	17.24	7.09	1023	0.08	10.6	<0.002	0.112	398	10	5	21
DH-15	10/17/2023	Low-Flow	18.03	7.07	1023	0.59	10.6	<0.002	0.110	387	10	4	20
DH-15	11/16/2023	Low-Flow	18.84	6.98	1030	0.08	9.5	<0.002	0.111	384	10	4	20
DH-15	12/19/2023	Low-Flow	19.84	6.97	1042	0.20	9.2	<0.002	0.109	395	10	4	21
DH-15	1/23/2024	Low-Flow	19.20	7.04	1006	0.16	9.0	<0.002	0.101	389	10	5	20
DH-15	2/20/2024	Low-Flow	19.74	7.05	1008	0.19	8.8	<0.002	0.107	363	10	5	19
DH-15	3/19/2024	Low-Flow	19.50	6.93	1003	0.16	9.2	<0.002	0.107	358	10	5	18
DH-15	6/13/2024	Low-Flow	18.65	6.88	969	0.14	10.5	<0.002	0.095	350	10	4	18
DH-15	10/11/2024	Low-Flow	20.01	7.04	914	0.19	9.9	<0.002	0.077	322	9	4	18
DH-15	95% USL		--	--	--	--	--	0.003	0.530	1351	68	9	68

Appendix E - Unfumed Slag Indicator, Sentinel, and Tier 2 Well Data Table
2021-2024

Site	Sample Date	Purge Method	SWL (ft bmp)	pH (s.u.)	SC (µmhos/cm)	Dissolved O2 (mg/L)	Temperature (°C)	Arsenic (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)
DH-52	7/29/2021 (Pre-Crushing)	Standard	8.28	7.30	766	0.26	11.0	0.508	0.023	207	7	66	8
DH-52	10/1/2021	Standard	8.82	7.41	676	0.32	11.5	0.517	0.016	178	6	65	7
DH-52	10/18/2021	Low-Flow	8.77	7.31	689	0.90	12.1	0.487	0.018	159	6	63	8
DH-52	11/2/2021	Low-Flow	8.98	6.92	660	2.10	9.6	0.445	0.019	166	6	65	8
DH-52	11/17/2021	Low-Flow	9.15	7.28	707	1.40	9.8	0.463	0.020	175	6	62	8
DH-52	12/2/2021	Low-Flow	9.19	7.19	709	1.38	10.1	0.450	0.018	186	6	62	8
DH-52	12/21/2021	Low-Flow	7.82	7.37	709	1.27	8.9	0.457	0.017	180	7	63	8
DH-52	1/12/2022	Low-Flow	7.74	7.37	463	**	8.2	0.558	0.025	87	8	47	4
DH-52	2/7/2022	Low-Flow	8.03	7.40	441	**	6.7	0.544	0.020	78	7	46	4
DH-52	3/11/2022	Low-Flow	8.85	7.24	558	1.84	6.5	0.367	0.030	133	6	52	7
DH-52	4/18/2022	Low-Flow	8.81	7.40	571	1.78	7.0	0.371	0.022	150	7	56	8
DH-52	5/11/2022	Low-Flow	8.12	6.69	557	1.57	7.7	0.396	0.041	111	7	51	6
DH-52	6/13/2022	Low-Flow	6.78	7.52	298	4.85	8.7	0.680	0.019	42	3	34	2
DH-52	7/13/2022	Low-Flow	7.64	7.21	534	0.96	10.3	0.448	0.035	107	7	54	6
DH-52	8/16/2022	Low-Flow	8.36	7.15	736	0.73	11.4	0.401	0.026	203	7	67	10
DH-52	9/13/2022	Low-Flow	8.72	7.27	747	2.54	12.1	0.392	0.019	208	7	69	9
DH-52	10/13/2022	Low-Flow	8.52	7.23	706	0.58	11.0	0.406	0.019	196	7	65	9
DH-52	11/15/2022	Low-Flow	8.40	7.32	764	1.32	9.7	0.396	0.015	224	8	65	9
DH-52	12/27/2022	Low-Flow	6.28	7.15	382	9.74	7.6	0.456	0.009	68	7	37	3
DH-52	1/18/2023	Low-Flow	7.50	7.08	397	7.97	6.2	0.411	0.020	73	8	41	4
DH-52	2/16/2023	Low-Flow	8.32	7.29	516	2.82	5.4	0.339	0.040	109	7	46	4
DH-52	3/16/2023	Low-Flow	8.75	6.88	657	**	5.3	0.281	0.033	176	7	58	10
DH-52	4/20/2023	Low-Flow	8.25	7.17	709	1.33	5.1	0.301	0.048	183	7	55	9
DH-52	5/19/2023	Low-Flow	5.35	7.28	289	4.52	7.1	0.478	0.017	52	4	31	3
DH-52	6/22/2023	Low-Flow	5.28	6.95	660	2.18	9.6	0.314	0.037	178	7	56	8
DH-52	7/18/2023	Low-Flow	6.32	7.02	1164	0.74	11.6	0.273	0.036	394	8	71	15
DH-52	8/16/2023	Low-Flow	7.04	7.07	1014	0.93	11.8	0.318	0.055	380	7	75	13
DH-52	9/26/2023	Low-Flow	7.03	7.11	922	0.56	12.6	0.309	0.037	312	7	69	11
DH-52	10/17/2023	Low-Flow	7.48	7.08	1011	6.88	11.9	0.311	0.043	354	9	73	12
DH-52	11/16/2023	Low-Flow	8.02	7.08	1114	0.75	9.8	0.308	0.050	405	9	71	13
DH-52	12/19/2023	Low-Flow	8.53	7.10	1200	0.90	8.0	0.288	0.048	437	10	72	15
DH-52	1/23/2024	Low-Flow	6.50	7.24	508	6.73	6.5	0.417	0.033	113	9	43	4
DH-52	2/20/2024	Low-Flow	8.05	7.12	812	1.42	6.2	0.306	0.041	229	8	61	9
DH-52	3/19/2024	Low-Flow	7.93	7.03	1055	0.84	7.5	0.270	0.044	351	10	78	13
DH-52	6/13/2024	Low-Flow	7.29	7.05	774	0.85	8.7	0.347	0.068	205	6	57	9
DH-52	10/11/2024	Low-Flow	8.61	6.98	761	0.27	11.1	0.300	0.018	214	7	64	9
DH-52	95% USL		--	--	--	--	--	2.19	0.090	474	11	87	15

Appendix E - Unfumed Slag Indicator, Sentinel, and Tier 2 Well Data Table
2021-2024

Site	Sample Date	Purge Method	SWL (ft bmp)	pH (s.u.)	SC (µmhos/cm)	Dissolved O2 (mg/L)	Temperature (°C)	Arsenic (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)
DH-53	7/29/2021 (Pre-Crushing)	Standard	10.83	7.20	468	0.22	10.7	0.196	0.034	88	6	36	6
DH-53	10/1/2021	Standard	11.25	7.27	444	0.10	13.1	0.188	0.011	71	7	36	6
DH-53	10/18/2021	Low-Flow	11.34	7.19	454	0.54	13.6	0.186	0.004	65	7	35	6
DH-53	11/2/2021	Low-Flow	11.49	6.96	439	0.90	11.5	0.215	0.005	73	8	34	7
DH-53	11/17/2021	Low-Flow	11.63	7.18	434	0.57	10.8	0.170	0.004	72	7	34	6
DH-53	12/2/2021	Low-Flow	11.65	7.15	412	0.27	11.5	0.150	0.006	73	7	29	6
DH-53	12/2/2021	Standard	11.65	7.12	416	0.05	12.1	0.168	0.007	72	7	29	6
DH-53	12/21/2021	Low-Flow	10.39	7.37	403	0.27	9.9	0.140	0.011	75	7	27	6
DH-53	1/12/2022	Low-Flow	10.22	7.27	431	0.42	8.6	0.148	0.028	85	8	29	7
DH-53	2/7/2022	Low-Flow	10.74	7.20	493	0.63	7.0	0.136	0.042	93	7	31	8
DH-53	3/11/2022	Low-Flow	11.18	7.16	473	0.54	6.4	0.121	0.044	99	7	28	9
DH-53	4/18/2022	Low-Flow	11.22	7.42	453	0.65	6.5	0.118	0.027	102	8	28	9
DH-53	5/11/2022	Low-Flow	10.50	6.88	482	1.48	7.3	0.116	0.027	94	8	26	8
DH-53	6/13/2022	Low-Flow	9.13	7.26	505	0.76	8.3	0.159	0.034	96	7	28	8
DH-53	7/13/2022	Low-Flow	10.22	7.11	506	0.36	10.5	0.165	0.039	96	7	30	8
DH-53	8/16/2022	Low-Flow	11.03	7.27	478	0.49	11.3	0.152	0.034	86	6	29	8
DH-53	9/13/2022	Low-Flow	11.43	7.25	386	4.78	12.8	0.150	0.007	50	6	27	6
DH-53	10/13/2022	Low-Flow	11.21	7.18	383	0.52	12.8	0.153	0.003	61	7	26	6
DH-53	11/15/2022	Low-Flow	10.26	7.14	368	0.45	11.0	0.127	0.006	69	8	23	6
DH-53	12/27/2022	Low-Flow	9.14	6.93	350	0.41	9.1	0.116	0.010	62	7	19	6
DH-53	1/18/2023	Low-Flow	10.50	6.94	385	0.34	8.1	0.152	0.025	68	7	23	6
DH-53	2/16/2023	Low-Flow	11.16	7.20	394	0.65	6.8	0.115	0.014	72	8	20	6
DH-53	3/16/2023	Low-Flow	11.42	6.92	364	0.52	6.0	0.100	0.012	69	9	19	6
DH-53	4/20/2023	Low-Flow	10.67	7.13	408	1.16	4.2	0.109	0.012	70	10	20	7
DH-53	5/19/2023	Low-Flow	7.95	7.02	456	0.20	7.1	0.148	0.032	86	8	23	8
DH-53	6/22/2023	Low-Flow	8.26	6.92	671	5.67	10.0	0.160	0.069	137	8	34	13
DH-53	7/18/2023	Low-Flow	9.43	6.97	747	0.41	11.1	0.172	0.054	166	6	36	12
DH-53	8/16/2023	Low-Flow	10.18	7.03	572	3.28	11.9	0.197	0.044	125	6	36	10
DH-53	9/26/2023	Low-Flow	9.98	7.02	567	0.30	13.2	0.166	0.035	137	7	35	9
DH-53	10/17/2023	Low-Flow	10.43	7.01	575	6.27	12.6	0.170	0.034	141	7	34	9
DH-53	11/16/2023	Low-Flow	10.96	6.93	566	1.55	11.1	0.144	0.020	120	7	31	10
DH-53	12/19/2023	Low-Flow	11.48	6.95	407	0.40	9.8	0.130	0.003	64	7	24	7
DH-53	1/23/2024	Low-Flow	9.01	7.07	435	4.00	7.3	0.122	0.013	90	8	25	7
DH-53	2/20/2024	Low-Flow	10.81	7.05	504	0.53	6.8	0.116	0.038	108	7	26	8
DH-53	3/19/2024	Low-Flow	10.64	6.99	546	1.74	7.3	0.111	0.038	124	7	30	9
DH-53	6/13/2024	Low-Flow	10.09	6.88	520	0.81	8.2	0.146	0.030	112	7	24	9
DH-53	10/11/2024	Low-Flow	11.58	6.96	369	0.22	12.8	0.117	0.002	55	7	21	6
DH-53	95% USL		--	--	--	--	--	0.86	0.028	277	12	63	8

Appendix E - Unfumed Slag Indicator, Sentinel, and Tier 2 Well Data Table
2021-2024

Site	Sample Date	Purge Method	SWL (ft bmp)	pH (s.u.)	SC (µmhos/cm)	Dissolved O2 (mg/L)	Temperature (°C)	Arsenic (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)
DH-55	7/29/2021 (Pre-Crushing)	Standard	81.37	7.25	1611	0.57	9.9	0.148	0.059	576	17	122	14
DH-55	10/1/2021	Standard	81.59	7.31	1741	0.61	9.5	0.142	0.049	660	18	135	16
DH-55	10/18/2021	Low-Flow	81.69	7.19	1950	0.82	9.3	0.124	0.073	686	16	146	19
DH-55	11/2/2021	Low-Flow	81.67	7.19	1820	1.26	7.6	0.128	0.056	728	19	132	18
DH-55	11/2/2021	Standard	81.76	7.24	1915	0.53	9.4	0.132	0.064	760	19	137	19
DH-55	11/17/2021	Low-Flow	81.82	7.23	1946	0.68	7.6	0.132	0.064	792	19	139	18
DH-55	12/2/2021	Low-Flow	81.85	7.22	1917	0.54	8.8	0.132	0.056	734	19	133	18
DH-55	12/21/2021	Low-Flow	81.85	7.33	1960	1.34	7.6	0.138	0.048	747	20	136	19
DH-55	1/12/2022	Low-Flow	81.26	7.28	1880	1.29	7.3	0.135	0.057	694	18	132	18
DH-55	2/7/2022	Low-Flow	81.22	7.38	1752	1.71	6.5	0.139	0.052	628	16	127	16
DH-55	3/11/2022	Low-Flow	81.11	7.41	1565	1.62	6.8	0.129	0.065	622	15	117	14
DH-55	4/18/2022	Low-Flow	81.52	7.63	1399	3.09	9.2	0.141	0.054	549	15	115	15
DH-55	5/11/2022	Low-Flow	81.52	7.18	1653	2.86	9.0	0.128	0.044	587	16	122	16
DH-55	6/13/2022	Low-Flow	81.01	7.30	1573	3.00	9.3	0.134	0.058	533	15	114	13
DH-55	7/13/2022	Low-Flow	81.14	7.39	1198	1.22	9.2	0.163	0.056	389	11	98	8
DH-55	8/16/2022	Low-Flow	81.41	7.23	1421	1.63	10.3	0.144	0.063	499	14	119	13
DH-55	9/13/2022	Low-Flow	81.83	7.33	1576	1.42	9.0	0.125	0.084	602	16	137	16
DH-55	10/13/2022	Low-Flow	81.50	7.32	1767	2.22	8.6	0.121	0.087	716	18	135	18
DH-55	11/15/2022	Low-Flow	81.48	7.30	2029	1.33	7.0	0.113	0.145	871	19	139	18
DH-55	12/27/2022	Low-Flow	81.17	7.23	1959	4.67	7.8	0.107	0.137	740	16	124	17
DH-55	1/18/2023	Low-Flow	81.36	7.22	1968	0.93	7.0	0.112	0.128	761	17	139	18
DH-55	2/16/2023	Low-Flow	81.72	7.32	2149	2.18	6.9	0.113	0.113	910	18	134	19
DH-55	3/16/2023	Low-Flow	81.86	7.13	2006	0.91	7.4	0.118	0.084	862	18	141	19
DH-55	4/20/2023	Low-Flow	81.36	7.39	2100	1.05	7.3	0.126	0.114	868	18	152	19
DH-55	5/19/2023	Low-Flow	80.22	7.24	1928	0.50	9.5	0.119	0.120	754	15	134	16
DH-55	6/22/2023	Low-Flow	79.57	7.22	2079	4.63	8.6	0.097	0.269	856	16	138	16
DH-55	7/18/2023	Low-Flow	80.25	7.12	2889	3.96	10.8	0.090	0.303	1350	20	176	30
DH-55	8/16/2023	Low-Flow	80.82	7.20	2465	0.71	9.8	0.110	0.254	1090	16	172	21
DH-55	9/27/2023	Low-Flow	80.97	7.33	2187	0.74	8.5	0.104	0.176	914	17	147	16
DH-55	10/17/2023	Low-Flow	80.94	7.32	2290	4.14	9.6	0.102	0.191	956	17	159	17
DH-55	11/16/2023	Low-Flow	81.19	7.28	2685	5.16	8.3	0.097	0.232	1140	19	193	22
DH-55	12/19/2023	Low-Flow	81.44	7.24	3011	0.92	7.7	0.097	0.244	1360	21	220	28
DH-55	1/23/2024	Low-Flow	81.00	7.28	3037	0.42	7.5	0.096	0.207	1390	22	219	26
DH-55	2/20/2024	Low-Flow	81.09	7.36	2795	0.91	7.3	0.105	0.178	1170	20	200	21
DH-55	3/19/2024	Low-Flow	80.99	7.31	2550	0.50	8.8	0.112	0.162	1020	18	207	18
DH-55	6/13/2024	Low-Flow	80.91	7.21	2538	3.39	9.9	0.113	0.148	988	19	201	18
DH-55	10/11/2024	Low-Flow	81.58	7.31	2528	3.15	8.7	0.110	0.114	1070	21	200	22
DH-55	95% USL		--	--	--	--	--	1.48	0.316	1232	24	198	43

Appendix E - Unfumed Slag Indicator, Sentinel, and Tier 2 Well Data Table
2021-2024

Site	Sample Date	Purge Method	SWL (ft bmp)	pH (s.u.)	SC (µmhos/cm)	Dissolved O2 (mg/L)	Temperature (°C)	Arsenic (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)
DH-56	6/22/2023	Bailer	82.01	7.77	2737	**	10.8	0.461	0.323	1010	21	215	13
DH-56	7/18/2023	Bailer	80.75	7.49	7970	**	13.7	0.413	2.75	3530	85	727	59
DH-56	8/16/2023	Low-Flow	82.50	7.45	6639	4.15	11.0	0.346	1.22	3420	64	728	56
DH-56	9/26/2023	Low-Flow	82.81	7.57	5790	2.35	11.2	0.338	0.672	2840	48	577	45
DH-56	10/17/2023	Low-Flow	83.05	7.55	5577	6.82	11.7	0.349	0.600	2640	45	541	39
DH-56	11/16/2023	Low-Flow	83.52	7.62	5209	2.81	9.5	0.374	0.576	2320	38	476	34
DH-56	12/19/2023	Low-Flow	84.36	7.59	4808	2.81	9.5	0.396	0.495	2090	34	471	31
DH-56	1/23/2024		Sample Tubing Frozen in Well - No Sample										
DH-56	2/20/2024		Sample Tubing Frozen in Well - No Sample										
DH-56	3/19/2024	Low-Flow	84.48	7.60	3644	2.91	11.5	0.419	0.293	1480	25	393	18
DH-56	6/13/2024	Low-Flow	83.70	7.45	3400	4.29	12.3	0.407	0.204	1290	22	319	18
DH-56	10/11/2024	Low-Flow	85.16	7.66	3089	4.02	11.3	0.378	0.137	1230	19	308	17
DH-56	95% USL		--	--	--	--	--	3.70	1.75	3889	89	864	74

Appendix E - Unfumed Slag Indicator, Sentinel, and Tier 2 Well Data Table
2021-2024

Site	Sample Date	Purge Method	SWL (ft bmp)	pH (s.u.)	SC (µmhos/cm)	Dissolved O2 (mg/L)	Temperature (°C)	Arsenic (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)
EH-51	10/5/2021	Standard	19.95	6.99	354	5.21	10.8	0.026	0.003	64	10	19	5
EH-51	10/18/2022	Standard	18.49	6.98	423	5.74	10.6	0.024	0.004	81	14	22	7
EH-51	8/15/2023	Low-Flow	14.58	6.80	418	6.66	10.9	0.029	0.003	61	17	20	7
EH-51	9/26/2023	Low-Flow	14.34	6.91	437	6.51	11.5	0.062	0.003	75	21	22	7
EH-51	10/10/2023	Low-Flow	15.13	6.97	446	6.47	11.0	0.032	0.003	75	20	22	7
EH-51	11/16/2023	Low-Flow	17.13	6.79	437	5.53	9.1	0.026	0.003	75	18	22	7
EH-51	12/19/2023	Low-Flow	18.79	6.77	443	5.07	9.3	0.028	0.003	76	17	21	7
EH-51	3/19/2024	Low-Flow	17.11	6.81	395	6.80	8.6	0.030	0.003	66	12	24	6
EH-51	10/10/2024	Low-Flow	17.57	7.00	392	4.80	11.4	0.032	0.002	68	16	20	7
EH-51	95% USL		--	--	--	--	--	0.215	0.394	780	33	46	28

Appendix E - Unfumed Slag Indicator, Sentinel, and Tier 2 Well Data Table
2021-2024

Site	Sample Date	Purge Method	SWL (ft bmp)	pH (s.u.)	SC (µmhos/cm)	Dissolved O2 (mg/L)	Temperature (°C)	Arsenic (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)
EH-60	4/20/2023	Low-Flow	26.85	5.56	1962	7.38	7.9	2.41	0.004	657	171	13	38
EH-60	5/19/2023	Low-Flow	26.05	5.36	1975	1.43	10.5	2.48	0.004	695	167	12	43
EH-60	6/22/2023	Low-Flow	24.30	5.48	1891	4.15	11.5	2.79	0.003	604	189	12	39
EH-60	7/18/2023	Low-Flow	23.82	5.54	1747	5.73	14.0	3.10	0.005	500	191	11	30
EH-60	8/15/2023	Low-Flow	23.89	5.53	1967	5.13	12.8	2.94	0.009	424	228	12	34
EH-60	9/26/2023	Low-Flow	23.79	5.55	2036	6.49	12.0	2.75	0.018	492	284	12	36
EH-60	10/17/2023	Low-Flow	24.01	5.60	2014	6.45	14.6	2.82	0.021	495	287	13	35
EH-60	11/16/2023	Low-Flow	24.49	5.53	2048	5.74	9.8	2.72	0.031	511	278	12	35
EH-60	12/19/2023	Low-Flow	25.13	5.56	1962	3.59	9.6	2.37	0.038	540	242	13	36
EH-60	1/23/2024	Low-Flow	25.49	5.70	1859	3.10	8.6	2.09	0.040	545	221	12	32
EH-60	2/20/2024	Low-Flow	25.53	5.76	1869	2.53	8.9	1.96	0.042	536	204	12	31
EH-60	3/19/2024	Low-Flow	24.95	5.69	1873	2.29	10.7	2.11	0.042	538	201	13	34
EH-60	6/13/2024	Low-Flow	24.70	5.58	1880	4.87	13.9	2.01	0.033	537	212	12	32
EH-60	10/10/2024	Low-Flow	25.78	5.80	1840	2.45	12.4	1.96	0.035	564	198	12	37
EH-60	95% USL		--	--	--	--	--	9.85	0.005	674	212	15	45

Appendix E - Unfumed Slag Indicator, Sentinel, and Tier 2 Well Data Table
2021-2024

Site	Sample Date	Purge Method	SWL (ft bmp)	pH (s.u.)	SC (µmhos/cm)	Dissolved O2 (mg/L)	Temperature (°C)	Arsenic (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)
EH-61	10/1/2021	Standard	30.00	6.95	1900	0.08	11.7	<0.002	0.299	814	23	16	23
EH-61	10/18/2021	Low-Flow	30.28	6.79	1838	**	11.0	<0.002	0.314	742	21	15	23
EH-61	11/3/2021	Low-Flow	30.47	7.01	1861	**	10.6	<0.002	0.299	755	22	15	23
EH-61	11/17/2021	Low-Flow	30.71	6.90	1884	0.29	9.9	<0.002	0.305	740	23	16	23
EH-61	12/2/2021	Low-Flow	30.90	6.87	1848	0.45	11.4	<0.002	0.301	719	21	15	23
EH-61	12/21/2021	Low-Flow	31.05	7.14	1866	2.45	10.5	<0.002	0.277	772	22	15	23
EH-61	1/12/2022	Low-Flow	31.20	7.08	1853	1.57	10.0	<0.002	0.281	732	22	15	23
EH-61	2/7/2022	Low-Flow	31.29	7.01	1894	0.35	10.3	<0.002	0.263	700	22	16	24
EH-61	3/11/2022	Low-Flow	31.47	7.04	1731	0.44	8.0	0.004	0.257	761	23	14	23
EH-61	4/18/2022	Low-Flow	31.62	7.27	1664	0.49	11.4	<0.002	0.252	747	22	15	23
EH-61	5/11/2022	Low-Flow	31.72	6.92	1805	0.72	12.0	<0.002	0.224	736	21	16	22
EH-61	6/14/2022	Low-Flow	31.29	7.07	1799	1.18	10.8	<0.002	0.263	704	21	14	20
EH-61	7/14/2022	Low-Flow	30.25	7.08	1641	0.79	11.8	<0.002	0.225	652	19	14	18
EH-61	8/16/2022	Low-Flow	29.63	6.95	1483	0.9	16.6	<0.002	0.206	552	17	13	16
EH-61	9/13/2022	Low-Flow	29.75	7.10	1377	7.78	12.3	<0.002	0.161	494	16	14	14
EH-61	10/13/2022	Low-Flow	29.57	7.08	1327	0.96	14.0	<0.002	0.155	502	17	12	13
EH-61	11/15/2022	Low-Flow	29.68	7.08	1318	0.91	10.0	<0.002	0.157	486	17	12	12
EH-61	12/27/2022	Low-Flow	29.28	6.98	1373	1.80	10.5	<0.002	0.180	479	17	11	13
EH-61	1/18/2023	Low-Flow	29.01	7.00	1374	1.53	9.6	<0.002	0.173	495	18	12	13
EH-61	2/16/2023	Low-Flow	28.95	7.12	1412	1.93	9.3	<0.002	0.181	524	19	12	13
EH-61	3/16/2023	Low-Flow	28.85	6.96	1390	1.20	7.5	<0.002	0.187	521	22	13	14
EH-61	4/20/2023	Low-Flow	28.25	7.12	1468	1.49	9.4	<0.002	0.207	518	23	13	15
EH-61	5/19/2023	Low-Flow	27.44	6.93	1488	0.94	11.1	<0.002	0.201	533	24	13	17
EH-61	6/22/2023	Low-Flow	25.93	6.96	1465	1.23	11.5	<0.002	0.179	512	24	13	16
EH-61	10/17/2023	Low-Flow	25.71	7.04	1358	1.69	11.9	<0.002	0.155	468	23	12	13
EH-61	95% USL		--	--	--	--	--	<0.002	0.535	1132	42	16	44

Appendix E - Unfumed Slag Indicator, Sentinel, and Tier 2 Well Data Table
2021-2024

Site	Sample Date	Purge Method	SWL (ft bmp)	pH (s.u.)	SC (µmhos/cm)	Dissolved O2 (mg/L)	Temperature (°C)	Arsenic (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)
EH-101	10/5/2021	Standard	20.45	7.00	346	4.35	10.3	0.003	0.003	66	9	15	6
EH-101	10/18/2022	Standard	17.95	7.01	379	4.64	10.2	0.003	0.003	77	11	16	6
EH-101	8/15/2023	Low-Flow	14.88	6.77	383	6.15	11.0	0.003	0.002	55	16	16	7
EH-101	9/26/2023	Low-Flow	14.72	6.93	382	5.55	11.3	0.003	0.002	66	19	16	7
EH-101	10/10/2023	Low-Flow	15.41	7.00	390	5.40	11.7	0.003	0.002	65	17	17	7
EH-101	11/16/2023	Low-Flow	17.41	6.82	373	4.45	8.9	0.003	0.002	64	14	16	6
EH-101	12/19/2023	Low-Flow	19.02	6.80	368	4.54	9.0	0.003	0.002	63	12	16	7
EH-101	3/19/2024	Low-Flow	17.40	6.81	352	2.43	8.5	0.003	0.002	60	9	18	6
EH-101	10/10/2024	Low-Flow	17.83	7.02	362	4.18	11.6	0.003	0.002	64	14	16	7
EH-101	95% USL		--	--	--	--	--	0.215	0.394	780	33	46	28

Appendix E - Unfumed Slag Indicator, Sentinel, and Tier 2 Well Data Table
2021-2024

Site	Sample Date	Purge Method	SWL (ft bmp)	pH (s.u.)	SC (µmhos/cm)	Dissolved O2 (mg/L)	Temperature (°C)	Arsenic (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)
EH-103	7/29/2021 (Pre-Crushing)	Standard	30.58	6.91	1768	0.02	12.3	<0.002	0.335	711	24	11	33
EH-103	10/1/2021	Standard	30.58	6.93	1741	0.06	11.9	<0.002	0.312	787	24	11	32
EH-103	10/18/2021	Low-Flow	30.85	6.85	1867	**	11.6	<0.002	0.370	753	30	7	52
EH-103	11/2/2021	Low-Flow	31.02	6.84	1711	0.49	10.6	<0.002	0.328	780	32	7	51
EH-103	11/2/2021	Standard	31.02	6.86	1709	0.22	11.8	<0.002	0.311	753	25	10	37
EH-103	11/17/2021	Low-Flow	31.29	6.71	1755	0.20	9.8	<0.002	0.369	743	31	7	50
EH-103	12/2/2021	Low-Flow	31.50	6.69	1728	0.17	11.4	<0.002	0.347	733	30	6	52
EH-103	12/21/2021	Low-Flow	31.64	6.90	1748	0.29	10.5	<0.002	0.343	773	32	7	51
EH-103	1/12/2022	Low-Flow	31.79	6.84	1722	0.21	10.4	<0.002	0.311	762	30	7	50
EH-103	2/7/2022	Low-Flow	31.89	6.84	1757	0.23	10.4	<0.002	0.342	733	30	7	51
EH-103	3/11/2022	Low-Flow	32.07	6.96	1629	0.43	8.0	<0.002	0.344	690	27	6	49
EH-103	4/18/2022	Low-Flow	32.23	7.10	1576	0.44	11.3	<0.002	0.344	781	31	7	51
EH-103	5/11/2022	Low-Flow	32.34	6.76	1725	0.80	12.0	<0.002	0.315	782	30	7	52
EH-103	6/14/2022	Low-Flow	31.87	6.97	1744	1.35	10.9	<0.002	0.369	734	30	6	47
EH-103	7/14/2022	Low-Flow	30.84	6.97	1702	0.62	11.7	<0.002	0.348	777	30	6	47
EH-103	8/16/2022	Low-Flow	30.13	6.75	1706	0.48	13.9	<0.002	0.376	771	31	7	52
EH-103	9/13/2022	Low-Flow	30.31	6.84	1735	0.72	11.6	<0.002	0.344	751	30	7	52
EH-103	10/13/2022	Low-Flow	30.17	6.83	1727	0.38	12.1	<0.002	0.345	858	32	7	53
EH-103	11/15/2022	Low-Flow	30.31	6.83	1731	0.48	9.1	<0.002	0.324	850	32	7	49
EH-103	12/27/2022	Low-Flow	29.85	6.74	1700	2.23	10.5	<0.002	0.338	731	30	6	47
EH-103	1/18/2023	Low-Flow	29.63	6.78	1695	3.29	9.8	<0.002	0.324	747	30	7	47
EH-103	2/16/2023	Low-Flow	29.55	6.86	1720	0.80	9.4	<0.002	0.337	798	30	6	46
EH-103	3/16/2023	Low-Flow	29.52	6.72	1622	0.37	10.6	<0.002	0.341	757	30	6	47
EH-103	4/20/2023	Low-Flow	28.89	6.88	1696	1.27	9.1	<0.002	0.369	770	30	7	51
EH-103	5/19/2023	Low-Flow	28.06	6.74	1700	0.16	11.2	<0.002	0.356	773	30	6	53
EH-103	6/22/2023	Low-Flow	26.58	6.76	1688	0.24	11.1	<0.002	0.321	743	29	7	47
EH-103	7/18/2023	Low-Flow	26.13	6.79	1707	0.69	12.3	<0.002	0.317	808	26	6	49
EH-103	8/15/2023	Low-Flow	26.20	6.77	1783	0.49	12.8	<0.002	0.338	815	25	6	50
EH-103	9/26/2023	Low-Flow	26.11	6.83	1695	0.72	11.3	<0.002	0.304	785	29	6	49
EH-103	10/17/2023	Low-Flow	26.28	6.85	1703	1.26	12.1	<0.002	0.316	782	29	7	49
EH-103	11/16/2023	Low-Flow	26.80	6.76	1711	0.42	10.4	0.002	0.303	769	29	6	48
EH-103	12/19/2023	Low-Flow	27.44	6.76	1709	0.36	10.0	<0.002	0.290	756	28	6	50
EH-103	1/23/2024	Low-Flow	27.81	6.81	1670	0.28	9.8	<0.002	0.302	776	28	6	45
EH-103	2/20/2024	Low-Flow	27.81	6.83	1679	0.92	10.3	<0.002	0.321	707	28	6	42
EH-103	3/19/2024	Low-Flow	27.13	6.76	1688	0.10	11.2	<0.002	0.326	744	27	7	47
EH-103	6/11/2024	Low-Flow	26.95	6.78	1640	0.41	12.8	<0.002	0.317	732	27	7	48
EH-103	10/10/2024	Low-Flow	27.94	6.83	1604	0.78	11.9	<0.002	0.286	732	27	6	46
EH-103	95% USL		--	--	--	--	--	<0.002	0.484	1088	47	11	55

Appendix E - Unfumed Slag Indicator, Sentinel, and Tier 2 Well Data Table
2021-2024

Site	Sample Date	Purge Method	SWL (ft bmp)	pH (s.u.)	SC (µmhos/cm)	Dissolved O2 (mg/L)	Temperature (°C)	Arsenic (mg/L)	Selenium (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)
EH-110	10/6/2021	Standard	25.94	7.20	765	2.35	12.3	<0.002	0.050	163	21	5	5
EH-110	4/18/2022	Low-Flow	27.44	7.56	653	2.60	10.2	<0.002	0.046	170	17	5	5
EH-110	1/23/2024	Low-Flow	22.98	7.13	656	3.70	11.1	<0.002	0.022	125	29	4	4
EH-110	2/20/2024		No Access - Flush Mount Well Buried in Plowed Snow and Ice - No Sample										
EH-110	3/19/2024	Low-Flow	22.40	7.04	663	3.79	10.8	<0.002	0.022	119	31	6	4
EH-110	10/11/2024	Low-Flow	23.18	7.21	713	3.57	12.0	<0.002	0.033	126	41	5	5
EH-110	95% USL		--	--	--	--	--	<0.002	0.405	724	38	10	28

Purge method comparison samples (low-flow and standard sampling methods) were collected at wells DH-55 and EH-103 on 11/2/2021, and at wells DH-6 and DH-53 on 12/2/2021.
Field parameters (pH, SC, dissolved oxygen, water temperature) are monitored as groundwater purging/stabilization indicators.
**Dissolved oxygen not recorded due to air entrainment/meter malfunction.



APPENDIX F

2024 WELL PURGE METHOD COMPARISON SAMPLING RESULTS

Table F-1. June 2024 Groundwater Purge/Sample Method Comparison

Monitoring Site	EH-114			EH-141			EH-126		
	Waterra Low Flow	Grundfos Submersible	RPD	Waterra Low Flow	Grundfos Submersible	RPD	Waterra Low Flow	Grundfos Submersible	RPD
Sample ID	AEH-2406-119	AEH-2406-120		AEH-2406-109	AEH-2406-110		AEH-2406-117	AEH-2406-118	
Sample Date	6/12/2024			6/12/2024			6/12/2024		
Field Parameters									
pH (s.u.)	6.42	6.42	0.0%	7.11	7.05	0.8%	7.23	6.95	3.9%
SC (µmhos/cm)	1913	1874	2.1%	783	782	0.1%	997	1257	23.1%
Diss O ₂	8.7	NM	NC	4.75	4.95	4.1%	7.71	4.42	54.2%
Water Temp (°C)	12.1	12.2	0.8%	10.4	11.0	5.6%	11.8	11.7	0.9%
ORP (mV)	190	183	3.8%	233	197	16.7%	191	178	7.0%
E _H (mV)	409	402	1.7%	454	417	8.5%	412	398	3.5%
Turbidity (NTU)	5.7	3.4	50.5%	18.8	1.8	165.0%	9.8	3.3	99.2%
Laboratory Analyses									
pH (s.u.)	6.6	6.6	0.0%	7.3	7.3	0.0%	7.4	7.1	4.1%
SC (µmhos/cm)	1900	1850	2.7%	774	773	0.1%	998	1240	21.6%
Total Suspended Solids	13	10	±RL	10	10	±RL	11	11	±RL
Total Dissolved Solids	1460	1390	4.9%	552	552	0.0%	712	939	27.5%
Total Alkalinity as CaCO ₃	160	160	0.0%	160	160	0.0%	200	190	5.1%
Bicarbonate as HCO ₃	200	200	0.0%	190	190	0.0%	250	230	8.3%
Calcium	145	143	1.4%	81	76	6.4%	95	119	22.4%
Magnesium	44	43	2.3%	23	22	4.4%	44	43	2.3%
Sodium	230	219	4.9%	48	47	2.1%	55	91	49.3%
Potassium	10	9	10.5%	6	6	0.0%	3	5	> ±RL
Chloride	35	36	2.8%	19	19	0.0%	34	32	6.1%
Sulfate	816	789	3.4%	202	202	0.0%	268	433	47.1%
Bromide	1.67	1.61	3.7%	0.70	0.70	0.0%	0.91	1.29	34.5%
Trace Metals (Dissolved)									
Antimony	0.003	0.003	±RL	0.003	0.003	±RL	0.003	0.003	±RL
Arsenic	2.09	1.86	11.6%	0.002	0.002	±RL	0.003	0.002	±RL
Cadmium	0.001	0.001	±RL	0.001	0.001	±RL	0.001	0.001	±RL
Copper	0.001	0.001	±RL	0.001	0.001	±RL	0.001	0.001	±RL
Iron	0.02	0.02	±RL	0.02	0.02	±RL	0.02	0.02	±RL
Lead	0.005	0.005	±RL	0.005	0.005	±RL	0.005	0.005	±RL
Manganese	0.01	0.01	±RL	0.01	0.01	±RL	0.01	0.01	±RL
Mercury	0.001	0.001	±RL	0.001	0.001	±RL	0.001	0.001	±RL
Selenium	0.014	0.015	6.9%	0.050	0.052	3.9%	0.108	0.112	3.6%
Thallium	0.001	0.001	±RL	0.001	0.001	±RL	0.001	0.001	±RL
Zinc	0.010	0.010	±RL	0.010	0.010	±RL	0.010	0.010	±RL

All concentrations in mg/L unless otherwise noted.

Italicized results are nondetect values, replaced with the detection limit for comparison purposes.

RPD = relative percent difference

Typical duplicate sample quality control limits are ≤20% RPD for values ≥ 5x reporting limits, or ± the reporting limit for one or both values ≤ 5x the reporting limit.

±RL = results agree to within plus or minus the laboratory reporting limit

Comparison value exceeds duplicate criteria (>20% RPD or > ±RL).

Table F-2. October 2024 Groundwater Purge/Sample Method Comparison

Monitoring Site	EH-59			EH-114			EH-141			EH-126		
	Waterra Low Flow	Grundfos Submersible	RPD	Waterra Low Flow	Grundfos Submersible	RPD	Waterra Low Flow	Grundfos Submersible	RPD	Waterra Low Flow	Grundfos Submersible	RPD
Sample ID	AEH-2410-312	AEH-2410-313		AEH-2406-119	AEH-2406-120		AEH-2406-109	AEH-2406-110		AEH-2406-117	AEH-2406-118	
Sample Date	10/8/2024			6/12/2024			6/12/2024			6/12/2024		
Field Parameters												
pH (s.u.)	7.07	6.97	1.4%	6.70	6.57	2.0%	7.57	7.32	3.4%	7.60	7.22	5.1%
SC (µmhos/cm)	429	424	1.2%	1860	1839	1.1%	782	793	1.4%	915	1096	18.0%
Diss O ₂	3.45	2.26	41.7%	1.99	4.57	78.7%	6.20	7.64	20.8%	6.86	6.00	13.4%
Water Temp (°C)	12.1	12.9	6.4%	12.1	11.8	2.5%	10.1	10.8	6.7%	12.5	11.6	7.5%
ORP (mV)	-20	-17	16.2%	122	123	0.8%	85	93	9.0%	95	99	4.1%
E _H (mV)	199	202	1.5%	341	343	0.6%	306	313	2.3%	314	319	1.6%
Turbidity (NTU)	6.6	2.0	107.0%	14.6	2.2	147.6%	2.8	0.9	102.7%	9.7	2.8	110.4%
Laboratory Analyses												
pH (s.u.)	7.0	7.0	0.0%	6.6	6.6	0.0%	7.3	7.3	0.0%	7.4	7.2	2.7%
SC (µmhos/cm)	424	424	0.0%	1870	1840	1.6%	790	790	0.0%	914	1110	19.4%
Total Suspended Solids	10	10	±RL	294	10	±RL	10	11	±RL	14	15	±RL
Total Dissolved Solids	261	269	3.0%	1420	1370	3.6%	552	550	0.4%	628	797	23.7%
Total Alkalinity as CaCO ₃	140	140	0.0%	160	160	0.0%	160	160	0.0%	200	190	5.1%
Bicarbonate as HCO ₃	170	170	0.0%	190	200	5.1%	200	200	0.0%	250	240	4.1%
Calcium	48	47	2.1%	144	144	0.0%	83	82	1.2%	93	108	14.9%
Magnesium	11	11	0.0%	42	42	0.0%	23	23	0.0%	42	41	2.4%
Sodium	21	21	0.0%	214	209	2.4%	50	50	0.0%	46	75	47.9%
Potassium	8	9	11.8%	9	9	0.0%	7	7	0.0%	4	5	±RL
Chloride	7	7	0.0%	36	37	2.7%	20	20	0.0%	33	33	0.0%
Sulfate	66	65	1.5%	796	774	2.8%	210	212	0.9%	227	348	42.1%
Bromide	0.05	0.05	±RL	1.78	1.74	2.3%	0.74	0.75	1.3%	0.79	1.19	40.4%
Trace Metals (Dissolved)												
Antimony	0.005	0.008	±RL	0.003	0.003	±RL	0.003	0.003	±RL	0.003	0.003	±RL
Arsenic	0.022	0.021	4.7%	1.82	1.61	12.2%	0.002	0.002	±RL	0.003	0.002	±RL
Cadmium	0.001	0.001	±RL	0.001	0.001	±RL	0.001	0.001	±RL	0.001	0.001	±RL
Copper	0.001	0.001	±RL	0.002	0.001	±RL	0.001	0.001	±RL	0.001	0.001	±RL
Iron	0.14	0.02	> ±RL	0.02	0.02	±RL	0.02	0.02	±RL	0.02	0.02	±RL
Lead	0.005	0.005	±RL	0.005	0.005	±RL	0.005	0.005	±RL	0.005	0.005	±RL
Manganese	0.05	0.30	> ±RL	0.01	0.01	±RL	0.01	0.01	±RL	0.01	0.01	±RL
Mercury	0.001	0.001	±RL	0.001	0.001	±RL	0.001	0.001	±RL	0.001	0.001	±RL
Selenium	0.002	0.002	±RL	0.014	0.014	0.0%	0.047	0.047	0.0%	0.076	0.084	10.0%
Thallium	0.001	0.001	±RL	0.001	0.001	±RL	0.001	0.001	±RL	0.001	0.001	±RL
Zinc	0.010	0.010	±RL	0.010	0.010	±RL	0.010	0.010	±RL	0.010	0.010	±RL

All concentrations in mg/L unless otherwise noted.

Italicized results are nondetect values, replaced with the detection limit for comparison purposes.

RPD = relative percent difference

Typical duplicate sample quality control limits are ≤20% RPD for values > 5x reporting limits, or ± the reporting limit for one or both values ≤ 5x the reporting limit.

±RL = results agree to within plus or minus the laboratory reporting limit

Comparison value exceeds duplicate criteria (>20% RPD or > ±RL).



EXHIBITS

