East Mission Flats Repository 2015 Annual Water Quality Report

State of Idaho
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Acronyms and Abbreviations

ARARs	applicable or relevant and appropriate requirements
BCR	Big Creek Repository
bgs	below ground surface
BPRP	Basin Property Remediation Program
BHSS	Bunker Hill Mining and Metallurgical Complex Superfund Site
CDA River	Coeur d’Alene River
cfs	cubic feet per second
CLP	Contract Laboratory Program
COC	contaminant of concern
CRQL	contract required quantitation limit
DEQ	Idaho Department of Environmental Quality
DO	dissolved oxygen
EMFR	East Mission Flats Repository
I-90	Interstate-90
ICP	Institutional Controls Program
MDL	method detection limit
MFA	Maul Foster Alongi
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS	matrix spike
mV	millivolts
MW	monitoring well
North Wind	North Wind Construction Services
OIG	Office of the Inspector General
ORP	oxidation reduction potential
OU	operable unit
PZ	piezometers
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
Ralston	Ralston Hydrologic Services, Inc.
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SCM	site conceptual model
SSI	statistically significant increase
SVL	SVL Analytical, Inc.
TerraGraphics	TerraGraphics Environmental Engineering, Inc.
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

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1 Introduction and Purpose

During implementation of the 2015 remedial actions, approximately 7,327 compact cubic yards of metals contaminated soils were placed at the East Mission Flats Repository (EMFR) (North Wind 2016). Consolidation of contaminated soils, sediments, and source materials into controlled repositories is a critical component of the human health remedy for the Bunker Hill Mining and Metallurgical Complex Superfund Site (BHSS), as described in the Records of Decision (RODs; USEPA 1991, 1992, 2002). As part of ongoing repository operations, routine monitoring and evaluation of surrounding environmental conditions are conducted to evaluate repository performance. The purpose of this annual report is to provide a summary and interpretation of monitoring data collected at the EMFR through 2015.

Water monitoring activities have been conducted at EMFR since the fall of 2007. The contaminants of concern (COCs) include the metals antimony, arsenic, cadmium, lead, and zinc. Groundwater, floodwater, and repository pore water are monitored for COCs to evaluate the EMFR's potential impacts on the surrounding water quality. Ongoing water monitoring is conducted to meet the following goals: 1) evaluate water levels and water quality parameters of pore water within the repository waste; 2) evaluate the influence of surface water elevation on groundwater levels at the site; 3) evaluate hydraulic gradients and groundwater flow direction over time, both vertically and horizontally at the EMFR site; and 4) evaluate the potential effects of the repository on groundwater.

Beginning in 2015 a review was conducted to identify potential methods to optimize the repository monitoring. Specific questions related to the EMFR monitoring that were addressed by the independent optimization team include the following:

1. Given that the repositories are surrounded by and located on top of mine waste, what should be the approach for monitoring potential impacts of repositories on the environment?
2. Is the statistical data analysis approach currently specified in the monitoring plans appropriate for monitoring performance of the repository system?
3. Are there additional analyses or evaluation methods to better distinguish between repository contaminants and the historical contamination surrounding the repositories?
4. Are there recommendations regarding optimization to the spatial or temporal aspects of the current monitoring strategy?

The results of the optimization review will be included in a separate document in 2016. Optimization recommendations will be evaluated during 2017 for incorporation into the repository monitoring program.

1.1 Location

The EMFR is located on a 23-acre parcel in Kootenai County approximately three-quarters of a mile west of Cataldo. The site is bounded to the northeast by Canyon Road, to the southwest by

Interstate 90 (I-90) and exit 39, and to the north and northwest by private property. The site is located in the 100 year floodplain of the Coeur d'Alene (CDA) River. The river flows in an approximate arc around the site approximately three-quarters of a mile to the east, south, and west. The EMFR site is north of I-90, across the freeway from the Old Mission State Park and the Cataldo Mission (Figure 1).

1.2 Report Organization

This annual water quality report for the EMFR is structured as follows:

Section 1.0 – Introduction and Purpose provides a brief description of the EMFR, its location, and the purpose of the report.

Section 2.0 – Background and Site Conceptual Model describes the EMFR history, regional and site-specific conditions, and existing water quality conditions in the area.

Section 3.0 – Methods briefly summarizes the field sampling and monitoring activities, quality assurance/quality control (QA/QC) procedures, and data analysis conducted for this report.

Section 4.0 – Results and Discussion presents dissolved metals data through 2014, summarizes data analyses, and discusses the data and results as they relate to the sampling and monitoring objectives.

Section 5.0 – Conclusions and Recommendations summarizes the conclusions drawn from the data and analyses and recommends future actions for the project.

Section 6.0 – **References** lists those used to develop the information presented in this annual report.

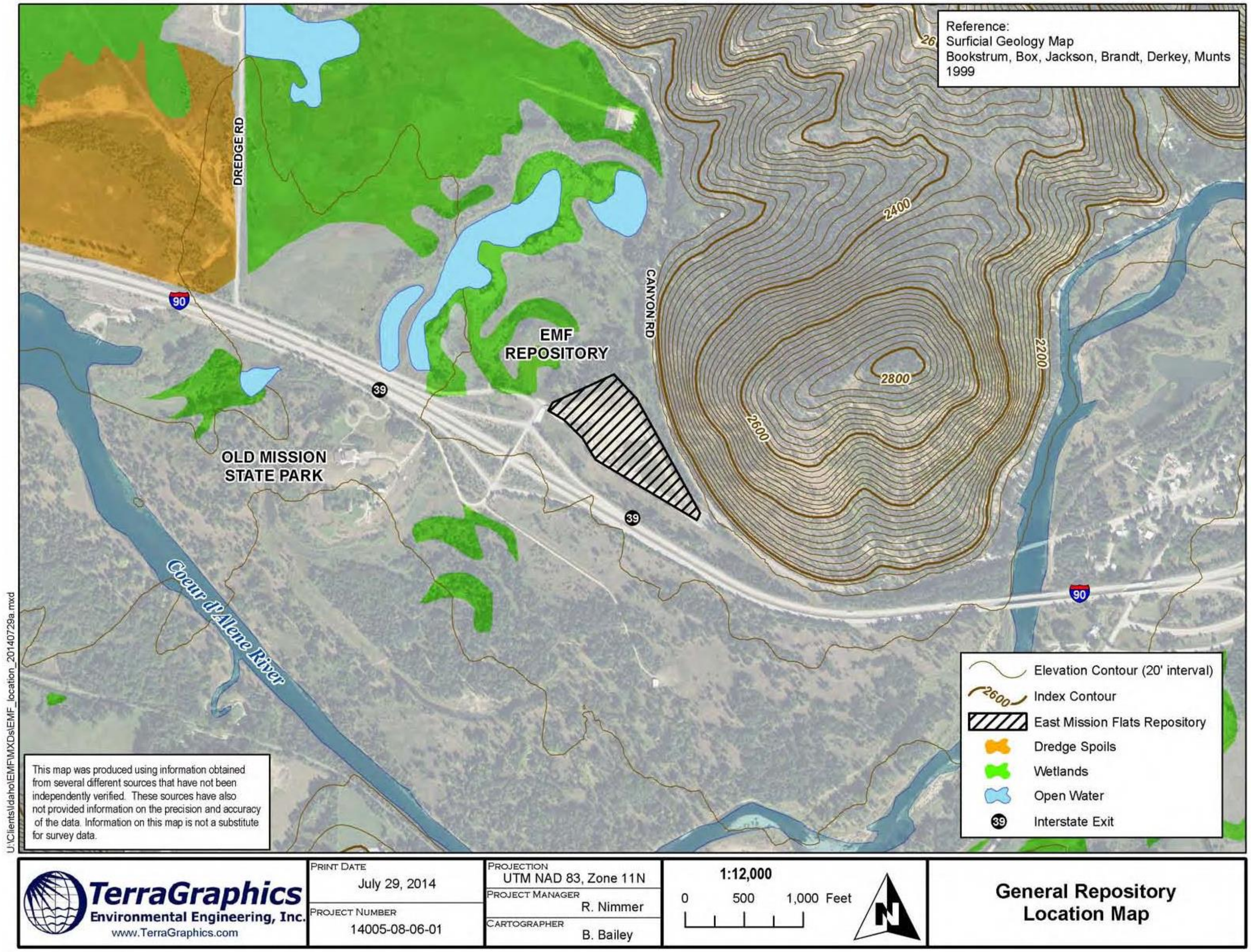

Figure 1. East Mission Flats Repository Location - Cataldo Idaho.

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2 Background and Site Conceptual Model

This section summarizes past information and data in terms of a site conceptual model (SCM) to describe: the site background (Section 2.1), regional conditions (Section 2.2), site specific conditions (Section 2.3), and groundwater quality surrounding the EMFR Repository (Section 2.4).

This SCM is considered a living document and will be updated as additional site characterization information and data are gathered. In future annual reports, the purpose of updating the SCM will be to capture new information that improves our current understanding of site knowledge.

2.1 Site Background

Prior to EMFR construction activities, there is no history of development in the EMFR footprint, with the exception of utilities construction. From the 1930's through the 1960's dredging operations removed mining contaminated sediments from the CDA River. The dredge spoils were deposited on property the Mine Owners Association purchased on nearby Cataldo Mission Flats for the purpose of impounding the waste. The dredge spoils are located west of the EMFR site and are not thought to occur below the repository site (Bookstrom et al. 1999).

Since August, 2009, the EMFR has been used as a disposal site in support of the BHSS Operable Unit (OU) 3 ROD (USEPA 2002). Waste materials from a variety of sources in OU3 including the Basin Property Remediation Program (BPRP), Institutional Controls Program (ICP), and commercial and infrastructure development projects are placed at the EMFR (TerraGraphics 2009). Waste is added to the repository primarily during the construction season from approximately May to November.

Waste placement occurs in thin lifts that are compacted to 90 to 95% maximum density. Successive thin lifts of waste are placed until the desired interim or final elevation is achieved. Repository construction began by filling the western third of the final repository footprint to an interim elevation through the 2010 season. During the 2011 and 2012 construction season the footprint was extended east at the interim elevation to encompass approximately two-thirds of the final footprint. During 2013, waste placement was expanded to the east at the interim elevation to encompass the entire final footprint. Waste will continue to be placed in the repository until the final design elevation is achieved.

The BPRP data for sample locations requiring remediation should be representative of waste contained at EMFR as this is the primary waste disposed of in the repository. Since 2004 more than 20,000 residential soil samples were analyzed through the program. The average lead concentration was 2,575 milligrams per kilogram (mg/kg) and the average arsenic concentration was 67 mg/kg. Table 1 presents detailed BPRP lead and arsenic results.

The results of the historical BPRP sampling are consistent with the results of a 2015 study (MFA 2015) that measured lead concentrations in the upper two feet of the Big Creek Repository (BCR). Like EMFR, the primary waste placed within the BCR is related to the BPRP program. The lead concentrations in six composite samples from 0 to 12 inches below the repository surface ranged from 1,410 mg/kg to 2,600 mg/kg. The lead concentration in four composite samples from 12 to 24 inches below the repository surface ranged from 1,390 mg/kg to 2,330 mg/kg.

2.2 Regional Conditions

The BHSS facility includes mining contaminated areas in the CDA River corridor, adjacent floodplains, downstream water bodies, tributaries, and fill areas, as well as the 21-square mile Bunker Hill “Box” located in the area surrounding the historic smelting operations. As much as 100 million tons of contaminated sediment is dispersed over thousands of acres throughout the area. The contaminants are primarily metals, including arsenic, cadmium, lead, and zinc.

Regional deposition of contaminated sediments surrounding the repository is related to historical dredging operations and the historical and ongoing deposition of contaminated floodwater sediments on the floodplain. Lead concentrations as high as 8,000 mg/kg have been measured in dredge spoils (Brookstrom et al. 2001). The dredge spoils were deposited just over half a mile northwest of the repository site covering more than 130 acres at depths of up to 36 feet thick. The wetlands to the east of the dredge spoils and north of the repository site and the surrounding floodplain contain contaminated floodwater deposits greater than two feet thick. Lead concentrations greater than 10,000 mg/kg were found in these floodplain deposits (Box et al. 2001).

2.3 Site-Specific Conditions

The EMFR is set within the low relief, wide floodplain valley of the CDA River within the Middle Proterozoic depositional basin of the Belt Supergroup. The repository site lies about 2,135 feet above sea level, and slopes gently from north to south. The local vegetation is a mix of Ponderosa pine, cottonwood, alder and Rocky Mountain maple trees interspersed with open meadows. Wetlands are located nearby to the east, northeast, and northwest of the EMFR footprint.

The EMFR location was previously impacted by metals-contaminated sediments from historical mining and milling activities occurring upstream (Bookstrom et al. 2001). Contaminated sediments are deposited at the site by frequent flooding during spring runoff events. Soil samples collected from 23 borings at the site show concentrations that exceed 8,700 mg/kg lead, 2,800 mg/kg zinc, 114 mg/kg arsenic, and 20 mg/kg cadmium from the top two to four feet of soil. The soil metals concentrations decrease sharply at two to four feet below ground surface (bgs), interpreted as the native soil horizon (TerraGraphics 2009).

2.3.1 Geology

The footprint of the EMFR is on unconsolidated alluvial sediments that overlie metamorphic rocks of the Belt Supergroup, most likely the Prichard Formation (Browne 2006). The underlying Quaternary alluvial sediments comprise gravel, sand, and silt from the ancestral flood channel of the CDA River (CH2M Hill 2009).

Extensive ancient faulting occurred in the vicinity of the EMFR, predominantly in the northwest to southeast orientation associated with the Lewis and Clark Shear Zone (Browne 2006). However, the U.S. Geological Survey (USGS) indicates no earthquakes of Richter Scale magnitude 6.0 or greater occurred in the local area during the current Quaternary period (USGS 2005).

2.3.2 Hydrology

Frequent flooding of the area surrounding the repository occurs during spring runoff events. The area surrounding EMFR is inundated by CDA River floodwater when discharge exceeds approximately 20,000 cubic feet per second (cfs). Floods of this magnitude have approximately a 50% chance of occurring during any given year (CH2M Hill 2010). When discharge remains between approximately 20,000 and 30,000 cfs, floodwater enters the area surrounding EMFR through culverts under I-90 to the south and west of the repository. When discharge exceeds approximately 30,000 cfs, floodwater may enter the area through the culverts and from the southeast through the channel along the north embankment of I-90. Contributions of likely uncontaminated tributary water to the wetlands north of the site also occur but these flows are thought to be minimal in comparison to contributions from flooding of the CDA River. Local groundwater levels rise in response to high river stages and may also contribute to the presence of surface water surrounding the repository during flood events.

Sediment contaminated with metals is carried by the CDA River floodwater and deposited on the floodplain surrounding EMFR (TerraGraphics 2009). Evidence of the ongoing depositional process is suggested through the results of floodwater sampling. Historical sampling results show that in general, floodwater draining from the site has lower total lead concentrations when compared to the incoming floodwater.

2.3.3 Hydrogeology

Figure 2 shows the hydrogeology underlying the EMFR consists of a four-layered sequence from top to bottom as follows:

1) Low-permeability silt and clay from the ground surface to approximately 15 feet bgs.
2) An upper aquifer of alluvial sand and gravel from approximately 15 to 105 feet bgs.
3) A silt layer from 105 to 116 feet bgs that likely forms a confining layer.
4) A lower aquifer composed of fine sand and clay lenses below 116 feet bgs.

Groundwater in the upper alluvial sand and gravel aquifer is confined by the low permeability silt and clay above and the underlying silt layer. The low permeability layer above the upper aquifer was found to be ubiquitous throughout the site during pre-design investigations and is thought to prevent groundwater from migrating into the repository contaminants (TerraGraphics 2009). The properties of the lower confining layer have not been well characterized but it likely isolates the lower aquifer from the contaminants found within the upper aquifer. The characteristics of the lower aquifer are also not well characterized but not considered to influence conditions in the upper aquifer.

The repository site is located in an apparent transitional area forming two distinct hydrologic units moving from east to west through the area as noted by well logs (Ralston 2008):

1) The upper sand and gravel aquifer is encountered below and to the east of the repository site.
2) The upper sand and gravel aquifer appears to be absent northwest of the repository site with sand and clay zones encountered in borings approximately 1,750 feet to the northwest.

This may be explained by the transitional zone which is apparent locally at the surface in the current river channel as the transition from a higher gradient gravel and cobble floored channel to a low-gradient sand floored channel (Ralston 2008). The historical location of the gradient transition is controlled by the elevation of Lake Coeur d'Alene which is regulated by the elevation of the bedrock outfall in Post Falls and the Post Falls Dam. The gravels present in the upper aquifer below the repository site were likely deposited by former channels that migrated through the area. These gravels are absent and transitions into sand and clay bands to the west. The implications of this transition on groundwater flow are not fully understood but should be considered during evaluation of monitoring results.

In general, the groundwater in the upper sand and gravel aquifer has a downward vertical gradient and a horizontal gradient toward the south-southwest. This suggests that the upper sand and gravel aquifer is recharged locally through the wetlands located to the north of the site. During flood events, changes in river stage cause a rapid response in groundwater elevations. This suggests that the sand and gravel aquifer may extend to the CDA River which in turn likely contributes to aquifer recharge. Monitoring data indicates that the horizontal gradient can shift to the west-northwest during flood events with an upward vertical gradient. Artesian conditions have been observed in wells completed in the lower portion of the upper aquifer during flood events. A gradient shift to the west-northwest has also been measured during some of the lowest flow periods included in the record. Groundwater flow within the upper sand and clay aquifer to the west is not well characterized because only a single well is completed in that unit.

After passing below the repository site, groundwater in the upper aquifer is thought to travel toward the south or southwest around the east side of the bedrock outcrop that forms the topographic high at the Old Mission State Park and toward the CDA River. Gain/loss studies may not be possible in the low gradient section of the river to the west and have not been conducted to date so the amount of groundwater that discharges to the river is unknown. Under high flow conditions, discharge to the river west of the bedrock outcrop may occur.

2.4 Groundwater Quality

Historical analytical results for groundwater COCs in the Mission Flats area are summarized in Ralston 2008. Average zinc concentrations measured from piezometers throughout the Cataldo Mission Flats area prior to the start of repository construction range from less than 0.1 milligrams per liter (mg/L) to more than 140 mg/L (Gill 2003). The historical results indicate the potential for high spatial variability in groundwater metals concentrations and widespread contamination prior to repository construction. Significant metals loading to the CDA River from groundwater discharges in the area of Mission Flats and the dredge spoils have not been confirmed in previous evaluations (Ralston 2008).

The potential for high spatial variability in field parameters within the local repository monitoring network is suggested by the transitional fluvial setting, multiple sources of recharge to the upper aquifer, and the results of monitoring. The sand and clay zone west of the repository site shows elevated pH, specific conductance, and groundwater elevations compared to the upper sand and gravel aquifer located below the repository site. This suggests a separate hydrologic unit to the west which may not be appropriate for evaluating potential repository impacts. The potential influence of the sand and clay zone on conditions found in the sand and gravel aquifer below the repository is not well understood because groundwater flow within the sand and clay zone has not been fully characterized.

The COC concentrations also differ between the two hydrologic units. The sand and clay zone to the west shows the greatest arsenic concentrations with frequent exceedances of the regulatory threshold of 0.01 mg/L while the upper sand and gravel aquifer shows elevated concentrations of cadmium and zinc. Spatial variability in COC concentrations is most evident in dissolved zinc and dissolved cadmium concentrations, as other constituents are only detected infrequently. Downgradient wells located within the sand and gravel aquifer furthest south and west of the repository have historically had the greatest concentrations of cadmium and zinc. The elevated constituent concentrations occurring in these wells are likely related to the larger area of historical contamination that is located upgradient of this location compared to other wells monitoring the site.

Cadmium and zinc concentrations up/cross gradient and east of the repository also show evidence of the ubiquitous contamination in the area. Although concentrations are below those observed in the downgradient wells, elevated concentrations are measured when compared to upgradient concentrations entering the site from the north. During previous evaluations of EMFR data, statistically significant increases in zinc concentration were detected in monitoring wells east of the repository. It is unlikely that the increase in zinc concentration is related to repository operations because this is an up/cross gradient location. These results indicate that sources unrelated to the repository are contributing to increased contaminant concentrations in groundwater.

Despite the spatial variability, both hydrologic units share a few similarities. Field parameters indicate conditions approaching a reduced environment with dissolved oxygen (DO) concentrations less than 0.5 mg/L and oxidation reduction potential (ORP) values less than 200 millivolts (mV). While the upper sand and gravel aquifer shows ORP values greater than zero, the sand and clay zone to the west has occasional values that are slightly negative.

2.5 Contaminant Transport

The primary fate and transport mechanisms considered in the design of the EMFR are described below. These pathways were evaluated in the EMFR 90% Design Report (TerraGraphics, 2009):

- Rainwater and snowmelt percolating through the repository waste and, potentially, leaching metals to groundwater and surface water.

- Lateral infiltration of ponded floodwater into the repository and leaching of metals to groundwater and surface water as water drains from the repository waste.
- Upwelling of groundwater into repository waste and leaching metals to groundwater and surface water as water drains from the repository waste.
- Erosion due to floodwater.
- Erosion and transport due to wind.

The potential for the repository waste to leach metals to groundwater and surface water was evaluated during the initial design. Column test data indicated that leaching of metals from repository soil by precipitation and snowmelt percolating through the repository would not release any arsenic, cadmium, or lead, and only very low concentrations of antimony and zinc. The repository soils pose minimal risk to groundwater quality. The column test data for the contaminated soils underlying the repository waste showed a greater potential for leaching metals to groundwater but not at levels that posed a risk to human health.

The repository design work also evaluated the potential for lateral infiltration of ponded surface water and upwelling of groundwater into the repository waste. Results indicated that waste saturation due to these conditions would not be significant based on the low hydraulic conductivity of the compacted waste and the compacted silts and clays underlying the repository. With only minimal saturation of the repository materials, it was concluded that any residual water in the base of the repository would not pose a significant threat to groundwater quality.

Erosion and transport of contaminants due to wind, flooding and storm events was also evaluated during the design. The potential for wind and water erosion is mitigated through use of best management practices during the daily performance of repository operations. The potential for erosion from floodwater was mitigated during the design by armoring the repository embankment to an elevation equivalent to the 100-year flood.

In addition to early design work, a fate and transport model has been developed for the EMFR to estimate risk from metals leaching (Golder 2014). The purpose of the modeling effort was to understand if repository contaminants could migrate to a designated compliance boundary at unacceptable concentrations after placement of a one-foot soil cover on EMFR after closure. The model considered transport by percolation of meteoric water through the waste and the shallow subsurface silts and clays to the alluvial sand and gravel aquifer. Conservative (ten times maximum measured waste leachate concentrations) as well as less conservative (maximum measured waste leachate concentrations) input values were used during the modeling to account for uncertainties in current and future geochemical conditions. The modeling did not include geochemical modeling to predict metals mobility. Results of the modeling effort indicate that there would be no exceedances of applicable or relevant and appropriate requirements (ARARs) at the model calculation boundary over the next several hundred years given the most conservative input parameters.

Table 1: BPRP Arsenic and Lead Concentrations in Sample Locations Requiring Remediation (2004–2011).

Metal	Number of Samples[a]	Min (mg/kg)	Max (mg/kg)	Arithmetic[b] Mean (mg/kg)	Standard Deviation (mg/kg)	Median (mg/kg)
Arsenic	20,622	0.69	7,000	67	151	30.5
Lead	20,623	2	90,800	2,575	4,117	1,440

Notes:

mg/kg = milligram per kilogram
Max = Maximum
Min = Minimum

aNumber of samples collected from sample locations requiring remediation used to create summary statistics: 0–1, 1–6 and 6–12 inch samples were included but the 12–18 inch horizon were excluded for non-garden sample locations; 0–1, 1–6, 6–12, 12–18, 18–24 inch samples were included for garden sample locations. The higher of original/duplicate, original/split and original/resample pairs was used for calculations.

[b]Based on data from properties that were initially sampled between 2004 and 2011. Assumes: (1) all sample locations sampled 2004–2011 that require remediation have been remediated and the remediated material was sent to a repository; (2) all sample locations requiring remediation (except gardens) were remediated to 12 inches (some actually may have been remediated to 6 inches, meaning 6 to12 inches of material included in this analysis may not have actually gone to the repository); and (3) garden sample locations requiring remediation were remediated to 24 inches.

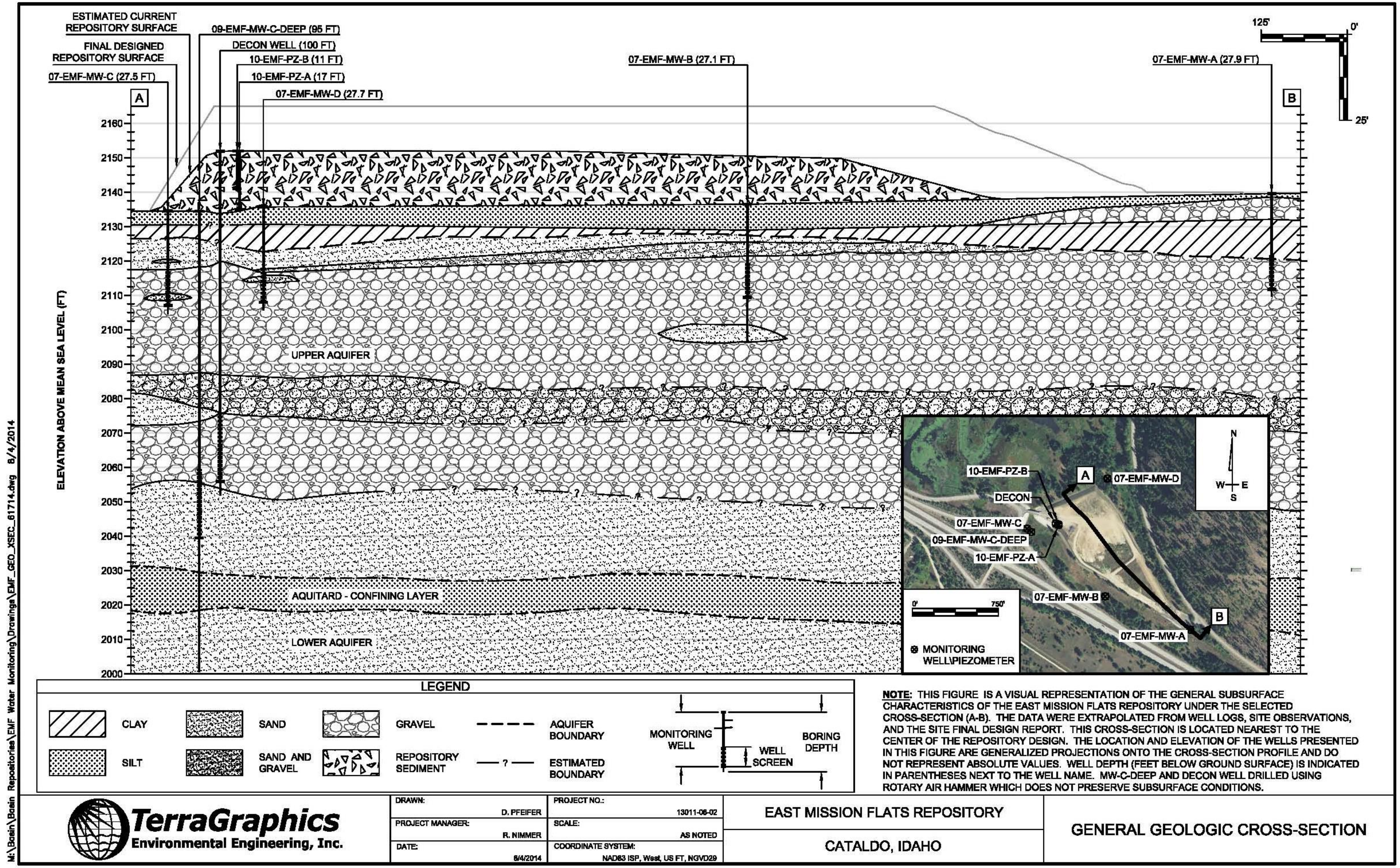

Figure 2. East Mission Flats Repository geologic cross section.

3 Methods

This section summarizes the monitoring network; monitoring methods for groundwater, floodwater, and repository pore water; and data analysis and statistical methods. The EMFR Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) provides further detail on the monitoring, sampling, documentation, analytical, and data review procedures for the groundwater monitoring (TerraGraphics 2014).

3.1 Monitoring Network

The current monitoring network is displayed in Figure 3 and consists of the following:

- Seven groundwater monitoring wells (MW):
    - MW-A, MW-B, MW-C, MW-D and MW-F are screened in the upper alluvial aquifer.
    - MW-C-Deep is screened deeper in the upper alluvial aquifer.
    - MW-E is screened in a different hydrologic unit from the other monitoring wells based on a comparison of water levels and groundwater chemistry and drill logs.
- Two surface water (i.e., floodwater) level sites: LL-1 and LL-2 monitor floodwater levels adjacent to the EMFR.
- Two piezometers (PZ): PZ-A and PZ-B are screened in the repository waste mass to monitor for the presence of water in the waste (and in the event of sufficient water, water chemistry) and are set approximately 0.5 feet and 6.5 feet, respectively, above the native topographic surface.

Additional details about these monitoring sites, their position with respect to the EMFR, and monitoring frequency are included in Table 2.

3.2 Groundwater Monitoring and Sampling

During 2015 the field crew collected groundwater samples using dedicated low-flow pumps. Groundwater samples were shipped to:

- The U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) designated laboratory and analyzed for dissolved metals (antimony, arsenic, cadmium, lead, and zinc), hardness, total phosphorus, and dissolved cations (calcium, magnesium, potassium, and sodium), and
- Idaho Department of Environmental Quality’s (DEQ’s) contracted local laboratory (SVL Analytical, Inc. [SVL]) and analyzed for dissolved anions (chloride, nitrate and nitrogen, and sulfate) and alkalinity.

Dataloggers are deployed in all monitoring wells and record water level measurements every half hour or hour. Dataloggers in the monitoring wells were downloaded during the sampling events and the water-level data were compensated for barometric pressure. Water levels were measured by hand at the seven monitoring wells prior to sample collection.

Groundwater field parameters were measured prior to sample collection. Field parameters include temperature, pH, specific conductance, DO, and ORP.

3.3 Floodwater Monitoring and Sampling

The location of level loggers installed to monitor the elevation of floodwater surrounding the repository are shown on Figure 3. Dataloggers deployed at LL-1 and LL-2 record water-level measurements every half hour and were downloaded during the sampling events.

3.4 Piezometer Monitoring and Sampling

Piezometers are installed within the repository waste mass to monitor for the presence of saturated conditions within the waste material. The piezometers are sounded to manually check for the presence of water or obtain water level measurements when possible. In addition, a water quality probe that records water level, temperature, pH, DO, conductivity, and ORP is installed in PZ-A and a data logger that records water levels is deployed in PZ-B. Both devices provide hourly measurements when water is present. If sufficient water is present, sampling will be attempted to evaluate water quality conditions within the waste mass.

3.5 Data Analysis and Statistical Methods

The following subsections describe how data were reviewed and/or analyzed for this annual report.

3.5.1 Water Levels and Hydraulic Gradient

Water levels were used to evaluate the hydrogeologic conceptual model of the EMFR area, horizontal and vertical hydraulic gradients, and groundwater flow direction. Groundwater fluctuations were compared to the CDA River stage elevation at the USGS gage station at Cataldo (Site #12413500, *http://waterdata.usgs.gov/usa/nwis/uv?site_no=12413500*).

3.5.2 Regulatory Thresholds

Dissolved metals data collected in 2015 were compared to regulatory thresholds (Table 3). Regulatory thresholds for antimony, arsenic, cadmium, and lead in groundwater are the National Primary Drinking Water Standards (i.e., maximum contaminant levels) and the regulatory threshold for zinc is the National Secondary Drinking Water Standard. These standards are based on total concentrations; however, the dissolved metals concentrations in the groundwater are compared to the regulatory thresholds because it is assumed that dissolved concentrations are indicators of contamination in groundwater under all conditions (CH2M Hill 2006).

3.5.3 Statistics

During 2014, the monitoring approach and statistical evaluation of the EMFR groundwater data was evaluated. It was determined that changing to semi-annual sampling and using a prediction limit test with a 1-of-3 retesting strategy would be logistically possible and result in a good trade-off between controlling the false positive rate while maximizing power (Terragraphics 2015a).

Semi-annual sampling with prediction limits was implemented in April 2015. Table 4 shows the non-parametric prediction limits calculated using results of monitoring from 2007 through 2013. For any well that exceeds the prediction limit for a constituent, a resample is collected from that well and retested for that constituent. If the new measurement is below the prediction limit, then monitoring continues as normal at the next scheduled monitoring event. If the new measurement is above the PL, a second resample is collected and retested for that constituent. This means up to three total samples for a constituent at a well may be collected from one semi-annual monitoring event (including the initial scheduled sample). If, and only if, all three results for a constituent from a well during any semi-annual event are above the prediction limit then a statistically significant increase (SSI) can be concluded at that well for that constituent.

For a well with no detections of a constituent through 2013 a slightly altered method is used. A resample is collected from a well only if the constituent exceeds the reporting limit. If both the original sample and the resample exceed the reporting limit, then the detection is considered a SSI. Under these conditions the EPA and DEQ may decide that another resample is appropriate as a more definitive confirmation.

3.5.4 Data Quality Review

A data quality review was conducted to ensure compliance with the SAP/QAPP (TerraGraphics 2014). Information was reviewed for holding times, appropriate preservation, field QC sample frequency and results, laboratory verification and validation, and data completeness. The data quality review included Stage 2A validation review of the SVL data (USEPA 2009, 2010). The USEPA chemist conducted Stage 4 data verification and validation on 100% of the CLP-analyzed data (USEPA 2009, 2010). The USEPA data validation reports are included and summarized as part of the data-quality review.

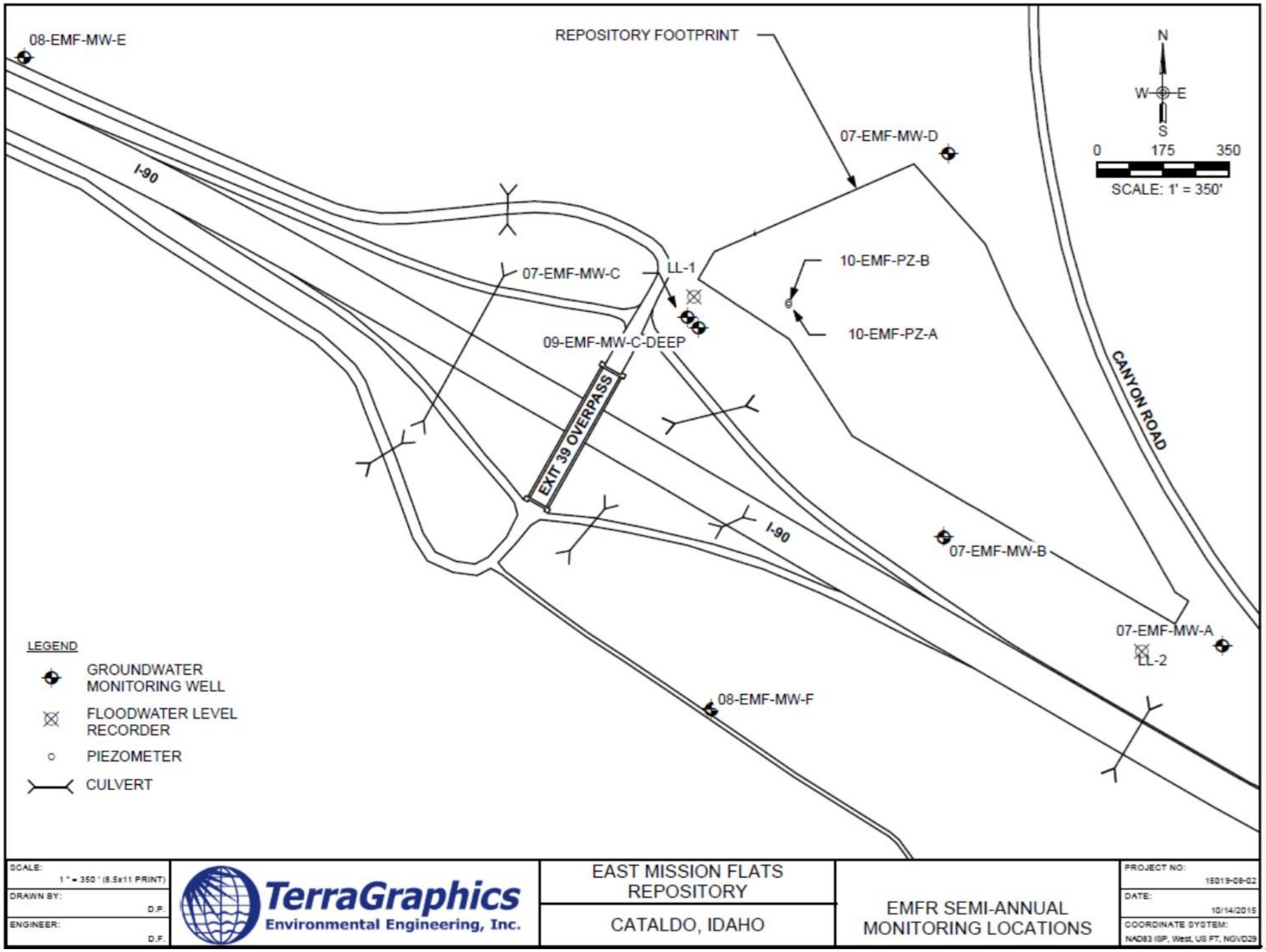

Figure 3. East Mission Flats Repository groundwater and surface water monitoring location.

Table 2. Summary of East Mission Flats Repository water quality monitoring program.

Site	Media	Monitoring		Position with Respect to Groundwater at the EMFR				Period of Record	Purpose
		Frequency	Datalogger[a]	Upgradient	Downgradient	Cross-gradient	Other		
07-EMF-MW-A 07-EMF-MW-B 07-EMF-MW-C 07-EMF-MW-D	Groundwater Groundwater Groundwater Groundwater	S S S S	Y Y Y Y	X X	 X X	 X		Oct 2007 – present Oct 2007 – present Oct 2007 – present Oct 2007 – present	Horizontal groundwater gradients and groundwater quality in the uppermost portion of the upper aquifer
09-DMF-MW-C-DEEP	Deep groundwater	S	Y		X			Dec 2009 – present	Evaluate the vertical hydraulic gradient and groundwater quality in lower portion of the upper aquifer
08-EMF-MW-E	Groundwater	S	Y				X	Oct 2008 – present	Hydraulic gradients, flow directions, and water quality in uppermost portion of the upper aquifer
08-EMF-MW-F	Groundwater	S	Y		X			Oct 2008 – present	
Decon Well	Deep groundwater	D			X			June 2010 – May 2014	Decontamination well water quality
10-EMF-PZ-A	Waste mass pore water	O	Y				X	Oct 2010 – present	Waste mass pore water quality and saturation
10-EMF-PZ-B	Waste mass pore water	O	Y				X	Oct 2010 – present	
LL-1 LL-2	Surface water – floodwater Surface water – floodwater	O O	Y Y					Aug 2009 – present Jan 2009 – present	Monitor floodwater timing and depth
EMF-SW-A EMF-SW-B EMF-SW-C EMF-SW-D	Surface water – floodwater Surface water – floodwater Surface water – floodwater Surface water – floodwater	D D D D						May 2008 – March 2014 May 2011 – March 2014 May 2008 – March 2014 May 2011 – March 2014	Evaluate the quality of floodwater entering and leaving the site

Notes:

[a]Dataloggers monitor groundwater level. The datalogger in 10-EMF-PZ-A also monitors water quality field parameters.
O = opportunistic sampling
S = Semi-annual sampling
D = Discontinued
Blank cells are not applicable

Table 3. East Mission Flats Repository Regulatory thresholds for groundwater metals.

Analyte	Regulatory Threshold[a] (mg/L)
Antimony	0.006
Arsenic	0.01
Cadmium	0.005
Lead	0.015[b]
Zinc	5.0[c]

Notes:

a. National Primary Drinking Water Regulations (IDAPA 58.01.08.050 and 40 CFR Part 141.62)

b. Lead is regulated by a treatment technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps (IDAPA 58.01.08.350 and 40 CFR Part 141.80).

c. National Secondary Drinking Water Regulations (IDAPA 58.01.08.400 and 40 CFR Part 143.3)

mg/L – milligrams per liter

Table 4. Non-parametric Prediction Limits (mg/L).

COC	MW-A	MW-B	MW-C	MW-D	MW-F
Arsenic	0.0014	0.0014	0.0027	0.00291	0.0014
Cadmium	0.000777	0.0002[A]	0.00364	0.0002[A]	0.001
Lead	0.001[A]	0.001[A]	0.001[A]	0.001[A]	0.001[A]
Zinc	1.71	0.0264	2.03	0.132	3.82

Notes:

[A]Use the Double Quantification Rule, value shown is the contract required quantitation limit.

4 Results and Discussion

The objectives of water quality monitoring are outlined in the SAP/QAPP and summarized in Section 1.0 of this annual report. The methods used to evaluate applicable data to these objectives are presented in Section 3.0. This section summarizes the evaluation of the 2015 piezometer monitoring data, hydraulic gradients, and groundwater analyte results, and field parameter information. Monitoring memoranda and QA/QC memoranda were prepared after each sampling and monitoring event (TerraGraphics 2015b-I and TerraGraphics 2016a). Appendix A contains the groundwater field parameter and analytical results.

4.1 Piezometer Monitoring Data

Only insignificant quantities (less than half an inch) of water were detected in PZ-A and no water was detected in PZ-B during 2015. Insufficient water was available to collect water quality data from the repository waste mass. These results indicate that saturation of the waste material did not occur during the 2015 monitoring period.

4.2 Floodwater Data

Level loggers LL-1 and LL-2 recorded small amounts of water in the area surrounding the repository beginning on February 8, 2015 and ending February 13, 2015 (Figure 4). The water is likely related to minor flooding in the area surrounding EMFR which occurs when CDA River stage exceeds approximately 2,143 feet at the USGS gage at Cataldo. Level logger LL-2 also recorded the presence of water on October 10, 2015 but no water was recorded at the LL-1 site. Based on river stage below 2,133 feet at the time water was recorded, it is likely the water detected is related to a precipitation event.

4.3 Water Levels and Groundwater Hydraulic Gradients

Hydrographs of the CDA River at the Cataldo gaging station and groundwater elevations display water-level fluctuations at the site during 2015 (Figure 4). Fluctuations in groundwater levels in the sand and gravel aquifer in the vicinity of the repository are closely related to fluctuations in river stage. Well MW-E is located in the sand and clay aquifer located north and west of the repository and shows the highest groundwater elevations compared to other wells in the monitoring network. The sand and clay aquifer to the west appears to be recharged during periods of elevated river discharge but displays a delayed response to decreases in river stage.

Groundwater contour maps from the April and October 2015 monitoring reports are provided in Appendix B. Well MW-E and MW-C-Deep were not used to develop the groundwater contour maps. The April 2015 contour map depicts the typical groundwater flow direction from northeast toward the southwest. The October 2015 contour map depicts groundwater flow direction toward the west during low flow conditions. While groundwater flow toward the west and northwest have previously been observed during high flow conditions, October 2015 was the first time a westerly flow direction was observed during low flow conditions.

Water levels from MW-C and MW-C-Deep were used to evaluate the vertical hydraulic gradient. These two wells are located less than 50 feet apart and MW-C-Deep is approximately 67.5 feet deeper than MW-C. Generally, there was a slight downward hydraulic gradient during most of the year. However, an upward hydraulic gradient was noted during periods of elevated river discharge and corresponding periods of elevated groundwater levels. The downward gradient returns upon decreases in river and groundwater levels.

4.4 Groundwater Monitoring Data

The final quarterly groundwater monitoring event was performed in January 2015 prior to implementation of semi-annual sampling with prediction limit testing. Semi-annual sampling was performed in April and October 2015. Due to prediction limit exceedances resampling was performed at monitoring well MW-C during June, August, and December 2015. The 2015 monitoring results are presented below.

4.4.1 Dissolved Metals Regulatory Threshold Exceedances

During the April and October 2015 semiannual monitoring events and the June and August resample events, dissolved cadmium concentrations at MW-C ranging in concentration from 0.0056 mg/L to 0.0073 mg/L exceeded the groundwater regulatory threshold of 0.005 mg/L. No other regulatory exceedances were measured.

4.4.2 Prediction Limit Comparisons

During 2015 prediction limits were exceeded for cadmium and zinc at monitoring wells MW-C. The samples collected in April, June, August, and October 2015 exceeded the cadmium prediction limit of 0.0036 (Figure 5). Samples collected in January and December 2015 did not exceed the prediction limit for cadmium. Zinc concentrations in MW-C samples also exceeded the prediction limit of 2.03 mg/L during sampling performed in April, June, August, and October 2015 (Figure 6). The January and December 2015 samples did not exceed prediction limits.

During 2015 the cadmium prediction limit of 0.001 mg/L was exceeded at monitoring well MW-F. Sampling was performed in April and October 2015. Cadmium at MW-F has exceeded the prediction limit since January 2014 (Figure 7). Zinc concentration at MW-F exceeded the prediction limit of 3.82 mg/L in January 2015 prior to implementation of prediction limit testing in April 2015. Zinc concentrations remained below the prediction limit in April and October (Figure 8). MW-F is not considered a reliable indicator of potential groundwater impacts from the repository and resampling of this well did not occur in 2015. The well will continue to be sampled during the regular semi-annual events. MW-F is located off the repository site on the south side of I-90. The monitoring location is intended to provide additional details regarding the surrounding groundwater quality and groundwater flow. Based on groundwater flow direction and well location it is likely that sources other than the repository contribute to increases in metals concentrations at this well.

The zinc prediction limit of 0.0264 mg/L was exceeded at MW-B during the January 2015 (0.0268 mg/L) and October 2015 (0.0266 mg/L) sampling events (Figure 9). Resampling and prediction limit testing was not implemented in January 2015 and the small exceedance was within the accuracy of the method. Resampling was not performed after the October 2015 event for similar reasons. The exceedance was within the accuracy of the method, a zinc concentration of 0.0063 mg/L was detected in the blank sample biasing the results high, and the low zinc concentration in the sample relative to the groundwater standard of 5 mg/L.

The period of record for groundwater monitoring at the EMFR is relatively short given the range of complex processes influencing groundwater metals concentrations. The full range of complex interactions between the contaminated soils surrounding the repository and local hydrology may not yet be documented in the monitoring record. Exceedances of the upper prediction limit for metals may continue as the full range of environmental conditions are encountered and sample sizes increase. When monitoring groundwater in a complex and highly contaminated environment, prediction limit exceedances do not necessarily indicate that contaminants are being released from the facility. To help illustrate this point, a prediction limit using the second lowest water level measured at MW-C through 2013 was identified for low flow water elevations (Figure 10). The method used to identify the lower prediction limit is similar to that used to develop prediction limits for dissolved metals. Figure 10 shows that the record low groundwater elevations exceeding the prediction limit correspond with the timing of the prediction limit exceedances for metals.

The record low groundwater elevations that exceed the prediction limit at MW-C were measured throughout the EMFR monitoring well network and likely occur throughout the entire surrounding area. The low groundwater levels facilitate wetting and drying cycles of the contaminated soils underlying and surrounding the repository not previously included in the monitoring record. These interactions are occurring below the elevation of the repository soils. It is likely that the elevated metal concentrations and prediction limit exceedances are a result of interactions between the record low water levels and the contaminated soils underlying and surrounding the repository. This conclusion is further supported by the piezometer monitoring data indicating that the saturation of the repository soils did not occur during 2015. Significant contaminant migration from the repository soils to the underlying groundwater is unlikely to occur without significant quantities of water to facilitate transport. Based on these monitoring results it is unlikely that the increased metals concentrations are related to the repository.

4.4.3 Other Constituents and Analytes

In addition to metals data, field parameters were collected and other analytes have been analyzed by the laboratory. These are monitored to provide information on physical and chemical processes occurring at the site and to support ongoing evaluations of floodwater and repository pore water. The additional analytes and field parameter data are maintained electronically for use in future evaluations.

4.5 Data Quality Review Summary

A total of 39 groundwater samples were submitted for laboratory analysis during 2015. Twenty-four (24) samples were collected from seven sites and 15 samples were collected for QA/QC purposes (i.e., field duplicates, field blanks, and a sample for the matrix spike [MS]). A “sample” represents all of the bottles collected at a particular site. Additional sample volume for MS analysis was collected in the field and provided to SVL. CLP laboratory used existing sample volume from a field-collected sample for the MS analysis as designated by the Scribe Project

File Manager on the chain-of-custody form. All field QA/QC samples were collected at the appropriate frequency. All samples were analyzed within the required holding times. Preservation was confirmed by the laboratories. Laboratory analyses were performed through the USEPA CLP and the local analytical laboratory (SVL in Kellogg, Idaho). The data validation reports and a detailed record of qualified results can be found in the associated quarterly QA/QC memoranda (TerraGraphics 2015b, 2015d, 2015e, 2015f, 2015h, 2015i).

Procedures for sample collection, labeling, handling, and analysis were performed as described in the EMFR SAP/QAPP and addenda (TerraGraphics, 2014) with the following exceptions:

- For the January event, at well 07-EMF-MW-A, DO did not reach the ±10% stabilization criterion for values greater than 0.5 milligrams per liter (mg/L) as listed in the EMFR SAP/QAPP and was qualified as an estimate (*J*) as a result.
- For the April event, temperature was out of range (4.0 ± 2.0 ºC) on two samples submitted to SVL. Samples for 08-EMF-MW-F and the field blank were still at 10ºC as they were submitted within an hour of sample collection and did not have time to cool. These samples were stored by the lab for more than 24 hours prior to analysis, and therefore no results were qualified because of temperature.

Sample results were qualified as estimates (*J*) by the laboratory, by the USEPA chemist, or as part of the data quality review for the following reasons:

- Reported results were above the method detection limit (MDL) but below the contract required quantitation limit (CRQL).
- Laboratory serial dilution results were outside of acceptable range.
- Detected sample analyte results were less than 10 times the detected field blank concentrations.

No laboratory sample results were rejected and the final completeness in 2015 is assessed at 100%.

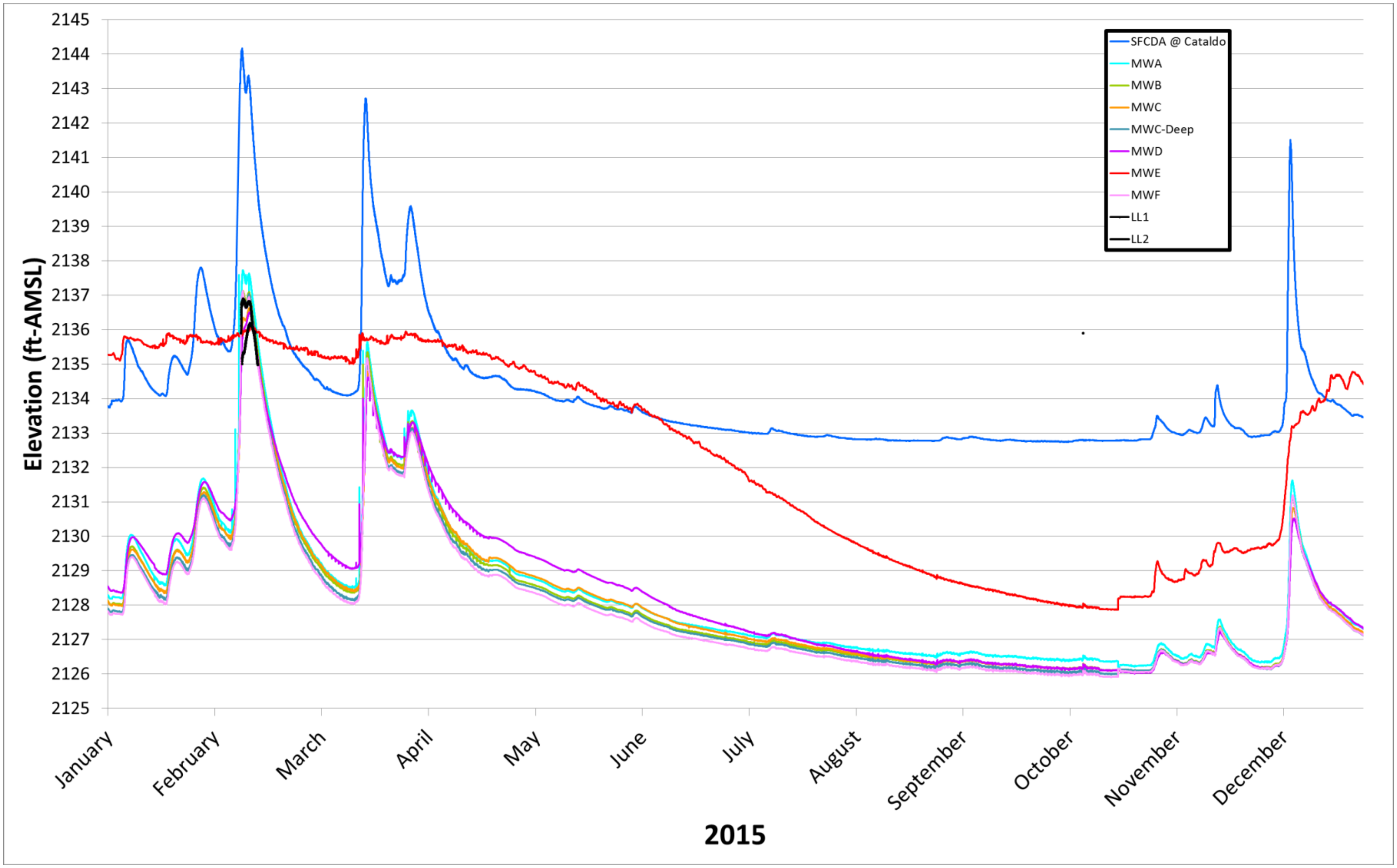

Figure 4. Coeur d'Alene River and groundwater elevations near the East Mission Flats Repository - Cataldo, Idaho.

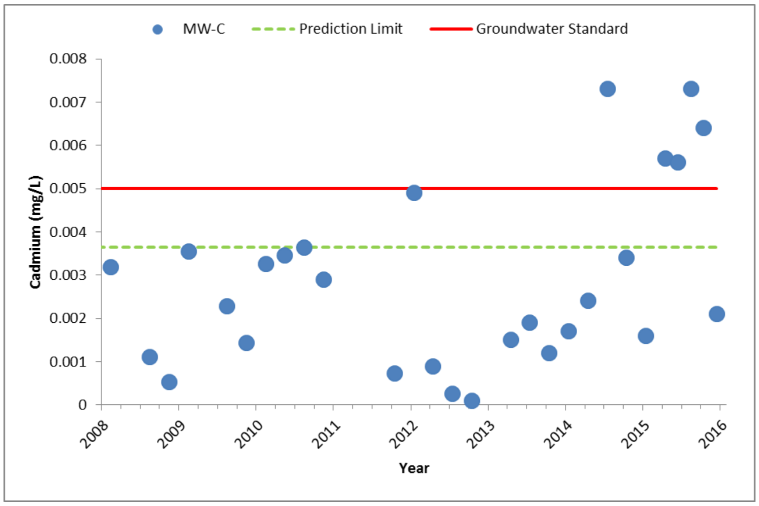

Figure 5. Monitoring Well MW-C cadmium concentrations.

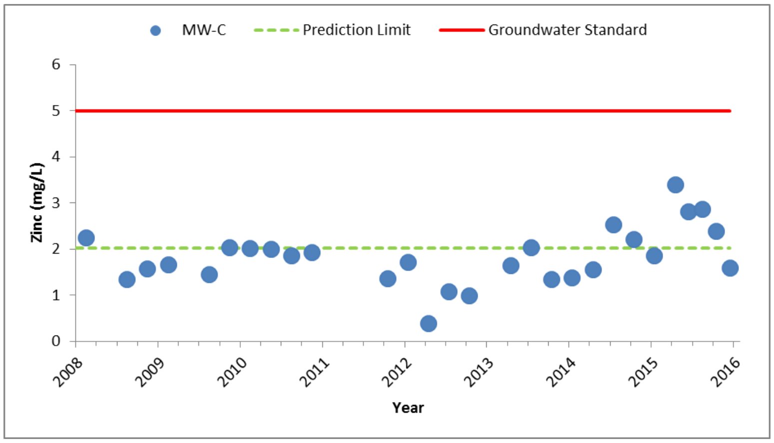

Figure 6. Monitoring Well MW-C zinc concentrations.

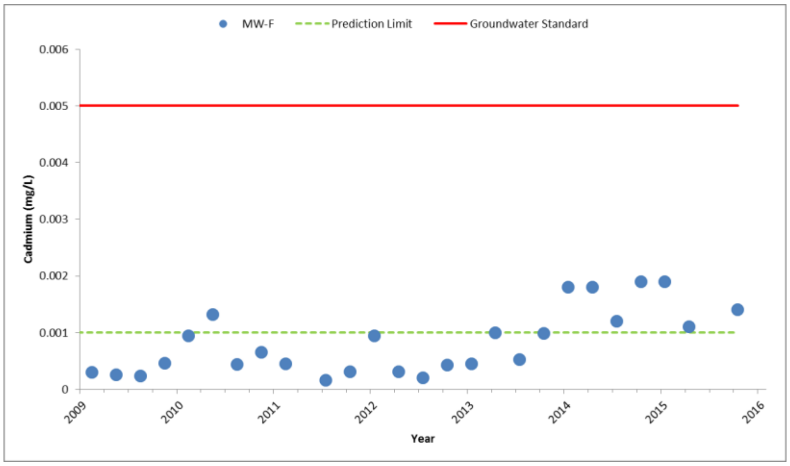

Figure 7. Monitoring Well MW-F cadmium concentrations.

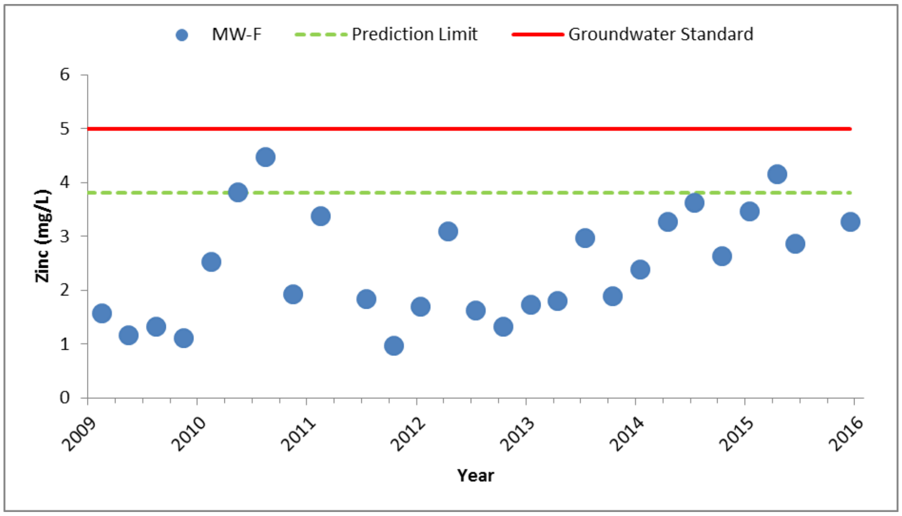

Figure 8. Monitoring Well MW-F zinc concentrations.

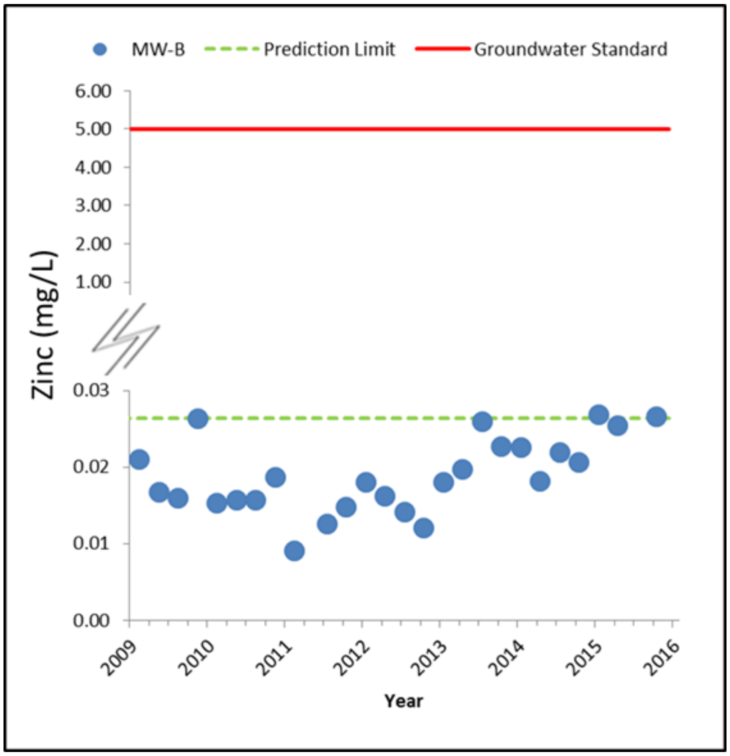

Figure 9: Monitoring Well MW-B zinc concentrations.

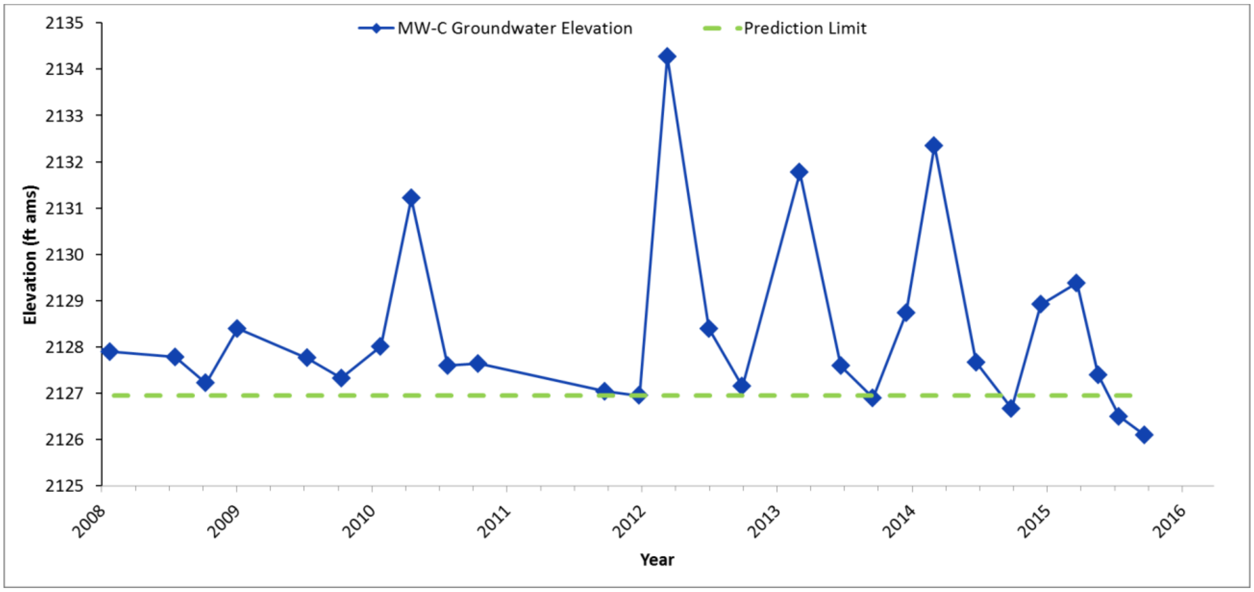

Figure 10: Monitoring well MW-C groundwater elevations.

5 Conclusions and Recommendations

Conclusions and recommendations for the EMFR sampling and monitoring objectives are summarized in Table 5.

Table 5. East Mission Flats Repository monitoring objectives, conclusions, and recommendations.

Monitoring Objective	Conclusion	Recommendation
Evaluate water levels and water quality parameters of pore water within the repository waste.	No repository pore water was detected in 2015.	Continue monitoring water levels at both piezometers and collect water quality samples if sufficient water is detected. Evaluate and, if appropriate, implement the recommendations of the EPA optimization team.
Evaluate surface water influence on groundwater levels and flow direction at the site.	There is a strong correlation between fluctuations in river stage and water levels in the sand and gravel aquifer below the repository. Fluctuations in river stage also influence water levels in the sand and clay unit to the west and northwest of the site. The relationship is more subdued than that observed in the sand and gravel aquifer.	Continue to review hydrographs and maintain water level data to aid in the interpretation of metals and piezometer data at the site. Evaluate and, if appropriate, implement the recommendations of the EPA optimization team.
Evaluate hydraulic gradients and groundwater flow direction over time, both vertically and horizontally, at the EMFR site.	2015 hydraulic gradients were generally toward the southwest which corresponds to the current conceptual flow model. During the October 2015 sample event groundwater flow was toward the west during low flow conditions. This condition has not been measured previously at this site.	Continue monitoring hydraulic gradients to aid evaluation of metals data. Update the conceptual site model with the October 2015 groundwater flow direction. Evaluate and if appropriate implement the recommendations of the EPA optimization team.
Evaluate the potential effects of the repository on groundwater.	Dissolved cadmium concentrations at MW-C exceeded the groundwater regulatory threshold. Prediction limits were exceeded for cadmium and zinc at monitoring well MW-C. Prediction limits were exceeded for cadmium and zinc at monitoring well MW-F. Prediction limits were exceeded for zinc at monitoring well MW-B. Elevated metals concentrations and prediction limit exceedances are likely related to record low water levels observed during 2014 and 2015. Differences from the conceptual model in groundwater flow direction during low flow conditions may also contribute to prediction limit exceedances in 2015.	Continue semi-annual monitoring of dissolved metals, field parameters, and other non-metal analytes. For wells exceeding prediction limits for a constituent during 2015 implement the retesting strategy in 2016 only if future observations exceed the newly recorded maximum concentrations. For wells not exceeding prediction limits in 2015 the current prediction limits and retesting strategy should continue in 2016 for all other well constituent pairs. Future updates to prediction limits at all wells should occur according to guidance document recommendations and incorporate new observations into the updated prediction limits. Evaluate and if appropriate implement the recommendations of the EPA optimization team.

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Appendix A. Analyte and Field Parameter Data

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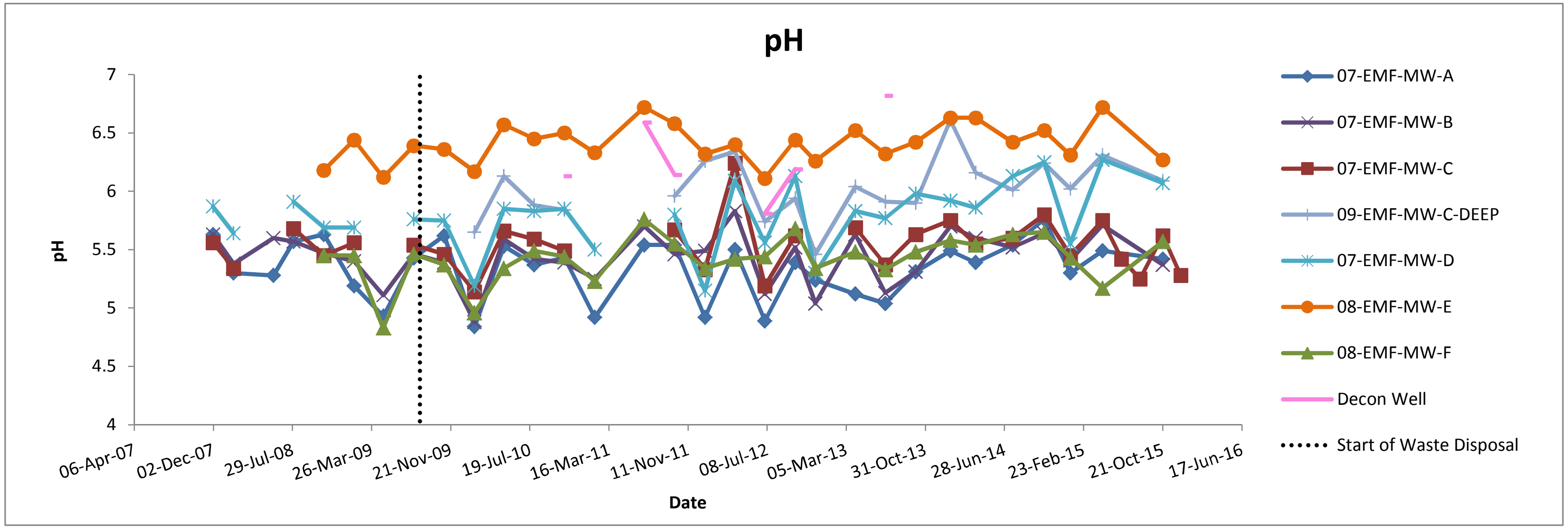
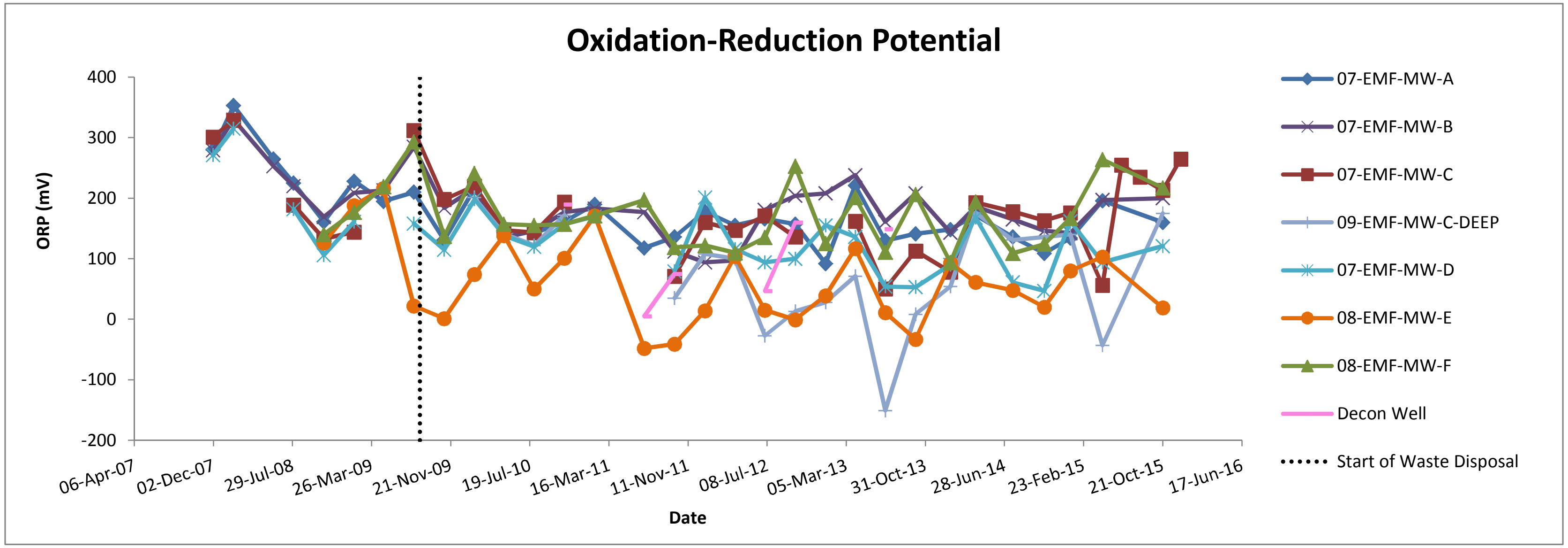
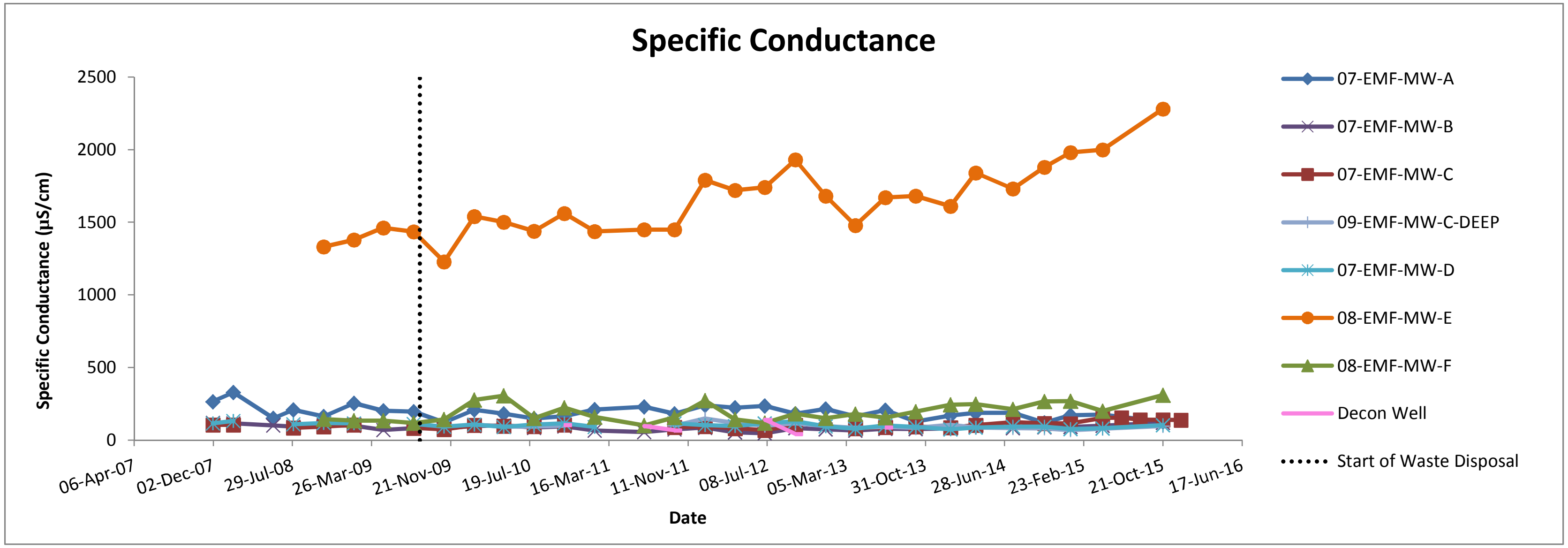
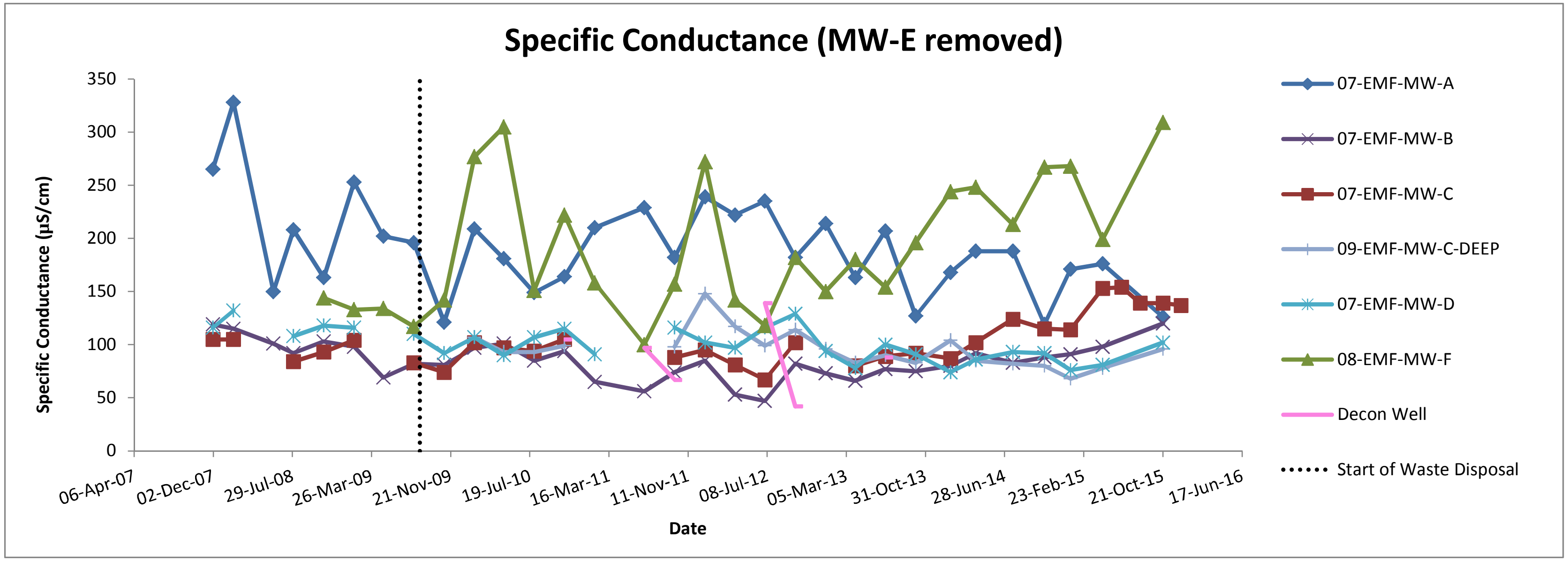
Field Parameter Data at EMFR Groundwater Sites



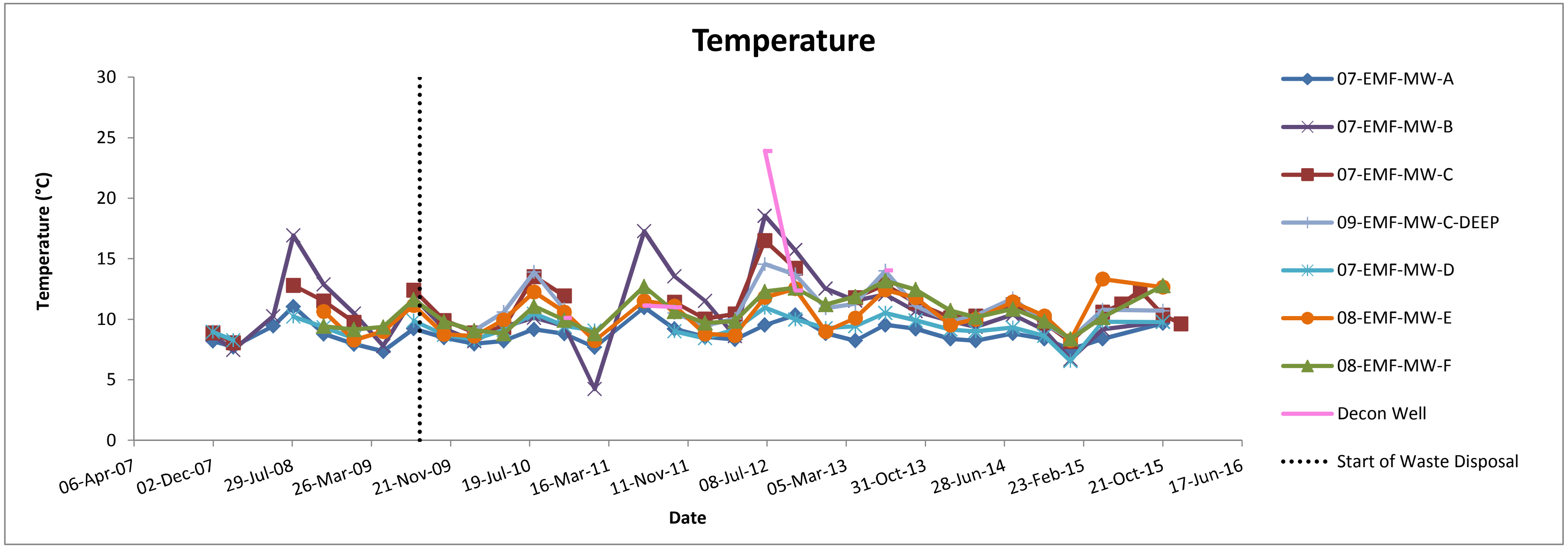


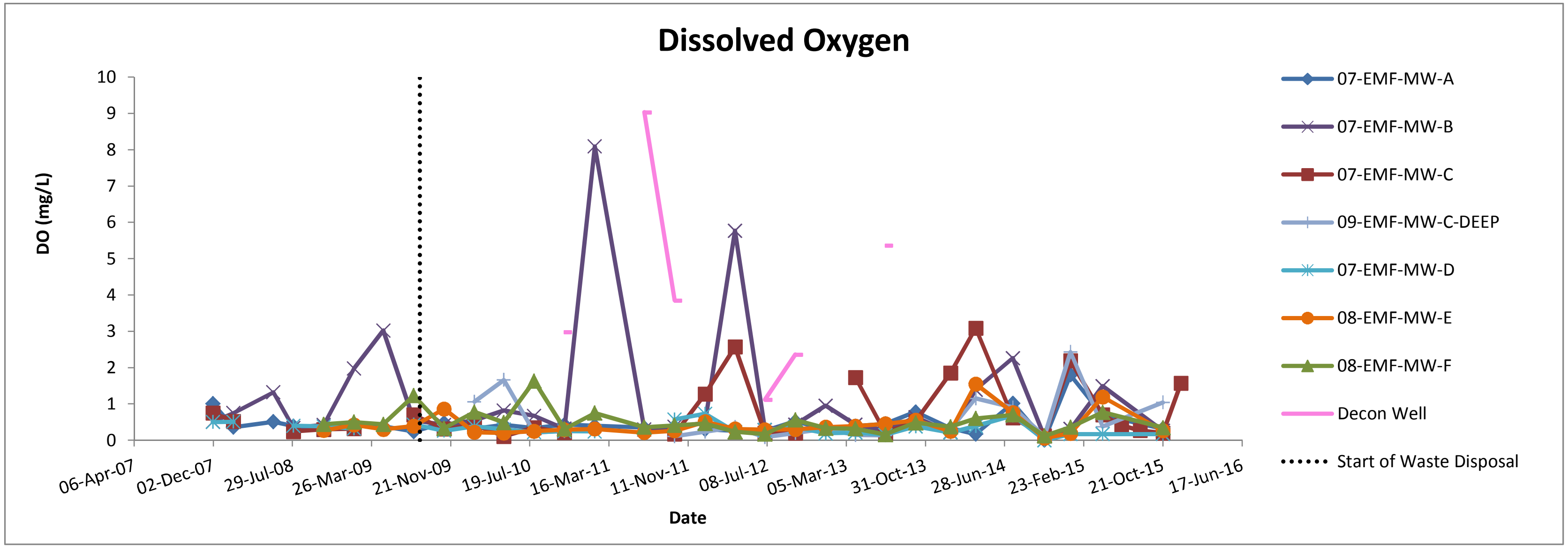
Field Parameter Data at EMFR Groundwater Sites





Field Parameter Data at EMFR Groundwater Sites





Field Parameter Data
EastMission Flats Repository

Well	Date	pH	Specific Conductance (μS/cm)	Temperature (^{o}C)	DO (mg/L)	ORP (mV)	Depth to Water (feet)	Groundwater Elevation (feet amsl)
	Parameter							
07-EMF-MW-A	11-Dec-07	5.63	265	8.21	1.01	280	13.49	2128.09
	25-Feb-08	5.30	328	7.73	0.36	353	13.64	2127.94
	3-Jun-08	5.28	150	9.45	0.51	265	5.81	2135.77
	19-Aug-08	5.57	208	11.05	0.39	225	14.12	2127.46
	10-Nov-08	5.63	163	8.79	0.34	161	14.38	2127.20
	4-Feb-09	5.19	253	7.95	0.39	228	13.6	2127.98
	7-May-09	4.93	202	7.35	0.38	195	7.69	2133.89
	10-Aug-09	5.43	196	9.23	0.24	210	14.09	2127.49
	11-Nov-09	5.62	121	8.49	0.48	131	14.18	2127.40
	25-Feb-10	4.84	209	7.97	0.32	216	13.5	2128.08
	19-May-10	5.53	181	8.21	0.42	147	10.28	2131.30
	25-Aug-10	5.37	149	9.17	0.33	142	14.21	2127.37
	16-Nov-10	5.43	164	8.81	0.43	161	13.93	2127.65
	10-Feb-11	4.92	210	7.69	0.40	190	11.89	2129.69
	6-Jul-11	5.54	229	10.98	0.35	118	11.14	2130.44
	24-Oct-11	5.54	182	9.21	R	136	14.55	2127.03
	25-Jan-12	4.92	239	8.54	0.30	178	14.5	2127.08
	10-Apr-12	5.50	222	8.34	0.26	155	8.56	2133.02
	31-Jul-12	4.89	235	9.53	0.26	166	13.48	2128.10
	29-Oct-12	5.39	182	10.35	0.52	157	14.35	2127.23
	23-Jan-13	5.24	214	8.84	0.30	92	13.83	2127.75
	2-Apr-13	5.12	163	8.23	0.39	221	9.62	2131.96
	23-Jul-13	5.04	207	9.54	0.45	130	14.07	2127.51
	17-Oct-13	5.31	127	9.22	0.78	141	14.66	2126.92
	15-Jan-14	5.49	168	8.39	0.33	148	12.69	2128.89
	1-Apr-14	5.39	188	8.23	0.17	172	9.05	2132.53
	23-Jul-14	5.54	188	8.83	1.02	136	14	2127.58
	27-Oct-14	5.76	119	8.39	0.01	109	14.9	2126.68
	14-Jan-15	5.30	171	7.51	1.8 J	134	12.8	2128.78
	21-Apr-15	5.49	176	8.38	0.69	196	12.43	2129.15
	21-Oct-15	5.42	126	9.68	0.32	160	15.38	2126.20
07-EMF-MW-B	10-Dec-07	5.63	119	8.71	0.51	279	11.15	2128.00
	25-Feb-08	5.38	115	7.46	0.75	330	11.37	2127.78
	3-Jun-08	5.60	101	10.26	1.32	253	3.31	2135.84
	19-Aug-08	5.57	92	16.92	0.34	220	11.6	2127.55
	10-Nov-08	5.47	103	12.88	0.42	169	12.03	2127.12
	4-Feb-09	5.40	98	10.48	1.98	209	11.2	2127.95
	7-May-09	5.11	69	7.8	3.02	213	5.31	2133.84
	10-Aug-09	5.46	82	11.81	0.55	285	11.66	2127.49
	11-Nov-09	5.39	81	9.24	0.42	184	11.89	2127.26
	25-Feb-10	4.88	97	8.2	0.55	216	11.08	2128.07
	19-May-10	5.59	101	9.37	0.82	135	7.99	2131.16
	25-Aug-10	5.42	85	10.13	0.67	146	11.79	2127.36
	16-Nov-10	5.39	94	9.44	0.32	177	11.66	2127.49
	10-Feb-11	5.25	65	4.24	8.09	183	9.48	2129.67
	6-Jul-11	5.70	56	17.28	0.30	177	8.55	2130.6
	24-Oct-11	5.46	74	13.55	0.37 J	112	12.2	2126.95
	25-Jan-12	5.49	85	11.53	0.47	94	12.21	2126.94
	10-Apr-12	5.83	53	8.61	5.77	97	5.63	2133.52
	31-Jul-12	5.12	47	18.55	0.28	181	11.03	2128.12
	29-Oct-12	5.52	82	15.71	0.43	204	12.08	2127.07
	24-Jan-13	5.04	73	12.53	0.95	208	11.47	2127.68
	2-Apr-13	5.63	66	11.54	0.43	238	11.69	2127.46
	23-Jul-13	5.13	77	12.06	0.27	161	11.69	2127.46
	17-Oct-13	5.31	75	10.67	0.64	208	12.32	2126.83
	15-Jan-14	5.70	80	9.88	0.22	143	10.46	2128.69
	1-Apr-14	5.60	92	9.38	1.39	186	6.8	2132.35
	23-Jul-14	5.52	83	10.38	2.26	165	11.62	2127.53
	27-Oct-14	5.64	88	9.10	0.11	146	12.6	2126.55
	14-Jan-15	5.41	91	6.68	0.31	142	10.56	2128.59
	21-Apr-15	5.71	98	9.17	1.49	197	10.04	2129.11
	21-Oct-15	5.37	120	9.80	0.26	200	13.0	2126.15

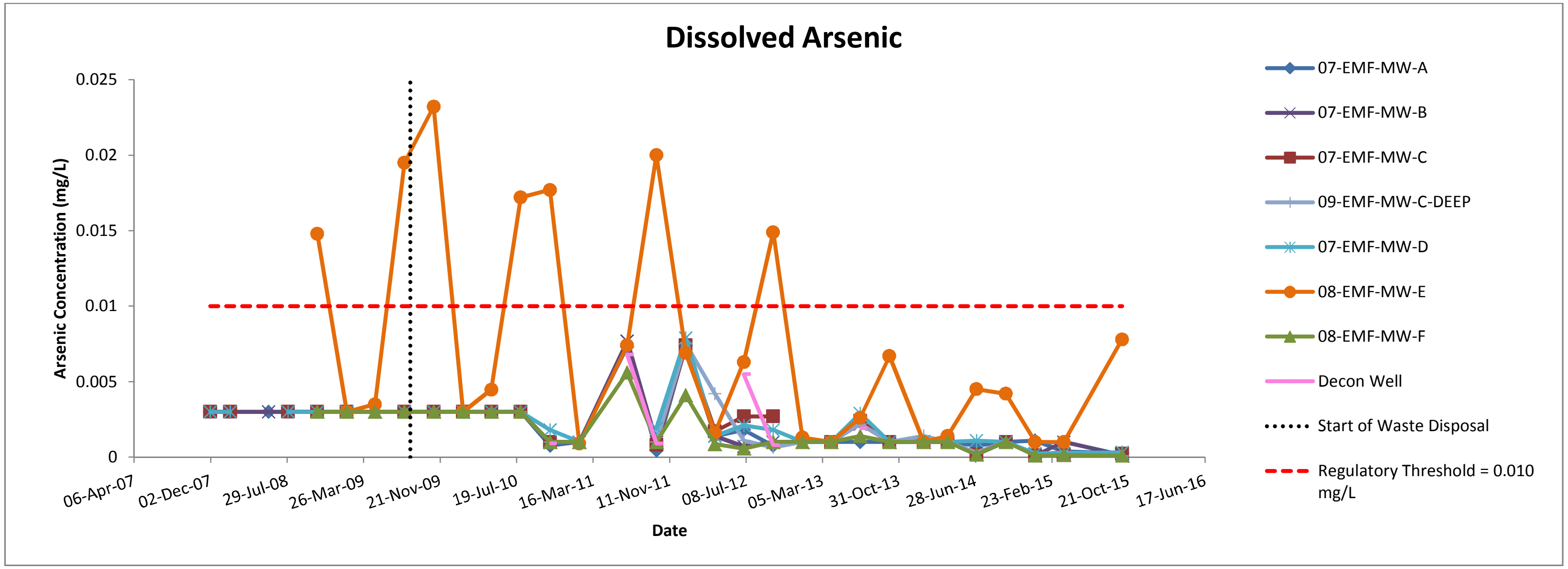
Well	Date	pH	Specific Conductance (µS/cm)	Temperature (^{o}C)	DO (mg/L)	ORP (mV)	Depth to Water (feet)	Groundwater Elevation (feet amsl)
	Parameter							
07-EMF-MW-C	10-Dec-07	5.56	105	8.89	0.75	301	8.62	2128.08
	25-Feb-08	5.34	105	8.07	0.52	329	8.8	2127.90
	3-Jun-08	NS	NS	NS	NS	NS	NS	NS
	19-Aug-08	5.68	84	12.81	0.24	189	8.92	2127.78
	10-Nov-08	5.45	93	11.51	0.3	133	9.48	2127.22
	3-Feb-09	5.56	104	9.76	0.32	144	8.3	2128.40
	7-May-09	NS	NS	NS	NS	NS	NS	NS
	10-Aug-09	5.54	83	12.42	0.7	312	8.94	2127.76
	11-Nov-09	5.46	74	9.91	0.31	198	9.37	2127.33
	25-Feb-10	5.14	102	8.89	0.42	220	8.69	2128.01
	19-May-10	5.66	97	9.33	0.11 J	147	5.49	2131.21
	25-Aug-10	5.59	94	13.54	0.35	143	9.1	2127.60
	16-Nov-10	5.49	105	11.94	0.21	194	9.06	2127.64
	10-Feb-11	NS	NS	NS	NS	NS	NS	NS
	6-Jul-11	NS	NS	NS	NS	NS	NS	NS
	24-Oct-11	5.67	88	11.41	0.17 J	71	9.66	2127.04
	25-Jan-12	5.33	95	10.03	1.27	160	9.75	2126.95
	10-Apr-12	6.24	81	10.45	2.57	147	2.43	2134.27
	31-Jul-12	5.19	67	16.51	0.2	171	8.3	2128.40
	29-Oct-12	5.62	102	14.22	0.20	136	9.55	2127.15
	23-Jan-13	NS	NS	NS	NS	NS	NS	NS
	2-Apr-13	5.69	80	11.78	1.73	162	4.93	2131.77
	23-Jul-13	5.37	89	12.85	0.2	50	9.11	2127.59
	17-Oct-13	5.63	92	11.36	0.52	113	9.8	2126.90
	15-Jan-14	5.75	87	10.14	1.85	78	7.97	2128.73
	1-Apr-14	5.55	102	10.27	3.09	193	4.35	2132.35
	23-Jul-14	5.6	124	11.21	0.62	178	9.03	2127.67
	27-Oct-14	5.80	115	9.71	0.12	163	10.03	2126.67
	14-Jan-15	5.45	114	8.16	2.19	176	7.78	2128.92
	21-Apr-15	5.75	153	10.60	0.70	56	7.32	2129.38
	18-Jun-15	5.42	154	11.26	0.41	255	9.3	2127.40
	13-Aug-15	5.25	139	12.37	0.27	235	10.2	2126.50
	21-Oct-15	5.62	139	10.36	0.20	213	10.6	2126.10
	15-Dec-15	5.28	137	9.63	1.57	265	7.65	2129.05
09-EMF-MW-C Deep	25-Feb-10	5.65	107	9.07	1.06	201	8.7	2127.87
	19-May-10	6.13	93	10.60	1.66	141	5.41	2131.16
	25-Aug-10	5.88	93	13.90	0.21	122	9.19	2127.38
	16-Nov-10	5.84	99	10.79	0.26	172	9.04	2127.53
	10-Feb-11	NS	NS	NS	NS	NS	NS	NS
	6-Jul-11	NS	NS	NS	NS	NS	NS	NS
	24-Oct-11	5.96	98	10.52	0.11	35	9.6	2126.97
	25-Jan-12	6.26	148	9.46	0.23	108	9.7	2126.87
	10-Apr-12	6.34	117	10.03	0.36	100	3.43	2133.14
	31-Jul-12	5.74	99	14.56	0.08	-27	8.44	2128.13
	29-Oct-12	5.94	114	13.70	0.20	13	9.5	2127.07
	23-Jan-13	5.46	96	10.90	0.32	28	9	2127.57
	2-Apr-13	6.04	83	11.29	0.14	71	4.82	2131.75
	23-Jul-13	5.91	90	13.99	0.13	-151	9.1	2127.47
	17-Oct-13	5.9	83	11.09	0.50	8	9.68	2126.89
	15-Jan-14	6.61	104	9.82	0.29	54	7.96	2128.61
	1-Apr-14	6.16	85	10.31	1.15	176	4.28	2132.29
	23-Jul-14	6.01	82	11.72	0.90	131	9.02	2127.55
	27-Oct-14	6.24	80	9.67	0.11	136	10.05	2126.52
	14-Jan-15	6.02	68	8.36	2.43	140	7.82	2128.75
	21-Apr-15	6.31	78	10.78	0.37	-43	7.47	2129.10
	21-Oct-15	6.09	96	10.71	1.04	175	10.43	2126.14

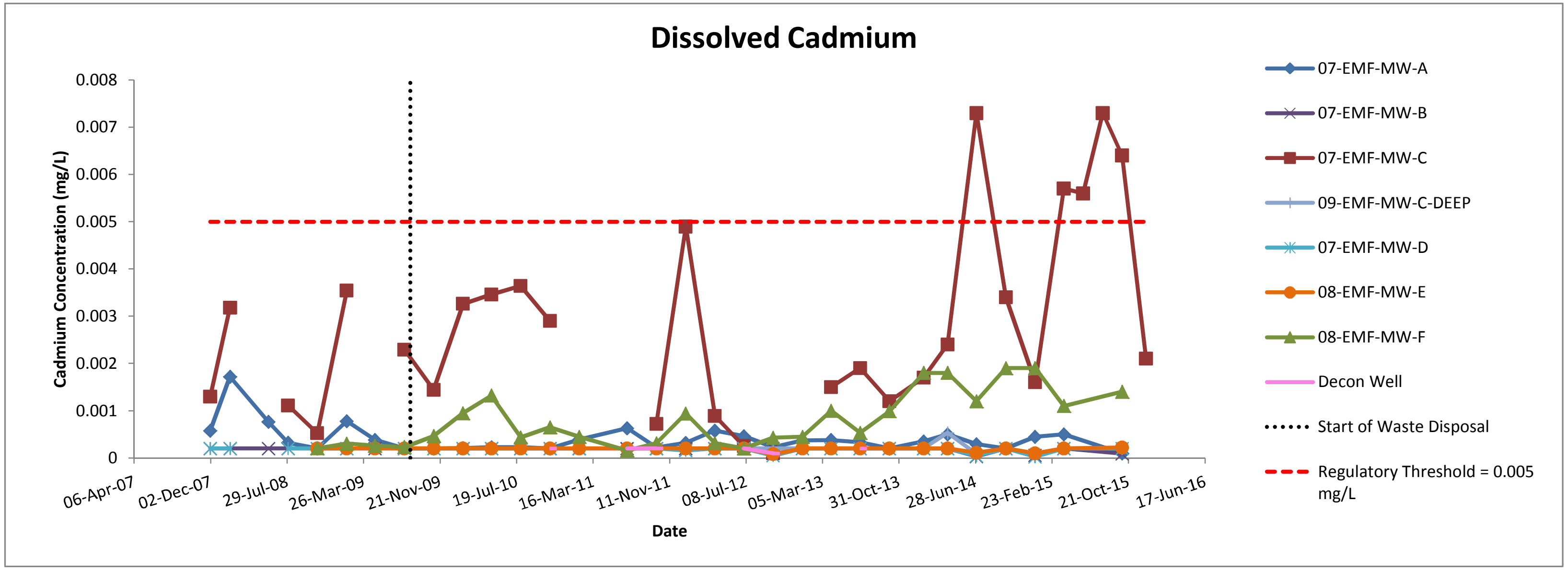
Well	Parameter								
	Date	pH	Specific Conductance (µS/cm)	Temperature (°C)	DO (mg/L)	ORP (mV)	Depth to Water (feet)	Groundwater Elevation (feet amsl)
07-EMF-MW-D	10-Dec-07	5.87	116	8.95	0.5	271	9.43	2128.24
	25-Feb-08	5.64	132	8.26	0.51	315	9.4	2128.27
	3-Jun-08	NS	NS	NS	NS	NS	NS	NS
	19-Aug-08	5.91	108	10.22	0.4	182	9.23	2128.44
	10-Nov-08	5.69	118	9.34	0.38	106	10.23	2127.44
	3-Feb-09	5.69	116	8.43	0.32	161	8.42	2129.25
	7-May-09	NS	NS	NS	NS	NS	NS	NS
	11-Aug-09	5.76	110	9.87	0.43	158	9.39	2128.28
	11-Nov-09	5.75	92	8.72	0.26	115	10.18	2127.49
	25-Feb-10	5.19	107	8.32	0.38	198	9.37	2128.30
	19-May-10	5.85	90	9.13	0.30	138	6.23	2131.44
	25-Aug-10	5.83	107	10.46	0.22	120	9.43	2128.24
	16-Nov-10	5.85	115	9.44	0.25	157	9.68	2127.99
	10-Feb-11	5.50	91	9.07	0.24	170	6.59	2131.08
	6-Jul-11	NS	NS	NS	NS	NS	NS	NS
	25-Oct-11	5.80	116	9	0.57 J	79	10.43	2127.24
	26-Jan-12	5.15	102	8.44	0.73	201	10.37	2127.30
	10-Apr-12	6.09	97	9.16	0.23	116	2.59	2135.08
	1-Aug-12	5.56	116	10.95	0.29	94	8.75	2128.92
	30-Oct-12	6.13	129	9.99	0.36	100	10.14	2127.53
	24-Jan-13	5.30	94	9.27	0.19	155	9.52	2128.15
	2-Apr-13	5.83	78	9.43	0.21	136	7.4	2130.27
	23-Jul-13	5.77	100	10.52	0.15	54	9.75	2127.92
	17-Oct-13	5.98	91	9.91	0.38	53	10.69	2126.98
	15-Jan-14	5.92	74	9.15	0.21	90	8.69	2128.98
	1-Apr-14	5.86	86	9.00	0.39	168	5.23	2132.44
	23-Jul-14	6.13	93	9.32	0.68	61	9.65	2128.02
	27-Oct-14	6.25	92	8.63	0.00	47	11.03	2126.64
	14-Jan-15	5.55	76	6.55	0.17	162	8.51	2129.16
	21-Apr-15	6.27	81	9.80	0.17	94	7.7	2129.97
	21-Oct-15	6.07	102	9.77	0.17	121	11.54	2126.13
08-EMF-MW-E	10-Nov-08	6.18	1,332	10.66	0.27	126	7.42	2133.54
	3-Feb-09	6.44	1,379	8.29	0.42	188	5.35	2135.61
	7-May-09	6.12	1,461	8.99	0.3	216	4.79	2136.17
	11-Aug-09	6.39	1,435	11.14	0.39	22	7.74	2133.22
	11-Nov-09	6.36	1,228	8.77	0.86	1	7.08	2133.88
	25-Feb-10	6.17	1,540	8.61	0.22	74	5.91	2135.05
	19-May-10	6.57	1,500	9.96	0.20	138	5.08	2135.88
	25-Aug-10	6.45	1,438	12.26	0.25	50	7.71	2133.25
	16-Nov-10	6.50	1,560	10.61	0.29	101	5.32	2135.64
	10-Feb-11	6.33	1,436	8.23	0.31	171	4.7	2136.26
	6-Jul-11	6.72	1,449	11.52	0.21	-48	5.36	2135.60
	24-Oct-11	6.58	1,450	11.1	0.26	-41	9.6	2131.36
	26-Jan-12	6.32	1,790	8.79	0.51	14	5.23	2135.73
	11-Apr-12	6.40	1,720	8.67	0.31	104	4.52	2136.44
	1-Aug-12	6.11	1,740	11.81	0.29	15	7.36	2133.60
	29-Dec-12	6.44	1,930	12.53	0.30	-1	8.3	2132.66
	23-Jan-13	6.26	1,680	8.99	0.36	39	5.34	2135.62
	2-Apr-13	6.52	1,478	10.10	0.39	117	5.39	2135.57
	23-Jul-13	6.32	1,670	12.43	0.45	11	8.42	2132.54
	17-Oct-13	6.42	1,680	11.79	0.55	-33	9.93	2131.03
	15-Jan-14	6.63	1,610	9.53	0.25	93	5.22	2135.74
	1-Apr-14	6.63	1,840	10.01	1.55	61	4.93	2136.03
	23-Jul-14	6.42	1,730	11.44	0.76	48	7.84	2133.12
	27-Oct-14	6.52	1,880	10.28	0.06	20	10.75	2130.21
	14-Jan-15	6.31	1,980	8.27	0.19	80	5.21	2135.75
	21-Apr-15	6.72	2,000	13.33	1.19	103	5.42	2135.54
	21-Oct-15	6.27	2,280	12.66	0.26	19	12.76	2128.20

	Parameter								
Well	Date	pH	Specific Conductance (µS/cm)	Temperature (°C)	DO (mg/L)	ORP (mV)	Depth to Water (feet)	Groundwater Elevation (feet amsl)
08-EMF-MW-F	11-Nov-08	5.45	144	9.43	0.44	140	12.12	2126.95
	3-Feb-09	5.45	133	9.16	0.5	177	11.23	2127.84
	7-May-09	4.83	134	9.37	0.44	219	5.45	2133.62
	10-Aug-09	5.46	117	11.63	1.23	293	11.69	2127.38
	11-Nov-09	5.37	142	9.81	0.33	137	11.88	2127.19
	25-Feb-10	4.96	277	9.07	0.78	241	11.23	2127.84
	19-May-10	5.34	305	8.82	0.49	157	7.98	2131.09
	25-Aug-10	5.49	151	11.08	1.63	155	11.81	2127.26
	16-Nov-10	5.44	222	9.94	0.31	157	11.44	2127.63
	10-Feb-11	5.23	158	8.82	0.75	171	9.54	2129.53
	6-Jul-11	5.76	100	12.72	0.36	197	8.66	2130.41
	25-Oct-11	5.55	157	10.65	0.41 J	119	12.24	2126.83
	26-Jan-12	5.34	272	9.70	0.46	122	12.05	2127.02
	11-Apr-12	5.42	142	9.85	0.23	110	6.03	2133.04
	1-Aug-12	5.44	118	12.29	0.17	135	11.14	2127.93
	30-Oct-12	5.68	182	12.59	0.56	253	11.8	2127.27
	23-Jan-13	5.34	150	11.22	0.33	125	11.51	2127.56
	2-Apr-13	5.48	180	11.87	0.32	201	7.28	2131.79
	23-Jul-13	5.33	154	13.18	0.16	111	11.69	2127.38
	17-Oct-13	5.48	196	12.45	0.48	206	12.33	2126.74
	15-Jan-14	5.58	244	10.72	0.37	94	10.47	2128.60
	1-Apr-14	5.54	248	10.17	0.6	194	6.79	2132.28
	23-Jul-14	5.63	213	10.86	0.7	109	11.6	2127.47
	27-Oct-14	5.65	267	9.85	0.12	124	12.63	2126.44
	14-Jan-15	5.43	268	8.38	0.36	167	10.59	2128.48
	22-Apr-15	5.17	199	10.16	0.77	264	10.07	2129.00
	21-Oct-15	5.57	309	12.78	0.35	217	12.97	2126.10
Decon Well	16-Nov-10	6.13	105	10.12	2.98	190	NS	NS
	10-Feb-11	NS	NS	NS	NS	NS	NS	NS
	6-Jul-11	6.59	97	11.14	9.03	5	NS	NS
	25-Oct-11	6.14	67	11.00	3.85	75	NS	NS
	26-Jan-11	NS	NS	NS	NS	NS	NS	NS
	10-Apr-12	NS	NS	NS	NS	NS	NS	NS
	1-Aug-12	5.81	139	23.92	1.12	47	NS	NS
	30-Oct-12	6.19	42	12.40	2.36	160	NS	NS
	23-Jan-13	NS	NS	NS	NS	NS	NS	NS
	2-Apr-13	NS	NS	NS	NS	NS	NS	NS
	24-Jul-13	6.82	88	14.05	5.36	149	NS	NS
	17-Oct-13	NS	NS	NS	NS	NS	NS	NS
sampling discontinued	15-Jan-14	NS	NS	NS	NS	NS	NS	NS
after April 2014	1-Apr-14	NS	NS	NS	NS	NS	NS	NS

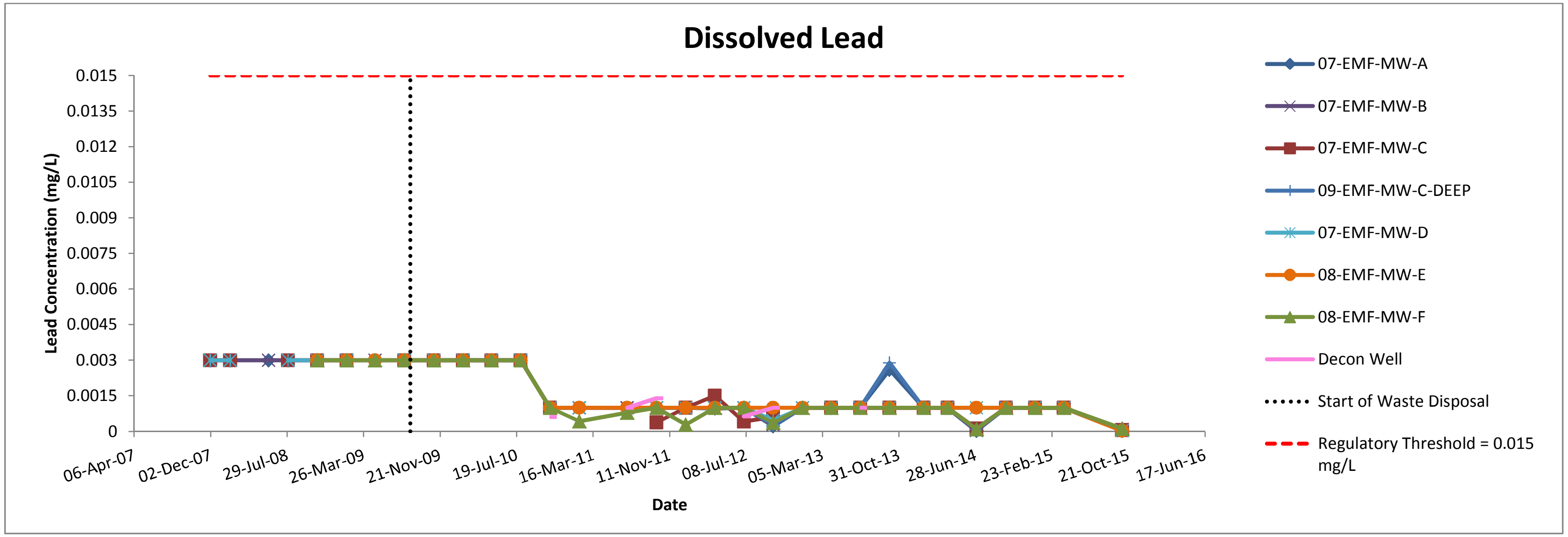
Notes:
°C = degrees Celsius
mg/L = milligrams per liter
mV = millivolts
µS/cm = microSiemens per centimeter
amsl = above mean sea level
DO = Dissolved oxygen
ORP = Oxidation-reduction potential
NS = Not sampled
R = Rejected
J = Estimate

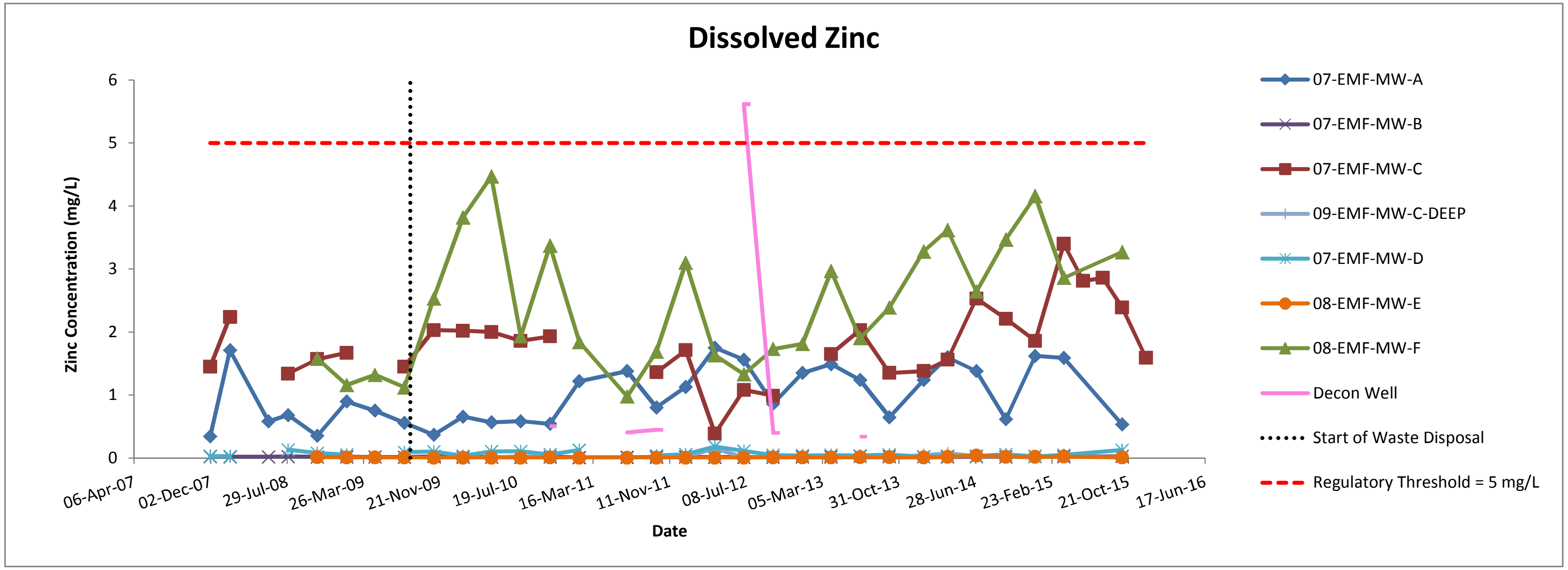
Dissolved Metals Data at EMFR Groundwater Sites





Dissolved Metals Data at EMFR Groundwater Sites





*Dissolved antimony not shown as it has never been detected at EMFR.

Groundwater Monitoring Results
Dissolved Metals
East Mission Flats Repository

Well No.	Sample Date	Constituents (mg/L)				
		Antimony	Arsenic	Cadmium	Lead	Zinc
07-EMF-MW-A	11-Dec-07	0.003 U	0.003 U	0.000578 J	0.003 U	0.347 J
	25-Feb-08	0.003 U	0.003 U	0.00172	0.003 U	1.71 J
	3-Jun-08	0.003 U	0.003 U	0.000763	0.003 U	0.582
	19-Aug-08	0.003 U	0.003 U	0.000321	0.003 U	0.683
	10-Nov-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.353
	4-Feb-09	0.003 U	0.003 U	0.000777	0.003 U	0.898
	7-May-09	0.003 U	0.003 U	0.000382	0.003 U	0.753
	10-Aug-09	0.003 U	0.003 U	0.000204	0.003 U	0.558
	11-Nov-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.368
	25-Feb-10	0.003 U	0.003 U	0.000208	0.003 U	0.657
	19-May-10	0.003 U	0.003 U	0.000225	0.003 U	0.568
	25-Aug-10	0.003 U	0.003 U	0.000227	0.003 U	0.584
	16-Nov-10	0.002 U	0.00076 J	0.0002 U	0.001 U	0.544 J
	10-Feb-11	0.002 U	0.001 U	0.00039	0.001 U	1.22 J
	6-Jul-11	0.002 U	0.0073 J*	0.00063	0.001 U	1.38
	24-Oct-11	0.002 U	0.00044 J	0.000220	0.001 UJ	0.804
	25-Jan-12	0.0020 U	0.0074 J*	0.00032	0.001 U	1.13
	10-Apr-12	0.002 U	0.0014	0.00058	0.001 U	1.75
	31-Jul-12	0.002 U	0.0018	0.00046	0.001 U	1.56
	29-Oct-12	0.002 U	0.00075 J	0.00023	0.00022 J	0.862 J
	23-Jan-13	0.002 U	0.001 U	0.00037	0.001 U	1.35
	2-Apr-13	0.002 U	0.001 U	0.00038	0.001 U	1.49
	23-Jul-13	0.002 U	0.001 U	0.00033	0.001 U	1.24
	17-Oct-13	0.002 U	0.001 U	0.0002 U	0.0026	0.648
	15-Jan-14	0.002 U	0.0011	0.00035	0.001 U	1.24 J
	1-Apr-14	0.002 U	0.001 U	0.00050	0.001 U	1.600 J
	23-Jul-14	0.002 U	0.00076 J	0.00029	0.000025 J	1.38 J
	27-Oct-14	0.002 U	0.001 U	0.0002 U	0.001 U	0.616
	14-Jan-15	NS	0.0011	0.00045	0.001 U	1.62 J
	21-Apr-15	NS	0.00039 J	0.00050	0.001 U	1.59 J
	21-Oct-15	NS	0.00026 J	0.000097 J	0.000039 J	0.533 J
07-EMF-MW-B	10-Dec-07	0.003 U	0.003 U	0.0002 U	0.003 U	0.0243 J
	25-Feb-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.0198 J
	3-Jun-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.0212
	19-Aug-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.0244
	10-Nov-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.0197
	4-Feb-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.0210
	7-May-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.0168
	10-Aug-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.0160
	11-Nov-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.0264
	25-Feb-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.0153
	19-May-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.0157
	25-Aug-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.0157
	16-Nov-10	0.002 U	0.001 U	0.0002 U	0.001 U	0.0187 J
	10-Feb-11	0.002 U	0.001 U	0.0002 U	0.001 U	0.0091 J*
	6-Jul-11	0.002 U	0.0077 J*	0.0002 U	0.001 U	0.0126
	24-Oct-11	0.002 U	0.001 U	0.0002 U	0.001 UJ	0.0148 J*
	25-Jan-12	0.002 U	0.0073 J*	0.0002 U	0.001 U	0.0180
	10-Apr-12	0.002 U	0.0014	0.0002 U	0.001 U	0.0162
	31-Jul-12	0.002 U	0.00071 J	0.0002 U	0.001 U	0.0142
	29-Oct-12	0.002 U	0.001 U	0.0002 U	0.00028 J	0.0121 J
	24-Jan-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0181
	2-Apr-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0197
	23-Jul-13	0.002 U	0.0022 J*	0.0002 U	0.001 U	0.0285 J*
	17-Oct-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0227
	15-Jan-14	0.002 U	0.001 U	0.0002 U	0.001 U	0.0226 J
	1-Apr-14	0.002 U	0.001 U	0.0002 U	0.001 U	0.0182 J
	23-Jul-14	0.002 U	0.00016 J	0.000031 J	0.000037 J	0.0219 J
	27-Oct-14	0.002 U	0.001 U	0.0002 U	0.001 U	0.0207
	14-Jan-15	NS	0.00011 J	0.000058 J	0.001 U	0.0268 J
	21-Apr-15	NS	0.001 U	0.0002 U	0.001 U	0.0254 J*
	21-Oct-15	NS	0.00013 J	0.000093 J	0.000083 J	0.0266 J*

Well No.	Sample Date	Constituents (mg/L)				
		Antimony	Arsenic	Cadmium	Lead	Zinc
07-EMF-MW-C	10-Dec-07	0.003 U	0.003 U	0.0013 J	0.003 U	1.45 J
	25-Feb-08	0.003 U	0.003 U	0.00318	0.003 U	2.24 J
	3-Jun-08	NS	NS	NS	NS	NS
	19-Aug-08	0.003 U	0.003 U	0.00111	0.003 U	1.34
	10-Nov-08	0.003 U	0.003 U	0.000522	0.003 U	1.57
	3-Feb-09	0.003 U	0.003 U	0.00354	0.003 U	1.67
	7-May-09	NS	NS	NS	NS	NS
	10-Aug-09	0.003 U	0.003 U	0.00229	0.003 U	1.45
	11-Nov-09	0.003 U	0.003 U	0.00144	0.003 U	2.03
	25-Feb-10	0.003 U	0.003 U	0.00326	0.003 U	2.02
	19-May-10	0.003 U	0.003 U	0.00346	0.003 U	2.00
	25-Aug-10	0.003 U	0.003 U	0.00364	0.003 U	1.86
	16-Nov-10	0.002 U	0.001 U	0.0029	0.001 U	1.93 J
	10-Feb-11	NS	NS	NS	NS	NS
	6-Jul-11	NS	NS	NS	NS	NS
	24-Oct-11	0.002 U	0.00081 J	0.00072	0.00038 J	1.36
	25-Jan-12	0.002 U	0.0074 J*	0.0049	0.001 U	1.71
	10-Apr-12	0.002 U	0.0017 J*	0.00089	0.0015	0.388
	31-Jul-12	0.002 U	0.0027	0.00025	0.00041 J	1.08
	29-Oct-12	0.002 U	0.0027	0.00010 J	0.00061 J	0.988 J
	23-Jan-13	NS	NS	NS	NS	NS
	2-Apr-13	0.002 U	0.001 U	0.0015	0.001 U	1.65
	23-Jul-13	0.002 U	0.0024 J*	0.0019	0.001 U	2.03
	17-Oct-13	0.002 U	0.001 U	0.0012	0.001 U	1.35
	15-Jan-14	0.002 U	0.001 U	0.0017	0.001 U	1.38 J
	1-Apr-14	0.002 U	0.001 U	0.0024	0.001 U	1.56 J
	23-Jul-14	0.002 U	0.00019 J	0.0073	0.00012 J	2.53 J
	27-Oct-14	0.002 U	0.001 U	0.0034	0.001 U	2.21
	14-Jan-15	NS	0.00013 J	0.0016	0.001 U	1.86 J
	21-Apr-15	NS	0.00013 J	0.0057	0.001 U	3.4 J
	18-Jun-15	NS	NS	0.0056	NS	2.8
	13-Aug-15	NS	NS	0.0073	NS	2.86 J
	21-Oct-15	NS	0.00022 J	0.0064	0.000051 J	2.39 J
	15-Dec-15	NS	NS	0.0021 J	NS	1.59
09-EMF-MW-C Deep	25-Feb-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.0113
	19-May-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.005 U
	25-Aug-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.0317
	16-Nov-10	0.002 U	0.001 U	0.0002 U	0.001 U	0.0216 J
	10-Feb-11	NS	NS	NS	NS	NS
	6-Jul-11	NS	NS	NS	NS	NS
	24-Oct-11	0.002 U	0.001 U	0.0002 U	0.001 UJ	0.0167
	25-Jan-12	0.002 U	0.0075 J*	0.0002 U	0.001 U	0.0191
	10-Apr-12	0.002 U	0.0042 J*	0.0002 U	0.00095 J	0.154
	31-Jul-12	0.002 U	0.0011	0.0002 U	0.001 U	0.0116
	29-Oct-12	0.002 U	0.00065 J	0.0002 U	0.00028 J	0.0032 J
	23-Jan-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0226
	2-Apr-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0237
	23-Jul-13	0.002 U	0.0022 J*	0.0002 U	0.001 U	0.0088 J*
	17-Oct-13	0.002 U	0.001 U	0.0002 U	0.0029	0.0096 J*
	15-Jan-14	0.002 U	0.0014	0.0002 U	0.001 U	0.0463 J
	1-Apr-14	0.002 U	0.001 U	0.00053	0.001 U	0.0724 J
	23-Jul-14	0.002 U	0.00029 J	0.00009 J	0.000079 J	0.0328 J
	27-Oct-14	0.002 U	0.001 U	0.0002 U	0.001 U	0.0222
	14-Jan-15	NS	0.0002 J	0.000045 J	0.001 U	0.012 J
	21-Apr-15	NS	0.00032 J	0.0002 U	0.001 U	0.0304 J
	21-Oct-15	NS	0.000087 J	0.0002 U	0.000047 J	0.0133 J*

Well No.	Sample Date	Constituents (mg/L) Antimony	Arsenic	Cadmium	Lead	Zinc
07-EMF-MW-D	10-Dec-07	0.003 U	0.003 U	0.0002 U	0.003 U	0.0326 J
	25-Feb-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.0285 J
	3-Jun-08	NS	NS	NS	NS	NS
	19-Aug-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.132
	10-Nov-08	0.003 U	0.003 U	0.0002 U	0.003 U	0.0794
	3-Feb-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.0531
	7-May-09	NS	NS	NS	NS	NS
	11-Aug-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.0918
	11-Nov-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.103
	25-Feb-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.0352
	19-May-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.105
	25-Aug-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.109
	16-Nov-10	0.002 U	0.0018	0.0002 U	0.001 U	0.0563 J
	10-Feb-11	0.002 U	0.001 U	0.0002 U	0.001 U	0.127 J*
	6-Jul-11	NS	NS	NS	NS	NS
	25-Oct-11	0.002 U	0.0019	0.0002 U	0.001 UJ	0.0395
	26-Jan-12	0.002 U	0.0079 J*	0.00016 J	0.001 U	0.0584
	10-Apr-12	0.002 U	0.0014	0.0002 U	0.001 U	0.184
	1-Aug-12	0.002 U	0.0021	0.0002 U	0.001 U	0.112
	30-Oct-12	0.002 U	0.0018	0.00005 J	0.00047 J	0.0464 J
	24-Jan-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0425
	2-Apr-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0466
	23-Jul-13	0.002 U	0.0029 J*	0.0002 U	0.001 U	0.0387 J*
	17-Oct-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0537
	15-Jan-14	0.002 U	0.001 U	0.0002 U	0.001 U	0.0210 J
	1-Apr-14	0.002 U	0.001 U	0.0002 U	0.001 U	0.0326 J
	23-Jul-14	0.002 U	0.0011	0.000048 J	0.001 U	0.0331 J
	27-Oct-14	0.002 U	0.001 U	0.0002 U	0.001 U	0.0587
	14-Jan-15	NS	0.00024 J	0.000028 J	0.001 U	0.0251 J
	21-Apr-15	NS	0.00027 J	0.0002 U	0.001 U	0.0506 J
	21-Oct-15	NS	0.00032 J	0.0002 U	0.000037 J	0.127 J
08-EMF-MW-E	10-Nov-08	0.003 U	0.0148	0.0002 U	0.003 U	0.0141
	3-Feb-09	0.003 U	0.003 U	0.0002 U	0.003 U	0.01 U
	7-May-09	0.003 U	0.0035	0.0002 U	0.003 U	0.00889
	11-Aug-09	0.003 U	0.0195	0.0002 U	0.003 U	0.00848
	11-Nov-09	0.003 U	0.0232	0.0002 U	0.003 U	0.00671
	25-Feb-10	0.003 U	0.003 U	0.0002 U	0.003 U	0.00599
	19-May-10	0.003 U	0.00447	0.0002 U	0.003 U	0.00633
	25-Aug-10	0.003 U	0.0172	0.0002 U	0.003 U	0.00687
	16-Nov-10	0.002 U	0.0177	0.0002 U	0.001 U	0.0069 J
	10-Feb-11	0.002 U	0.00089 J	0.0002 U	0.001 U	0.0042 J
	6-Jul-11	0.002 U	0.0074 J*	0.0002 U	0.001 U	0.0048 J
	24-Oct-11	0.002 U	0.020	0.0002 U	0.001 UJ	0.0045
	26-Jan-12	0.002 U	0.0069 J*	0.0002 U	0.001 U	0.0051 J*
	11-Apr-12	0.002 U	0.002	0.0002 U	0.001 U	0.0063 J*
	1-Aug-12	0.002 U	0.0063	0.0002 U	0.001 U	0.0064
	29-Oct-12	0.002 U	0.0149	0.00008 J	0.001 U	0.0071 J*
	23-Jan-13	0.002 U	0.0013	0.0002 U	0.001 U	0.0091 J*
	2-Apr-13	0.002 U	0.001 U	0.0002 U	0.001 U	0.0083 J*
	23-Jul-13	0.002 U	0.0026 J*	0.0002 U	0.001 U	0.0124 J*
	17-Oct-13	0.002 U	0.0067	0.0002 U	0.001 U	0.0120 J*
	15-Jan-14	0.002 U	0.001 U	0.0002 U	0.001 U	0.0073 J
	1-Apr-14	0.002 U	0.0014	0.0002 U	0.001 U	0.0175 J
	23-Jul-14	0.002 U	0.0045	0.0001 J	0.001 U	0.0392 J
	27-Oct-14	0.002 U	0.0042	0.0002 U	0.001 U	0.0198
	14-Jan-15	NS	0.001	0.000096 J	0.001 U	0.0175 J
	21-Apr-15	NS	0.00099 J	0.0002 U	0.001 U	0.0218 J*
	21-Oct-15	NS	0.0078	0.00022	0.000032 J	0.0090 J*

Well No.	Sample Date	Constituents (mg/L) Antimony	Arsenic	Cadmium	Lead	Zinc
08-EMF-MW-F	11-Nov-08	0.003 U	0.003 U	0.000205	0.003 U	1.58
	3-Feb-09	0.003 U	0.003 U	0.000304	0.003 U	1.16
	7-May-09	0.003 U	0.003 U	0.000258	0.003 U	1.32
	10-Aug-09	0.003 U	0.003 U	0.00023	0.003 U	1.12
	11-Nov-09	0.003 U	0.003 U	0.000464	0.003 U	2.53
	25-Feb-10	0.003 U	0.003 U	0.000947	0.003 U	3.82
	19-May-10	0.003 U	0.003 U	0.00132	0.003 U	4.47
	25-Aug-10	0.003 U	0.003 U	0.000436	0.003 U	1.93
	16-Nov-10	0.002 U	0.001 U	0.00065	0.001 U	3.37 J
	10-Feb-11	0.002 U	0.001 U	0.00045	0.00043 J	1.84 J
	6-Jul-11	0.002 U	0.0056 J*	0.00016 J	0.00079 J	0.976
	25-Oct-11	0.002 U	0.001 U	0.00031	0.001 UJ	1.69
	26-Jan-12	0.002 U	0.0041 J*	0.00094	0.00029 J	3.10
	11-Apr-12	0.002 U	0.00086 J	0.00031	0.001 U	1.63
	1-Aug-12	0.002 U	0.00057 J	0.0002 U	0.001 U	1.33
	30-Oct-12	0.002 U	0.001 U	0.00043	0.00036 J	1.73 J
	23-Jan-13	0.002 U	0.001 U	0.00045	0.001 U	1.81
	2-Apr-13	0.002 U	0.001 U	0.0010	0.001 U	2.97
	23-Jul-13	0.002 U	0.0014 J*	0.00053	0.001 U	1.90
	17-Oct-13	0.002 U	0.001 U	0.00099	0.001 U	2.39
	15-Jan-14	0.002 U	0.001 U	0.0018	0.001 U	3.28 J
	1-Apr-14	0.002 U	0.001 U	0.0018	0.001 U	3.62 J
	23-Jul-14	0.002 U	0.00017 J	0.0012	0.000098 J	2.64 J
	27-Oct-14	0.002 U	0.001 U	0.0019	0.001 U	3.47
	14-Jan-15	NS	0.0001 J	0.0019	0.001 U	4.16 J
	22-Apr-15	NS	0.00014 J	0.0011	0.001 U	2.86 J
	21-Oct-15	NS	0.00010 J	0.0014	0.00012 J	3.27 J
Decon Well	16-Nov-10	0.002 U	0.00092 J	0.0002 U	0.00061 J	0.504 J
	10-Feb-11	NS	NS	NS	NS	NS
	6-Jul-11	0.002 U	0.0068 J*	0.0002 U	0.001 U	0.407
	25-Oct-11	0.002 U	0.0009 J	0.0002 U	0.0014 J	0.449
	26-Jan-12	NS	NS	NS	NS	NS
	10-Apr-12	NS	NS	NS	NS	NS
	1-Aug-12	0.002 U	0.0055	0.0002 U	0.00063 J	5.62
	30-Oct-12	0.002 U	0.00080 J	0.000099 J	0.001 U	0.401 J
	23-Jan-13	NS	NS	NS	NS	NS
	2-Apr-13	NS	NS	NS	NS	NS
	24-Jul-13	0.002 U	0.00190 J*	0.0002 U	0.001 U	0.342
	17-Oct-13	NS	NS	NS	NS	NS
sampling discontinued	15-Jan-14	NS	NS	NS	NS	NS
after April 2014	1-Apr-14	NS	NS	NS	NS	NS
Regulatory Threshold		0.006[a]	0.01[a]	0.005[a]	0.015[a]	5.0[b]

Notes:

mg/L = milligrams per liter

NS = Not sampled

U = Concentration was not detected (detection limits used by the laboratories are the contract required quantitation limit, the reporting limit, or the method detection limit, depending on the laboratory).

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

J* = The result is an estimated quantity. This analyte was detected in both the sample and an associated field blank sample during the same sampling event.

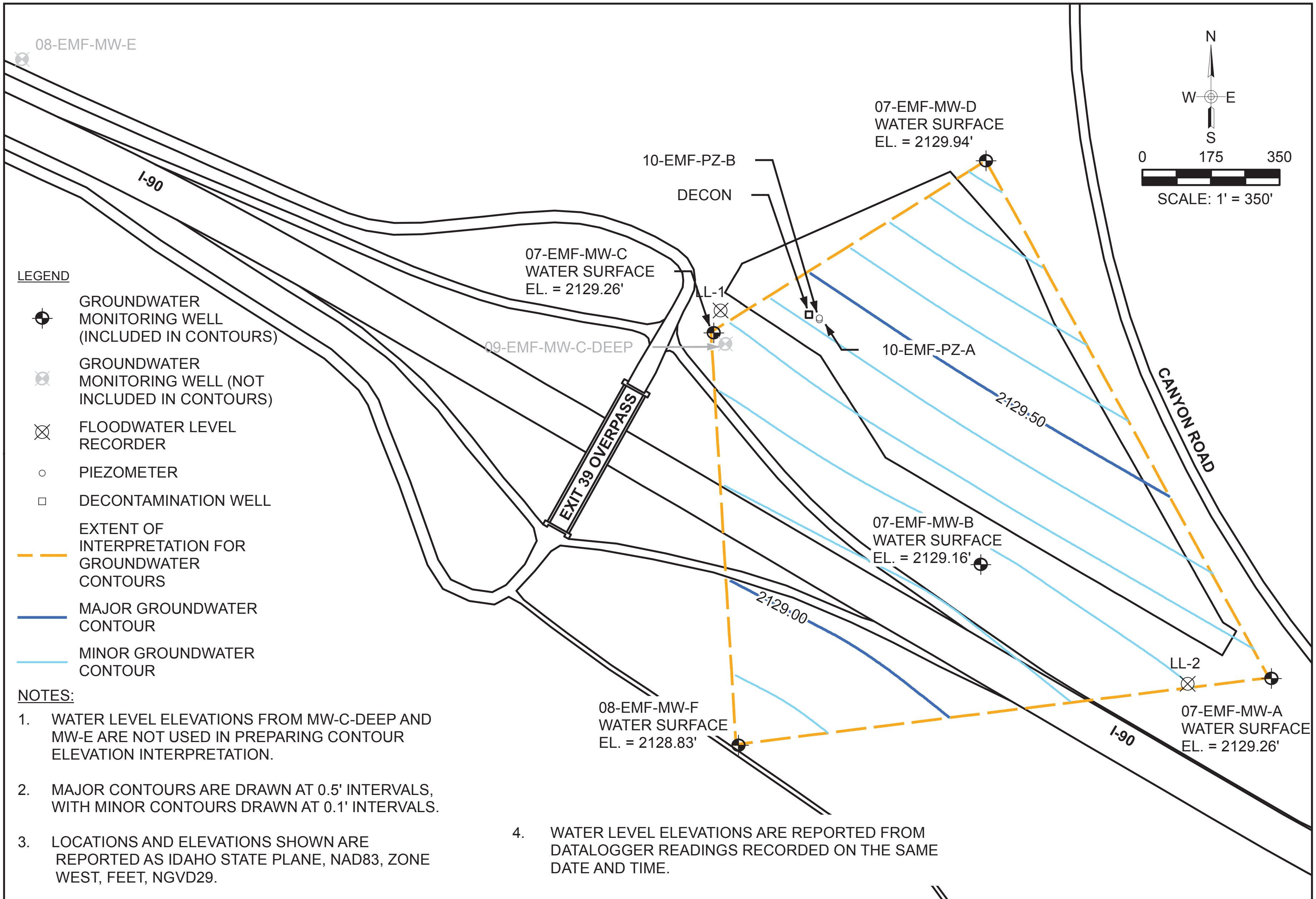
a. National Primary Drinking Water Regulation (Maximum Contaminant Level)

b. National Secondary Drinking Water Regulation

Antimony no longer analyzed for as of December 2014.

= Value exceeds the regulatory threshold

Appendix B. Groundwater Contour Maps



LEGEND

- GROUNDWATER MONITORING WELL (INCLUDED IN CONTOURS)
- GROUNDWATER MONITORING WELL (NOT INCLUDED IN CONTOURS)
- FLOODWATER LEVEL RECORDER
- PIEZOMETER
- DECONTAMINATION WELL
- EXTENT OF INTERPRETATION FOR GROUNDWATER CONTOURS
- MAJOR GROUNDWATER CONTOUR
- MINOR GROUNDWATER CONTOUR

NOTES:

1. WATER LEVEL ELEVATIONS FROM MW-C-DEEP AND MW-E ARE NOT USED IN PREPARING CONTOUR ELEVATION INTERPRETATION.
2. MAJOR CONTOURS ARE DRAWN AT 0.5' INTERVALS, WITH MINOR CONTOURS DRAWN AT 0.1' INTERVALS.
3. LOCATIONS AND ELEVATIONS SHOWN ARE REPORTED AS IDAHO STATE PLANE, NAD83, ZONE WEST, FEET, NGVD29.
4. WATER LEVEL ELEVATIONS ARE REPORTED FROM DATALOGGER READINGS RECORDED ON THE SAME DATE AND TIME.

SCALE: 1 " = 350 ' (8.5x11 PRINT)	TerraGraphics Environmental Engineering, Inc.	EAST MISSION FLATS REPOSITORY	FIGURE 3 APRIL 2015 GROUNDWATER LEVEL ELEVATIONS AND CONTOURS	PROJECT NO: 15019-08-02
DRAWN BY: B.B.				DATE: 10/14/2015
ENGINEER: D.F.		CATALDO, IDAHO		FILE NAME: EMF_GW_MAP_APR2015.MXD

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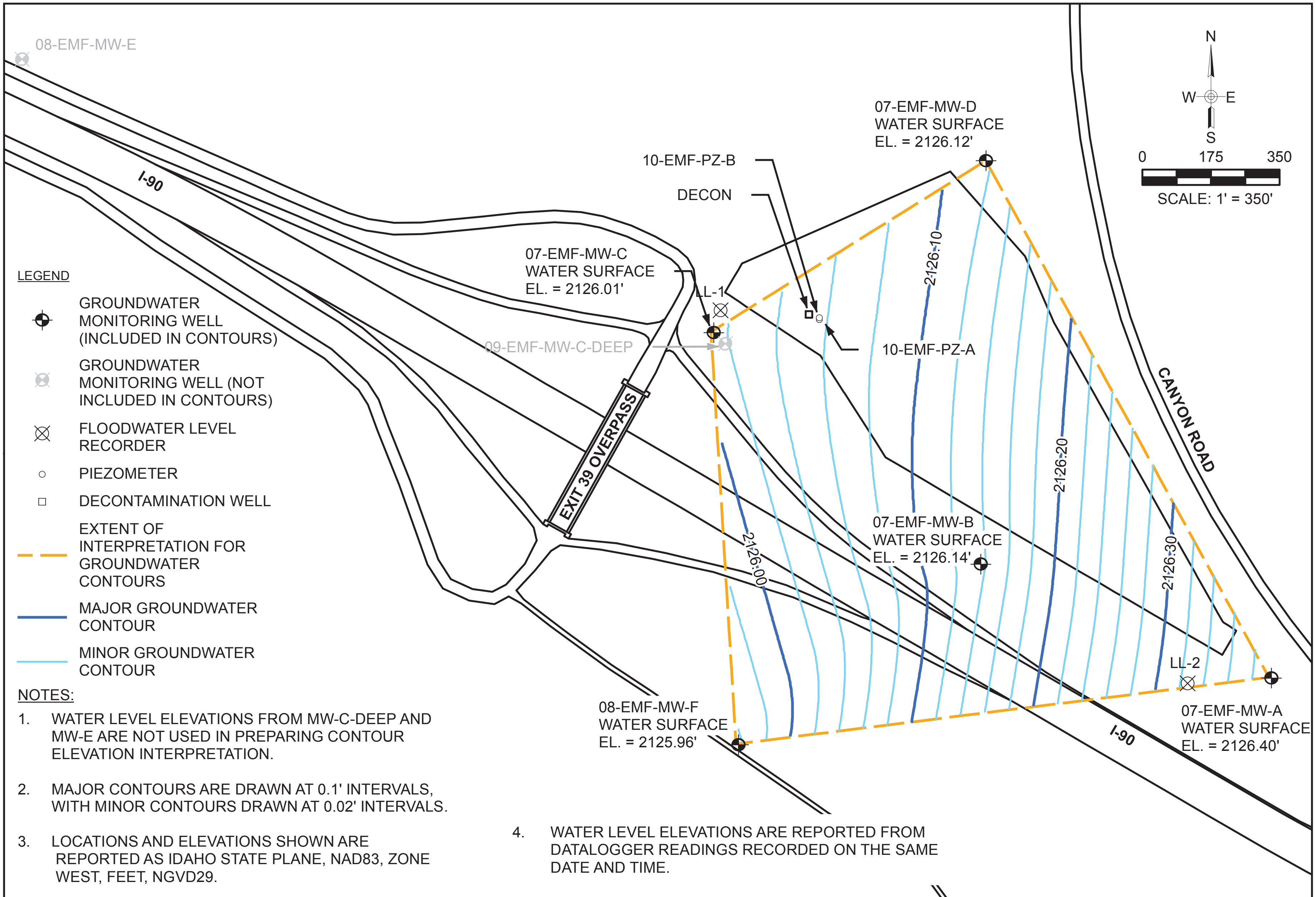

LEGEND

- GROUNDWATER MONITORING WELL (INCLUDED IN CONTOURS)
- GROUNDWATER MONITORING WELL (NOT INCLUDED IN CONTOURS)
- FLOODWATER LEVEL RECORDER
- PIEZOMETER
- DECONTAMINATION WELL
- EXTENT OF INTERPRETATION FOR GROUNDWATER CONTOURS
- MAJOR GROUNDWATER CONTOUR
- MINOR GROUNDWATER CONTOUR

NOTES:

1. WATER LEVEL ELEVATIONS FROM MW-C-DEEP AND MW-E ARE NOT USED IN PREPARING CONTOUR ELEVATION INTERPRETATION.
2. MAJOR CONTOURS ARE DRAWN AT 0.1' INTERVALS, WITH MINOR CONTOURS DRAWN AT 0.02' INTERVALS.
3. LOCATIONS AND ELEVATIONS SHOWN ARE REPORTED AS IDAHO STATE PLANE, NAD83, ZONE WEST, FEET, NGVD29.
4. WATER LEVEL ELEVATIONS ARE REPORTED FROM DATALOGGER READINGS RECORDED ON THE SAME DATE AND TIME.

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SCALE: 1 " = 350 ' (8.5x11 PRINT)
DRAWN BY: B.B.
ENGINEER: D.F.

TerraGraphics Environmental Engineering, Inc.

EAST MISSION FLATS REPOSITORY

CATALDO, IDAHO

FIGURE 3
OCTOBER 2015 GROUNDWATER LEVEL ELEVATIONS AND CONTOURS

PROJECT NO: 15019-08-02
DATE: 02/01/2016
FILE NAME: EMF_GW_MAP_APR2015.MXD