



REPORT

# QUARTERLY MONITORING REPORT FOURTH QUARTER 2017 RAVENSDALE SITE

28131 Ravensdale-Black Diamond Road  
Ravensdale, Washington 98051

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## 1.0 INTRODUCTION

This report, prepared by Golder Associates Inc. (Golder) for Holcim (US) Inc., presents the results of surface water and groundwater monitoring conducted at the Ravensdale Site during the fourth quarter of 2017. The quarterly surface and groundwater monitoring events were completed during November 2017.

### 1.1 Site Description

The Ravensdale Site (Site) is located at 28131 Ravensdale-Black Diamond Road in Ravensdale, Washington. Figure 1 shows the Site location. The Site is comprised of two distinct areas: the Lower Disposal Area (LDA) and the Dale Strip Pit (DSP). The LDA encompasses about 7 acres and is located in the northwestern portion of the Site. The DSP, an area of about 6 acres, is located in the southeastern portion of the Site. The LDA and DSP are shown in Figure 2.

Historically, sand and coal mining operations occurred on the Site. The Site is currently owned and operated by the Reserve Silica Corporation and is in the reclamation phase. Reserve Silica Corporation is backfilling the remaining historical excavation areas with material from construction sites in the Puget Sound area. The Site's historical background and previous environmental investigations are discussed further in Section 2.0.

### 1.2 Purpose and Scope

The purpose of the quarterly monitoring activities is to assess the groundwater and surface water conditions with respect to potential impact from buried cement kiln dust (CKD). Quarterly monitoring and reporting activities are conducted in accordance with the procedures established in the *Sampling and Analysis and Quality Assurance Project Plan* (SAP/QAPP) (ARCADIS 2006). The SAP/QAPP was approved by the Interagency Group (Washington State Department of Ecology, Public Health – Seattle and King County, and King County Department of Development and Environmental Services) in a letter to ARCADIS U.S., Inc. (ARCADIS) dated August 3, 2006 (Ecology 2006). Modifications to the SAP/QAPP related to sampling locations, test parameters, and sampling frequency were agreed upon as documented in the ARCADIS March 3, 2008 letter to the Department of Ecology. Modifications to the sampling frequency were agreed upon as documented in the Golder April 9, 2015 letter to Public Health – Seattle and King County and a subsequent approval letter from Public Health dated April 7, 2016.

The groundwater and surface water monitoring scope of work includes the following:

- Quarterly collection of groundwater samples from six on-site shallow/alluvial groundwater monitoring wells (MW-1A, MW-2A, MW-3A, MW-4A, MW-5A, and MW-6A) as part of the LDA monitoring program.
- Annual collection of groundwater samples from three on-site bedrock groundwater monitoring wells (MWB-1LDA, MWB-2LDA, and MWB-3LDA) as part of the LDA monitoring program.



- Annual collection of groundwater samples from four on-site bedrock groundwater-monitoring wells (MWB-1SDSP, MWB-1DDSP, MWB-5DSP, MWB-6DSP) as part of the DSP monitoring program.
- Semi-annual measurement of water levels and field parameters in monitoring wells MWB-2DSP and MWB-4SDSP.
- Quarterly collection of surface water samples from Infiltration Ponds #1, Weir (or the constructed wetlands located upstream if the Weir is dry), South Pond, and Still Well as part of the LDA surface water sampling program.
- Annual collection of water samples from the culvert that discharges from the former mine Portal (the Portal) as part of the DSP sampling program.
- Measurement of field parameters in water purged from the groundwater monitoring wells, and sampled directly from the surface water areas. Field parameters include: groundwater level readings (in wells only), pH, conductivity, temperature, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity.
- Analysis of the groundwater, surface water, and quality control samples for dissolved arsenic, lead, iron, manganese, potassium, and total dissolved solids (TDS).
- Analysis of duplicate samples for quality control.
- Quarterly Interceptor Trench monitoring for instantaneous flow volume and sampling for pH, TDS, and turbidity.

Figure 2 shows the location of the monitoring wells and surface water collection points. Table 1 presents details of each monitoring well.



## 2.0 BACKGROUND

### 2.1 Site Background

The following is a brief description of the historical mining and reclamation activities that occurred at the Site as provided by ARCADIS (ARCADIS 2009). This section also includes a discussion of the quarterly monitoring program.

#### 2.1.1 LDA Background

The LDA is a former open pit sand mine that was reclaimed by placing CKD and other material into the mine excavation from June 1979 to October 1982. The LDA was filled with approximately 175,000 tons of CKD. Records indicate that a cap consisting of clay and up to 7 feet of overburden material from sand mining operations was placed over the CKD.

Historically, high pH seepage has surfaced along the slope west of the LDA. The outbreaks are primarily located along the northern half of the western boundary of the LDA. The leachate drained through low-lying, marshy areas and commingled with stormwater before flowing to the three infiltration ponds (near the Infiltration Ponds #1 sampling point, as shown in Figure 2) near the Ravensdale-Black Diamond Road (ARCADIS 2004).

#### 2.1.2 DSP Background

The DSP was created to mine the Dale No. 4 coal seam from the surface in 1946. Prior to 1946, the coal seam was worked from an underground mine. The underground mining chutes were driven upward to the surface to provide ventilation and allow the transportation of timbers into the mine. Construction of the mine allowed groundwater to drain by gravity to the mine portal (Portal). The Portal has since collapsed, and now a pipe in the collapsed Portal allows water to continuously drain from the mine under an Ecology Sand and Gravel General Permit (Ecology 2005) with monitoring as described below. The Portal is located north of the LDA on the east side of the main haul road.

The DSP was approximately 1,800 feet long (north to south), averaged 140 feet wide (east to west), and averaged 40 feet deep. It was filled in the 1970s and 1980s with approximately 250,000 cubic yards of material including CKD, borrow, and other materials pursuant to a permit from Public Health – Seattle and King County. It is estimated that about one third of the DSP was filled with CKD (ARCADIS 2004).



## 2.2 Monitoring Locations

### 2.2.1 LDA

Shallow/alluvial monitoring wells were installed near the LDA in July 2005 and are monitored to assess the shallow/alluvial groundwater conditions with respect to potential impact from the CKD. Four of the wells (MW-1A, MW-2A, MW-5A, and MW-6A) are located around the infiltration ponds. MW-3A is located west of the high pH seepage area. MW-4A, a background well, is located south of, and upstream with respect to surface water drainage, the high pH seepage area.

Bedrock monitoring wells were installed along the west side of the main access road, west of the LDA, in December 2006 to assess bedrock groundwater conditions in the vicinity of the LDA. MWB-1LDA is located near the northern tip of the LDA, MWB-2LDA is located near the center of the LDA, and MWB-3 LDA is located near the southern end of the LDA.

The LDA surface water sampling locations were chosen to evaluate the effects of high pH seepage in the vicinity of the LDA. Infiltration Ponds #1 sampling location is situated in the westernmost infiltration pond. The infiltration ponds are located at the north end of the Site, near Ravensdale-Black Diamond Road. The Weir is located north of the access road to MW-3A immediately below the discharge point from the wetlands. If no flow is observed at the Weir, the constructed wetlands upstream are the alternative sampling location. The South Pond is a closed depression located west of MWB-2LDA near the southern end of the high pH seepage zone. The Still Well is a 2-inch-diameter flush-mount well located along the high pH seepage zone west of the LDA.

The LDA groundwater and surface water sampling locations are shown in Figure 2.

### 2.2.2 DSP

The DSP bedrock groundwater monitoring program was required by Public Health – Seattle and King County and Ecology as a condition of the CKD exemption as a dangerous waste on December 13, 1984 (Public Health 1984). The DSP bedrock groundwater monitoring program includes four wells in the DSP area (MWB-1SDSP, MWB-1DDSP, MWB-5DSP, and MWB-6DSP) and the Portal, which is considered to reflect groundwater conditions. There are two additional monitoring wells (MWB-2DSP and MWB-4SDSP) located in the DSP area that are being monitored for water levels and field parameters.

The DSP groundwater monitoring locations are shown in Figure 2.



### **2.2.3 LDA Interceptor Trench**

The purpose of the Interceptor Trench is to intercept clean groundwater before the water enters the Lower Disposal Area CKD deposit and direct the water away from the deposit. Monitoring is performed at the Interceptor Trench outfall for pH, turbidity, and total dissolved solids. The purpose of the monitoring is to ensure that the trench is not collecting impacted groundwater.

## **2.3 Mitigation Activities**

### **2.3.1 LDA Cover Upgrade**

During September and October 2007, the existing soil cover on the LDA was regraded to provide positive drainage at all locations, reduce overly-steep slope areas, and place a minimum 2-foot-thick clean soil cover over the entire area, including locations where CKD was exposed at the surface. The construction activities are described in the *Construction Summary Report* (Golder 2008a).

### **2.3.2 LDA Seep Collection System Test Trenches**

During September and October 2008, test trenches for collecting high pH seepage were constructed (Golder 2008b). The purpose of this test system was to evaluate the feasibility of using a more extensive trench system to collect high pH seepage that would otherwise discharge at the ground surface adjacent to the LDA. Details of the test trench construction are presented in the *Construction Summary Report* (Golder 2009a).

Between October 2008 and September 2009, Golder monitored seepage flow rates from each of two test trenches and the tightline discharge once per month, on average. A summary of activities and results of this monitoring program is presented in the flow monitoring report (Golder 2009b).

### **2.3.3 LDA Seep Collection Ditch**

In February 2013, a surface water collection ditch and concrete catch basin were constructed on the bench below the main access road on the west side of the LDA. This system was installed to capture leachate seeps emerging from the bank along the east side of the bench (west of the main access road) and direct them into the existing tightline that carries flow from the test trenches to the infiltration pond. In April 2015, the 4-inch diameter pipeline from the catch basin to the infiltration ponds, approximately 1,000 feet in length, was replaced with a 12-inch diameter pipeline to alleviate plugging issues.

### **2.3.4 LDA Interceptor Trench**

In September 2013, a gravel-filled interceptor trench that included a perforated drain pipe and vertical downgradient liner was installed south of the LDA to intercept clean groundwater moving in a northerly direction prior to encountering the cement kiln dust in the LDA.



### **2.3.5 DSP Cover Upgrade**

Cover upgrade activities began at the DSP in November 2010 and were completed in July 2011. Cover upgrade activities included stripping surficial vegetation and topsoil, regrading the existing surface to establish positive drainage, placing low permeability soil to provide a minimum 2-foot-thick layer at all locations, filling the existing ditch along the northeast side of the DSP, replacing topsoil, and revegetating the cover surface.

## **2.4 Groundwater and Surface Water Monitoring Schedule**

Various levels of groundwater and surface water monitoring have been conducted at the Site since 2002. ARCADIS performed monthly and quarterly monitoring activities through the second quarter of 2009. Golder assumed responsibility for monitoring activities in August 2009 and conducted groundwater and surface water monitoring until April 2014. GeoEngineers performed groundwater and surface monitoring from May to December 2014. Golder resumed the groundwater and surface monitoring in February 2015.

### **2.4.1 LDA Groundwater Sampling**

Groundwater monitoring of the shallow/alluvial monitoring wells generally occurred on a quarterly schedule from July 2005 to September 2008. After the seep collection test trenches were installed, groundwater monitoring frequency for the four wells around the infiltration ponds was increased to monthly through September 2009. At the end of the formal test trench monitoring program in October 2009, the sampling frequency for these four wells returned to quarterly.

Groundwater monitoring of the bedrock monitoring wells generally occurred on a quarterly schedule since December 2006. A letter was submitted to the Public Health – Seattle and King County dated April 9, 2015 requesting a variance to the LDA bedrock groundwater monitoring frequency. In a letter to Golder dated April 7, 2016, Public Health – Seattle and King County granted a variance for three years to reduce the monitoring frequency of the Ravensdale LDA bedrock wells to annually (Public Health 2016).

### **2.4.2 LDA Surface Water Sampling**

Surface water monitoring of Infiltration Ponds #1, Weir (or the constructed wetlands located upstream if the Weir was dry), South Pond, and Still Well generally occurred on a monthly schedule from February 2005 to June 2008 and then was reduced to the current quarterly schedule.

### **2.4.3 DSP Groundwater Sampling**

Groundwater monitoring of wells MWB-1SDSP and MWB-1DDSP generally occurred on a quarterly schedule starting in December 2002. Monitoring of well MWB-5DSP generally occurred on a monthly schedule from December 2006 to June 2008 and then monitoring was reduced to quarterly. Groundwater monitoring of well MWB-6DSP generally occurred on a quarterly schedule starting in December 2006. Groundwater levels and field parameters are being measured in wells MWB-2DSP and MWB-4SDSP on a



quarterly schedule. Surface water monitoring of the Portal discharge generally occurred on a quarterly schedule starting in March 2002.

In a letter to Golder dated May 16, 2012, Public Health – Seattle and King County granted a variance for three years to reduce the monitoring frequency of the Ravensdale DSP wells and Portal to semi-annually (Public Health 2012). During this variance period, groundwater monitoring of the DSP wells occurred during the first and third quarters each year. During the second and fourth quarters, only water levels were measured in these wells. This variance expired in May 2015. A letter was submitted to the Public Health – Seattle and King County dated April 9, 2015, requesting a variance to the groundwater monitoring frequency. Pending approval, sampling of the DSP and Portal was reverted back to quarterly, starting with the August 2015 sampling quarter. In a letter to Golder dated April 7, 2016, Public Health – Seattle and King County granted a variance for three years to reduce the monitoring frequency of the DSP wells and Portal to annually (Public Health 2016).

#### **2.4.4 LDA Interceptor Trench Sampling**

The Interceptor Trench was monitored monthly from October 2013 to December 2014 and data showed that the water being collected and discharged is not impacted. A reduction in monitoring frequency to quarterly was approved by King County Public Health in an email to Joel Bolduc of Holcim dated January 2, 2015 (Public Health 2015). The Interceptor Trench is monitored for pH, turbidity, and TDS.



### 3.0 SAMPLING ACTIVITIES

The following section summarizes the activities associated with the fourth quarter monitoring event conducted in November 2017.

#### 3.1 Common Elements

##### 3.1.1 Field Parameter Measurements

Field parameters for groundwater and surface water were measured as part of the sampling activities described in the following sections. These measurements were performed with the following equipment:

- YSI ProDSS multi-parameter meter
- Hach 2100P Turbidimeter

##### 3.1.2 Laboratory Analysis

Laboratory analyses were performed on samples collected from the various locations described in the following sections. Although the analytic parameters varied between the types of samples, the following elements are common to all the sampling and analysis activities:

- The collected samples were transported to the laboratory within appropriate sample hold times following chain-of-custody protocols.
- The testing was performed by Analytical Resources, Inc. (ARI) of Tukwila, Washington.
- All samples were tested for the following parameters using the methods indicated:

Arsenic (dissolved)	EPA Method 200.8
Lead (dissolved)	EPA Method 200.8
Potassium (dissolved)	EPA Method 6010C
Iron (dissolved)	EPA Method 6010C
Manganese (dissolved)	EPA Method 6010C
Total Dissolved Solids (TDS)	EPA Method 160.1

- Interceptor Trench samples were tested for the following parameters using the method indicated:

pH	Field Measurement
TDS	EPA Method 160.1
Turbidity	Field Measurement

- Summaries of historical analytic data for the various sampling locations are presented in Appendix A. Validated analytical laboratory data packages are provided electronically on USB drive in Appendix C.



## 3.2 Sampling Procedures

### 3.2.1 LDA Groundwater Sampling

On November 9 and 10, 2017, Golder sampled groundwater from the LDA shallow/alluvial groundwater monitoring wells (MW-1A, MW-2A, MW-3A, MW-4A, MW-5A, and MW-6A). The following methods and procedures were used in collecting the groundwater samples:

- Depth to groundwater was measured in the wells prior to purging and sampling. Table 1 presents depth to water measurements and elevations.
- Using dedicated tubing connected to a portable, stainless steel bladder pump or a peristaltic pump (if groundwater elevation allowed), water from wells MW-1A, MW-2A, MW-3A, MW-4A, MW-5A, and MW-6A was purged at a rate between approximately 200 and 300 milliliters (mL) per minute.
- Field parameters of pH, conductivity, temperature, dissolved oxygen, oxidation-reduction potential, and turbidity were measured and recorded during purging at approximately five minute intervals until parameters were stable. Parameters were considered stable when three consecutive readings of pH, temperature, and conductivity were within five percent.
- Once the field parameters stabilized, the purging phase of the process was concluded. Groundwater samples were then collected directly from the dedicated sample tubing. Samples collected for dissolved metals were field-filtered through a 0.45  $\mu\text{m}$  in-line filter.
- For quality control purposes, a duplicate sample was collected from MW-2A (labeled as MW-7A).
- Laboratory-provided containers were used to collect the samples. For each groundwater sample, one 500-mL bottle preserved with nitric acid and one 1-Liter (L) un-preserved bottle were collected. The samples were then labeled and placed in a cooler with ice.

All groundwater and quality control samples were analyzed for the parameters listed in Section 3.1.2. Analytical results are discussed in Section 4.0, and the field parameters and analytical data are presented in Table 2.

### 3.2.2 LDA Surface Water Sampling

On November 9 and 10, 2017, Golder sampled surface water from the Still Well, the Infiltration Ponds #1, Weir and South Pond sampling locations. The following methods and procedures were used in collecting the surface water samples:

- Field parameters of pH, conductivity, temperature, dissolved oxygen, oxidation-reduction potential, and turbidity were measured and recorded. These parameters were measured and recorded at each of the surface water locations at the time of sample collection.
- Grab surface water samples were collected using dedicated sample tubing connected to a peristaltic pump. Samples collected for dissolved metals were field-filtered through a 0.45  $\mu\text{m}$  in-line filter.
- For quality control purposes, a duplicate sample was collected from Infiltration Ponds #1 (labeled as Infiltration Ponds #2).



- Laboratory-provided containers were used to collect the surface water samples. For each surface water sample, one 500-mL bottle preserved with nitric acid and one unpreserved 1-L bottle were collected. The samples were then labeled and placed in a cooler with ice.
- The pH of the LDA surface water samples is typically high (greater than 10). Sampling protocol requires that the preserved samples for dissolved metals analysis have a pH of less than 2 upon receipt at the laboratory. In order to meet this requirement, the pH of the LDA surface water samples collected for metals analysis were checked at the time of sample collection using pH test paper strips. If the pH was higher than 2, nitric acid (provided by the laboratory) was added until the pH of the sample was less than 2.

All surface water and quality control samples were analyzed for the parameters listed in Section 3.1.2. Analytical results are discussed in Section 4.0, and the field parameters and analytical data are presented in Table 2.

### **3.2.3 LDA Interceptor Trench Sampling**

On November 10, 2017, Golder sampled groundwater from the Interceptor Trench. The following methods and procedures were used in collecting the groundwater sample:

- Field pH, turbidity, and the flow rate at the Interceptor Trench outfall were measured and recorded.
- Grab water samples were collected from the Interceptor Trench by placing the sample bottles under the flow of water. pH and turbidity were measured and recorded at the Interceptor Trench at the time of sample collection.
- Laboratory-provided containers were used to collect the sample for TDS lab analysis. One 1-L un-preserved bottle was collected. The sample was then labeled and placed in a cooler with ice.

The Interceptor Trench sample was analyzed for the parameters listed in Section 3.1.2. Analytical results are discussed in Section 4.0, and the field parameters and analytical data are presented in Table 4.



## 4.0 RESULTS

### 4.1 Preliminary Standards

Preliminary standards have been established from the Washington State Administrative Code (WAC) 173-200 and 246-290-310(3)(a) for some of the field parameters and analytes measured as part of the monitoring program. These standards are presented in Table 3.

### 4.2 Method Detection Limits and Reporting Limits

The Method Detection Limit (MDL) is the minimum concentration of an analyte that the laboratory can detect using the specified analytical method and equipment. The Reporting Limit (RL) is the lowest concentration that the laboratory can report with certainty after adjustments have been made for sample dilution, sample weight, and other factors.

Where the laboratory analytical results indicate non-detection (ND), the concentration of an analyte is below the MDL. On the trend graphs presented in Appendix B, non-detections for sampling events prior to the December 2009 fourth quarter monitoring were plotted as fifty percent of the RL value. Beginning with the December 2009 fourth quarter monitoring event, non-detections are plotted as the MDL value, which is more representative of actual laboratory results. Method Detection Limits are not available for all of the historical data; therefore, non-detect data prior to December 2009 remains plotted as fifty percent of the RL value. For TDS results, non-detect data are plotted at the RL.

### 4.3 Data Validation

All analytical data were subject to a data validation review. Data validation was conducted in accordance with the USEPA Contract Laboratory Program *National Functional Guidelines for Inorganic Data Review* (EPA 2014) and the *Site Sampling and Analysis and Quality Assurance Project Plan* (ARCADIS 2006). Data reporting qualifiers are included with the analytical results in Appendix A. Copies of the data validation checklist are included in Appendix C, along with the raw analytical data packages provided by the laboratory. The data validation review found that, although some of the data were qualified due to minor analytical issues, all of the data were considered to be valid and usable.

### 4.4 Measurement Results

A summary of the groundwater field parameters and analytical results for the November 2017 fourth quarter monitoring are included in Table 2. Interceptor Trench results are provided in Table 4. Trend graphs of pH, TDS, and arsenic and potassium concentrations measured in each monitoring well are presented in Appendix B.



## 5.0 LIMITATIONS

We have prepared this report for the exclusive use of Holcim (US) Inc. and their authorized agents. It may also be submitted to regulatory agencies.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood. This report was prepared, in part, based on previous investigations and data collected by others. Golder Associates Inc. is not responsible for any data that were inaccurately reported by others and reproduced here.



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## **TABLES**

**Table 1: Fourth Quarter 2017 Water Level Measurements, Ravensdale Site, Ravensdale, Washington**

Sample Area	Sample Location ID	Date Sampled	Well Data				Water Levels		
			Total Well Depth (feet bgs)	Screened Interval (feet bgs)	Bentonite Seal (feet bgs)	Casing Diameter (inches)	TOC Elevation (feet msl)	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)
LDA - Shallow/Alluvial Groundwater	MW-1A	9-Nov-17	44	28-43	2-26	2	609.83	32.20	577.63
	MW-2A	9-Nov-17	40	25-40	2-23	2	603.61	26.04	577.57
	MW-3A	9-Nov-17	20	4-20	2-4	2	685.51	6.06	679.45
	MW-4A	10-Nov-17	20	5-20	2-4	2	701.85	3.58	698.27
	MW-5A	10-Nov-17	40	25-40	2-23	2	607.61	29.96	577.65
	MW-6A	10-Nov-17	39	24-39	2-22	2	605.35	27.72	577.63
LDA - Bedrock Groundwater	MWB-1LDA	9-Nov-17	135	115-135	-	2	701.08	23.96	677.12
	MWB-2LDA	9-Nov-17	125	110-125	-	2	738.06	37.11	700.95
	MWB-3LDA	9-Nov-17	145	125-145	-	2	740.59	6.00	734.59
DSP - Bedrock Groundwater	MWB-1SDSP	9-Nov-17	165	150-160	138-148	2	932.69	44.71	887.98
	MWB-1DDSP	9-Nov-17	270	255-265	243-253	2	931.77	58.71	873.06
	MWB-2DSP	9-Nov-17	256	236-256	-	2	931.22	197.11	734.11
	MWB-4SDSP	9-Nov-17	36	25-36	-	2	928.81	20.72	908.09
	MWB-5DSP	9-Nov-17	83	73-83	-	2	931.45	27.17	904.28
	MWB-6DSP	9-Nov-17	195	120-195	-	2	902.35	11.70	890.65

Notes:

- Not measured or not available
- feet bgs Feet below ground surface
- feet bmp Feet below measuring point
- feet msl Feet above mean sea level
- TOC Top of casing inside PVC well

**Table 2: Fourth Quarter 2017 Field Parameters and Analytical Data, Ravensdale Site, Ravensdale, Washington**

Sample Area	Sample Location ID	Date Sampled	Field Parameters									Gen. Chem.	Dissolved Metals (mg/L)				
			TOC Elevation (feet msl)	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
LDA - Shallow/Alluvial Groundwater	MW-1A	9-Nov-17	609.83	32.20	577.63	9.2	460	5.89	75.1	2.70	7.01	380	0.00163	<0.05	<0.0001	0.0019	16.3
	MW-2A	9-Nov-17	603.61	26.04	577.57	9.8	480	5.79	74.4	68.8	7.00	391	0.00139	<0.05	<0.0001	0.0005 J	25.4
	MW-2A dupl MW-7A	9-Nov-17	-	-	-	-	-	-	-	-	-	398	0.00135	<0.05	<0.0001	0.0008 J	26.1
	MW-3A	9-Nov-17	685.51	6.06	679.45	9.6	<b>833</b>	0.64	75.3	2.01	7.08	<b>748</b>	0.00184	<0.05	<0.0001	0.554	191
	MW-4A	10-Nov-17	701.85	3.58	698.27	11.0	264	3.88	56.5	0.76	6.01	217	0.000186 J	<0.05	<0.0001	0.0054	0.669
	MW-5A	10-Nov-17	607.61	29.96	577.65	10.0	<b>1077</b>	4.65	85.2	10.50	7.18	<b>953</b>	0.00582	0.0685	0.000338	0.0042	308
	MW-6A	10-Nov-17	605.35	27.72	577.63	11.6	<b>1090</b>	4.17	109.6	38.2	<b>9.12</b>	<b>931</b>	0.0243	0.251	0.00277	0.0161	356
LDA - Bedrock Groundwater <sup>2</sup>	MWB-1LDA	9-Nov-17	701.08	23.96	677.12	-	-	-	-	-	-	-	-	-	-	-	-
	MWB-1LDA dupl MWB-7LDA	9-Nov-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MWB-2LDA	9-Nov-17	738.06	37.11	700.95	-	-	-	-	-	-	-	-	-	-	-	-
	MWB-3LDA	9-Nov-17	740.59	6.00	734.59	-	-	-	-	-	-	-	-	-	-	-	-
LDA- Surface Water	South Pond	9-Nov-17	-	-	-	6.5	<b>1049</b>	6.38	92.30	14.4	<b>10.13</b>	<b>1260</b>	0.0588	1.46	<b>0.0534 J+</b>	0.0661	441
	Still Well	9-Nov-17	-	-	-	8.2	<b>7215</b>	3.48	90.9	18.2	<b>12.65</b>	<b>2360</b>	0.0621	<0.1	0.00352	0.0025	822
	Weir	9-Nov-17	-	-	-	7.0	<b>851</b>	7.57	88.0	67.3	8.43	<b>865</b>	0.0366	1.33	0.0107	0.284	236
	Infiltration #1	10-Nov-17	-	-	-	7.9	<b>2016</b>	7.72	64.4	30.7	<b>12.00</b>	<b>1520</b>	0.063	0.156	0.0322	0.0141	578
	Infiltration #1 dupl Infiltration #2	10-Nov-17	-	-	-	-	-	-	-	-	-	<b>1530</b>	0.0636	0.197	0.0379	0.0205	584
DSP - Bedrock Groundwater <sup>2</sup>	MWB-1SDSP	9-Nov-17	932.69	44.71	887.98	-	-	-	-	-	-	-	-	-	-	-	-
	MWB-1DDSP	9-Nov-17	931.77	58.71	873.06	-	-	-	-	-	-	-	-	-	-	-	-
	MWB-2DSP	9-Nov-17	931.22	197.11	734.11	-	-	-	-	-	-	-	-	-	-	-	-
	MWB-4SDSP	9-Nov-17	928.81	20.72	908.09	-	-	-	-	-	-	-	-	-	-	-	-
	MWB-5DSP	9-Nov-17	931.45	27.17	904.28	-	-	-	-	-	-	-	-	-	-	-	-
	MWB-6DSP	9-Nov-17	902.35	11.70	890.65	-	-	-	-	-	-	-	-	-	-	-	-
	MWB-6DSP dupl MWB-9DSP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Portal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Preliminary Standard <sup>a</sup>			-	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.3	0.05	0.05	-

Notes:

- Not measured or not available.
- \* Depth to water (DTW) measurements for all shallow/alluvial wells collected on the same day; date noted is sampling date.
- < Analyte not detected above the reporting limit shown.
- a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest.
- b Site background arsenic value to be determined (TBD).
- J Data validation code; estimated value.
- J+ Data validation code; estimated value with positive bias
- U Data validation code; not detected at the Reporting Limit (RL).
- 1 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated May 16, 2012.
- 2 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated April 7, 2016.
- dry Location is dry. Unable to collect field parameters or samples.

- TOC Top of casing inside PVC well
- °C Degrees Celsius
- feet bmp Feet below measuring point
- feet msl Feet above mean sea level
- mg/L Milligrams per liter
- mV Millivolts
- NTU Nephelometric Turbidity Unit
- µmhos/cm Micromhos per centimeter

**Table 3: Preliminary Standards, Ravensdale Site, Ravensdale, Washington**

Parameter	Preliminary Standard	Reference
Conductivity	700 µmhos/cm	WAC 246-290-310(3)(a)
pH	6.5 – 8.5	WAC 173-200; WSDOE Permit 2005
Turbidity	None	None
Total Dissolved Solids	500 mg/L	WAC 173-200
Dissolved Iron	0.3 mg/L	WAC 173-200
Dissolved Lead	0.05 mg/L	WAC 173-200
Dissolved Manganese	0.05 mg/L	WAC 173-200
Dissolved Arsenic	TBD	TBD
Dissolved Potassium	None	None

## Notes:

µmhos/cm	Micromhos per centimeter
mg/L	Milligrams per liter
WAC	Washington State Administrative Code
WSDOE	Washington State Department of Ecology
TBD	Site background arsenic value to be determined

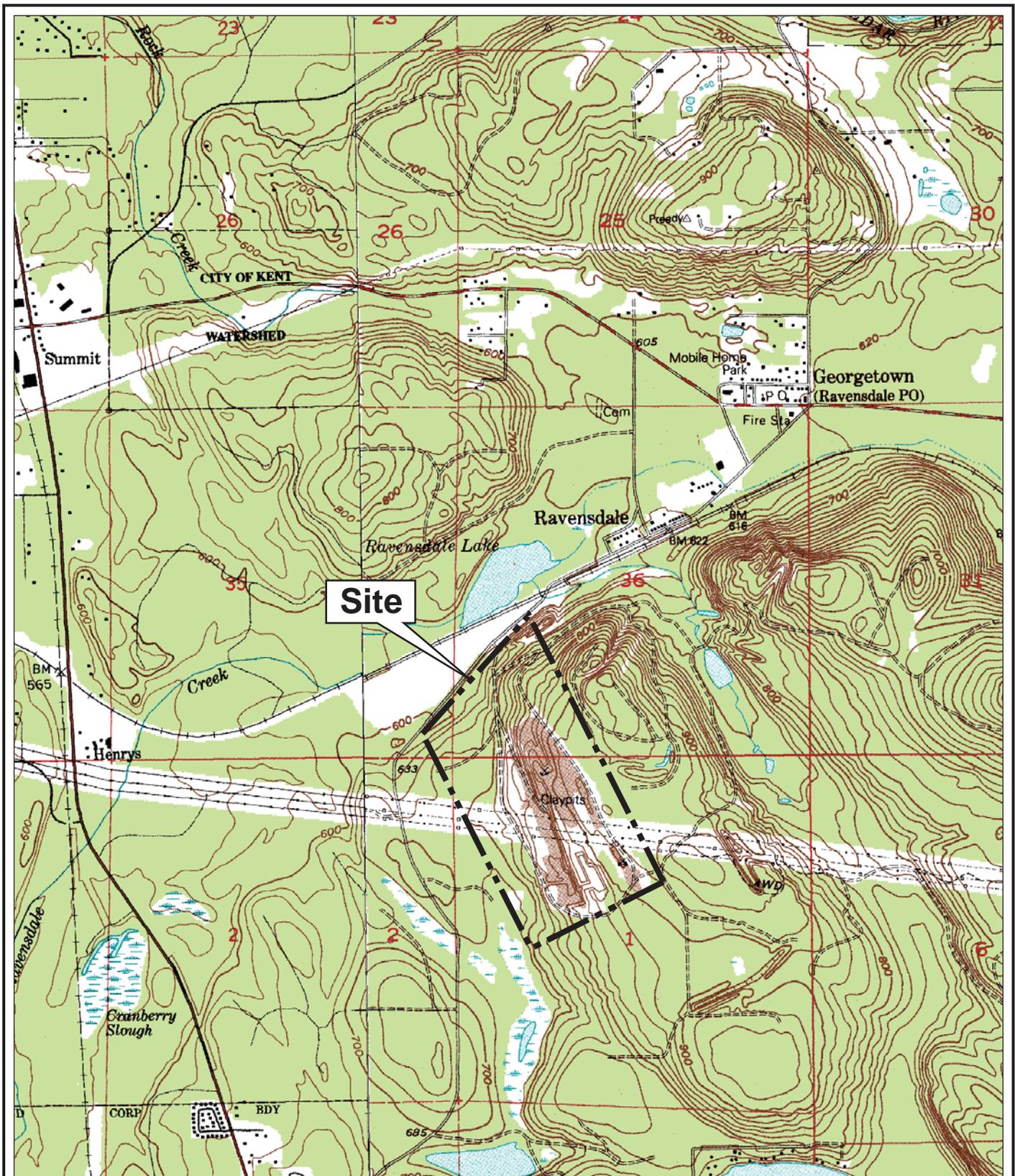
**Table 4: Interceptor Trench Discharge Monitoring, Ravensdale Site, Ravensdale, Washington**

Date Sampled	Time Sampled	Flow (gpm)	Field pH (standard units)	Turbidity (NTU)	Total Dissolved Solids (mg/L)
19-Oct-13	8:45	0.3	7.47	-	-
19-Nov-13	9:25	0.7	7.52	-	-
23-Dec-13	15:25	1.2	7.27	-	-
20-Jan-14	11:15	0.8	7.58	1.0	277
-	-	-	-	-	-
31-Mar-14	11:12	1.0	7.22	1.6	257
22-Apr-14	16:05	3.6	6.85	474	214
27-May-14	15:30	0.8	7.12	21.9	294
27-Jun-14	11:10	0.3	7.13	13.3	136
31-Jul-14	19:45	0.2	6.95	4.1	305
28-Aug-14	14:00	0.1	7.20	1.8	294
29-Sep-14	13:39	0.1	7.87	1.4	340
29-Oct-14	11:45	0.3	7.03	1.1	319
24-Nov-14	11:50	0.8	7.09	0.7	229
22-Dec-14	8:00	0.4	7.08	0.4	253
30-Jan-15 <sup>1</sup>	10:10	1.1	7.09	0.7	270
4-May-15	9:30	0.3	7.54	2.1	290
4-Aug-15	12:20	0.1	7.61	1.5	268
3-Nov-15	13:15	0.8	7.38	36.9	320
8-Feb-16	10:40	1.9	7.23	9.3	279
2-May-16	16:00	0.5	7.77	22.5	431
22-Aug-16	11:00	0.1	7.78	3.3	302
1-Nov-16	11:40	2.4	8.16	96.3	345
2-Feb-17	9:25	4.5	7.61	0.9	514
30-May-17	15:45	4.5	7.33	4.0	324
18-Aug-17	8:50	0.1	7.57	34.0	300
10-Nov-17	11:20	1.1	6.81	12.9	365

## Notes:

- Not measured or not available
- gpm Gallons per minute
- NTU Nephelometric Turbidity Unit
- mg/L Milligrams per liter
- 1 Reduction in monitoring frequency to quarterly approved by Public Health – Seattle and King County in an email to Holcim dated January 2, 2015.

## FIGURES



Source: USGS 7.5 Minute Topographic Quadrangle Map, Cumberland, WA, 1993, Black Diamond, WA, 1994

FIGURE 1  
**VICINITY MAP**  
HOLCIM/GROUNDWATER MONITORING/WA

**NOTES**

1. BASE TOPOGRAPHY OUTSIDE OF LDA FOOTPRINT PREPARED BY AERO-METRIC, INC., SEATTLE, WA FROM AERIAL PHOTOS FLOWN ON FEBRUARY 10, 2007.

HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE,  
NAD 27 US FEET  
VERTICAL DATUM: NGVD 29  
CONTOUR INTERVAL: 5 FT

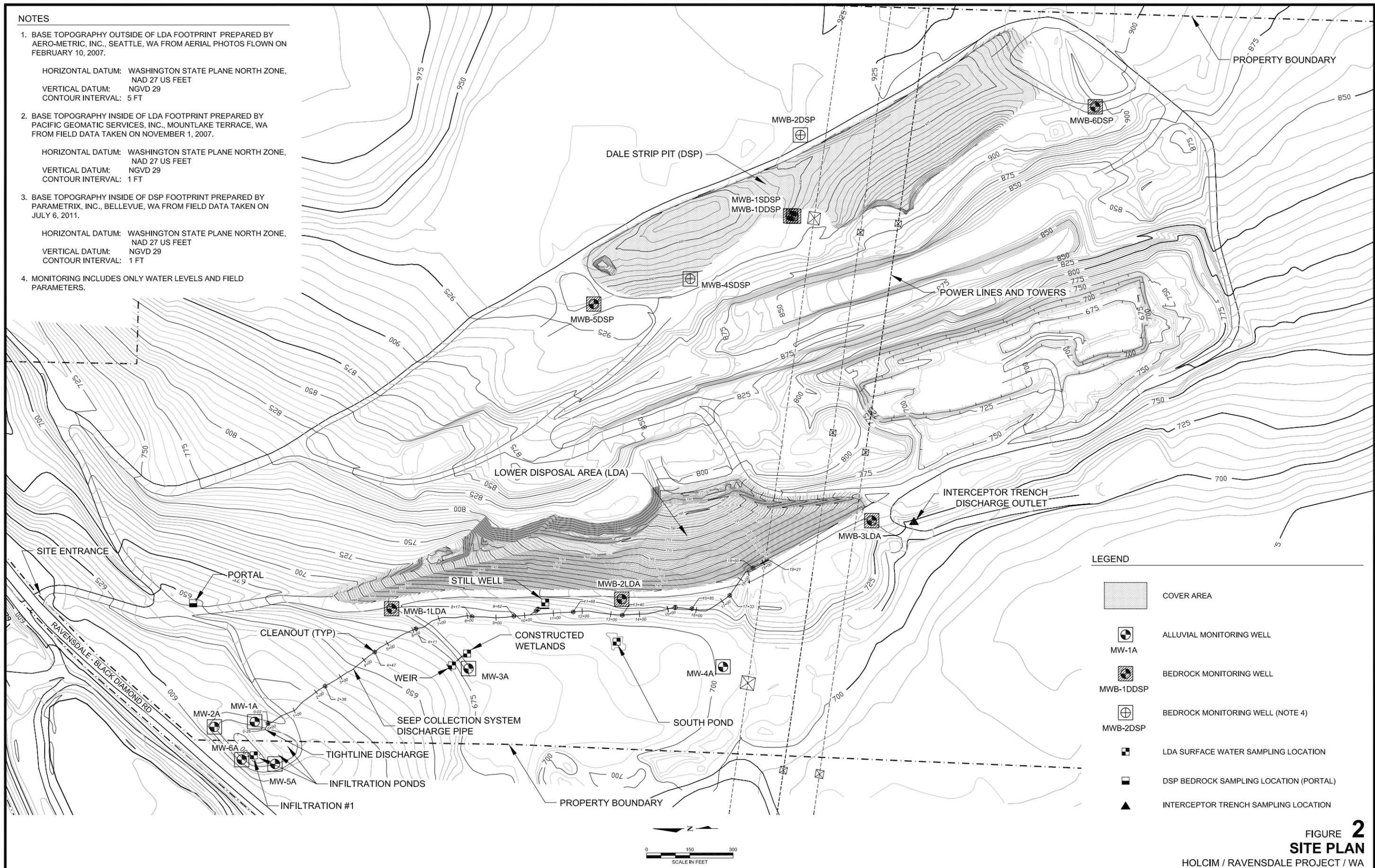
2. BASE TOPOGRAPHY INSIDE OF LDA FOOTPRINT PREPARED BY PACIFIC GEOMATIC SERVICES, INC., MOUNTLAKE TERRACE, WA FROM FIELD DATA TAKEN ON NOVEMBER 1, 2007.

HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE,  
NAD 27 US FEET  
VERTICAL DATUM: NGVD 29  
CONTOUR INTERVAL: 1 FT

3. BASE TOPOGRAPHY INSIDE OF DSP FOOTPRINT PREPARED BY PARAMETRIX, INC., BELLEVUE, WA FROM FIELD DATA TAKEN ON JULY 6, 2011.

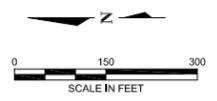
HORIZONTAL DATUM: WASHINGTON STATE PLANE NORTH ZONE,  
NAD 27 US FEET  
VERTICAL DATUM: NGVD 29  
CONTOUR INTERVAL: 1 FT

4. MONITORING INCLUDES ONLY WATER LEVELS AND FIELD PARAMETERS.



**LEGEND**

	COVER AREA
	ALLUVIAL MONITORING WELL
MW-1A	
	BEDROCK MONITORING WELL
MWB-1DDSP	
	BEDROCK MONITORING WELL (NOTE 4)
MWB-2DSP	
	LDA SURFACE WATER SAMPLING LOCATION
	DSP BEDROCK SAMPLING LOCATION (PORTAL)
	INTERCEPTOR TRENCH SAMPLING LOCATION



**FIGURE 2**  
**SITE PLAN**  
HOLCIM / RAVENSDALE PROJECT / WA

**APPENDIX A**  
**SUMMARY DATA TABLES FOR INDIVIDUAL WELLS AND MONITORING LOCATIONS**

**APPENDIX A-1**  
**SUMMARY OF LOWER DISPOSAL AREA – SURFACE WATER SAMPLING RESULTS**

**TABLE A-1A STILL WELL**  
**TABLE A-1B INFILTRATION PONDS #1**  
**TABLE A-1C WEIR**  
**TABLE A-1D SOUTH POND**

**Table A-1a: Summary of Lower Disposal Area - Surface Water Sampling Results - Still Well Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters						General Chemistry		Dissolved Metals (mg/L)				
	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	pH (standard units)	Arsenic	Iron	Lead	Manganese	Potassium
12-Feb-15	10.70	7540	2.68	-18.6	9.64	12.71	2150	-	0.05160	<0.100	0.00030	<0.0020	690
4-May-15	12.90	9140	2.73	110.4	26.80	13.02	2520	-	0.05460	<0.100	0.00022 J	<0.0020	734
5-Aug-15	19.50	8060	2.58	-29.8	61.10	12.62	2980	-	0.06390	<0.250	0.00170	0.0047 J	898
3-Nov-15	11.10	5150	0.37	38.6	171.00	8.93	1840	-	0.10900	0.270	0.02170	0.0130	747
9-Feb-16	9.70	7390	0.78	80.8	7.79	13.07	2170	-	0.05360	<0.100	0.00120	0.0060	601
3-May-16	14.70	7530	1.40	358.1	2.65	12.98	2480	-	0.0542	<0.100	0.00170 J-	0.0020	711
22-Aug-16	20.50	8	2.10	-	59.00	12.95	2780	-	0.09130	<0.250	0.00587	0.0023 J	831
1-Nov-16	12.30	2884	2.66	-72.1	19.10	13.17	2620	-	0.04620	<0.100	0.00964	<0.0020	841
31-Jan-17	7.40	8510	2.37	-167.0	7.35	13.17	2050	-	0.05250	0.026 J	0.00119	0.0016 J	582
31-May-17	14.60	7500	2.44	-	4.17	12.89	1900	-	0.04540	0.011 J	0.00068 J+	0.0007 J	615
17-Aug-17	18.30	8460	3.35	-84.0	15.90	12.79	2680	-	0.05680	0.003 J	0.00214	0.0013 J	750
9-Nov-17	8.20	7215	3.48	90.9	18.20	12.65	2360	-	0.0621	<0.1	0.00352	0.0025	822
Preliminary Standard <sup>c</sup>	-	700	-	-	-	6.5-8.5	500	6.5-8.5	TBD <sup>d</sup>	0.3	0.05	0.05	-

Notes:

- Not analyzed or not available
- < Analyte not detected above the reporting limit shown
- a North Creek Analytical, Inc.
- b Severn Trent Laboratories
- c Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest
- d Site background arsenic value to be determined (TBD)
- J Data validation code; estimated value
- J+ Data validation code; estimated value with positive bias
- °C Degrees Celsius
- µmhos/cm Micromhos per centimeter
- feet bmp Feet below measuring point
- feet msl Feet above mean sea level
- mg/L Milligrams per liter
- mV Millivolts
- NTU Nephelometric Turbidity Unit

**Table A-1b: Summary of Lower Disposal Area - Surface Water Sampling Results - Infiltration Ponds #1<sup>e</sup>  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters						General Chemistry		Dissolved Metals (mg/L)				
	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	pH (standard units)	Arsenic	Iron	Lead	Manganese	Potassium
1-Feb-05	8.17	1315	-	-	8.13	9.95	874	9.75	0.08490	0.234	0.00499	0.0249	-
9-Mar-05	14.04	1183	-	-	23.00	9.59	960	9.46	0.09620	0.470	0.00392	0.0321	-
5-Apr-05	11.00	1115	-	-	43.70	9.80	800	9.49	0.06230	0.574	0.00321	<0.0200	-
10-May-05	14.91	1275	-	-	564.00	9.83	844	9.79	0.07650	0.790	<0.00500	0.0462	-
7-Jun-05	15.11	1140	-	-	239.00	9.61	804	9.53	0.08430	0.722	<0.00500	0.0327	-
15-Jul-05 <sup>a</sup>	23.56	1276	-	-	94.40	9.30	1100	9.54	0.09250	<0.300	0.00414	0.0534	-
15-Jul-05 <sup>b</sup>	-	-	-	-	-	-	874	9.45	0.09990	0.533	0.00382	<0.0200	-
9-Aug-05 <sup>a</sup>	19.05	1744	-	-	57.20	9.44	1000	9.22	0.12300	0.792	0.00510	0.0499	-
9-Aug-05 <sup>b</sup>	-	-	-	-	-	-	1030	9.05	0.14000	0.339	0.00612	0.0308	-
14-Sept-05 <sup>a</sup>	13.59	1154	-	-	99.80	8.97	790	9.04	0.11000	<0.750	0.00354	<0.0500	-
14-Sept-05 <sup>b</sup>	-	-	-	-	-	-	806	9.03	0.11800	0.877	0.00518	-	-
5-Oct-05	14.82	970	-	-	82.70	8.98	736	8.73	0.08930	0.329	0.00283	0.0263	-
9-Nov-05	8.43	1285	-	-	135.00	8.83	970	9.28	0.04600	0.194	<0.01000	0.0295	-
9-Dec-05	2.12	1361	-	-	14.20	9.71	980	9.54	0.06460	0.179	0.00311	0.0399	-
19-Jan-06	6.66	728	7.96	-	64.70	10.13	470 J	9.77	0.04070	0.181	0.00229	0.0402	-
16-Feb-06	2.63	624	9.75	30.3	25.20	8.54	530 J	8.99	0.01330	<0.150	<0.00100	0.1190	-
15-Mar-06	7.16	639	11.61	236.8	23.10	9.22	530 J	9.19	0.02250	0.167	<0.00100	0.0791	-
7-Apr-06	11.91	1013	10.81	27.8	18.80	9.98	780	9.72	0.06380	0.344	0.00324	0.0483	-
16-May-06	15.58	1160	7.58	50.6	16.50	9.57	950	9.65	0.07790	0.462	0.00249	0.0505	-
23-Jun-06	18.63	1261	7.41	-	126.00	9.85	920	9.35	0.07070	0.228	0.00365	0.0366	-
20-Jul-06	20.65	932	5.36	-35.1	279.00	8.94	980	8.79	0.10800	0.287	0.00348	0.0285	-
22-Aug-06	15.65	860	7.64	86.5	218.00	9.22	760	9.15	0.11600	0.734	0.00384	0.0237	-
26-Sep-06	21.86	903	8.98	-72.8	263.00	8.89	820	8.76	0.07580	0.616	0.00306	0.0558	-
26-Oct-06	11.04	702	9.97	90.4	221.00	8.56	760	8.59	0.06830	<1.500	0.00166	<0.1000	-
15-Nov-06	7.73	715	9.21	149.2	33.60	9.07	500	9.25	0.02080	0.174	0.00229	0.0367	-
20-Dec-06	4.98	1082	9.05	86.3	9.29	9.78	680	9.83	0.05130	0.269	0.00267	0.0549	-
24-Jan-07	2.12	1058	10.71	130.4	20.50	9.97	640 J	9.97	0.06610	<0.150	0.00758	0.0403	-
12-Feb-07	10.10	1218	12.40	-61.8	103.00	9.98	860	9.97	0.09010	0.642	0.00449	0.0451	-
27-Mar-07	7.94	772	9.67	13.3	25.50	8.27	540 J	9.96 J	0.04980	<0.150	0.00274	0.0336	-
18-Apr-07	7.52	2418	9.23	84.4	58.10	11.73	1400	11.4 J	0.07920	0.212	0.01050	0.0296	-
31-May-07	15.45	1879	6.47	-92.2	3.15	9.79	1300	10 J	0.16500	<0.750	0.00811	0.1340	-
20-Jun-07	24.18	1925	10.88	-52.1	251.00	10.24	1300 J	10.1 J	0.14400	<0.150	0.00534	<0.0100	-
31-Jul-07	19.05	1418	5.97	-36.1	128.00	9.81	1200	9.4 J	0.14000	1.070	0.00723	0.0433	-
29-Aug-07	18.00	1193	5.60	-35.4	158.00	9.29	1300 J	9.48 J	0.16400	0.427 J	0.00701	0.0277 J	-
27-Sep-07	14.97	987	5.44	45.9	186.00	8.99	970	9.15 J	0.19600	0.438	0.00549	0.0326	-

**Table A-1b: Summary of Lower Disposal Area - Surface Water Sampling Results - Infiltration Ponds #1<sup>e</sup>  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters						General Chemistry		Dissolved Metals (mg/L)				
	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	pH (standard units)	Arsenic	Iron	Lead	Manganese	Potassium
26-Oct-07	2.66	504	6.02	63.1	282.00	8.64	770 J	8.17 J	0.04290	0.422	0.00225	0.0602	-
30-Nov-07	1.86	955	9.77	190.1	163.00	10.02	570	8.9 J	0.04890	0.205	0.00162	0.0271	-
12-Dec-07	4.22	790	11.11	126.8	56.00	9.40	520	9.05 J	0.03430	0.179	0.00167	0.0175	-
24-Jan-08	2.12	875	19.35	142.0	-	8.68	640	9.24 J	0.04280	0.162	0.00166	0.0155	-
28-Feb-08	-	-	-	-	25.60	-	510	9.18 J	0.04130	<0.150	0.00266	0.0159	-
25-Mar-08	5.27	937	14.46	91.0	86.80	9.60	630	9.55 J	0.05020	0.180	0.00215	0.0213	-
29-Apr-08	9.02	1079	10.56	190.8	61.30	9.87	670 J	9.76 J	0.06600	0.27 J	0.00287	0.0286	-
20-May-08	15.42	1191	7.58	160.0	91.40	9.75	820	9.7 J	0.08590	0.334	0.00485	0.0432	-
18-Jun-08	12.94	1124	9.62	167.3	76.90	9.65	810 J	9.55 J	0.07760	0.486	0.00367	0.0222	-
26-Aug-08	15.95	880	3.75	53.5	490.00	8.00	650 J	7.81 J	0.07690	0.334	0.00164	0.0713	144
20-Nov-08	6.91	897	7.02	183.5	376.00	10.22	960	10.1 J	0.08720	0.196	0.00421	0.0584 J	313
12-Feb-09	1.29	-	13.72	-	10.20	10.52	800	10.1 J	0.11800	0.177	0.00584	0.0561	271
19-May-09	11.90	862	6.52	71.9	133.00	9.59	840 J	9.9 J	0.09130	0.350	0.00399	0.0366	238
18-Nov-09	5.70	852	6.61	185.9	68.00	9.88	490	-	0.04000	0.700	0.00440	0.0350	160
15-Dec-09	2.30	1162	8.22	460.1	63.30	9.97	640	-	0.07100	0.850	0.00720	0.0500	220
24-Mar-10	13.00	1299	5.83	408.2	13.00	10.48	1,000	-	0.14000	0.720	0.00850	0.0370	340
17-Jun-10	12.00	947	4.45	332.1	33.60	10.56	540	-	0.06200	0.660	0.00620	0.0630	220
22-Sep-10	15.60	1736	3.14	342.5	33.00	9.84	1300	-	0.13000	2.900	0.02100	0.1700 J+	360
8-Dec-10	5.40	1382	7.73	371.1	12.10	10.75	870	-	0.10000	0.490	0.01200	0.0370	300
29-Mar-11	9.60	627	5.16	577.6	19.80	11.05	760 J	-	0.07800	0.200 J+	0.00310	0.0210	270
21-Jun-11	21.00	1778	5.46	239.1	11.60	10.44	1700 J	-	0.07800	0.810	0.01100	0.0650	340
27-Sep-11	14.80	1382	3.98	239.8	33.40	9.58	1600	-	0.12000	1.600	0.01300	0.0820	670
14-Dec-11	3.10	1046	5.60	281.7	15.70	9.93	1100	-	0.08700	1.100	0.01400	0.0630	330
20-Mar-12	6.10	986	11.04	271.1	11.70	10.32	500	-	0.07100	0.470	0.00330	0.0590	180
19-Jun-12	14.80	862	7.83	352.2	38.80	9.57	500	-	0.06400	0.560 J+	0.00370	0.0540	180
20-Sep-12	12.40	1961	1.81	419.0	10.30	9.43	4600 J	-	0.13000	0.480	0.00210	0.0470	440
19-Dec-12	4.10	1320	10.11	303.1	5.86	9.69	700	-	0.07500	0.690	0.00430	0.0710	250
25-Feb-13	7.10	1963	9.30	234.7	26.60	11.30	1000	-	0.09000	0.100 J	0.00600	0.0230	370
22-May-13	10.50	4380	7.72	411.7	202.00	12.56	1400	-	0.02500	<0.500	0.01100	0.0064 J	530
21-Aug-13	20.10	12850	1.24	-2.3	18.20	12.18	3430	-	0.10600	0.270	0.04750	0.0210	1180
20-Nov-13	5.70	1198	8.03	131.9	22.20	10.23	704	-	0.04130	0.210	0.00620	0.0400	260
1-Apr-14	9.80	1708	9.77	136.4	8.79	12.26	832	-	0.02410	0.049 J	0.00300	0.0050 J+	317
23-May-14	12.63	6574	8.63	120.8	-	12.61	2120	-	0.00480	<0.100	0.03540	<0.0020	811
13-Aug-14	18.99	3273	6.29	77.7	89.00	12.34	1660	-	0.07140	<0.100	0.00630 J	0.0070	548
11-Nov-14	8.80	578	3.55	179.2	62.50	12.73	2000	-	0.05670	<0.100	0.02040	<0.0020	739

**Table A-1b: Summary of Lower Disposal Area - Surface Water Sampling Results - Infiltration Ponds #1<sup>e</sup>  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters						General Chemistry		Dissolved Metals (mg/L)				
	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	pH (standard units)	Arsenic	Iron	Lead	Manganese	Potassium
11-Feb-15	9.70	487	9.97	66.2	42.00	9.40	337	-	0.00910	0.120	0.00090	0.0120	87.7
4-May-15	14.30	4210	5.60	281.2	7.67	12.53	1670	-	0.03530	0.039 J	0.00740	0.0014 J	589
5-Aug-15	19.90	4890	5.14	18.8	89.80	11.79	3080	-	0.08540	0.390	0.01810	0.0120	1150
3-Nov-15	9.20	760	6.39	129.9	34.60	9.78	707	-	0.02350	0.270	0.00530	0.0150	235
9-Feb-16	10.20	-	10.29	100.3	8.01	12.78	1330	-	0.00530	<0.1000	0.02480	0.0030	530
2-May-16	-	-	-	-	-	-	2490	-	0.02400	0.0754 J	0.0370 J-	0.0041 J	996
23-Aug-16	19.30	4250	3.95	386.5	46.30	11.76	2970	-	0.10500	0.404	0.01430	0.0113	989
1-Nov-16	11.70	229	9.26	185.2	48.90	10.33	508	-	0.01260	0.155	0.00079	0.0067	164
1-Feb-17	2.40	8890	10.78	26.1	3.17	13.36	2220	-	0.01010	<0.250	0.04680	<0.0050	854
30-May-17	14.70	6800	56.90	17.7	1.38	12.73	1720	-	0.00175	0.030 J	0.03160 J+	0.0009 J	759
17-Aug-17	18.10	5410	3.88	-19.5	14.90	11.93	3080	-	0.06260	0.122 J	0.03280	0.0111	1150
10-Nov-17	7.90	2016	7.72	64.4	30.70	12.00	1520	-	0.063	0.156	0.0322	0.0141	578
Preliminary Standard <sup>c</sup>	-	700	-	-	-	6.5-8.5	500	6.5-8.5	TBD <sup>d</sup>	0.3	0.05	0.05	-

Notes:

- Not analyzed or not available
- < Analyte not detected above the reporting limit shown
- a North Creek Analytical, Inc.
- b Severn Trent Laboratories
- c Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest
- d Site background arsenic value to be determined (TBD)
- e Field parameters for Infiltration Ponds #1 were inadvertently not collected during May 2016 sampling
- J Data validation code; estimated value
- J+ Data validation code; estimated value with positive bias
- °C Degrees Celsius
- µmhos/cm Micromhos per centimeter
- feet bmp Feet below measuring point
- feet msl Feet above mean sea level
- mg/L Milligrams per liter
- mV Millivolts
- NTU Nephelometric Turbidity Unit

**Table A-1c: Summary of Lower Disposal Area - Surface Water Sampling Results - Weir Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters							General Chemistry		Dissolved Metals (mg/L)				
	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	Turbidity (NTU)	pH (standard units)	Weir Flow Rate (gpm)	Total Dissolved Solids (mg/L)	pH (standard units)	Arsenic	Iron	Lead	Manganese	Potassium
1-Feb-05	8.47	2205	-	-	6.24	10.23	-	1440	10.37	0.14900	0.323	0.01070	0.0569	-
9-Mar-05	11.38	2054	-	-	7.80	10.15	2.64	1630	10.11	0.20000	0.526	0.01190	0.0938	-
5-Apr-05	7.7	2169	-	-	7.99	10.42	10.00	1420	10.18	0.12900	1.150	0.00861	0.0540	-
10-May-05	14.1	1912	-	-	562.00	9.87	25.00	1210	9.85	0.10500	1.460	0.00763	0.0818	-
7-Jun-05	15.74	2588	-	-	11.60	10.03	6.82	1570	10.18	0.13800	1.470	0.01010	0.1170	-
15-Jul-05 <sup>a</sup>	20.38	3184	-	-	8.91	10.36	0.94	3200	10.3	0.19200	0.367	0.00998	0.2060	-
15-Jul-05 <sup>b</sup>	-	-	-	-	-	-	-	1990	10.44	0.18900	1.460	0.01080	0.1640	-
9-Aug-05 <sup>a</sup>	-	-	-	-	-	-	Dry	-	-	-	-	-	-	-
9-Aug-05 <sup>b</sup>	-	-	-	-	-	-	Dry	-	-	-	-	-	-	-
14-Sept-05 <sup>a</sup>	15.60	3792	-	-	14.50	9.92	0.07	2800	10	0.20800	1.250	0.05780	0.1000	-
14-Sept-05 <sup>b</sup>	-	-	-	-	-	-	-	2730	10.16	0.22300	1.070	0.07330	-	-
5-Oct-05	12.96	3237	-	-	4.99	9.89	0.32	2150	9.97	0.17000	1.430	0.01250	0.2250	-
9-Nov-05	8.40	2545	-	-	13.80	9.64	7.50	1900	9.88	0.07820	0.167	<0.01000	0.0835	-
9-Dec-05	3.34	1377	-	-	8.03	10.43	5.00	1700	10.4	0.13000	0.189	0.00612	0.0857	-
19-Jan-06	7.37	1424	7.92	-	12.20	10.61	7.50	1000 J	10.4	0.08950	0.449	0.00481	0.1040	-
16-Feb-06	3.74	1680	12.19	*	14.60	10.78	7.50	1400 J	10.8	0.10500	0.343	0.00546	0.0817	-
15-Mar-06	7.21	1634	12.61	194.4	7.44	10.63	5.28	1300 J	10.7	0.12800	0.204	0.00638	0.0750	-
7-Apr-06	14.33	2055	8.54	55.3	9.21	10.84	3.17	1500	10.4	0.14300	0.552	0.00663	0.1140	-
16-May-06	21.65	2474	6.09	11.6	9.37	10.69	0.83	2000	10.6	0.15700	0.921	0.00819	0.2000	-
23-Jun-06	24.58	2820	6.66	-	15.40	11.64	0.63	1400	10.6	0.15400	0.210	0.01310	0.1090	-
20-Jul-06	21.17	3291	8.56	-85.5	68.30	10.75	Dry*	2300	10.8	0.13100	0.454	0.00941	0.0406	-
22-Aug-06	-	-	-	-	-	-	Dry	-	-	-	-	-	-	-
26-Sep-06	16.38	2997	3.00	-57.1	31.60	9.92	Dry*	2900	9.94	0.10300	1.070	0.01680	0.1010	-
26-Oct-06	11.00	2650	5.35	59.6	25.80	9.65	0.63	2300	9.45	0.13200	2.220	0.02630	<0.100	-
15-Nov-06	8.51	1708	8.16	-35.7	34.70	10.15	17.14	1200	10.1	0.06740	0.518	0.00807	0.0794	-
20-Dec-06	5.07	1927	8.84	14.8	7.94	10.67	10.91	1200	10.5	0.09970	0.384	0.00478	0.0844	-
24-Jan-07	2.30	1846	10.72	5.9	11.70	10.37	9.00	1100 J	10.6	0.12600	0.359	0.01610	0.0729	-
12-Feb-07	9.26	1777	11.75	-91.3	26.70	10.56	6.00	1100	10.3	0.13900	0.283	0.00712	0.0808	-
27-Mar-07	8.71	1219	9.18	-12.6	13.80	8.70	24.00	840 J	10.2 J	0.08850	0.289	0.00486	0.0821	-
18-Apr-07	7.39	4563	8.65	41.0	16.80	12.12	9.00	2000	11.9 J	0.09750	0.830	0.03250	0.0408	-
31-May-07	-	3916	6.33	-149.5	10.70	10.96	1.36	2100	11.5 J	0.27500	<0.750	0.02290	0.1560	-
20-Jun-07	22.59	3336	8.50	-20.4	42.50	10.46	0.29	2400 J	10.4 J	0.25500	<0.150	0.02740	0.0309	-
31-Jul-07	18.94	3915	7.85	-69.2	41.30	10.92	0.06	3300	10.8 J	0.23600	1.100	0.01260	0.0846	-
29-Aug-07	21.52	2406	5.75	-5.3	24.10	9.72	Dry*	2300 J	9.53 J	0.12900	0.627	0.00845	0.1940	-
27-Sep-07	13.88	2009	5.75	15.5	28.30	9.56	0.06	1600	9.51 J	0.20700	1.150	0.00437	0.4170	-

**Table A-1c: Summary of Lower Disposal Area - Surface Water Sampling Results - Weir Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters							General Chemistry		Dissolved Metals (mg/L)				
	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	Turbidity (NTU)	pH (standard units)	Weir Flow Rate (gpm)	Total Dissolved Solids (mg/L)	pH (standard units)	Arsenic	Iron	Lead	Manganese	Potassium
26-Oct-07	7.68	1662	9.06	80.5	13.00	9.92	2.04	1800 J	9.74 J	0.13200	0.591	0.00753	0.1960	-
30-Nov-07	4.34	2446	9.63	26.7	11.70	9.86	2.63	1600	9.74 J	0.13500	0.432	0.00827	0.1000	-
12-Dec-07	5.88	2056	10.34	39.3	10.30	10.18	2.63	1500	9.85 J	0.10500	0.324	0.00573	0.0784	-
24-Jan-08	3.05	1601	15.03	42.3	-	9.40	2.63	1000	9.73 J	0.08740	0.451	0.00406	0.1500	-
28-Feb-08	-	-	-	-	9.22	-	4.13	1200	10.1 J	0.11800	0.260	0.00892	0.0714	-
25-Mar-08	6.80	1622	12.37	95.1	16.40	9.98	5.25	1100	9.98 J	0.11000	0.307	0.00386	0.0683	-
29-Apr-08	7.53	1997	9.10	137.4	11.90	10.29	7.50	1100 J	10.4 J	0.12400	0.328	0.00705	0.0789	-
20-May-08	16.35	2504	9.03	77.4	32.90	10.92	7.50	1700	10.8 J	0.14600	0.558	0.01470	0.1580	-
18-Jun-08	11.82	2925	8.32	68.3	25.70	11.14	1.69	1800 J	10.9 J	0.20800	0.351	0.00848	0.1540	-
26-Aug-08	17.69	3376	7.98	62.8	41.10	10.43	0.84	2200 J	10.3 J	0.28700	0.391	0.01320	0.4630	647
20-Nov-08	8.10	1447	9.65	112.0	43.70	11.00	11.25	1400	10.6 J	0.12100	0.386	0.01620	0.0888	485
12-Feb-09	2.99	1214	14.46	-	14.60	10.93	4.06	1200	10.6 J	0.21900	0.410	0.01180	0.0986	434
19-May-09	13.05	1962	7.92	32.6	36.70	10.23	7.50	1800 J	10.8 J	0.21000	0.620	0.01370	0.1430	521
24-Sep-09	16.30	2792	1.59	263.8	13.70	8.82	Dry*	2400	-	0.13000	8.600	0.05300	0.6400	730
15-Dec-09	2.80	1702	7.47	343.0	-	10.18	6.67	1200	-	0.17000	2.300	0.02200	0.1200	330
24-Mar-10	13.80	2629	2.09	270.7	263.00	11.46	6.03	1800	-	0.18000	0.660	0.02000	0.0360	600
17-Jun-10	12.00	1876	0.01	-	157.00	10.76	14.15	1200	-	0.02700	1.600	0.00390	0.1700	410
20-Sep-10	11.40	3100	6.34	198.6	12.20	10.63	2.38	2800	-	0.25000	4.800	0.04000	0.4600	580
7-Dec-10	6.60	2455	4.03	154.0	11.00	11.61	16.69	1600	-	0.24000	1.300	0.02600	0.0710	510
30-Mar-11	8.10	848	0.22	136.1	31.50	13.08	58.61	940 J	-	0.09100	0.720 J+	0.00990	0.0500	330
22-Jun-11	14.40	2286	5.68	164.2	13.20	11.28	5.68	2600 J	-	0.12000	1.200	0.02500	0.1000	490
27-Sep-11	16.20	1911	4.62	253.4	39.10	10.07	13.40	2100	-	0.17000	4.900	0.04500	0.4400	880
15-Dec-11	4.10	1439	7.40	139.4	10.60	10.33	6.65	1400	-	0.18000	2.000	0.02100	0.1100	500
20-Mar-12	5.20	1687	8.50	27.5	9.60	11.17	60.00	410	-	0.13000	0.970	0.00740	0.1700	290
18-Jun-12	14.70	2336	0.11	326.9	15.60	11.25	60.00	410	-	0.13000	1.000 J+	0.00980	0.0540	430
20-Sep-12	15.30	2972	7.81	106.0	12.10	9.55	0.10	1400 J	-	0.13000	0.460	0.00220	0.0480	450
18-Dec-12	4.80	1908	9.34	-14.2	7.41	10.28	18.50	870	-	0.12000	1.100	0.00810	0.3000	390
26-Feb-13	5.80	6470	11.27	161.6	22.00	12.46	9.90	1800	-	0.09900	<0.500	0.06200	0.0200	710
23-May-13	10.50	1625	9.14	291.8	14.40	9.93	4.84	980	-	0.09400	2.100	0.02100	0.1500	310
21-Aug-13	15.70	7260	7.69	51.6	9.00	10.71	0.32	2780	-	0.34200	0.770	0.01830	0.1610	954
19-Nov-13	8.10	2032	10.00	87.4	9.95	11.19	25.40	1270	-	0.07080	0.350	0.01690	0.0800	487
1-Apr-14	13.70	3420	9.11	129.4	59.00	12.57	20.77	1300	-	0.03730	0.120	0.01200	0.0160	572
23-May-14	12.83	986	11.63	105.7	-	9.36	-	822	-	0.04700	0.550	0.01390	0.1950	274
13-Aug-14	18.38	2000	5.52	63.6	8.93	8.02	2.00	1250	-	0.01340	0.050	0.00060	0.4140	326
11-Nov-14	6.70	259	9.77	164.8	4.27	8.09	1.50	955	-	0.01900	0.080	0.00020	0.0780	315

**Table A-1c: Summary of Lower Disposal Area - Surface Water Sampling Results - Weir  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters							General Chemistry		Dissolved Metals (mg/L)				
	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	Turbidity (NTU)	pH (standard units)	Weir Flow Rate (gpm)	Total Dissolved Solids (mg/L)	pH (standard units)	Arsenic	Iron	Lead	Manganese	Potassium
12-Feb-15	10.00	669	11.13	142.9	2.75	8.62	40.00	1490	-	0.01490	0.310	0.00180	0.2020	155
4-May-15	13.70	1293	8.69	181.7	155.00	9.38	0.09	1100	-	0.04330	0.660	0.01130	0.1700	292
5-Aug-15	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-	Dry	Dry	Dry	Dry	Dry
3-Nov-15	9.70	1296	7.66	165.6	13.70	8.03	1.98	1200	-	0.01140	0.120	0.00080	0.1690	355
9-Feb-16	9.10	838	8.79	181.4	2.17	7.87	0.69	529	-	0.00780	0.110	0.00050 J+	0.0630	145
2-May-16	23.40	1126	6.16	128.1	7.59	7.63	Dry*	688	-	0.00760	0.023 J	0.00006 J-	0.3240	162
23-Aug-16	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-	Dry	Dry	Dry	Dry	Dry
1-Nov-16	11.70	332	7.12	97.5	7.71	7.76	7.24	703	-	0.00918	0.097	0.00030	0.0223	207
1-Feb-17	2.30	925	11.55	39.1	2.04	7.71	0.30	567	-	0.00490	<0.050	0.00009 J	0.0397	135
30-May-17	13.30	817	57.50	8.3	22.20	7.40	0.30	516	-	0.01310	0.526	0.00008 J+	3.4700	94
17-Aug-17	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-	Dry	Dry	Dry	Dry	Dry
9-Nov-17	7.00	851	7.57	88.0	67.30	8.43	Dry*	865	-	0.0366	1.33	0.0107	0.284	236
Preliminary Standard <sup>c</sup>	-	700	-	-	-	6.5-8.5	-	500	6.5-8.5	TBD <sup>d</sup>	0.3	0.05	0.05	-

## Notes:

- \* Sample collected from constructed wetland (alternative sampling location) upstream of weir
- Not analyzed or not available
- Dry Weir dry; unable to collect field parameters or samples
- < Analyte not detected above the reporting limit shown
- a North Creek Analytical, Inc.
- b Severn Trent Laboratories
- c Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest
- d Site background arsenic value to be determined (TBD)
- J Data validation code; estimated value
- J+ Data validation code; estimated value with positive bias
- °C Degrees Celsius
- µmhos/cm Micromhos per centimeter
- feet bmp Feet below measuring point
- feet msl Feet above mean sea level
- gpm Gallons per minute
- mg/L Milligrams per liter
- mV Millivolts
- NTU Nephelometric Turbidity Unit

**Table A-1d: Summary of Lower Disposal Area - Surface Water Sampling Results - South Pond Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters						General Chemistry		Dissolved Metals (mg/L)				
	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	pH (standard units)	Arsenic	Iron	Lead	Manganese	Potassium
1-Feb-05	7.13	9580	-	-	4.19	13.02	4080	12.61	0.17400	1.140	0.02430	0.0694	-
9-Mar-05	14.28	9979	-	-	6.79	12.52	4640	12.57	0.24000	0.988	0.04210	0.0853	-
5-Apr-05	9.90	10820	-	-	43.50	11.99	3830	12.31	0.13300	2.520	0.00985	0.1280	-
10-May-05	15.10	6091	-	-	45.60	12.14	3270	12.4	0.09290	0.866	0.02550	0.0339	-
7-Jun-05	14.49	8257	-	-	24.20	12.19	3780	12.32	0.13200	1.540	0.02470	0.0526	-
15-Jul-05 <sup>a</sup>	18.34	6937	-	-	6.89	11.69	5000	11.6	0.28100	1.260	0.03180	0.0922	-
15-Jul-05 <sup>b</sup>	-	-	-	-	-	-	4260	11.8	0.23700	0.286	0.03420	<0.0200	-
9-Aug-05 <sup>a</sup>	23.53	7654	-	-	17.1	10.26	6600	10.3	0.32200	8.360	0.04450	0.1480	-
9-Aug-05 <sup>b</sup>	-	-	-	-	-	-	5580	10.35	0.34000	0.648	0.03710	0.0828	-
14-Sept-05 <sup>a</sup>	18.55	6730	-	-	10.00	10.51	5100	11.1	0.23500	1.860	0.01930	0.1550	-
14-Sept-05 <sup>b</sup>	-	-	-	-	-	-	4750	11.78	0.26800	2.270	0.03420	-	-
5-Oct-05	12.14	4323	-	-	17.60	9.80	3090	10.15	0.13000	0.947	0.02650	0.0638	-
9-Nov-05	6.78	3784	-	-	11.80	11.12	2600	11.5	0.12100	0.504	0.02170	0.0802	-
9-Dec-05	3.22	8745	-	-	12.90	12.85	3900	12.3	0.17500	5.720	0.01410	0.1490	-
19-Jan-06	7.73	5215	5.43	-	13.30	12.52	2000 J	12.3 J	0.02030	0.556	0.00324	0.0355	-
16-Feb-06	3.96	9342	8.97	231.2	9.08	12.30	4100 J	12.6	0.04300	1.480	0.02560	0.0548	-
15-Mar-06	8.72	12910	9.59	222.1	7.64	12.60	5100 J	12.7	0.03860	<0.150	0.04180	<0.0100	-
7-Apr-06	14.26	15220	6.90	18.9	3.65	12.92	5700	12.7	0.04850	0.382	0.06560	0.0119	-
16-May-06	19.75	10880	2.61	33.8	15.40	12.46	5100	12.6	0.13000	3.200	0.09210	0.0916	-
23-Jun-06	22.76	7586	2.98	-	14.10	12.65	5100	11.9	0.13000	0.606	0.05790	0.0618	-
20-Jul-06	24.33	7457	0.73	-148.4	16.70	11.33	6400	11.5	0.27200	1.180	0.05130	0.0418	-
22-Aug-06	15.03	7481	3.75	61.0	14.10	10.40	6100	10.3	0.31800	0.824	0.03320	0.0390	-
26-Sep-06	17.30	8409	1.31	-312.4	15.10	12.38	5500	12.2	0.23000	0.966	0.04570	0.0490	-
26-Oct-06	10.95	6075	4.10	-265.6	13.30	12.18	4600	11.7	0.24300	3.980	0.04150	<0.2000	-
15-Nov-06	8.07	5022	7.71	-152.7	21.50	12.24	2600	11.9	0.07620	0.217	0.00368	0.1110	-
20-Dec-06	6.32	9148	5.73	-139.6	12.20	12.85	2900 J	12.6	0.04610	1.630	0.00128	0.0820	-
24-Jan-07	2.15	12690	9.24	-98.4	9.74	13.10	3000 J	12.4	0.01920	<0.150	0.02680	<0.0100	-
12-Feb-07	9.35	14110	8.43	-86.7	32.50	13.13	4700	12.6	0.09620	<0.150	0.08350	0.0233	-
27-Mar-07	9.16	10560	8.41	-46.2	7.42	11.31	2900 J	12.5 J	0.00598	<0.150	0.01450	<0.0100	-
18-Apr-07	8.27	14570	8.32	10.8	10.30	12.79	5200	12.5 J	0.01980	<0.300	0.02210	<0.0200	-
31-May-07	23.66	13410	6.42	-95.0	31.20	11.77	5100	12.5 J	0.07840	<1.500	0.05040	<0.100	-
20-Jun-07	26.35	10050	5.53	-195.7	27.90	12.29	5300 J	12.4 J	0.11200	0.315	0.03820	0.0207	-
31-Jul-07	21.39	6666	4.76	-106.4	72.00	10.86	6300	10.9 J	0.20800	2.540	0.06880	0.1160	-
29-Aug-07	22.61	6950	1.57	-193.4	61.80	12.05	6300 J	11.7 J	0.14900	0.835	0.03060	0.0710	-
27-Sep-07	11.45	5059	2.66	-180.4	78.40	11.43	4800	11.3 J	0.19000	1.430	0.01740	0.1140	-

**Table A-1d: Summary of Lower Disposal Area - Surface Water Sampling Results - South Pond Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters						General Chemistry		Dissolved Metals (mg/L)				
	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	pH (standard units)	Arsenic	Iron	Lead	Manganese	Potassium
26-Oct-07	6.98	4147	1.44	-204.7	39.50	12.48	3900 J	11.8 J	0.16800	1.510	0.02550	0.0861	-
30-Nov-07	2.86	5030	8.50	-74.9	12.40	12.20	2600	11.7 J	0.12100	0.885	0.01430	0.1120	-
12-Dec-07	4.45	3564	2.03	-141.8	20.70	10.93	2700	11 J	0.07930	1.130	0.00987	0.1640	-
24-Jan-08	1.13	4859	4.10	-186.8	-	11.19	2200	12.4 J	0.08610	<0.150	0.00679	<0.0100	-
28-Feb-08	-	-	-	-	18.10	-	2800	11.2 J	0.18300	0.499	0.07340	0.0279	-
25-Mar-08	7.37	5413	7.88	-58.2	122.00	12.29	2900	11.7 J	0.18200	0.548	0.01300	0.0583	-
29-Apr-08	8.43	3685	9.04	59.3	19.20	11.63	2400 J	11.2 J	0.15200	0.708	0.01600	0.0520	-
20-May-08	18.03	3554	6.69	58.0	156.00	11.01	2100	10.8 J	0.13700	0.406	0.03830	0.0688	-
18-Jun-08	13.01	5680	6.46	57.5	71.80	11.14	4000 J	11 J	0.27900	0.381	0.03440	0.0423	-
26-Aug-08	18.02	2800	5.72	16.9	49.80	10.08	2500 J	9.9 J	0.09170	0.404	0.01860	0.0532	557
20-Nov-08	7.46	2011	9.04	38.3	23.60	10.49	2300	10.1 J	0.07290	1.980	0.00920	0.1710	566
12-Feb-09	1.63	1870	11.74	-	46.10	10.83	2300	10.6 J	0.12900	0.982	0.01720	0.1130	738
19-May-09	12.73	1895	5.37	-16.4	168.00	9.82	1700 J	9.94 J	0.07890	1.320	0.01130	0.0736	515
23-Sep-09	21.50	4190	0.09	175.1	14.40	9.70	4100	-	0.12000	4.500	0.09900	0.0890	1300
14-Dec-09	+	+	+	+	+	+	+	+	+	+	+	+	+
22-Mar-10	13.10	2480	-	342.0	15.60	10.05	1700	-	0.07600	5.700	0.03400	0.1400	520
17-Jun-10	13.40	2429	5.14	-	26.10	10.77	2100	-	0.12000	7.700	0.08900	0.1100	630
21-Sep-10	16.30	2733	1.10	216.8	21.50	9.81	2200	-	0.02500	4.400 J	0.02700	0.2400	510
8-Dec-10	6.00	1994	2.70	-	18.70	10.05	1400	-	0.05300	6.000	0.01800	0.2100	490
30-Mar-11	9.10	509	0.37	179.2	13.80	12.04	730 J	-	0.03600	3.000	0.01400	0.0760	260
21-Jun-11	21.60	2092	1.90	192.2	13.60	10.07	2800 J	-	0.06200	4.300	0.02900	0.0890	380
27-Sep-11	14.60	1516	9.34	220.4	32.50	9.34	1800	-	0.07800	2.800	0.03600	0.0580	780
15-Dec-11	3.00	1449	1.90	94.6	13.80	10.75	2100	-	0.14000	6.200	0.07400	0.0810	630
21-Mar-12	2.60	1088	8.10	285.7	13.10	9.95	780	-	0.03000	2.800	0.00720	0.0580	240
19-Jun-12	17.10	1747	5.54	345.3	10.80	9.93	780	-	0.07000	4.200	0.02900	0.0620	400
20-Sep-12	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Dec-12	4.00	1771	6.37	104.0	6.12	10.71	1300	-	0.04700	4.000	0.01800	0.0960	440
26-Feb-13	6.90	3720	5.40	196.7	10.60	11.86	1100	-	0.14000	4.000	0.03900	0.1000	690
23-May-13	11.50	2335	5.21	323.5	44.10	12.48	1800	-	0.13000	3.100	0.05000	0.0510	530
22-Aug-13	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-	Dry	Dry	Dry	Dry	Dry
19-Nov-13	8.20	1256	4.12	79.3	18.20	9.89	1260	-	0.03980	0.650	0.02040	0.0590	487
1-Apr-14	15.30	2053	4.42	130.9	772.00	11.27	1800	-	0.11300	1.270	0.04220	0.0520	649
23-May-14	14.15	2187	5.50	77.3	-	10.19	1860	-	0.11200	1.180	0.02360	0.0840	623
13-Aug-14	20.29	1298	5.35	40.1	24.80	9.63	949	-	0.04490	0.560	0.02280	0.0480	306
12-Nov-14	1.30	315	4.55	-0.5	22.10	10.45	2440	-	0.12200	1.160	0.03420	0.0480	804

**Table A-1d: Summary of Lower Disposal Area - Surface Water Sampling Results - South Pond Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters						General Chemistry		Dissolved Metals (mg/L)				
	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	pH (standard units)	Arsenic	Iron	Lead	Manganese	Potassium
12-Feb-15	11.10	1267	4.01	-8.2	23.90	10.20	905	-	0.02720	2.500	0.00960	0.0440	320
4-May-15	15.60	3200	4.35	240.5	9.21	10.42	2280	-	0.15400	1.320	0.03080	0.0580	774
5-Aug-15	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-	Dry	Dry	Dry	Dry	Dry
3-Nov-15	8.30	1143	2.01	88.1	35.40	9.22	1050	-	0.02800	0.660	0.02820	0.0430	364
9-Feb-16	7.30	1672	3.45	95.9	7.79	10.45	1170	-	0.05100 J+	0.880	0.03400	0.0540	410
3-May-16	14.20	3150	3.61	335.2	63.80	10.35	2260	-	0.14800	1.430	0.09790 J-	0.0600	777
24-Aug-16	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-	Dry	Dry	Dry	Dry	Dry
1-Nov-16	12.10	401	5.56	-65.9	15.00	9.43	742	-	0.02190	0.423	0.01410	0.0213	356
1-Feb-17	2.10	2064	4.82	5.0	17.80	10.27	1330	-	0.05760	0.963	0.13900	0.0693	455
31-May-17	14.50	2594	5.36	-	22.70	9.93	1920	-	0.10500	0.888	0.05150 J+	0.0472	664
17-Aug-17	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-	Dry	Dry	Dry	Dry	Dry
9-Nov-17	6.50	1049	6.38	92.3	14.40	10.13	1260	-	0.0588	1.46	0.0534 J+	0.0661	441
Preliminary Standard <sup>c</sup>	-	700	-	-	-	6.5-8.5	500	6.5-8.5	TBD <sup>d</sup>	0.3	0.05	0.05	-

Notes:

- Not analyzed or not available
- < Analyte not detected above the reporting limit shown
- + South Pond frozen; unable to collect field parameters or samples
- Dry South Pond dry; unable to collect field parameters or samples
- a North Creek Analytical, Inc.
- b Severn Trent Laboratories
- c Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest
- d Site background arsenic value to be determined (TBD)
- J Data validation code; estimated value
- J+ Data validation code; estimated value with positive bias
- °C Degrees Celsius
- µmhos/cm Micromhos per centimeter
- feet bmp Feet below measuring point
- feet msl Feet above mean sea level
- mg/L Milligrams per liter
- mV Millivolts
- NTU Nephelometric Turbidity Unit

**APPENDIX A-2**  
**SUMMARY OF LOWER DISPOSAL AREA – SHALLOW/ALLUVIAL GROUNDWATER**  
**SAMPLING RESULTS**

**TABLE A-2A WELL MW-1A**  
**TABLE A-2B WELL MW-2A**  
**TABLE A-2C WELL MW-3A**  
**TABLE A-2D WELL MW-4A**  
**TABLE A-2E WELL MW-5A**  
**TABLE A-2F WELL MW-6A**

**Table A-2a: Summary of Lower Disposal Area - Shallow/Alluvial Groundwater Sampling Results - Well MW-1A Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
15-Jul-05	35.43	574.40	15.17	883	-	-	358.00	7.03	664	0.00847	<0.100	<0.00200	0.6020	-
9-Nov-05	31.83	578.00	10.77	1037	-	-	22.20	6.89	680	0.00345	<0.150	<0.00100	0.0286	-
15-Feb-06	23.91	585.92	9.14	623	1.53	497.4	6.76	7.26	470 J	0.00325	<0.150	<0.00100	<0.0100	-
17-May-06	31.91	577.92	11.32	1029	1.33	121.6	10.30	7.18	600	0.00518	<0.150	<0.00100	0.3160	-
23-Aug-06	35.35	574.48	19.21	481	5.97	60.4	6.30	6.67	340	0.00170	<0.150	<0.00100	0.0234	-
14-Nov-06	20.00	589.83	10.35	635	4.55	95.1	22.20	7.23	550	0.00307	<0.150	<0.00100	0.0131	-
14-Feb-07	29.29	580.54	11.13	435	3.88	85.6	32.10	6.76	260	0.00200	<0.150	<0.00100	0.0116	-
30-May-07	32.90	576.93	10.30	545	6.63	145.7	6.93	6.81	320	0.00248	<0.150	<0.00100	<0.0100	-
27-Aug-07	35.68	574.15	10.49	428	7.13	76.7	8.65	6.95	260 J	0.00187	<0.150	<0.00100	0.0189	-
29-Nov-07	32.75	577.08	10.10	625	7.14	144.3	12.20	6.96	340 J	0.00232	<0.150	<0.00100	<0.0100	-
27-Feb-08	27.83	582.00	-	-	-	-	19.60	-	320	0.00258	<0.150	<0.00100	<0.0100	-
20-May-08	31.86	577.97	10.22	471	6.38	177.0	109.00	6.48	290 J	0.00224	<0.150	<0.00100	0.0253	-
27-Aug-08	36.04	573.79	9.84	427	7.40	118.4	63.60	7.08	260	0.00205	<0.150	<0.00100	0.0173	23.0
26-Sep-08	<i>Test Trench Drain Line Installed</i>													
16-Oct-08	35.65	574.18	9.51	443	9.78	113.9	38.00	7.38	260 J	0.00179	<0.150	<0.00100	0.0136	22.9
20-Nov-08	25.62	584.21	9.49	563	6.11	231.0	5.48	7.18	430	0.00368	<0.150	<0.00100	<0.0100	106.0
30-Dec-08	23.14	586.69	9.84	402	8.40	106.9	8.92	7.25	280 J	0.00247	<0.150	<0.00100	0.0130	43.9
15-Jan-09	20.66	589.17	8.40	336	9.65	229.6	1.07	6.88	290	0.00225	<0.150	<0.00100	<0.0100	35.7
12-Feb-09	30.00	579.83	9.05	372	8.46	-	16.70	7.34	320	0.00193	<0.150	<0.00100	0.0165	27.0
12-Mar-09	31.30	578.53	9.13	409	8.60	174.9	15.80	7.03	340	0.00166	<0.150	<0.00100	<0.0100	20.6
16-Apr-09	23.88	585.95	8.17	343	10.24	131.8	13.50	6.78	310	0.00177	<0.150	<0.00100	<0.0100	24.6
19-May-09	30.50	579.33	8.99	392	8.69	82.6	23.70	7.75	340 J	0.00156	<0.150	<0.00100	<0.0100	19.6
23-Jun-09	34.00	575.83	9.21	480	9.56	79.0	22.90	7.89	430	<0.00200	<0.200	<0.00200	<0.0200	20.0
25-Aug-09	36.95	572.88	13.10	373	6.47	311.9	4.98	6.76	270 J+	0.00064 J	<0.200	<0.00200	0.0042 J	17.0
23-Sep-09	37.12	572.71	11.30	336	6.90	368.3	21.30	6.73	240	<0.00200	0.054 J	0.00018 J	0.0120 J	14.0
15-Dec-09	28.30	581.53	9.20	643	5.30	567.0	18.00	6.72	330	<0.00200	0.033 J	<0.00200	0.0065 J	26.0
24-Mar-10	30.03	579.80	9.80	562	5.72	545.9	5.04	6.74	370	0.00190 J	<0.200	<0.00200	<0.0200 U	19.0
16-Jun-10	23.55	586.28	9.20	506	5.93	405.4	16.10	6.53	<40	0.00360	0.110 J	<0.00200	0.0110 J	20.0
21-Sep-10	35.89	573.94	10.40	593	4.82	288.5	117.00	6.96	370	0.00260	<0.200	0.00023 J	0.0350 J+	19.0
7-Dec-10	27.39	582.44	10.00	504	1.45	198.4	139.00	7.15	330	0.00230	0.650	<0.00200	0.1700	14.0
29-Mar-11	29.76	580.07	8.10	247	2.47	169.0	6.81	7.14	300	0.00240	0.290 J+	<0.00200	0.0540	15.0
21-Jun-11	30.45	579.38	9.30	606	4.58	332.9	3.56	7.17	400 J	<0.00500	<0.200	<0.00200	0.0100 J	16.0
27-Sep-11	36.65	573.18	9.90	366	7.27	356.2	2.18	6.85	310	<0.00500	<0.200	<0.00200	0.0060 J	17.0
14-Dec-11	31.53	578.30	9.20	407	1.97	234.7	20.40	7.09	370	<0.00500	0.330	<0.00200	0.0860	16.0
20-Mar-12	21.60	588.23	7.70	561	7.06	385.4	4.80	7.18	280	0.00230	<0.200	<0.00040	0.0029 J	16.0

**Table A-2a: Summary of Lower Disposal Area - Shallow/Alluvial Groundwater Sampling Results - Well MW-1A Ravensdale Site, Ravensdale, Washington**

Date Sampled*	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
19-Jun-12	21.60	588.23	10.00	575	7.04	378.2	5.60	7.31	330	0.00250	<0.200	<0.00040	0.0068 J	16.0
19-Sep-12	36.42	573.41	11.30	561	8.76	286.0	2.49	7.02	310	0.00240	<0.200	<0.00040	<0.0200	17.0
19-Dec-12	23.43	586.40	9.30	671	6.67	348.2	0.74	7.26	<20	0.00170	<0.200	<0.00040	<0.0200	17.0
25-Feb-13	29.32	580.51	8.00	572	9.51	337.0	26.00	7.28	300	0.00250	<0.500	<0.00040	<0.0200	16.0
22-May-13	31.23	578.60	9.00	518	8.59	397.7	4.68	7.40	310	0.00180	<0.500	<0.00040	<0.0200	15.0
21-Aug-13	37.02	572.81	10.20	534	9.27	152.7	1.46	7.11	227	0.00120	<0.050	<0.00010	0.0030	14.1
20-Nov-13	29.69	580.14	9.50	852	7.62	243.5	39.50	6.75	419	0.00160	<0.050	<0.00010	0.0020	19.9
1-Apr-14	23.29	586.54	8.90	347	7.60	248.1	2.54	7.30	247	0.00200	<0.050	<0.00010	<0.0007	16.5
21-May-14	28.31	581.52	9.50	349	4.02	178.6	-	7.12	280	0.00180	<0.050	<0.00010	0.0150	15.1
13-Aug-14	36.52	573.31	12.10	441	9.22	51.9	6.20	7.10	283	0.00140	<0.050	<0.00010	0.0030	15.2
13-Nov-14	31.63	578.20	11.50	438	8.80	173.0	14.70	7.10	352	0.00160	<0.050	<0.00010	0.0020	17.1
11-Feb-15	23.02	586.81	9.40	498	3.89	98.1	10.50	7.72	319	0.00910	0.180	0.00030	0.0040	42.9
4-May-15	31.93	577.90	9.80	578	7.35	416.9	1.05	7.26	413	0.00170	0.008 J	<0.00010	0.0100	16.0
6-Aug-15	37.65	572.18	10.70	447	0.17	71.6	49.00	7.21	343	0.00390	0.110	<0.00010	0.2140	10.3
4-Nov-15	32.89	576.94	9.50	657	8.56	240.5	5.70	6.92	554	0.00230	0.013 J	<0.00010	<0.0010	49.3
10-Feb-16	25.39	584.44	9.80	322	7.36	204.8	3.21	7.31	202	0.00200	0.0076 J	<0.00010	0.0070	22.2
2-May-16	32.32	577.51	10.80	579	5.95	250.2	4.70	7.02	350	0.00180	<0.050	0.00004 J-	0.0040	17.8
23-Aug-16	37.66	572.17	11.00	488	1.34	459.9	259.00	7.08	413	0.00388	0.130	0.00007 J	0.6220	14.6
2-Nov-16	31.30	578.53	9.70	280	3.94	225.0	6.13	7.18	531	0.00213	<0.050	0.00012	0.0020	37.7
1-Feb-17	29.01	580.82	8.60	510	5.26	187.7	0.97	7.04	270	0.00147	<0.050	<0.00010	0.0035	19.0
30-May-17	28.47	581.36	9.50	483	6.89	4.7	4.85	6.96	290	0.00209	0.005 J	<0.00010	0.0034	15.7
17-Aug-17	36.30	573.53	10.50	536	3.79	82.5	6.44	6.96	283	0.00155	0.061	<0.00010	0.0524	15.5
9-Nov-17	32.20	577.63	9.20	460	5.89	75.1	2.70	7.01	380	0.00163	<0.05	<0.0001	0.0019	16.3
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.3	0.05	0.05	-

Notes:

Top of casing elevation (feet msl): 609.83

- Not measured or not available

< Analyte not detected above the reporting limit shown

\* Depth to water (DTW) measurements for all shallow/alluvial wells collected on the same day; date noted is sampling date

a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest

b Site background arsenic value to be determined (TBD)

J Data validation code; estimated value

J+ Data validation code; estimated value with positive bias

°C Degrees Celsius

U Data validation code; not detected at the Reporting Limit (RL)

µmhos/cm Micromhos per centimeter

feet bmp Feet below measuring point

feet msl Feet above mean sea level

mg/L Milligrams per liter

mV Millivolts

NTU Nephelometric Turbidity Unit

**Table A-2b: Summary of Lower Disposal Area - Shallow/Alluvial Groundwater Sampling Results - Well MW-2A  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
15-Jul-05	29.18	574.43	13.78	853	-	-	28.30	7.70	606	<0.00200	<0.100	<0.00200	0.2090	-
9-Nov-05	25.64	577.97	10.95	860	-	-	3.82	7.43	550	0.00131	<0.150	<0.00100	0.4490	-
15-Feb-06	17.64	585.97	7.81	709	0.82	467.7	3.96	7.86	520 J	0.00106	<0.150	<0.00100	0.1340	-
17-May-06	25.76	577.85	9.67	810	2.17	246.1	3.01	7.06	490	0.00113	<0.150	<0.00100	0.0596	-
23-Aug-06	29.13	574.48	12.86	759	2.60	12.0	9.82	7.40	570	0.00154	<0.150	<0.00100	0.2300	-
14-Nov-06	13.74	589.87	10.44	649	3.72	63.6	9.78	7.72	460	0.00136	<0.150	<0.00100	0.0553	-
14-Feb-07	22.09	581.52	10.77	648	1.69	11.5	52.40	7.51	380	0.00107	<0.150	<0.00100	0.1650	-
30-May-07	26.72	576.89	11.46	732	2.05	72.2	12.80	7.44	480	0.00117	<0.150	<0.00100	0.1870	-
27-Aug-07	29.45	574.16	10.80	829	7.41	62.8	117.00	7.58	590 J	0.00109	<0.150	<0.00100	0.1160	-
29-Nov-07	26.57	577.04	10.74	899	2.00	81.1	392.00	6.05	490	0.00103	<0.150	<0.00100	0.1260	-
27-Feb-08	21.45	582.16	-	-	-	-	446.00	-	400	0.00109	<0.150	<0.00100	0.1230	-
20-May-08	25.73	577.88	9.48	706	3.07	110.2	419.00	7.26	420 J	0.00121	<0.150	<0.00100	0.0835	-
27-Aug-08	29.84	573.77	9.87	824	4.74	91.5	571.00	7.43	550 J	0.00130	<0.150	<0.00100	0.0929	65.1
26-Sep-08	<i>Test Trench Drain Line Installed</i>													
16-Oct-08	29.13	574.48	9.76	820	4.56	53.6	227.00	7.33	520 J	0.00130	<0.150	<0.00100	0.0496	76.3
20-Nov-08	19.48	584.13	9.31	462	5.24	240.1	6.16	7.35	360	0.00176	<0.150	<0.00100	0.0149	67.0
30-Dec-08	16.93	586.68	9.85	480	6.18	66.8	56.10	7.35	390 J	0.00155	<0.150	<0.00100	0.0157	61.5
15-Jan-09	14.46	589.15	7.71	402	7.47	177.8	1.61	7.61	360	0.00157	<0.150	<0.00100	<0.0100	58.5
12-Feb-09	23.84	579.77	9.63	-	8.72	-	74.90	7.54	390	0.00130	<0.150	<0.00100	0.0371 J	48.1
12-Mar-09	25.15	578.46	9.11	454	7.22	163.7	573.00	7.19	400	0.00117	<0.150	<0.00100	0.0135	43.1
16-Apr-09	17.72	585.89	8.40	417	8.27	126.4	128.00	7.26	400	0.00140	<0.150	<0.00100	0.0107	48.8
19-May-09	24.38	579.23	8.80	448	6.88	72.0	178.00	7.95	410 J	0.00110	<0.150	<0.00100	<0.0100	44.0
23-Jun-09	27.85	575.76	8.95	507	7.76	61.9	256.00	8.07	490	<0.00200	<0.200	<0.00200	<0.0200	39.0
25-Aug-09	30.68	572.93	10.50	707	6.94**	307.4	4.38	7.17	530 J+	<0.00200	0.091 J	0.00018 J	0.0300	49.0
23-Sep-09	30.84	572.77	11.20	661	5.41	374.7	15.00	7.28	500	<0.00200	<0.200	<0.00200	0.0041 J	51.0
15-Dec-09	22.10	581.51	9.50	720	5.10	579.0	39.00	6.92	380	<0.00200	<0.200	<0.00200	<0.0200	42.0
24-Mar-10	23.82	579.79	10.00	602	4.10	535.3	43.30	6.93	370	0.00170 J	0.062 J	<0.00200	<0.0200 U	39.0
17-Jun-10	17.45	586.16	9.30	547	4.06	-	157.00	6.57	350	0.00390	0.063 J	<0.00200	0.0030 J	39.0
22-Sep-10	29.66	573.95	10.20	722	5.77	360.2	7.20	7.22	450	0.00330	<0.200	<0.00200	<0.0200	55.0
8-Dec-10	22.10	581.51	9.90	566	6.69	-	64.60	7.09	350	<0.00200	<0.200	<0.00200	0.0018 J	35.0
29-Mar-11	19.94	583.67	8.40	251	6.95	620.0	28.00	7.13	250 J	0.00140 J	<0.200	<0.00200	0.0030 J	30.0
21-Jun-11	24.25	579.36	9.90	628	5.23	344.3	37.00	7.29	410 J	<0.00500	<0.200	<0.00200	0.0056 J	28.0
28-Sep-11	30.41	573.20	9.50	58	6.54	481.7	13.80	7.24	500	<0.00500	<0.200	<0.00200	<0.0200	54.0
14-Dec-11	25.35	578.26	9.30	441	3.86	346.5	386.00	7.26	440	<0.00500	<0.200	<0.00200	0.0037 J	29.0
20-Mar-12	15.45	588.16	7.70	580	1.53	382.0	32.30	7.40	280	0.00220	0.200	<0.00040	<0.0200	26.0

**Table A-2b: Summary of Lower Disposal Area - Shallow/Alluvial Groundwater Sampling Results - Well MW-2A  
Ravensdale Site, Ravensdale, Washington**

Date Sampled*	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
19-Jun-12	23.88	579.73	9.00	590	1.85	388.1	55.70	7.74	320	0.00250	<0.200	<0.00040	<0.0200	23.0
19-Sep-12	30.18	573.43	11.10	695	7.03	297.0	9.31	7.41	420	0.00270	<0.200	<0.00040	<0.0200	42.0
19-Dec-12	17.24	586.37	9.40	704	6.33	317.0	55.20	7.40	310	0.00170	<0.200	<0.00040	<0.0200	25.0
25-Feb-13	23.12	580.49	9.10	585	6.04	339.0	110.00	7.46	370	0.00250	<0.500	<0.00040	<0.0200	24.0
22-May-13	25.05	578.56	8.60	537	8.41	391.5	12.30	7.51	310	0.00190	<0.500	<0.00040	<0.0200	22.0
21-Aug-13	30.75	572.86	10.60	684	8.42	150.2	5.85	7.74	419	0.00150	<0.050	0.00020	0.0020	27.7
20-Nov-13	23.51	580.10	9.60	513	6.19	230.4	32.10	6.81	364	0.00130	<0.050	<0.00010	0.0010	27.5
1-Apr-14	17.11	586.50	8.50	386	7.32	243.1	14.60	7.46	294	0.00140	0.009 J	<0.00010	<0.0005	31.7
21-May-14	22.07	581.54	9.10	365	6.02	212.7	-	6.93	273	0.00130	<0.050	<0.00010	<0.0010	24.7
12-Aug-14	31.32	572.29	13.16	552	6.56	76.7	6.80	7.36	394	0.00150	<0.050	<0.00010	<0.0010	25.3
13-Nov-14	25.48	578.13	12.30	460	7.22	189.8	7.20	7.19	367	0.00140	<0.050	<0.00010	0.0010	25.5
11-Feb-15	16.83	586.78	9.30	447	6.76	134.4	36.60	7.52	286	0.00170	0.026 J	<0.00010	0.0007 J	30.4
4-May-15	25.78	577.83	10.20	619	6.27	407.1	7.70	7.36	382	0.00140	<0.050	<0.00010	0.0004 J	25.2
6-Aug-15	31.87	571.74	11.30	500	9.18	207.1	28.10	7.23	394	0.00150	<0.050	<0.00010	0.0030	22.0
4-Nov-15	26.74	576.87	9.90	481	8.76	222.6	16.80	6.88	381	0.00110	<0.050	<0.00010	0.0190	21.8
10-Feb-16	19.19	584.42	9.00	376	7.35	206.0	40.20	7.68	261	0.00360	0.0140 J	<0.00010	0.0040	37.1
2-May-16	26.14	577.47	11.30	552	3.19	194.5	87.80	7.35	344	0.00210	0.0045 J	0.00001 J-	0.0020	31.2
23-Aug-16	31.64	571.97	10.50	545	7.62	486.5	10.80	7.18	412	0.00154	<0.050	<0.00010	0.0011	32.6
2-Nov-16	25.12	578.49	10.20	220	4.01	238.9	245.00	7.19	431	0.00140	<0.050	<0.00010	0.0015	30.6
1-Feb-17	22.84	580.77	9.10	580	5.06	186.3	13.60	7.35	317	0.00317	0.010 J	<0.00010	<0.0010	51.1
30-May-17	22.31	581.30	9.40	520	7.01	5.0	40.20	7.18	322	0.00178	0.010 J	<0.00010	<0.0010	34.1
17-Aug-17	30.08	573.53	10.60	626	5.63	134.2	32.30	7.21	370	0.00128	0.014 J	<0.00010	0.0009 J	28.9
9-Nov-17	26.04	577.57	9.80	480	5.79	74.4	68.80	7.00	391	0.00139	<0.05	<0.0001	0.0005 J	25.4
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.3	0.05	0.05	-

Notes:

Top of casing elevation (feet msl): 603.61

- Not measured or not available

< Analyte not detected above the reporting limit shown

\* Depth to water (DTW) measurements for all shallow/alluvial wells collected on the same day; date noted is sampling date

\*\* Dissolved Oxygen meter working incorrectly at the time of sample collection

a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest

b Site background arsenic value to be determined (TBD)

J Data validation code; estimated value

feet bmp Feet below measuring point

J+ Data validation code; estimated value with positive bias

feet msl Feet above mean sea level

°C Degrees Celsius

mg/L Milligrams per liter

U Data validation code; not detected at the Reporting Limit (RL)

mV Millivolts

µmhos/cm Micromhos per centimeter

NTU Nephelometric Turbidity Unit

**Table A-2c: Summary of Lower Disposal Area - Shallow/Alluvial Groundwater Sampling Results - Well MW-3A Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
15-Jul-05	6.09	679.42	13.80	1124	-	-	30.30	6.96	922	0.00241	<0.100	<0.00200	0.6280	-
10-Nov-05	5.50	680.01	10.80	1518	-	-	2.32	6.88	960	0.01050	4.800	<0.00100	3.6000	-
15-Feb-06	5.31	680.20	9.52	1357	0.46	217.4	58.20	6.33	930 J	0.00666	4.290	<0.00100	2.8500	-
16-May-06	6.25	679.26	10.40	1296	0.96	91.0	11.40	6.91	910	0.01010	6.560	<0.00100	3.3800	-
22-Aug-06	8.85	676.66	12.84	1362	1.28	-64.8	56.00	6.97	900	0.01210	7.060	<0.00100	2.8500	-
13-Nov-06	5.03	680.48	11.24	1392	2.12	-74.4	234.00	6.89	910	0.00573	4.750	<0.00100	2.6900	-
16-Feb-07	5.55	679.96	8.99	1155	0.75	-71.3	12.30	6.96	770	0.00374	3.770 J	<0.00100	2.6100 J	-
30-May-07	6.72	678.79	11.86	1297	0.75	-25.2	12.50	7.04	790	0.00520	5.840	<0.00100	2.2200	-
27-Aug-07	8.38	677.13	12.65	1483	0.71	-96.3	15.30	6.73	1100 J	0.00874	9.160	<0.00100	2.3200	-
28-Nov-07	5.66	679.85	10.47	1363	1.05	-72.9	26.90	7.31	730	0.00424	5.460	<0.00100	2.2700	-
27-Feb-08	5.57	679.94	-	-	-	-	121.00	-	860	0.00976	5.990	<0.00100	2.4900	-
19-May-08	5.94	679.57	9.39	1346	0.66	-52.6	20.00	6.93	820 J	0.00664	8.740	<0.00100	2.3300	-
26-Aug-08	6.44	679.07	12.15	1495	0.85	-53.6	5.85	6.88	820	0.00342	2.610	<0.00100	1.5300	30.3
18-Nov-08	5.50	680.01	10.50	975	1.87	-67.4	225.00	6.93	880 J	0.00748	10.100	<0.00100	2.2900	62.5
11-Feb-09	5.62	679.89	7.67	877	0.98	-	68.00	7.28	810	0.00520	5.710	<0.00100	2.2700	50.6
19-May-09	5.60	679.91	8.52	847	0.91	-63.4	52.00	8.21	750 J	0.00251	<0.150	<0.00100	2.2000	49.5
22-Sep-09	8.36	677.15	15.70	1149	0.10	132.1	75.10	7.05	910	0.00660	5.200	<0.00200	1.8000	53.0
17-Dec-09	4.59	680.92	8.90	1300	0.40	194.0	401.00	7.08	710	<0.00200	0.740	<0.00200	2.2000	62.0
24-Mar-10	5.40	680.11	11.20	1010	0.12	-	226.00	6.76	800	0.00380	4.400	<0.00200	2.1000	46.0
16-Jun-10	5.27	680.24	10.10	1123	0.20	188.0	6.19	8.43	570	0.01300	6.400	<0.00200	1.9000	49.0
21-Sep-10	6.01	679.50	12.70	1314	0.19	177.7	2.97	6.91	1,000	0.00620	2.800	0.00019 J	1.3000	160.0
7-Dec-10	5.23	680.28	9.70	1183	0.23	182.7	25.30	6.86	840	0.00320	4.100	<0.00200	1.9000	82.0
30-Mar-11	5.04	680.47	8.30	498	0.28	174.0	4.93	7.89	700	0.00360	3.700	<0.00200	1.4000	36.0
22-Jun-11	6.77	678.74	9.70	895	0.43	172.2	9.18	7.01	700 J	<0.00500	5.100	<0.00200	1.5000	34.0
28-Sep-11	7.83	677.68	12.60	99	0.18	141.8	6.07	6.83	840	0.00880	7.700	<0.00200	2.7000	83.0
15-Dec-11	5.40	680.11	9.00	785	0.60	179.8	24.40	6.98	760	0.00450 J	2.400	<0.0020	1.9000	73.0
20-Mar-12	4.96	680.55	7.10	1092	0.16	22.6	12.10	7.11	470	0.00520	2.300	<0.0020	1.6000	73.0
19-Jun-12	6.76	678.75	10.30	1077	0.11	198.6	11.30	7.07	660	0.01200	8.500	<0.0004	1.8000	78.0
20-Sep-12	8.67	676.84	12.30	1235	0.15	111.0	1.96	6.99	710	0.01100	7.500	0.00005 J	2.1000	100.0
18-Dec-12	4.98	680.53	8.70	1450	0.30	-40.6	18.70	7.25	740	0.00480	1.800	<0.00040	1.6000	150.0
26-Feb-13	5.25	680.26	7.80	1211	0.15	186.6	27.80	7.21	740	0.00470	3.100	<0.00040	2.0000	98.0
23-May-13	6.56	678.95	9.90	1000	0.18	242.3	16.90	7.21	460	0.01400	5.100	0.00280	0.9100	150.0
21-Aug-13	9.01	676.50	12.10	917	0.12	-14.2	1.24	7.27	772	0.00760	5.210	0.00005 J	1.8100	94.0
19-Nov-13	6.09	679.42	9.90	697	0.07	61.8	2.93	6.77	852	0.01230	9.660	0.00020	1.5300	169.0
1-Apr-14	5.75	679.76	9.00	722	0.10	131.3	4.47	7.07	624	0.01050	11.100	0.00006 J	1.7600	104.0

**Table A-2c: Summary of Lower Disposal Area - Shallow/Alluvial Groundwater Sampling Results - Well MW-3A  
Ravensdale Site, Ravensdale, Washington**

Date Sampled*	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
22-May-14	5.80	679.71	9.80	580	1.08	185.3	-	6.85	494	0.00520	4.170	0.00010	1.4300	66.5
13-Aug-14	8.54	676.97	11.48	915	2.85	-67.6	8.16	7.09	740	0.00690	5.140	<0.00010	1.5100	116.0
12-Nov-14	5.97	679.54	11.10	314	2.79	-85.1	15.30	6.87	744	0.00690	3.400	<0.00010	2.0000	89.1
12-Feb-15	5.50	680.01	9.80	980	0.52	-54.5	1.28	7.04	696	0.00420	3.570	<0.00010	2.1900	73.2
4-May-15	5.80	679.71	10.80	994	0.17	143.4	15.40	7.12	701	0.00930	7.970	<0.00010	1.8800	100.0
5-Aug-15	10.12	675.39	12.60	881	0.13	-90.4	0.89	7.07	724	0.00730	5.000	<0.00010	2.0000	70.3
3-Nov-15	5.30	680.21	12.00	865	1.23	105.5	5.06	6.97	1020	0.00170	0.180	0.00020	0.6750	195.0
9-Feb-16	5.14	680.37	9.10	954	0.55	154.6	4.82	7.03	625	0.00340	3.000	<0.00010	1.8700	92.7
2-May-16	4.74	680.77	11.30	844	0.19	96.8	2.21	7.16	621	0.01050	7.310	0.00004 J-	1.7200	105.0
23-Aug-16	9.04	676.47	13.20	946	0.03	156.2	3.48	6.97	924	0.00819	6.780	0.00009 J	1.7000	148.0
1-Nov-16	6.18	679.33	11.90	349	0.15	18.5	2.43	7.11	744	0.00263	0.730	<0.00010	0.8630	180.0
1-Feb-17	5.91	679.60	7.50	1114	0.17	-67.4	6.05	7.08	694	0.00640	4.810	<0.00010	1.9200	100.0
30-May-17	7.40	678.11	10.40	753	2.20	8.6	3.28	7.12	465	0.00952	5.240	<0.00010	1.3800	89.3
17-Aug-17	9.71	675.80	12.40	1101	0.25	-60.2	3.39	7.01	737	0.00847	5.730	<0.00010	2.1700	72.0
9-Nov-17	6.06	679.45	9.60	833	0.64	75.3	2.01	7.08	748	0.00184	<0.05	<0.0001	0.5540	191.0
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.3	0.05	0.05	-

## Notes:

Top of casing elevation (feet msl): 685.51

- Not measured or not available

&lt; Analyte not detected above the reporting limit shown

\* Depth to water (DTW) measurements for all shallow/alluvial wells collected on the same day; date noted is sampling date

a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest

b Site background arsenic value to be determined (TBD)

J Data validation code; estimated value

°C Degrees Celsius

µmhos/cm Micromhos per centimeter

feet bmp Feet below measuring point

feet msl Feet above mean sea level

mg/L Milligrams per liter

mV Millivolts

NTU Nephelometric Turbidity Unit

**Table A-2d: Summary of Lower Disposal Area - Shallow/Alluvial Groundwater Sampling Results - Well MW-4A  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
15-Jul-05	4.60	697.25	12.43	629	-	-	6.07	6.45	490	<0.00200	<0.100	<0.00200	0.4260	-
10-Nov-05	3.70	698.15	11.98	441	-	-	7.40	6.22	290	<0.00100	<0.150	<0.00100	0.0991	-
19-Jan-06	3.56	698.29	8.29	319	0.42	-	1.46	6.53	290 J	<0.00100	<0.150	<0.00100	0.0908	-
15-Feb-06	3.82	698.03	8.32	326	0.62	99.7	3.50	7.39	220 J	<0.00100	<0.150	<0.00100	0.0341	-
15-Mar-06	3.79	698.06	7.58	254	0.87	201.9	0.82	6.65	210 J	<0.00100	<0.150	<0.00100	0.0650	-
7-Apr-06	3.87	697.98	9.36	295	0.55	157.4	0.24	6.34	220	<0.00100	<0.150	<0.00100	0.0724	-
16-May-06	4.92	696.93	10.80	321	0.45	142.1	0.99	6.36	220	<0.00100	<0.150	<0.00100	0.0376	-
23-Jun-06	4.41	697.44	12.62	316	0.57	-	2.05	6.25	200	<0.00100	<0.150	0.00264	0.0638	-
20-Jul-06	6.90	694.95	13.43	347	0.23	-20.9	0.32	6.11	120	<0.00100	<0.150	<0.00100	0.1040	-
22-Aug-06	8.46	693.39	13.68	406	0.90	153.5	2.20	6.13	280	<0.00100	<0.150	<0.00100	0.1510	-
26-Sep-06	6.50	695.35	14.59	417	2.47	-35.2	2.42	6.33	290	<0.00100	<0.150	<0.00100	0.0835	-
26-Oct-06	5.98	695.87	12.82	434	3.30	124.1	0.82	6.12	320	<0.00100	<0.150	<0.00100	0.2160	-
13-Nov-06	3.02	698.83	11.70	386	5.06	187.8	2.47	6.13	280	<0.00100	<0.150	<0.00100	0.0442	-
20-Dec-06	3.60	698.25	9.64	379	4.30	150.5	1.03	6.07	250	<0.00100	<0.150	<0.00100	0.0568	-
23-Jan-07	3.68	698.17	8.37	239	3.96	58.9	0.66	6.28	220	<0.00100	<0.150	<0.00100	0.1800	-
14-Feb-07	3.74	698.11	8.18	325	2.85	110.8	0.53	6.25	210	<0.00100	<0.150	<0.00100	0.0398	-
27-Mar-07	3.32	698.53	8.27	289	2.07	61.5	0.88	6.83	210 J	<0.00100	<0.150	<0.00100	0.2290	-
17-Apr-07	3.89	697.96	9.59	306	1.80	102.3	2.31	6.34	190	<0.00100	<0.150	<0.00100	0.2220	-
30-May-07	4.70	697.15	11.27	285	1.78	101.7	1.37	6.37	180	<0.00100	<0.150	<0.00100	0.0246	-
20-Jun-07	4.69	697.16	12.37	350	1.67	9.3	1.25	6.90	240 J	<0.00100	<0.150	<0.00100	0.0321	-
31-Jul-07	6.38	695.47	14.57	402	1.15	5.5	0.60	6.37	250	0.00129	<0.150	<0.00100	0.0307	-
29-Aug-07	7.44	694.41	13.78	353	1.11	128.3	1.87	6.18	280 J	<0.00100	<0.150	<0.00100	0.0490	-
27-Sep-07	8.25	693.60	13.60	375	0.96	142.6	0.70	6.70	300	<0.00100	<0.150	<0.00100	0.1170	-
26-Oct-07	4.09	697.76	12.16	343	2.27	75.9	3.93	6.10	310 J	<0.00100	<0.150	<0.00100	0.0117	-
29-Nov-07	3.93	697.92	10.13	428	3.17	197.3	1.63	6.32	270	<0.00100	<0.150	<0.00100	0.0164	-
12-Dec-07	5.82	696.03	9.51	384	3.37	185.0	0.80	6.06	260	<0.00100	<0.150	<0.00100	0.0392	-
24-Jan-08	3.86	697.99	7.74	354	3.09	109.0	-	6.35	250	<0.00100	<0.150	<0.00100	0.0376	-
28-Feb-08	4.04	697.81	-	-	-	-	1.06	-	220	<0.00100	<0.150	<0.00100	0.0275	-
19-May-08	4.35	697.50	9.79	329	1.38	209.2	1.20	6.08	200 J	<0.00100	<0.150	<0.00100	0.0191	-
26-Aug-08	7.83	694.02	12.66	431	1.38	210.5	0.28	6.19	270	<0.00100	<0.150	<0.00100	0.0493	<3.0
18-Nov-08	3.64	698.21	10.43	235	3.95	217.5	0.66	6.03	210	<0.00100	<0.150	<0.00100	0.0208	<3.0
11-Feb-09	4.09	697.76	7.24	188	2.13	-	0.12	6.54	180	<0.00100	<0.150	<0.00100	0.0180	<3.0
19-May-09	3.79	698.06	8.19	173	1.28	111.9	1.78	7.18	170 J	<0.00100	<0.150	<0.00100	0.0163	<3.0
22-Sep-09	9.70	692.15	16.50	440	0.82	383.3	12.50	6.31	370 J	<0.00200	<0.200	<0.00200	0.0700	1.2 J
17-Dec-09	3.47	698.38	9.20	311	4.37	470.0	16.00	6.25	110	<0.00200	<0.200	<0.00200	0.0200 J	0.7 J
24-Mar-10	3.87	697.98	9.40	410	0.34	204.8	30.70	6.65	240	0.00081 J	<0.200	<0.00200	0.1700	1.3 J
16-Jun-10	3.77	698.08	10.30	298	0.99	397.8	1.11	7.40	180	0.00360	0.049 J	<0.00200	0.0320	0.9 J
21-Sep-10	5.82	696.03	13.70	350	1.01	302.5	1.04	6.25	200	0.00140 J	<0.200	0.0002 J	<0.0200	1.2 J

**Table A-2d: Summary of Lower Disposal Area - Shallow/Alluvial Groundwater Sampling Results - Well MW-4A Ravensdale Site, Ravensdale, Washington**

Date Sampled*	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
7-Dec-10	3.83	698.02	9.60	283	0.72	405.6	0.42	6.16	190	<0.00200	<0.200	<0.00200	0.0090 J	0.8 J
30-Mar-11	3.91	697.94	8.20	133	0.51	248.2	0.29	9.87	140 J	0.00035 J	<0.200	<0.00200	0.0091 J	5.0
22-Jun-11	3.99	697.86	11.00	219	0.16	222.5	0.22	6.13	160	<0.00500	0.180 J	<0.00200	0.1900	0.7 J
28-Sep-11	8.54	693.31	14.30	35	0.26	333.9	2.45	6.30	270	<0.00500	0.110 J	<0.00200	0.1300	2.1 J
15-Dec-11	4.12	697.73	9.40	217	1.15	414.3	2.74	6.28	200	<0.00500	<0.200	<0.00200	0.0170 J	1.2 J
21-Mar-12	3.35	698.50	8.40	346	0.42	438.4	0.48	6.14	220	0.00480	<0.200	<0.00040	0.0280	1.3 J
19-Jun-12	3.78	698.07	11.30	290	0.09	314.0	0.46	6.28	170 J+	0.00130	<0.200	<0.00040	0.0710	<3.3
20-Sep-12	8.53	693.32	14.40	419	0.26	309.0	1.07	6.39	240	0.00160	0.085 J	<0.00040	0.1300	2.9 J
18-Dec-12	3.49	698.36	9.10	491	2.56	264.4	1.38	6.63	170	<0.00100	<0.200	<0.00040	0.0480	1.2 J
26-Feb-13	3.91	697.94	8.40	324	2.59	404.2	1.01	7.03	140	0.00110	<0.500	<0.00040	0.0079 J	3.4
23-May-13	3.76	698.09	10.60	338	1.15	465.9	0.57	6.31	190	<0.00100	<0.500	<0.00040	0.0060 J	<3.3
22-Aug-13	8.28	693.57	13.10	284	0.33	32.2	0.89	6.34	220	0.00040	<0.050	<0.00010	0.0320	1.3
19-Nov-13	3.33	698.52	10.30	323	1.70	109.2	0.64	6.27	200	0.00020	<0.050	<0.00010	0.0070	0.8
1-Apr-14	3.69	698.16	8.20	244	0.45	180.7	0.28	6.33	173	0.00018 J	<0.050	<0.00010	0.0050 J+	0.7
22-May-14	4.52	697.33	10.80	195	0.65	75.0	-	7.20	152	0.00030	<0.050	0.00010	0.0240	0.6
13-Aug-14	7.56	694.29	12.62	269	0.44	37.7	1.12	5.89	181	0.00080	0.200	<0.00010	0.0930	0.9
12-Nov-14	3.73	698.12	11.70	231	1.29	108.2	1.32	6.17	191	0.00030	<0.050	<0.00010	0.0450	1.0
11-Feb-15	3.50	698.35	9.20	270	0.53	-34.2	0.73	6.30	170	0.00020	0.021 J	<0.00010	0.0160	0.7
4-May-15	4.69	697.16	10.90	250	0.28	378.1	0.57	6.29	341	0.00020	0.012 J	<0.00010	0.0790	0.6
5-Aug-15	9.44	692.41	13.90	316	0.72	-38.1	1.16	6.45	262	0.00030	<0.050	<0.00010	0.0150	1.2
3-Nov-15	4.21	697.64	11.80	192	8.59	205.6	5.39	6.34	166	0.00020 J	<0.050	<0.00010	0.0008 J	0.8
9-Feb-16	3.82	698.03	9.20	292	4.61	230.7	0.49	6.45	164	0.00017 J	<0.050	<0.00010	0.0050	0.8
3-May-16	4.61	697.24	10.90	310	2.39	253.0	1.01	6.34	178	0.00030	<0.050	0.00001 J-	0.0020	0.9
24-Aug-16	8.76	693.09	13.20	287	1.24	490.4	1.01	6.35	177	0.00020 J	<0.050	<0.00010	0.0093	0.8
1-Nov-16	3.34	698.51	12.20	100	3.69	177.2	0.40	6.38	205	0.00019 J	<0.050	<0.00010	0.0062	1.0
2-Feb-17	3.94	697.91	7.80	363	3.11	190.0	0.10	6.39	223	0.00017 J	<0.050	<0.00010	0.0080	0.8
31-May-17	4.68	697.17	10.30	300	4.50	-	2.48	6.30	182	0.00020	<0.050	<0.00010	0.0145	0.8
18-Aug-17	8.61	693.24	12.70	393	0.51	120.2	0.87	6.44	228	0.00031	0.096	<0.00010	0.0516	1.3
10-Nov-17	3.58	698.27	11.00	264	3.88	56.5	0.76	6.01	217	0.000186 J	<0.05	<0.0001	0.0054	0.7
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.3	0.05	0.05	-

Notes:

- Top of casing elevation (feet msl): 701.85
- Not measured or not available
- < Analyte not detected above the reporting limit shown
- \* Depth to water (DTW) measurements for all shallow/alluvial wells collected on the same day; date noted is sampling date
- a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest
- b Site background arsenic value to be determined (TBD)
- J Data validation code; estimated value
- °C Degrees Celsius
- µmhos/cm Micromhos per centimeter
- feet bmp Feet below measuring point
- feet msl Feet above mean sea level
- mg/L Milligrams per liter
- mV Millivolts
- NTU Nephelometric Turbidity Unit

**Table A-2e: Summary of Lower Disposal Area - Shallow/Alluvial Groundwater Sampling Results - Well MW-5A  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
15-Jul-05	33.33	574.28	12.02	956	-	-	496.00	7.34	600	0.00201	<0.100	<0.00200	1.1300	-
10-Nov-05	29.62	577.99	11.24	1,212	-	-	27.60	7.32	800	0.00840	<0.150	<0.00100	0.0183	-
15-Feb-06	21.70	585.91	6.45	665	2.59	280.3	11.10	7.86	520 J	0.02230	0.256	<0.00100	0.0169	-
17-May-06	29.80	577.81	7.74	831	0.88	101.9	8.67	7.79	580	0.01100	<0.150	<0.00100	0.0207	-
23-Aug-06	33.25	574.36	15.19	737	1.76	33.5	19.60	7.32	660	0.00253	<0.150	<0.00100	0.5820	-
14-Nov-06	17.79	589.82	10.86	699	4.50	76.3	38.70	7.55	490	0.00315	<0.150	<0.00100	0.0134	-
16-Feb-07	27.08	580.53	8.08	630	6.07	2.3	57.60	8.26	500	0.01440	<0.150 UJ	<0.00100	0.016 J	-
30-May-07	30.75	576.86	9.60	894	2.59	13.3	13.40	7.76	540	0.00843	<0.150	<0.00100	<0.0100	-
29-Aug-07	33.60	574.01	9.56	684	7.64	67.0	-	7.10	670 J	0.00197	<0.150	<0.00100	0.4540	-
29-Nov-07	30.60	577.01	11.00	1075	3.53	151.5	23.50	8.37	560	0.00517	<0.150	<0.00100	<0.0100	-
27-Feb-08	25.68	581.93	-	-	-	-	29.90	-	400	0.01070	<0.150	<0.00100	<0.0100	-
20-May-08	29.73	577.88	7.93	768	4.27	180.7	77.80	7.39	480 J	0.00567	<0.150	<0.00100	0.0124	-
27-Aug-08	33.97	573.64	10.17	862	4.07	81.2	-	7.43	540 J	0.00117	<0.150	<0.00100	0.0644	87.5
26-Sep-08	<i>Test Trench Drain Line Installed</i>													
16-Oct-08	33.55	574.06	8.89	845	5.39	86.3	852.00	7.53	440 J	0.00103	<0.150	<0.00100	0.0578	90.7
20-Nov-08	23.48	584.13	9.34	577	5.27	234.3	9.48	7.50	470	0.00624	<0.150	<0.00200	0.0121	138.0
30-Dec-08	20.88	586.73	8.39	510	8.89	99.0	44.80	8.02	430 J	0.01420	0.202	0.00111	0.0251	138.0
15-Jan-09	18.50	589.11	4.97	347	8.90	154.8	17.20	8.47	380	0.02440	0.172	<0.00100	0.0238 J	104.0
12-Feb-09	27.90	579.71	8.47	-	10.21	-	22.00	7.60	420 J	0.00611	<0.150	<0.00100	<0.0100	99.0
12-Mar-09	29.19	578.42	7.47	521	6.15	171.7	26.80	7.39	480	0.00897	<0.150	<0.00100	<0.0100	124.0
16-Apr-09	21.70	585.91	6.99	456	7.60	151.6	72.70	8.66	470	0.02820	0.162	0.00101	0.0135	126.0
19-May-09	28.37	579.24	8.08	509	6.38	64.4	31.30	8.07	450 J	0.00919	<0.150	<0.00100	<0.0100	105.0
23-Jun-09	31.95	575.66	8.84	551	5.97	69.1	74.30	8.28	500	0.00430	<0.200	<0.00200	<0.0200	71.0
25-Aug-09	35.08	572.53	-	-	-	-	-	-	-	-	-	-	-	-
24-Sep-09	35.29	572.32	11.70	714	2.28	371.9	258.00	7.26	550 J	0.00076 J	0.180 J	0.00017 J	0.1200	88.0
15-Dec-09	26.11	581.50	8.60	928	2.89	544.0	89.00	7.14	450	0.00110 J	<0.200	<0.00200	0.0024 J	110.0
24-Mar-10	27.86	579.75	8.30	697	3.52	505.1	18.10	7.47	450	0.02300	0.160 J	0.00046 J	0.0280	110.0
16-Jun-10	21.35	586.26	10.70	783	2.07	379.0	41.40	7.73	340	0.05300	0.760	0.00210	0.0300	150.0
22-Sep-10	33.88	573.73	10.40	938	4.30	467.1	7.93	7.10	620	0.00500	<0.200	<0.00200	0.0770 J+	100.0
7-Dec-10	25.22	582.39	10.20	781	3.86	353.7	11.10	7.39	500	0.01200	0.094 J	0.00053 J	0.011 J	130.0
29-Mar-11	23.59	584.02	7.00	354	3.47	708.0	22.22	9.52	440 J	0.06300	0.650 J+	0.00140 J	0.0250	140.0
21-Jun-11	28.33	579.28	11.60	1000	2.22	285.3	10.60	9.06	1100 J	0.04300	0.420	0.00120 J	0.0230	180.0
27-Sep-11	34.70	572.91	12.70	641	1.46	307.2	12.80	7.30	680	<0.00500	0.063 J	0.00023 J	0.2800	100.0
14-Dec-11	29.46	578.15	9.50	691	1.95	757.1	9.69	7.35	690	0.00690	<0.200	0.00018 J	0.0019 J	180.0
20-Mar-12	19.50	588.11	6.20	841	3.98	320.2	8.52	8.25	350	0.02600	0.470	0.00100 J	0.0300	140.0

**Table A-2e: Summary of Lower Disposal Area - Shallow/Alluvial Groundwater Sampling Results - Well MW-5A  
Ravensdale Site, Ravensdale, Washington**

Date Sampled*	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
19-Jun-12	27.91	579.70	10.20	800	3.22	365.9	2.76	7.66	510	0.00870	<0.200	<0.00040	0.0290	120.0
20-Sep-12	34.53	573.08	11.00	859	0.73	387.0	46.80	7.64	530	0.00260	<0.200	<0.00040	0.6300	100.0
19-Dec-12	21.26	586.35	8.90	983	1.73	279.0	778.00	7.71	530	0.01100	0.110 J	0.00062	0.0670	180.0
25-Feb-13	27.19	580.42	7.50	682	7.61	330.5	4.36	7.85	380	0.01300	<0.500	0.00015 J	0.0110 J	74.0
22-May-13	29.09	578.52	8.80	828	3.88	411.4	8.11	8.29	350	0.02500	0.085 J	0.00053	0.0220	100.0
21-Aug-13	35.15	572.46	17.10	1248	3.41	114.2	144.00	7.78	1060	0.00150	0.060	0.00005 J	0.4870	95.0
20-Nov-13	27.45	580.16	10.00	1032	4.13	196.5	31.70	7.18	699	0.01450	0.100	0.00140	0.0080	202.0
1-Apr-14	21.08	586.53	8.40	567	3.04	168.2	15.70	10.24	413	0.06270	0.210	0.00150	0.0140	150.0
21-May-14	26.11	581.50	10.30	670	0.49	198.4	-	7.45	565	0.09500	0.200	0.00160	0.0480	166.0
12-Aug-14	34.56	573.05	14.07	812	3.64	87.7	1519.00	7.51	560	0.00300	0.070	<0.00010	0.1370	107.0
13-Nov-14	29.48	578.13	12.90	1135	3.50	241.7	10.46	7.69	956	0.02080	<0.050	0.00010	0.0020	295.0
11-Feb-15	20.81	586.80	7.70	619	6.17	81.4	18.00	9.63	430	0.03920	0.380	0.00130	0.0110	126.0
4-May-15	29.80	577.81	10.50	924	2.54	361.3	8.70	9.74	623	0.04230	0.110	0.00050	0.0130	192.0
6-Aug-15	36.08	571.53	12.80	781	2.40	129.6	261.00	7.24	Dry	Dry	Dry	Dry	Dry	Dry
4-Nov-15	30.80	576.81	10.70	1234	4.98	205.6	11.80	7.13	1130	0.00660	0.048 J	0.00030	0.0020	318.0
10-Feb-16	23.56	584.05	6.40	602	1.62	197.7	11.90	10.19	451	0.13200	0.190	0.00140	0.0190	148.0
2-May-16	30.19	577.42	11.50	1008	0.80	110.6	9.76	10.14	751	0.17100	0.250	0.00270 J-	0.0480	232.0
23-Aug-16	35.79	571.82	13.10	729	2.00	436.2	51.40	7.20	1010	0.00401	<0.050	<0.00010	0.1820	137.0
2-Nov-16	29.06	578.55	10.90	570	4.98	103.1	32.10	7.55	1180	0.01120	0.185	0.00056	0.0050	372.0
1-Feb-17	26.86	580.75	8.10	992	2.21	99.7	7.19	9.73	632	0.10900	0.089	0.00097	0.0179	194.0
30-May-17	26.86	580.75	10.50	814	6.12	5.8	5.74	9.73	487	0.04250	0.084	0.00036 J+	0.0044	168.0
17-Aug-17	34.23	573.38	11.70	1054	5.43	125.1	5.68	7.65	731	0.00652	0.029 J	<0.00010	0.0604	156.0
10-Nov-17	29.96	577.65	10.00	1077	4.65	85.2	10.50	7.18	953	0.00582	0.069	0.00034	0.0042	308.0
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.3	0.05	0.05	-

Notes:

- Top of casing elevation (feet msl): 607.61
- Not measured or not available
- < Analyte not detected above the reporting limit shown
- \* Depth to water (DTW) measurements for all shallow/alluvial wells collected on the same day; date noted is sampling date
- Dry Well went dry during sampling. Unable to collect sample.
- a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest
- b Site background arsenic value to be determined (TBD)
- J Data validation code; estimated value
- J+ Data validation code; estimated value with positive bias
- °C Degrees Celsius
- µmhos/cm Micromhos per centimeter
- feet bmp Feet below measuring point
- feet msl Feet above mean sea level
- mg/L Milligrams per liter
- mV Millivolts
- NTU Nephelometric Turbidity Unit

**Table A-2f: Summary of Lower Disposal Area - Shallow/Alluvial Groundwater Sampling Results - Well MW-6A  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
15-Jul-05	30.89	574.46	15.26	735	-	-	303.00	7.60	612	<0.00200	<0.100	<0.00200	0.3490	-
10-Nov-05	27.25	578.10	11.79	700	-	-	13.70	7.51	460	0.00216	<0.150	<0.00100	0.4510	-
15-Feb-06	19.42	585.93	6.17	759	2.00	162.9	9.42	8.27	550 J	0.00754	<0.150	<0.00100	0.6160	-
17-May-06	27.55	577.80	11.99	835	1.31	248.3	4.16	7.46	550	0.01100	<0.150	<0.00100	0.1060	-
23-Aug-06	30.99	574.36	15.92	862	1.60	-26.4	15.50	7.40	810	0.00134	<0.150	<0.00100	0.6820	-
14-Nov-06	15.30	590.05	10.56	712	4.59	84.1	14.50	7.32	500	0.00171	<0.150	<0.00100	0.0163	-
16-Feb-07	24.22	581.13	8.49	581	3.64	38.6	139.00	7.21	420	0.00160	<0.150 UJ	<0.00100	0.1710 J	-
30-May-07	28.50	576.85	13.93	1092	2.72	180.7	210.00	7.40	740	0.01620	<0.150	<0.00100	0.1570	-
29-Aug-07	31.34	574.01	10.15	701	4.48	84.8	662.00	7.80	620 J	0.00141	<0.150	<0.00100	0.3520	-
29-Nov-07	28.32	577.03	11.30	731	6.23	154.0	-	6.26	420	0.00178	<0.150	<0.00100	0.1760	-
27-Feb-08	23.42	581.93	-	-	-	-	-	-	410	0.00147	<0.150	<0.00100	0.0220	-
20-May-08	27.49	577.86	8.14	791	3.93	176.5	-	7.64	540 J	0.00818	0.170	<0.00100	0.0410	-
27-Aug-08	31.72	573.63	9.33	776	4.83	142.0	-	7.32	660 J	0.00186	<0.150	<0.00100	0.2660	109.0
26-Sep-08	Test Trench Drain Line Installed													
16-Oct-08	31.29	574.06	9.17	923	4.60	115.4	-	7.13	590 J	0.00185	<0.150	<0.00100	0.0910	106.0
20-Nov-08	21.18	584.17	9.70	578	5.22	249.4	11.70	7.40	460	0.00442	<0.150	<0.00200	0.0202	110.0
30-Dec-08	18.64	586.71	8.45	448	9.27	137.9	75.80	7.89	370 J	0.01190	0.209	0.00114	0.0267	106.0
15-Jan-09	16.23	589.12	6.84	344	9.25	181.9	2.77	7.47	320	0.00488	<0.150	<0.00100	<0.0100	72.9
12-Feb-09	25.64	579.71	7.89	-	10.82	-	71.70	7.70	420	0.01100	0.177	<0.00100	<0.0100	103.0
12-Mar-09	26.92	578.43	7.27	524	8.31	166.7	116.00	7.76	500	0.02350	0.244	<0.00100	0.0167	125.0
16-Apr-09	19.46	585.89	7.33	406	7.57	182.8	91.80	8.33	430	0.02410	0.154	0.00109	0.0244	101.0
19-May-09	26.10	579.25	9.07	554	6.39	65.6	161.00	8.32	550 J	0.01340	<0.150	<0.00100	<0.0100	115.0
23-Jun-09	29.67	575.68	9.51	522	6.05	71.4	-	8.17	540	0.00310	<0.200	<0.00200	0.0630	74.0
25-Aug-09	32.72	572.63	14.80	795	3.25	282.7	22.00	7.28	630 J	0.00075 J	<0.200	<0.00200	0.0330	100.0
24-Sep-09	32.93	572.42	10.60	745	4.02	361.3	29.80	7.27	560 J	0.00028 J	<0.200	<0.00200	0.0068 J	100.0
15-Dec-09	23.87	581.48	9.50	815	4.20	556.0	20.00	7.15	450	<0.00200	<0.200	<0.00200	0.0030 J	120.0
24-Mar-10	25.61	579.74	8.50	704	4.93	205.6	20.50	8.53	490	0.04700	0.370	0.00090 J	<0.0200 U	140.0
16-Jun-10	19.11	586.24	10.40	553	4.79	399.8	13.40	7.22	310	0.01600	0.100 J	<0.00200	0.0036 J	90.0
22-Sep-10	31.61	573.74	11.30	1019	3.89	413.8	20.30	7.10	770	0.00620	<0.200	0.00024 J	<0.0200	130.0
8-Dec-10	23.10	582.25	87.90	751	6.24	437.1	9.55	8.77	520	0.04300	0.220	0.00130 J	0.0100 J	130.0
29-Mar-11	21.32	584.03	7.10	303	4.76	809.4	13.40	9.35	350 J	0.04300	0.400 J+	0.00055 J	0.0110 J	110.0
21-Jun-11	26.04	579.31	11.20	840	3.24	300.2	8.50	8.40	790	0.01800	0.160 J	0.00058 J	0.0092 J	110.0
28-Sep-11	32.43	572.92	10.90	67	3.92	415.6	8.32	7.30	590	<0.00500	0.040 J	0.00019 J	0.0025 J	110.0
14-Dec-11	27.19	578.16	9.00	605	1.56	329.9	21.90	7.89	570	0.01100	0.280	0.00079 J	0.0085 J	150.0
20-Mar-12	17.23	588.12	6.70	639	5.03	362.5	59.90	7.79	200	0.01700	0.091 J	<0.00200	<0.0200	79.0

**Table A-2f: Summary of Lower Disposal Area - Shallow/Alluvial Groundwater Sampling Results - Well MW-6A Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
19-Jun-12	25.63	579.72	9.60	681	5.24	373.2	5.94	7.43	430	0.00740	<0.200	<0.00040	<0.0200	76.0
19-Sep-12	32.12	573.23	11.70	786	3.49	290.0	7.36	7.38	460	0.00570	<0.200	<0.00040	<0.0200	81.0
19-Dec-12	19.00	586.35	8.90	977	4.55	308.0	26.90	7.98	440	0.02000	0.490	0.00130	0.0120 J	150.0
25-Feb-13	24.93	580.42	7.10	766	7.59	306.9	6.18	8.20	450	0.03400	0.190 J	0.00073	0.0120 J	120.0
22-May-13	26.84	578.51	9.10	705	3.94	412.9	5.97	9.33	430	0.04300	0.150 J	0.00052	0.0054 J	140.0
21-Aug-13	32.84	572.51	11.20	879	4.54	110.2	8.28	8.28	548	0.00950	<0.050	<0.00010	0.0040	106.0
20-Nov-13	25.21	580.14	11.10	1264	4.69	201.4	30.80	7.55	640	0.02490	0.140	0.00190	0.0130	163.0
1-Apr-14	18.81	586.54	8.40	448	3.50	194.9	14.70	8.87	342	0.01480	0.060	0.00030	0.0040 J+	78.4
21-May-14	23.84	581.51	10.60	122	1.32	199.3	-	8.46	352	0.01800	<0.050	0.00020	0.0330	80.4
13-Aug-14	32.25	573.10	12.46	796	5.77	54.0	8.01	8.68	628	0.01610	<0.050	<0.00010	0.0040	165.0
13-Nov-14	27.21	578.14	13.30	837	4.02	234.3	11.40	8.63	711	0.04410	0.090	0.00040	0.0030	203.0
11-Feb-15	18.54	586.81	8.40	609	1.75	16.0	87.40	9.71	435	0.03620	0.420	0.00100	0.0120	117.0
4-May-15	27.52	577.83	9.90	974	3.27	356.5	12.30	10.14	654	0.04160	0.100	0.00050	0.0070	199.0
6-Aug-15	33.98	571.37	11.70	822	1.77	113.7	4.02	8.83	670	0.01910	<0.050	<0.00010	0.0020	210.0
4-Nov-15	28.51	576.84	11.70	1207	4.85	206.3	21.20	7.48	1090	0.00770	0.100	0.00100	0.0060	370.0
10-Feb-16	20.96	584.39	6.90	712	2.30	145.8	20.10	10.82	575	0.12100	0.190	0.00110	0.0290	173.0
2-May-16	28.91	576.44	10.60	1856	0.19	111.2	15.60	11.53	1010	0.19900	0.220	0.00250 J-	0.0250	347.0
23-Aug-16	33.58	571.77	11.40	1241	0.43	462.0	8.89	9.51	1150	0.03890	0.084	0.00034	0.0049	349.0
2-Nov-16	26.92	578.43	11.60	409	5.05	14.4	40.60	9.15	911	0.02560	0.448	0.00149	0.0133	297.0
1-Feb-17	24.61	580.74	6.20	1757	2.34	72.1	11.70	11.97	880	0.14100	0.037 J	0.00034	0.0026	283.0
30-May-17	24.56	580.79	10.80	1026	2.45	5.7	16.90	10.50	629	0.07280	0.081	0.00052 J+	0.0064	210.0
17-Aug-17	32.04	573.31	13.10	1019	3.94	87.3	42.70	9.36	726	0.02030	0.048 J	0.00015	0.0083	219.0
10-Nov-17	27.72	577.63	11.60	1090	4.17	109.6	38.20	9.12	931	0.02430	0.251	0.00277	0.0161	356.0
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.3	0.05	0.05	-

Notes:

Top of casing elevation (feet msl): 605.35

- Not measured or not available

< Analyte not detected above the reporting limit shown

\* Depth to water (DTW) measurements for all shallow/alluvial wells collected on the same day; date noted is sampling date

a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest

b Site background arsenic value to be determined (TBD)

J Data validation code; estimated value

J+ Data validation code; estimated value with positive bias

°C Degrees Celsius

U Data validation code; not detected at the Reporting Limit (RL)

µmhos/cm Micromhos per centimeter

feet bmp Feet below measuring point

feet msl Feet above mean sea level

mg/L Milligrams per liter

mV Millivolts

NTU Nephelometric Turbidity Unit

**APPENDIX A-3**  
**SUMMARY OF LOWER DISPOSAL AREA – BEDROCK GROUNDWATER SAMPLING**  
**RESULTS**

**TABLE A-3A WELL MWB-1LDA**  
**TABLE A-3B WELL MWB-2LDA**  
**TABLE A-3C WELL MWB-3LDA**

**Table A-3a: Summary of Lower Disposal Area - Bedrock Groundwater Sampling Results - Well MWB-1LDA  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters									Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water* (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)		Arsenic	Iron	Lead	Manganese	Potassium
19-Dec-06	26.51	674.57	10.96	546	0.43	-115.4	1.05	7.70	310	0.15100	<0.150	<0.00100	0.0377	-	
14-Feb-07	26.08	675.00	10.62	397	1.02	-90.8	3.07	7.53	240	0.16000	0.208	<0.00100	0.0463	-	
31-May-07	25.96	675.12	10.83	386	0.36	-172.8	4.20	8.20	220	0.12200	0.183	<0.00100	0.0442	-	
27-Aug-07	25.66	675.42	10.97	372	0.76	-128.2	1.08	7.51	240	0.08990	0.166	<0.00100	0.0466	-	
28-Nov-07	26.81	674.27	10.56	371	0.42	-121.2	1.29	8.03	220	0.08830	<0.150	<0.00100	0.0547	-	
27-Feb-08	25.80	675.28	10.62	371	2.01	-	1.07	-	230	0.08090	0.159	<0.00100	0.0553	<3.0	
20-May-08	25.62	675.46	10.61	391	0.36	-53.0	1.11	7.28	230	0.06430	0.162	<0.00100	0.0521	-	
27-Aug-08	26.14	674.94	10.58	394	0.50	-63.9	1.02	7.35	230 J	0.06400	0.170	<0.00100	0.0482	<3.0	
19-Nov-08	25.16	675.92	10.33	269	0.45	-88.6	0.48	7.51	230	0.05960	0.166	<0.00100	0.0536	<3.0	
11-Feb-09	25.08	676.00	10.04	268	0.48	-	0.97	7.89	230	0.05600	0.182	<0.00100	0.0519	<3.0	
18-May-09	24.83	676.25	10.10	271	0.42	-50.5	1.81	8.05	230 J	0.04660	<0.150	<0.00100	0.0500	<3.0	
24-Sep-09	26.32	674.76	11.80	323	0.24	202.0	3.59	7.57	260	0.02700	0.080 J	<0.00200	0.0650	1.1 J	
17-Dec-09	25.06	676.02	10.10	370	0.94	179.0	4.16	7.77	<40	0.03400	0.052 J	<0.00200	0.0700	1.2 J	
23-Mar-10	24.83	676.25	10.90	344	0.21	397.4	3.17	7.57	240	0.02500	0.058 J	<0.00200	0.0660	1.3 J	
15-Jun-10	24.38	676.70	10.50	355	0.08	195.5	0.42	7.66	150	0.02700	0.083 J	<0.00200	0.0590	1.1 J	
20-Sep-10	25.74	675.34	10.50	354	0.06	192.9	0.20	7.65	200	0.02200	<0.200	<0.00200	0.0660 J+	1.1 J	
6-Dec-10	24.59	676.49	10.00	347	0.09	99.3	0.17	7.86	230	0.02200	<0.200	<0.00200	0.0510	1.0 J	
28-Mar-11	24.01	677.07	10.00	173	0.16	90.6	0.88	7.58	200	0.02200	<0.200	<0.00200	0.0500	1.0 J	
20-Jun-11	24.11	676.97	10.30	330	0.07	121.5	0.17	7.65	250	0.02200	0.110 J	<0.00200	0.0510	0.9 J	
26-Sep-11	25.39	675.69	10.40	2906	0.06	123.6	0.43	7.65	280	0.01500	0.130 J	<0.00200	0.0560	1.1 J	
14-Dec-11	24.61	676.47	9.90	245	0.10	193.8	1.76	7.57	230	0.02100	0.110 J	<0.00200	0.0540	1.2 J	
21-Mar-12	23.70	677.38	10.10	392	0.07	392.0	0.22	7.47	240	0.02300	0.110 J	<0.00200	0.0480	1.1 J	
18-Jun-12	23.90	677.18	10.50	383	0.02	342.8	0.30	7.67	230	0.02000	<0.200	<0.00040	0.0510	<3.3	
19-Sep-12	25.38	675.70	10.30	402	0.01	151.0	0.44	7.63	220	0.01900	0.110 J	<0.00040	0.0550	1.0 J	
18-Dec-12	23.59	677.49	10.10	492	0.00	-45.7	0.16	7.70	92	0.01700	0.120 J	<0.00040	0.0490	1.2 J	
25-Feb-13	23.73	677.35	9.90	377	0.00	177.1	0.37	7.53	270 J	0.01900	0.140 J	<0.00040	0.0450	1.0 J	
22-May-13	23.85	677.23	9.90	398	0.00	430.4	0.44	7.73	290	0.01700	0.130 J	<0.00040	0.0460	<3.3	
21-Aug-13	25.34	675.74	10.40	467	0.01	-31.7	0.55	7.68	238	0.01680	0.140	0.00008 J	0.0480	1.1	
19-Nov-13	24.25	676.83	10.10	361	0.00	70.3	0.32	7.30	232	0.01570	0.160	<0.00010	0.0500	1.0	
31-Mar-14	22.36	678.72	10.70	286	0.01	107.4	0.21	7.79	211	0.01380	0.160	<0.00010	0.0490	1.0	
21-May-14	23.29	677.79	8.54	271	1.35	54.3	-	7.14	198	0.01310	0.160	<0.00010	0.0460	1.0	
12-Aug-14	24.87	676.21	14.79	335	0.41	-16.0	2.02	7.05	216	0.01190	0.140	<0.00010	0.0450	1.0	
11-Nov-14	24.96	676.12	10.10	262	0.79	11.1	1.51	7.49	221	0.01360	0.160	<0.00010	0.0450	1.1	
10-Feb-15	23.23	677.85	10.40	319	0.25	-114.0	0.36	7.70	240	0.01330	0.160	<0.00010	0.0450	1.0	
4-May-15	23.62	677.46	10.20	370	0.05	175.1	0.16	7.70	224	0.01170	0.180	<0.00010	0.0480	1.0	

**Table A-3a: Summary of Lower Disposal Area - Bedrock Groundwater Sampling Results - Well MWB-1LDA Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters									Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water* (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)		Arsenic	Iron	Lead	Manganese	Potassium
4-Aug-15	25.30	675.78	11.00	279	0.06	-30.5	0.72	7.72	234	0.01440	0.180	<0.00010	0.0460	1.0	
4-Nov-15	25.35	675.73	10.60	263	0.00	51.2	0.46	7.46	233	0.01100	0.170	<0.00010	0.0450	1.2	
8-Feb-16	23.03	678.05	10.20	319	0.03	206.5	0.20	7.77	210	0.01210	0.190	<0.00010	0.0480	1.1	
2-May-16	23.49	677.59	Monitored Semi-Annually <sup>1</sup>						Monitored Annually <sup>1</sup>						
22-Aug-16	25.00	676.08	11.10	323	0.02	-55.2	1.10	7.64	Monitored Annually <sup>1</sup>						
1-Nov-16	24.29	676.79	Monitored Semi-Annually <sup>1</sup>						Monitored Annually <sup>1</sup>						
31-Jan-17	23.06	678.02	10.20	391	0.05	169.3	0.13	7.66	223	0.01190	0.177	<0.00010	0.0418	1.0	
30-May-17	22.45	678.63	Monitored Semi-Annually <sup>1</sup>						Monitored Annually <sup>1</sup>						
16-Aug-17	24.27	676.81	10.70	385	0.15	123.4	0.40	7.64	Monitored Annually <sup>1</sup>						
9-Nov-17	23.96	677.12	Monitored Semi-Annually <sup>1</sup>						Monitored Annually <sup>1</sup>						
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.3	0.05	0.05	-	

Note:

Top of casing elevation (feet msl): 701.08

1 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated April 7, 2016. Field parameters collected semi-annually, analytical samples collected annually.

- Not available

< Analyte not detected above the reporting limit shown

\* Depth to water (DTW) measurements for all bedrock LDA wells collected on the same day; date noted is sampling date

a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest

b Site background arsenic value to be determined (TBD)

J Data validation code; estimated value

J+ Data validation code; estimated value with positive bias

°C Degrees Celsius

µmhos/cm Micromhos per centimeter

feet bmp Feet below measuring point

feet msl Feet above mean sea level

mg/L Milligrams per liter

mV Millivolts

NTU Nephelometric Turbidity Unit

**Table A-3b: Summary of Lower Disposal Area - Bedrock Groundwater Sampling Results - Well MWB-2LDA  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water* (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Iron	Lead	Manganese
19-Dec-06	36.82	701.24	12.15	394	0.57	114.6	1.84	7.58	230	0.00849	<0.150	<0.00100	0.0242	-
14-Feb-07	36.30	701.76	11.69	339	1.40	-85.7	2.72	7.39	200	0.00609	0.232	<0.00100	0.0266	-
31-May-07	36.93	701.13	12.13	346	0.20	-223.7	3.04	8.28	210	0.00695	0.255	<0.00100	0.0297	-
27-Aug-07	37.99	700.07	12.18	336	0.49	-169.7	0.84	7.54	210	0.00749	0.262	<0.00100	0.0313	-
28-Nov-07	37.89	700.17	11.82	338	0.28	-146.6	1.32	7.93	250	0.00691	0.259	<0.00100	0.0320	-
27-Feb-08	37.24	700.82	11.87	340	0.23	-	0.87	7.41	210	0.00746	0.254	<0.00100	0.0309	<3.0
20-May-08	37.31	700.75	11.91	359	0.23	-86.6	0.67	7.27	200	0.00631	0.315	<0.00100	0.0267	-
27-Aug-08	38.37	699.69	11.84	362	0.35	-77.6	0.70	7.21	210 J	0.00636	0.279	<0.00100	0.0231	<3.0
19-Nov-08	37.50	700.56	11.53	254	0.44	-105.9	2.08	7.45	200	0.00586	0.279	<0.00100	0.0231	<3.0
11-Feb-09	37.10	700.96	11.25	254	0.48	-	0.63	7.91	220	0.00561	0.290	<0.00100	0.0238	<3.0
18-May-09	37.00	701.06	11.42	258	0.42	-71.9	1.11	8.00	210 J	0.00517	<0.150	<0.00100	0.0208	<3.0
25-Sep-09	38.88	699.18	13.10	297	0.14	140.7	3.09	7.54	230	0.00650	0.250	<0.00200	0.0290	1.2 J
17-Dec-09	37.19	700.87	10.80	341	0.51	129.0	4.85	7.71	74	0.00430	0.250	<0.00200	0.0290	1.1 J
23-Mar-10	36.60	701.46	12.60	323	0.27	355.0	5.28	7.54	110	0.00760	0.220	<0.00200	0.0290	1.2 J
15-Jun-10	36.25	701.81	11.40	326	0.08	171.1	-	7.62	98	0.00880	0.310	<0.00200	0.0230	1.1 J
20-Sep-10	37.85	700.21	11.60	324	0.08	144.0	0.16	7.61	160	0.00650	0.310 J+	<0.00200	0.0280 J+	1.2 J
6-Dec-10	36.60	701.46	11.00	319	0.21	78.3	0.20	7.81	210	0.00290	0.180 J	<0.00200	0.0200	0.9 J
29-Mar-11	35.98	702.08	11.20	156	0.15	215.0	0.75	7.48	200	0.00560	0.320 J+	<0.00200	0.0200	1.5 J
21-Jun-11	36.34	701.72	11.80	352	0.06	101.5	0.24	7.59	220	<0.00500	0.270	<0.00200	0.0280	1.0 J
27-Sep-11	38.14	699.92	11.50	2484	0.06	114.4	0.45	7.60	220	<0.00500	0.290	<0.00200	0.0220	1.0 J
14-Dec-11	36.91	701.15	11.00	228	0.05	127.2	4.04	7.54	190	0.00670	0.280	<0.00200	0.0210	1.2 J
21-Mar-12	35.68	702.38	11.00	359	0.05	93.9	0.30	7.43	210	0.00690	0.270	<0.00200	0.0170 J	1.1 J
18-Jun-12	36.06	702.00	11.70	350	0.02	211.9	0.23	7.62	220	0.00620	0.350 J+	<0.00040	0.0170 J	<3.3
19-Sep-12	38.07	699.99	11.60	367	0.00	102.0	0.34	7.59	200	0.00650	0.290	<0.00040	0.0220	1.0 J
18-Dec-12	34.88	703.18	10.90	463	0.00	-97.8	0.17	7.81	68	0.00600	0.280	<0.00040	0.0170 J	1.2 J
25-Feb-13	35.70	702.36	10.90	347	0.09	112.6	0.27	7.56	190	0.00660	0.270 J	<0.00040	0.0180 J	1.1 J
22-May-13	36.24	701.82	11.00	412	0.00	412.5	0.43	7.71	190	0.00600	0.280 J	<0.00040	0.0170 J	<3.3
20-Aug-13	38.13	699.93	12.20	406	0.02	-41.5	0.64	7.48	211	0.00550	0.290	<0.00010	0.0220	1.0
19-Nov-13	36.56	701.50	11.10	344	0.01	43.6	0.32	7.35	206	0.00520	0.310	<0.00010	0.0190	1.1
31-Mar-14	35.36	702.70	11.50	285	0.00	93.1	0.31	7.71	207	0.00510	0.320	<0.00010	0.0200	1.1
22-May-14	35.80	702.26	10.05	260	0.24	17.5	-	7.22	186	0.00500	0.310	<0.00010	0.0190	1.0
13-Aug-14	37.50	700.56	13.10	294	0.57	-37.5	3.28	7.19	190	0.00540	0.400	0.00210 J	0.0280	1.1
11-Nov-14	37.06	701.00	10.10	241	0.68	-39.7	2.10	7.48	206	0.00540	0.320	<0.00010	0.0180	1.1
10-Feb-15	35.70	702.36	11.40	295	0.11	-123.2	2.11	7.69	206	0.00510	0.310	<0.00010	0.0190	1.0
4-May-15	36.34	701.72	11.70	336	0.05	340.2	0.72	7.73	204	0.00480	0.310	<0.00010	0.0200	1.0

**Table A-3b: Summary of Lower Disposal Area - Bedrock Groundwater Sampling Results - Well MWB-2LDA Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters									Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water* (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)		Arsenic	Iron	Lead	Manganese	Potassium
4-Aug-15	38.42	699.64	12.70	263	0.04	-81.8	0.77	7.72	204	0.00580	0.330	<0.00010	0.0200	1.0	
4-Nov-15	37.81	700.25	11.60	244	0.04	26.9	2.13	7.45	201	0.00470	0.320	<0.00010	0.0180	1.1	
8-Feb-16	35.68	702.38	11.60	307	0.00	208.4	0.74	7.68	186	0.00550	0.330	<0.00010	0.0220	1.1	
2-May-16	36.03	702.03	Monitored Semi-Annually <sup>1</sup>						Monitored Annually <sup>1</sup>						
22-Aug-16	37.92	700.14	12.20	306	0.02	-137.6	1.58	7.67	Monitored Annually <sup>1</sup>						
1-Nov-16	37.07	700.99	Monitored Semi-Annually <sup>1</sup>						Monitored Annually <sup>1</sup>						
31-Jan-17	36.00	702.06	10.90	348	0.10	120.5	0.86	7.67	195	0.00566	0.306	<0.00010	0.0168	1.1	
30-May-17	35.44	702.62	Monitored Semi-Annually <sup>1</sup>						Monitored Annually <sup>1</sup>						
16-Aug-17	37.69	700.37	12.30	356	0.14	-77.2	3.27	7.67	Monitored Annually <sup>1</sup>						
9-Nov-17	37.11	700.95	Monitored Semi-Annually <sup>1</sup>						Monitored Annually <sup>1</sup>						
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.3	0.05	0.05	-	

Note:

Top of casing elevation (feet msl): 738.06

1 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated April 7, 2016. Field parameters collected semi-annually, analytical samples collected annually.

- Not available

< Analyte not detected above the reporting limit shown

\* Depth to water (DTW) measurements for all bedrock LDA wells collected on the same day; date noted is sampling date

a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest

b Site background arsenic value to be determined (TBD)

J Data validation code; estimated value

J+ Data validation code; estimated value with positive bias

°C Degrees Celsius

µmhos/cm Micromhos per centimeter

feet bmp Feet below measuring point

feet msl Feet above mean sea level

mg/L Milligrams per liter

mV Millivolts

NTU Nephelometric Turbidity Unit

**Table A-3c: Summary of Lower Disposal Area - Bedrock Groundwater Sampling Results - Well MWB-3LDA  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters									Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water* (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)		Arsenic	Iron	Lead	Manganese	Potassium
19-Dec-06	7.08	733.51	11.37	670	0.42	-171.2	1.20	9.23	500	0.02570	0.173	<0.00100	0.0476	-	
23-Jan-07	5.62	734.97	13.07	383	0.51	-275.0	1.53	8.63	270	0.01840	0.450	<0.00100	0.0787	-	
14-Feb-07	5.81	734.78	12.57	328	1.09	-158.2	115.00	7.86	310	0.01510	<0.150	<0.00100	0.0718	-	
29-Mar-07	4.78	735.81	12.44	458	0.57	-140.8	4.25	7.78	260 J	0.03790	0.261	<0.00100	0.0601	-	
17-Apr-07	4.86	735.73	12.79	389	0.27	-102.4	1.22	7.46	240	0.02300	0.451	<0.00100	0.0900	-	
31-May-07	6.39	734.20	12.98	394	0.29	-223.8	3.32	8.14	240	0.02120	0.443	<0.00100	0.0998	-	
20-Jun-07	6.86	733.73	13.41	412	6.10	-128.5	1.35	8.02	230 J	0.02380	0.274	<0.00100	0.0898	-	
31-Jul-07	7.96	732.63	13.47	417	0.77	-174.1	0.92	7.64	250	0.01890	0.609	<0.00100	0.1190	-	
27-Aug-07	8.50	732.09	12.84	395	0.46	-132.4	1.97	7.43	250	0.01760	0.315	<0.00100	0.1040	-	
27-Sep-07	9.58	731.01	12.68	294	0.51	-133.8	0.53	7.87	250	0.01930	0.451	<0.00100	0.1170	-	
26-Oct-07	9.65	730.94	12.49	288	0.84	-111.9	9.83	7.60	240 J	0.01100	0.949	<0.00100	0.1970	-	
28-Nov-07	10.23	730.36	11.95	362	0.64	-86.1	1.58	7.87	200	0.01780	0.315	<0.00100	0.0819	-	
12-Dec-07	9.66	730.93	11.83	334	0.26	-93.2	0.63	7.63	280 J	0.01740	0.458	<0.00100	0.0953	-	
24-Jan-08	8.20	732.39	11.09	335	0.44	-108.3	-	7.46	220	0.01920	0.456	<0.00100	0.0861	-	
26-Feb-08	7.61	732.98	12.26	337	0.48	-	2.40	7.45	210	0.02200	0.448	<0.00100	0.0916	<3.0	
25-Mar-08	7.22	733.37	11.94	337	1.01	-48.6	2.80	7.51	210	0.01780	0.296	<0.00100	0.0789	-	
29-Apr-08	6.75	733.84	12.53	332	0.77	-50.3	1.95	7.41	200 J	0.01820	0.449	<0.00100	0.0826	-	
19-May-08	7.17	733.42	12.37	336	0.57	-57.2	2.19	7.34	200 J	0.01870	0.373	<0.00100	0.0758	-	
18-Jun-08	7.26	733.33	12.11	323	0.48	-64.1	0.83	7.13	190 J	0.01950	0.461	<0.00100	0.0896	-	
26-Aug-08	8.78	731.81	12.31	329	1.16	-36.5	2.89	7.30	200 J	0.01770	0.298	<0.00100	0.0532	<3.0	
19-Nov-08	9.03	731.56	11.91	243	0.52	-93.1	1.69	7.40	190	0.01820	0.394	<0.00100	0.0690	<3.0	
11-Feb-09	7.07	733.52	11.74	227	0.65	-	1.03	7.76	180	0.01770	0.582	<0.00100	0.1020	<3.0	
18-May-09	6.50	734.09	12.11	225	0.67	-63.9	1.51	7.83	190 J	0.01290	<0.150	<0.00100	0.0886	<3.0	
25-Sep-09	10.47	730.12	13.50	260.1	0.36	215.3	4.14	7.61	220	0.01700	0.260	0.00094 J	0.0440	12.0	
17-Dec-09	8.39	732.20	11.50	301.0	0.44	110.0	3.10	7.71	270	0.02300	0.610	<0.00200	0.0970	1.3 J	
23-Mar-10	6.46	734.13	12.20	294.8	0.43	332.5	3.52	7.57	150 J	0.02700	0.380	<0.00200	0.0760	1.3 J	
16-Jun-10	5.34	735.25	11.10	281.7	0.05	117.0	-	7.71	160	0.02700	0.490	<0.00200	0.0760	1.3 J	
21-Sep-10	7.72	732.87	11.80	276.3	0.06	169.5	0.36	7.54	140	0.02300	0.600 J+	<0.00200	0.0910 J+	1.3 J	
7-Dec-10	6.48	734.11	11.00	263.0	0.15	77.2	0.38	7.58	180	0.02000	0.360	<0.00200	0.0680	1.2 J	
28-Mar-11	4.42	736.17	10.80	134.0	0.44	75.6	1.06	7.46	160 J	0.02100	0.610 J+	<0.00200	0.0720	1.7 J	
20-Jun-11	4.76	735.83	12.10	252.7	0.07	68.4	0.13	7.48	200 J	0.01600	0.650	<0.00200	0.08900	1.0 J	
27-Sep-11	7.86	732.73	11.90	2064.0	0.04	102.6	0.37	7.48	170	0.01800	0.620	<0.00200	0.08300	1.1 J	
14-Dec-11	7.17	733.42	11.00	188.2	0.03	140.8	1.87	7.50	770	0.02200	0.310	<0.00200	0.05600	1.3 J	
21-Mar-12	4.68	735.91	10.70	297.8	0.07	130.6	0.41	7.39	170	0.02100	0.360	<0.00200	0.04600	1.1 J	
18-Jun-12	4.75	735.84	11.60	289.0	0.16	271.3	0.55	7.54	150 J+	0.01900	0.440 J+	<0.00040	0.05300	<3.3	

**Table A-3c: Summary of Lower Disposal Area - Bedrock Groundwater Sampling Results - Well MWB-3LDA Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters									Gen. Chem.	Dissolved Metals (mg/L)				
	Depth to Water* (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)		Arsenic	Iron	Lead	Manganese	Potassium
19-Sep-12	7.65	732.94	12.60	299.9	0.10	121.0	0.42	7.50	160	0.01800	0.370	<0.00040	0.05500	1.1 J	
18-Dec-12	5.58	735.01	10.90	384.0	0.03	15.6	1.39	7.50	200	0.01900	0.150 J	<0.00040	0.04100	1.3 J	
25-Feb-13	4.80	735.79	10.60	284.2	0.03	140.4	0.30	7.53	150	0.02200	0.390 J	<0.00040	0.05400	1.2 J	
22-May-13	4.81	735.78	11.00	294.9	0.14	387.7	0.52	7.61	160	0.01800	0.420 J	<0.00040	0.05800	<3.3	
20-Aug-13	7.63	732.96	12.60	383.0	0.81	-8.4	0.80	7.26	164	0.01670	0.350	<0.00010	0.05200	1.1	
19-Nov-13	7.11	733.48	11.30	218.1	0.14	54.3	0.73	7.20	169	0.01660	0.290	<0.00010	0.05200	1.1	
1-Apr-14	4.08	736.51	10.70	222.6	0.15	158.5	1.12	7.50	168	0.01330	0.480	<0.00010	0.07300	1.1	
22-May-14	4.21	736.38	9.98	206.0	1.59	27.1	-	7.17	158	0.01120	0.150	<0.00010	0.06500	1.0	
13-Aug-14	6.95	733.64	13.50	237.0	1.14	9.8	4.70	6.92	154	0.01050	0.160	<0.00010	0.07900	1.0	
12-Nov-14	6.04	734.55	8.40	185.1	0.28	-10.1	3.42	7.36	162	0.01610	0.440	<0.00010	0.09300	1.1	
11-Feb-15	4.62	735.97	11.50	205.1	1.20	68.1	1.32	7.41	169	0.00900	<0.050	<0.00010	0.07900	1.1	
4-May-15	4.93	735.66	12.20	262.0	1.64	190.2	0.84	7.43	168	0.01090	0.640	<0.00010	0.12400	1.0	
4-Aug-15	7.44	733.15	13.20	211.3	1.62	81.9	2.02	7.39	173	0.00680	0.043 J	<0.00010	0.05100	1.0	
5-Nov-15	8.14	732.45	12.50	186.0	1.49	166.9	1.87	7.10	162	0.00350	0.017 J	<0.00010	0.08600	1.0	
8-Feb-16	3.20	737.39	11.70	240.5	2.13	196.9	0.88	7.23	150	0.01120	1.060	<0.00010	0.13300	1.0	
2-May-16	3.77	736.82	Monitored Semi-Annually <sup>1</sup>							Monitored Annually <sup>1</sup>					
22-Aug-16	6.81	733.78	13.10	238.0	2.40	168.5	2.39	7.41	Monitored Annually <sup>1</sup>						
1-Nov-16	6.59	734.00	Monitored Semi-Annually <sup>1</sup>							Monitored Annually <sup>1</sup>					
31-Jan-17	4.02	736.57	11.30	265.8	2.79	218.2	1.39	7.34	154	0.00323	0.008 J	<0.00010	0.02720	1.0	
30-May-17	2.32	738.27	Monitored Semi-Annually <sup>1</sup>							Monitored Annually <sup>1</sup>					
16-Aug-17	5.48	735.11	13.20	258.4	3.54	92.2	2.50	7.41	Monitored Annually <sup>1</sup>						
9-Nov-17	6.00	734.59	Monitored Semi-Annually <sup>1</sup>							Monitored Annually <sup>1</sup>					
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.3	0.05	0.05	-	

Note:

Top of casing elevation (feet msl): 740.59

1 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated April 7, 2016. Field parameters collected semi-annually, analytical samples collected annually.

- Not available

< Analyte not detected above the reporting limit shown

\* Depth to water (DTW) measurements for all bedrock LDA wells collected on the same day; date noted is sampling date

a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest

b Site background arsenic value to be determined (TBD)

J Data validation code; estimated value

J+ Data validation code; estimated value with positive bias

°C Degrees Celsius

µmhos/cm Micromhos per centimeter

feet bnp Feet below measuring point

feet msl Feet above mean sea level

mg/L Milligrams per liter

mV Millivolts

NTU Nephelometric Turbidity Unit

**APPENDIX A-4**  
**SUMMARY OF DALE STRIP PIT – BEDROCK GROUNDWATER SAMPLING RESULTS**

**TABLE A-4A WELL MWB-1SDSP**  
**TABLE A-4B WELL MWB-1DDSP**  
**TABLE A-4C WELL MWB-5DSP**  
**TABLE A-4D WELL MWB-6DSP**  
**TABLE A-4E PORTAL**  
**TABLE A-4F WELL MWB-2DSP**  
**TABLE A-4G WELL MWB-4SDSP**

**Table A-4a: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Well MWB-1SDSP Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)		
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	Arsenic	Lead	Potassium
2-Dec-02	69.87	862.82	9.5	1690	-	-	-	7.29	910	0.04660	0.00268	-
3-Mar-03	36.83	895.86	11.5	1260	-	-	24.10	7.15	860	0.00973	-	-
3-May-03	34.88	897.81	12.8	1520	-	-	38.00	7.09	950	-	-	-
3-Aug-03	52.02	880.67	19.19	1460	-	-	11.40	7.01	990	-	-	-
1-Nov-03	53.61	879.08	11.60	915	-	-	8.97	7.19	1010	0.00858	0.00070	-
1-Feb-04	32.75	899.94	11.52	1033	-	-	7.36	6.78	1060	-	-	-
1-May-04	42.50	890.19	14.87	1126	-	-	7.53	7.23	1020	-	-	-
1-Aug-04	49.26	883.43	13.72	1234	-	-	8.07	6.98	981	-	-	-
1-Nov-04	42.81	889.88	11.88	1429	-	-	9.06	6.92	1060	0.01000	<0.00100	-
1-Feb-05	33.62	899.07	13.06	1615	-	-	7.11	7.01	1020	-	-	-
1-May-05	34.88	897.81	12.91	1459	-	-	6.54	6.85	1000	-	-	-
1-Aug-05	43.80	888.89	10.40	1472	-	-	10.40	6.80	1090	-	-	-
1-Nov-05	52.80	879.89	10.40	1458	-	-	6.02	6.64	1100	0.01030	<0.00100	-
1-Feb-06	42.70	889.99	10.40	1343	1.10	48.3	11.10	7.08	1100 J	-	-	-
1-May-06	37.81	894.88	11.52	1686	1.64	49.2	10.50	6.83	1100	-	-	-
1-Aug-06	46.11	886.58	14.10	1357	2.33	43.0	10.70	7.11	1100	-	-	-
1-Nov-06	46.47	886.22	-	-	-	-	-	-	-	-	-	-
28-Dec-06	33.20	899.49	-	-	-	-	-	-	-	-	-	-
7-Feb-07	34.50	898.19	-	-	-	-	-	-	-	-	-	-
7-May-07	36.48	896.21	15.19	1484	0.52	-83.4	6.78	7.60	1100	-	-	-
7-Aug-07	47.57	885.12	11.21	1488	8.80	107.4	9.53	6.51	1200	-	-	-
27-Nov-07	51.25	881.44	13.60	1483	1.82	-129.5	434.00	7.11	1000 J	0.00572	<0.00100	-
8-Feb-08	35.12	897.57	14.71	1489	3.11	-	10.20	6.97	1100	-	-	-
8-May-08	37.60	895.09	14.50	1594	3.99	112.5	4.71	6.90	1200 J	-	-	-
8-Aug-08	46.98	885.71	13.27	1617	2.49	105.3	5.32	6.96	1200 J	0.00782	<0.00100	5.6
1-Nov-08	43.35	889.34	11.17	1096	7.29	127.1	47.30	7.70	1100	0.00980	<0.00100	5.6
11-Feb-09	37.00	895.69	10.28	1112	4.15	-	7.68	7.25	1100	0.00752	<0.00100	5.6
9-May-09	36.53	896.16	13.87	1209	2.93	89.0	5.45	7.41	990 J	0.00757	<0.00100	5.6
24-Sep-09	53.61	879.08	12.10	1328	1.98	331.0	3.26	6.92	1200	0.00790	<0.00200	5.7
14-Dec-09	33.72	898.97	10.20	1519	0.55	393.0	2.82	6.99	1100	0.00340	<0.00200	5.7
22-Mar-10	35.11	897.58	10.90	1463	-	508.0	3.95	6.94	1200	0.01000	<0.00200	5.6
15-Jun-10	33.26	899.43	11.00	1485	0.20	210.3	1.50	7.02	1100	0.01100	<0.00200	5.9
20-Sep-10	45.81	886.88	11.30	1484	0.06	159.7	0.91	6.98	1100	0.00910	0.00048 J	6.0
6-Dec-10	36.20	896.49	10.70	1494	0.08	35.4	0.24	7.21	1200	0.00680	0.00034 J	5.2

**Table A-4a: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Well MWB-1SDSP Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)			
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	Arsenic	Lead	Potassium	
28-Mar-11	35.07	897.62	10.70	749	0.08	136.8	0.16	6.88	1100	0.00680	<0.00200	5.5	
20-Jun-11	38.53	894.16	11.40	1439	0.08	-19.2	0.21	6.99	1400	0.00460 J	<0.00200	5.5	
26-Sep-11	50.43	882.26	11.20	1249	0.07	38.5	0.41	7.01	1200	0.00450 J	<0.00200	5.7	
13-Dec-11	51.30	881.39	10.40	1308	0.06	50.3	2.03	7.07	530	0.00760	<0.00200	6.1	
22-Mar-12	43.75	888.94	10.60	1695	0.08	125.1	0.28	6.99	1200	0.01200	<0.00200	5.7	
18-Jun-12	44.86	887.83	<i>Monitored Semiannually<sup>1</sup></i>										
18-Sep-12	55.74	876.95	12.90	1506	0.05	99.5	0.36	7.08	1300	0.01000	<0.00040	5.8	
18-Dec-12	41.94	890.75	<i>Monitored Semiannually<sup>1</sup></i>										
21-Feb-13	37.86	894.83	10.40	1730	0.02	131.5	0.41	7.27	1200	0.01300	<0.00040	6.3	
22-May-13	39.34	893.35	<i>Monitored Semiannually<sup>1</sup></i>										
20-Aug-13	49.40	883.29	11.90	1707	0.05	-37.6	0.69	7.00	1240	0.01020	<0.00010	6.0	
19-Nov-13	44.94	887.75	<i>Monitored Semiannually<sup>1</sup></i>										
31-Mar-14	33.31	899.38	11.20	1256	0.01	103.5	0.27	7.00	1200	0.01310	<0.00010	6.6	
21-May-14	33.37	899.32	<i>Monitored Semiannually<sup>1</sup></i>										
15-Aug-14	45.31	887.38	13.43	1467	0.71	-1.1	2.32	6.79	1150	0.01340	<0.00010	6.1	
14-Nov-14	44.83	887.86	<i>Monitored Semiannually<sup>1</sup></i>										
10-Feb-15	35.97	896.72	11.00	1423	0.04	-109.4	2.16	7.00	1200	0.01300	<0.00010	6.3	
4-May-15	38.67	894.02	<i>Monitored Semiannually<sup>1</sup></i>										
4-Aug-15	49.21	883.48	12.50	1253	0.04	-100.7	0.26	7.07	1230	0.01390	<0.00010	6.1	
5-Nov-15	56.85	875.84	11.20	1159	0.02	57.4	0.91	6.75	1190	0.01490	<0.00010	7.0	
8-Feb-16	33.02	899.67	11.60	1429	0.00	167.6	0.10	7.05	1190	0.01940	<0.00010	6.7	
2-May-16	37.48	895.21	<i>Monitored Semiannually<sup>2</sup></i>						<i>Monitored Annually<sup>2</sup></i>				
22-Aug-16	49.78	882.91	12.10	1232	0.06	-143.8	0.77	7.00	<i>Monitored Annually<sup>2</sup></i>				
1-Nov-16	47.49	885.20	<i>Monitored Semiannually<sup>2</sup></i>						<i>Monitored Annually<sup>2</sup></i>				
31-Jan-17	35.57	897.12	11.10	1620	0.05	-241.6	0.24	6.99	1260	0.02180	<0.00010	6.7	
30-May-17	34.70	897.99	<i>Monitored Semiannually<sup>2</sup></i>						<i>Monitored Annually<sup>2</sup></i>				
16-Aug-17	44.32	888.37	11.90	1621	0.12	-144.5	0.47	6.97	<i>Monitored Annually<sup>2</sup></i>				
9-Nov-17	44.71	887.98	<i>Monitored Semiannually<sup>2</sup></i>						<i>Monitored Annually<sup>2</sup></i>				
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.05	-	

Notes:

Top of casing elevation (feet msl): 932.69

- Not measured or not available

< Analyte not detected above the reporting limit shown

1 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated May 16, 2012

2 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated April 7, 2016. Field parameters collected semi-annually, analytical samples collected annually.

a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest

b Site background arsenic value to be determined (TBD)

J Data validation code; estimated value

°C Degrees Celsius

µmhos/cm Micromhos per centimeter

feet bmp Feet below measuring point

feet msl Feet above mean sea level

mg/L Milligrams per liter

mV Millivolts

NTU Nephelometric Turbidity Unit

**Table A-4b: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Well MWB-1DDSP  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)		
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	Arsenic	Lead	Potassium
2-Dec-02	87.28	844.49	11.1	557	-	-	-	7.72	540	0.03270	<0.00050	-
3-Mar-03	48.63	883.14	12.0	623	-	-	24.00	7.48	370	0.00708	-	-
3-May-03	47.12	884.65	12.1	548	-	-	264.00	7.54	440	-	-	-
3-Aug-03	64.60	867.17	23.23	675	-	-	195.00	7.36	450	-	-	-
1-Nov-03	66.14	865.63	11.0	400	-	-	15.50	8.10	437	0.00603	<0.00050	-
1-Feb-04	46.55	885.22	10.68	455	-	-	8.70	7.15	440	-	-	-
1-May-04	55.82	875.95	13.61	508	-	-	12.40	7.58	429	-	-	-
1-Aug-04	61.89	869.88	13.15	585	-	-	15.70	7.47	399	-	-	-
1-Nov-04	56.83	874.94	10.94	655	-	-	9.40	7.22	477	0.00308	<0.00100	-
1-Feb-05	47.31	884.46	12.80	778	-	-	8.39	7.35	451	-	-	-
1-May-05	48.60	883.17	12.86	743	-	-	4.22	7.25	432	-	-	-
1-Aug-05	56.80	874.97	14.17	746	-	-	3.10	6.99	518	-	-	-
1-Nov-05	66.85	864.92	10.20	702	-	-	5.36	7.11	470	0.00360	<0.00100	-
1-Feb-06	47.88	883.89	10.11	648	0.71	109.4	2.72	7.53	450 J	-	-	-
1-May-06	52.23	879.54	12.22	686	1.82	43.7	3.68	7.43	450	-	-	-
1-Aug-06	59.41	872.36	12.28	665	1.06	-74.0	14.20	7.36	480	-	-	-
1-Nov-06	61.84	869.93	-	-	-	-	-	-	-	-	-	-
28-Dec-06	48.26	883.51	-	-	-	-	-	-	-	-	-	-
7-Feb-07	49.64	882.13	-	-	-	-	-	-	-	-	-	-
7-May-07	53.24	878.53	12.44	722	0.74	-150.8	6.06	7.94	470	-	-	-
7-Aug-07	60.45	871.32	13.76	712	0.79	-50.0	4.53	7.28	500	-	-	-
27-Nov-07	63.40	868.37	14.41	711	0.45	-194.4	7.07	7.34	470 J	0.00289	<0.00100	-
8-Feb-08	49.23	882.54	14.07	737	0.62	-	6.28	7.46	500	-	-	-
8-May-08	51.31	880.46	13.52	793	0.55	27.9	4.42	7.40	520 J	-	-	-
8-Aug-08	59.69	872.08	13.73	812	0.67	-24.7	9.33	7.37	560 J	0.00226	<0.00100	<3.0
1-Nov-08	57.38	874.39	14.75	619	0.89	-42.5	4.40	7.45	480	0.00222	<0.00100	<3.0
10-Feb-09	50.92	880.85	6.50	618	10.51	-	655.00	7.69 J	530	0.00219	<0.00100	3.0
9-May-09	51.25	880.52	13.95	637	2.21	39.3	5.87	7.74	540 J	0.00242	<0.00100	<3.0
25-Sep-09	65.46	866.31	13.20	678	2.25	331.8	2.29	7.15	570	0.00180 J	<0.00200	3.3
17-Dec-09	49.40	882.37	10.60	794	0.99	224.0	3.97	7.58	440	0.00070 J	<0.00200	3.2 J
22-Mar-10	49.18	882.59	10.40	762	-	245.0	0.74	7.39	580	0.00450	<0.00200	3.2 J
15-Jun-10	46.88	884.89	12.10	762	0.05	142.1	0.47	7.50	420	0.00550	<0.00200	3.3
20-Sep-10	58.97	872.80	11.40	765	0.07	89.6	0.47	7.47	520	0.00470	0.00027 J	3.4
6-Dec-10	50.66	881.11	10.20	763	0.19	58.9	0.32	7.72	550	0.00130 J	<0.00200	3.2 J
28-Mar-11	48.89	882.88	10.50	376	0.55	165.0	0.73	7.53	470	0.00370	<0.00200	3.0 J
20-Jun-11	52.13	879.64	13.40	718	0.45	-65.1	0.75	7.53	600 J	<0.00500	<0.00200	3.5

**Table A-4b: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Well MWB-1DDSP Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)			
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	Arsenic	Lead	Potassium	
26-Sep-11	63.02	868.75	11.80	633	1.73	-6.0	1.72	7.61	560	<0.00500	<0.00200	3.5	
13-Dec-11	63.88	867.89	8.60	678	0.69	-24.7	1.95	7.56	530	0.00570	<0.00200	4.1	
22-Mar-12	56.96	874.81	5.60	877	1.89	-26.6	0.84	7.69	540	0.00340	<0.00040	3.0 J	
18-Jun-12	58.01	873.76	<i>Monitored Semiannually<sup>1</sup></i>										
18-Sep-12	67.78	863.99	26.30	838	3.62	12.4	1.27	7.70	540	0.00310	<0.00040	3.1 J	
18-Dec-12	56.10	875.67	<i>Monitored Semiannually<sup>1</sup></i>										
21-Feb-13	51.62	880.15	4.30	895	7.54	31.3	0.83	8.04	510	0.00360	<0.00040	3.6	
22-May-13	53.14	878.63	<i>Monitored Semiannually<sup>1</sup></i>										
20-Aug-13	62.35	869.42	12.30	526	0.08	-60.4	2.91	7.47	585	0.00320	<0.00010	3.2	
19-Nov-13	58.70	873.07	<i>Monitored Semiannually<sup>1</sup></i>										
31-Mar-14	46.60	885.17	11.10	622	0.04	48.4	0.45	7.52	561	0.00180	<0.00010	3.3	
21-May-14	46.96	884.81	<i>Monitored Semiannually<sup>1</sup></i>										
15-Aug-14	58.62	873.15	12.48	732	0.90	-62.4	2.04	7.16	564	0.00200	0.00020	3.1	
14-Nov-14	59.59	872.18	<i>Monitored Semiannually<sup>1</sup></i>										
10-Feb-15	49.61	882.16	10.90	717	0.03	-114.4	1.82	7.48	551	0.00290	<0.00010	3.3	
4-May-15	52.25	879.52	<i>Monitored Semiannually<sup>1</sup></i>										
4-Aug-15	61.71	870.06	12.00	618	0.04	-115.0	0.35	7.56	552	0.00300	<0.00010	3.4	
5-Nov-15	68.72	863.05	11.10	625	0.05	27.5	1.26	7.21	603	0.00160	<0.00010	3.6	
8-Feb-16	46.93	884.84	11.40	794	0.00	155.1	0.17	7.57	599	0.00210	<0.00010	3.8	
2-May-16	50.77	881.00	<i>Monitored Semiannually<sup>2</sup></i>						<i>Monitored Annually<sup>2</sup></i>				
22-Aug-16	62.11	869.66	11.60	770	0.04	-251.0	0.86	7.50	<i>Monitored Annually<sup>2</sup></i>				
1-Nov-16	61.71	870.06	<i>Monitored Semiannually<sup>2</sup></i>						<i>Monitored Annually<sup>2</sup></i>				
31-Jan-17	49.02	882.75	10.60	916	0.13	-310.4	0.35	7.47	676	0.00187	<0.00010	3.4	
30-May-17	48.11	883.66	<i>Monitored Semiannually<sup>2</sup></i>						<i>Monitored Annually<sup>2</sup></i>				
16-Aug-17	57.17	874.60	11.80	898	0.12	-210.9	0.22	7.42	<i>Monitored Annually<sup>2</sup></i>				
9-Nov-17	58.71	873.06	<i>Monitored Semiannually<sup>2</sup></i>						<i>Monitored Annually<sup>2</sup></i>				
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.05	-	

Notes:

- Top of casing elevation (feet msl): 931.77
- Not measured or not available
- < Analyte not detected above the reporting limit shown
- 1 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated May 16, 2012
- 2 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated April 7, 2016. Field parameters collected semi-annually, analytical samples collected annually.
- a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest
- b Site background arsenic value to be determined (TBD)
- J Data validation code; estimated value
- °C Degrees Celsius
- µmhos/cm Micromhos per centimeter
- feet bmp Feet below measuring point
- feet msl Feet above mean sea level
- mg/L Milligrams per liter
- mV Millivolts
- NTU Nephelometric Turbidity Unit

**Table A-4c: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Well MWB-5DSP  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters									Gen. Chem.	Dissolved Metals (mg/L)		
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	Arsenic	Lead	Potassium	
18-Dec-06	20.56	910.89	11.30	1054	0.59	-10.5	6.76	7.01	630	0.00446	<0.00100	-	
7-Jan-07	18.48	912.97	12.53	700	0.61	-70.6	33.50	7.11	540	0.00519	<0.00100	-	
7-Feb-07	21.53	909.92	11.59	557	0.57	-59.1	33.50	6.88	530	0.00519	<0.00100	-	
7-Mar-07	15.34	916.11	11.71	817	0.45	-2.4	91.20	6.52	550 J	0.00491	<0.00100	-	
7-Apr-07	17.97	913.48	11.96	909	0.25	0.2	121.00	6.91	560	0.00475	<0.00100	-	
1-May-07	26.92	904.53	12.55	880	4.20	-14.3	63.70	7.13	540	0.00490	<0.00100	-	
7-Jun-07	29.94	901.51	13.12	1016	3.20	-5.6	3.58	7.52	600 J	0.00437	<0.00100	-	
7-Jul-07	35.27	896.18	13.00	910	1.74	-27.4	9.97	7.24	550	0.00491	<0.00100	-	
7-Aug-07	39.55	891.90	12.40	1065	0.92	-14.6	4.62	6.99	590	0.00446	<0.00100	-	
7-Sep-07	44.69	886.76	12.36	696	0.68	-33.3	3.22	7.29	590	0.00492	<0.00100	-	
26-Oct-07	38.90	892.55	11.46	667	0.56	-18.3	22.60	6.98	620 J	0.00443	<0.00100	-	
27-Nov-07	38.79	892.66	11.71	914	0.56	-46.7	3.32	6.91	560 J	0.00490	<0.00100	-	
12-Dec-07	35.33	896.12	12.61	909	0.53	-27.3	4.28	6.87	820	0.00409	<0.00100	-	
24-Jan-08	28.97	902.48	10.72	872	0.78	-49.1	-	7.14	550	0.00472	<0.00100	-	
8-Feb-08	26.00	905.45	11.25	888	0.44	-	4.18	6.85	550	0.00450	<0.00100	-	
8-Mar-08	26.03	905.42	10.94	915	0.59	-95.6	3.19	6.89	550	0.00521	<0.00100	-	
8-Apr-08	25.03	906.42	11.27	931	0.61	-20.1	3.44	6.89	550 J	0.00488	<0.00100	-	
8-May-08	27.33	904.12	11.68	949	0.68	-6.7	5.37	6.62	580 J	0.00534	<0.00100	-	
8-Jun-08	28.38	903.07	11.40	948	0.75	-50.4	1.59	6.68	580 J	0.00445	<0.00100	-	
8-Aug-08	39.80	891.65	11.80	970	0.68	-78.6	1.72	6.84	610 J	0.00464	<0.00100	<3.0	
1-Nov-08	33.96	897.49	11.20	682	0.63	-115.4	0.95	6.82	540	0.00480	<0.00100	<3.0	
10-Feb-09	25.56	905.89	10.54	671	0.71	-71.7	0.98	7.05	610	0.00473	<0.00100	<3.0	
9-May-09	25.79	905.66	11.23	682	0.55	-5.8	0.86	7.68	560 J	0.00340	<0.00100	<3.0	
22-Sep-09	46.68	884.77	18.70	737	0.64	214.5	0.99	6.91	580 J	0.00390	<0.00200	2.7 J	
14-Dec-09	30.45	901.00	9.80	901	0.18	200.0	0.70	6.96	450	0.00170 J	<0.00200	2.5 J	
23-Mar-10	19.92	911.53	11.30	773	0.25	148.0	4.40	6.86	510	0.00560	<0.00200	2.6 J	
15-Jun-10	16.74	914.71	11.00	838	0.10	202.3	2.89	7.01	860 J	0.00820	<0.00200	2.8 J	
20-Sep-10	33.31	898.14	11.20	852	0.09	174.7	0.60	6.97	540	0.00620	<0.00200	2.7 J	
6-Dec-10	19.81	911.64	10.80	838	0.10	30.5	0.47	7.17	530	0.00380	<0.00200	2.3 J	
28-Mar-11	17.16	914.29	10.80	403	0.15	48.4	1.13	6.89	500 J	0.00230	<0.00200	2.3 J	
20-Jun-11	18.95	912.50	11.10	775	0.05	-29.1	0.37	7.01	610 J	<0.00500	<0.00200	2.4 J	
26-Sep-11	33.71	897.74	11.20	690	0.03	-8.7	0.54	7.00	560	0.00410 J	<0.00200	2.8 J	
13-Dec-11	24.48	906.97	10.50	730	0.05	93.6	1.92	7.07	520	0.00610	<0.00200	2.8 J	
21-Mar-12	15.54	915.91	10.70	883	0.06	106.9	0.34	6.90	500	0.00650	<0.00200	2.4 J	

**Table A-4c: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Well MWB-5DSP  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)			
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	Arsenic	Lead	Potassium	
19-Jun-12	17.01	914.44	<i>Monitored Semiannually</i> <sup>1</sup>										
19-Sep-12	29.82	901.63	11.90	877	0.00	122.0	0.47	7.08	490	0.00690	<0.00040	2.6 J	
18-Dec-12	17.39	914.06	<i>Monitored Semiannually</i> <sup>1</sup>										
21-Feb-13	18.84	912.61	10.60	875	0.05	103.3	0.40	7.32	510	0.00590	<0.00040	2.6 J	
22-May-13	20.25	911.20	<i>Monitored Semiannually</i> <sup>1</sup>										
20-Aug-13	30.15	901.30	12.10	530	0.06	-50.3	0.75	6.98	510	0.00560	<0.00010	2.5	
19-Nov-13	22.73	908.72	<i>Monitored Semiannually</i> <sup>1</sup>										
31-Mar-14	15.50	915.95	11.30	574	0.06	95.7	0.53	7.15	447	0.00560	<0.00010	2.7	
21-May-14	14.83	916.62	<i>Monitored Semiannually</i> <sup>1</sup>										
15-Aug-14	25.16	906.29	14.49	741	0.48	-24.0	2.92	6.87	477	0.00590	<0.00010	2.6	
14-Nov-14	22.25	909.20	<i>Monitored Semiannually</i> <sup>1</sup>										
10-Feb-15	15.98	915.47	11.40	693	0.04	-117.5	0.80	7.13	503	0.00590	<0.00010	2.6	
4-May-15	20.05	911.40	<i>Monitored Semiannually</i> <sup>1</sup>										
4-Aug-15	31.90	899.55	11.90	620	0.16	-71.1	0.47	7.13	517	0.00640	<0.00010	2.7	
5-Nov-15	32.00	899.45	11.40	605	0.00	37.5	1.16	6.84	511	0.00530	<0.00010	3.1	
8-Feb-16	17.13	914.32	11.80	720	0.00	160.4	0.08	7.34	480	0.00600	<0.00010	3.0	
2-May-16	23.31	908.14	<i>Monitored Semiannually</i> <sup>2</sup>						<i>Monitored Annually</i> <sup>2</sup>				
22-Aug-16	34.07	897.38	12.50	571	0.00	-	0.66	7.11	<i>Monitored Annually</i> <sup>2</sup>				
1-Nov-16	26.04	905.41	<i>Monitored Semiannually</i> <sup>2</sup>						<i>Monitored Annually</i> <sup>2</sup>				
31-Jan-17	19.36	912.09	12.20	808	0.07	-219.2	0.30	7.21	509	0.00676	<0.00010	2.8	
30-May-17	17.31	914.14	<i>Monitored Semiannually</i> <sup>2</sup>						<i>Monitored Annually</i> <sup>2</sup>				
16-Aug-17	28.13	903.32	12.40	826	0.12	-71.9	0.66	7.10	<i>Monitored Annually</i> <sup>2</sup>				
9-Nov-17	27.17	904.28	<i>Monitored Semiannually</i> <sup>2</sup>						<i>Monitored Annually</i> <sup>2</sup>				
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.05	-	

Notes:

Top of casing elevation (feet msl): 931.45

- Not measured or not available

< Analyte not detected above the reporting limit shown

1 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated May 16, 2012

2 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated April 7, 2016. Field parameters collected semi-annually, analytical samples collected annually.

a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest

b Site background arsenic value to be determined (TBD)

J Data validation code; estimated value

°C Degrees Celsius

µmhos/cm Micromhos per centimeter

feet bmp Feet below measuring point

feet msl Feet above mean sea level

mg/L Milligrams per liter

mV Millivolts

NTU Nephelometric Turbidity Unit

**Table A-4d: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Well MWB-6DSP  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)		
	Depth to Water (feet broc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	Arsenic	Lead	Potassium
18-Dec-06	8.13	894.22	9.93	525	0.54	-54.5	0.61	7.78	300	0.00537	<0.00100	-
7-Feb-07	9.40	892.95	11.79	479	1.19	-30.0	7.40	7.41	330	0.00601	<0.00100	-
7-May-07	10.73	891.62	12.26	729	2.83	-103.6	16.40	7.63	480	0.01010	<0.00100	-
7-Aug-07	15.14	887.21	11.42	882	0.75	-11.5	1.82	7.10	470	0.00325	<0.00100	-
27-Nov-07	16.16	886.19	10.98	748	0.37	-47.9	0.83	6.99	440 J	0.00282	<0.00100	-
8-Feb-08	9.66	892.69	11.01	645	0.31	-	0.90	7.05	380	0.00268	<0.00100	-
8-May-08	10.34	892.01	11.27	665	0.64	13.4	1.52	6.93	380 J	0.00240	<0.00100	-
8-Aug-08	14.17	888.18	11.23	683	0.72	-8.2	2.49	7.05	390 J	0.00218	<0.00100	<3.0
1-Nov-08	12.98	889.37	10.61	488	0.60	-45.6	1.35	6.80	380	0.00204	<0.00100	<3.0
10-Feb-09	9.64	892.71	10.32	398	0.52	-57.0	1.20	7.31	350	0.00200	<0.00100	<3.0
9-May-09	9.91	892.44	10.50	405	0.73	-4.0	1.26	7.77	320 J	0.00169	<0.00100	<3.0
23-Sep-09	17.16	885.19	12.50	541	0.25	216.2	5.38	7.14	400 J	0.00091 J	<0.00200	1.3 J
14-Dec-09	12.73	889.62	9.10	580	0.47	231.0	2.70	7.23	270	<0.00200	<0.00200	1.3 J
22-Mar-10	9.62	892.73	10.90	504	-	321.7	3.50	7.22	320	0.00200	<0.00200	1.2 J
15-Jun-10	8.30	894.05	11.00	495	0.11	205.1	1.41	7.29	320	0.00420	<0.00200	1.3 J
20-Sep-10	14.90	887.45	10.90	560	0.10	187.2	0.28	7.29	270	0.00300	<0.00200	1.4 J
6-Dec-10	10.47	891.88	10.50	515	0.12	87.8	0.14	7.47	300	<0.00200	<0.00200	1.1 J
28-Mar-11	8.71	893.64	10.30	241	0.19	58.9	1.86	7.19	300	<0.00200	<0.00200	1.1 J
20-Jun-11	9.87	892.48	10.80	477	0.06	141.2	0.20	7.27	340	<0.00500	<0.00200	1.1 J
26-Sep-11	14.82	887.53	10.80	467	0.05	114.8	0.92	7.26	380	<0.00500	<0.00200	1.5 J
13-Dec-11	13.02	889.33	10.20	491	0.06	131.3	1.69	7.29	340	<0.00500	<0.00200	1.6 J
21-Mar-12	8.13	894.22	10.20	550	0.09	160.0	0.07	7.14	310	0.00250	<0.00040	1.2 J
18-Jun-12	0.00	10.20	<i>Monitored Semiannually</i> <sup>1</sup>									
18-Sep-12	14.76	887.59	12.50	587	0.00	122.0	0.35	7.31	370	0.00280	<0.00040	1.3 J
18-Dec-12	8.16	894.19	<i>Monitored Semiannually</i> <sup>1</sup>									
21-Feb-13	8.45	893.90	10.10	594	0.02	152.7	0.28	7.49	300	0.00190	<0.00040	1.3 J
22-May-13	9.36	892.99	<i>Monitored Semiannually</i> <sup>1</sup>									
20-Aug-13	13.28	889.07	11.70	478	0.01	-43.8	0.54	7.22	349 J	0.00160	<0.00010	1.3
19-Nov-13	9.71	892.64	<i>Monitored Semiannually</i> <sup>1</sup>									
31-Mar-14	8.42	893.93	10.70	455	0.06	166.1	0.27	7.35	315	0.00140	<0.00010	1.3
21-May-14	5.99	896.36	<i>Monitored Semiannually</i> <sup>1</sup>									
14-Aug-14	12.03	890.32	13.45	512	0.56	-21.4	1.99	6.95	317	0.00170	<0.00010	1.3
14-Nov-14	10.68	891.67	<i>Monitored Semiannually</i> <sup>1</sup>									

**Table A-4d: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Well MWB-6DSP  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)		
	Depth to Water (feet btrc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	Arsenic	Lead	Potassium
10-Feb-15	7.39	894.96	10.90	482	0.03	-86.2	0.59	7.32	337	0.00140	<0.00010	1.2
4-May-15	9.17	893.18	<i>Monitored Semiannually<sup>1</sup></i>									
4-Aug-15	13.64	888.71	12.40	449	0.18	-81.7	0.27	7.33	385	0.00170	<0.00010	1.3
5-Nov-15	13.98	888.37	11.50	435	2.23	85.2	1.09	7.04	354	0.00130	<0.00010	1.5
8-Feb-16	6.74	895.61	11.50	495	0.03	187.2	0.25	7.39	297	0.00140	<0.00010	1.4
2-May-16	8.64	893.71	<i>Monitored Semiannually<sup>2</sup></i>						<i>Monitored Annually<sup>2</sup></i>			
22-Aug-16	13.27	889.08	12.20	559	0.03	-52.7	0.80	7.28	<i>Monitored Annually<sup>2</sup></i>			
1-Nov-16	11.36	890.99	<i>Monitored Semiannually<sup>2</sup></i>						<i>Monitored Annually<sup>2</sup></i>			
31-Jan-17	7.91	894.44	10.90	539	0.08	124.4	0.18	7.31	321	0.00148	<0.00010	1.3
30-May-17	2.65	899.70	<i>Monitored Semiannually<sup>2</sup></i>						<i>Monitored Annually<sup>2</sup></i>			
16-Aug-17	12.08	890.27	12.10	573	0.12	-46.9	1.39	7.26	<i>Monitored Annually<sup>2</sup></i>			
9-Nov-17	11.70	890.65	<i>Monitored Semiannually<sup>2</sup></i>						<i>Monitored Annually<sup>2</sup></i>			
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.05	-

Notes:

Top of casing elevation (feet msl): 902.35

- Not measured or not available

< Analyte not detected above the reporting limit shown

1 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated May 16, 2012

2 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated April 7, 2016. Field parameters collected semi-annually, analytical samples collected annually.

a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest

b Site background arsenic value to be determined (TBD)

J Data validation code; estimated value

°C Degrees Celsius

µmhos/cm Micromhos per centimeter

feet bmp Feet below measuring point

feet msl Feet above mean sea level

mg/L Milligrams per liter

mV Millivolts

NTU Nephelometric Turbidity Unit

**Table A-4e: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Portal Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)		
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Lead
1-Mar-02	-	-	-	653	-	-	-	7.29	586	-	-	-
1-Jun-02	-	-	12	920	-	-	-	7.20	583	-	-	-
1-Sep-02	-	-	11	920	-	-	-	7.10	651	-	-	-
2-Dec-02	-	-	9.1	900	-	-	-	7.03	570	0.00444	<0.00050	-
3-Mar-03	-	-	10.1	873	-	-	-	7.09	530	-	-	-
3-May-03	-	-	11.2	981	-	-	10.00	6.94	590	-	-	-
3-Aug-03	-	-	12.78	1030	-	-	13.00	7.17	630	-	-	-
1-Nov-03	-	-	10.2	569	-	-	4.65	7.53	592	0.00333	<0.00050	-
1-Feb-04	-	-	9.31	568	-	-	5.41	6.85	560	-	-	-
1-May-04	-	-	10.93	952	-	-	5.98	7.12	615	-	-	-
1-Aug-04	-	-	12.10	835	-	-	6.29	7.11	601	-	-	-
1-Nov-04	-	-	10.20	941	-	-	6.58	6.94	656	0.00341	<0.00100	-
1-Feb-05	-	-	10.52	889	-	-	8.72	7.41	541	-	-	-
1-May-05	-	-	13.08	953	-	-	8.15	7.31	548	-	-	-
1-Aug-05	-	-	11.08	988	-	-	7.40	7.23	644	-	-	-
1-Nov-05	-	-	9.53	958	-	-	8.58	7.61	640	0.00315	<0.00100	-
1-Feb-06	-	-	9.23	669	7.88	*	7.93	6.78	450 J	-	-	-
1-May-06	-	-	11.49	947	7.60	38.5	10.40	7.01	570	-	-	-
1-Aug-06	-	-	10.52	835	8.82	-39.8	14.10	7.26	640	-	-	-
1-Nov-06	-	-	9.41	740	9.57	-32.2	12.50	7.23	510	0.00245	<0.00100	-
7-Feb-07	-	-	9.90	815	10.99	-6.2	27.80	7.74	510	-	-	-
7-May-07	-	-	18.39	810	11.05	-6.2	11.80	7.61	510	-	-	-
7-Aug-07	-	-	10.42	870	8.72	-44.9	25.20	7.42	560	-	-	-
30-Nov-07	-	-	9.41	783	9.56	-18.7	48.30	-	520	0.00317	<0.00100	-
8-Feb-08	-	-	10.02	708	10.04	-	50.00	7.20	420	-	-	-
8-May-08	-	-	10.83	815	12.13	0.1	7.28	7.29	480 J	-	-	-
8-Aug-08	-	-	10.63	906	11.05	-5.6	11.00	7.05	560 J	0.00369	<0.00100	41.6
1-Nov-08	-	-	9.79	553	10.70	-21.1	16.90	7.40	460	0.00320	<0.00100	35.5
11-Feb-09	-	-	9.16	488	6.99	-	15.40	7.52	430	0.00297	<0.00100	34.2
9-May-09	-	-	9.64	522	10.56	13.4	9.77	7.39	440 J	0.00201	<0.00100	32.4
23-Sep-09	-	-	10.70	745	8.95	271.7	14.70	6.88	570	<0.00200	<0.00200	40.0
15-Dec-09	-	-	8.60	713	5.20	279.0	12.50	6.67	350	<0.00200	<0.00200	30.0
24-Mar-10	-	-	9.90	681	6.14	370.7	-	6.57	470	0.00420	<0.00200	39.0
17-Jun-10	-	-	10.00	623	9.58	-	26.30	7.50	380	0.00590	<0.00200	28.0
22-Sep-10	-	-	10.00	783	9.02	225.9	17.40	7.00	510	0.00520	<0.00200	42.0
7-Dec-10	-	-	9.90	662	9.15	186.0	13.60	6.95	450	<0.00200	<0.00200	32.0
29-Mar-11	-	-	9.90	292	5.90	370.8	4.44	6.73	360 J	0.00410	<0.00200	25.0
20-Jun-11	-	-	10.50	591	6.42	219.1	4.44	7.01	420	<0.00500	<0.00200	26.0

**Table A-4e: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Portal Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)		
	Depth to Water (feet btrc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Total Dissolved Solids (mg/L)	Arsenic	Lead
26-Sep-11	-	-	10.70	623	5.76	240.5	11.90	6.83	520	<0.00500	<0.00200	39.0
15-Dec-11	-	-	8.80	472	4.92	310.4	7.32	6.78	430	0.00470 J	<0.00200	32.0
21-Mar-12			8.90	611	5.24	313.3	9.16	6.49	330	0.00480	<0.00040	20.0
18-Jun-12	<i>Monitored Semiannually<sup>1</sup></i>											
18-Sep-12	-	-	14.20	652	9.70	148.0	20.80	7.48	450	0.00500	<0.00040	29.0
18-Dec-12	<i>Monitored Semiannually<sup>1</sup></i>											
25-Feb-13	-	-	9.20	648	10.10	209.6	4.12	7.58	300	0.00500	<0.00040	25.0
25-Feb-13	<i>Monitored Semiannually<sup>1</sup></i>											
21-Feb-13	-	-	9.20	648	10.10	209.6	4.12	7.58	300	0.00500	<0.00040	25.0
22-May-13	<i>Monitored Semiannually<sup>1</sup></i>											
20-Aug-13	-	-	10.80	635	9.31	170.1	8.46	7.11	458	0.00390	<0.00010	32.3
19-Nov-13	<i>Monitored Semiannually<sup>1</sup></i>											
31-Mar-14	-	-	10.60	448	9.29	213.5	87.20	7.30	321	0.00370	0.00018 J	21.1
21-May-14	<i>Monitored Semiannually<sup>1</sup></i>											
15-Aug-14	-	-	10.01	595	10.01	-35.2	6.43	6.99	427	0.00350	<0.00010	31.5
14-Nov-14	<i>Monitored Semiannually<sup>1</sup></i>											
10-Feb-15	-	-	10.60	515	9.88	183.5	6.84	7.26	363	0.00280	0.00007 J	27.2
4-May-15	<i>Monitored Semiannually<sup>1</sup></i>											
4-Aug-15	-	-	10.90	554	9.98	95.8	8.68	7.48	438	0.00260	<0.00010	34.7
5-Nov-15	-	-	10.30	503	10.24	177.6	13.40	7.46	449	0.00280	<0.00010	31.8
8-Feb-16	-	-	9.30	541	11.30	215.0	5.12	7.30	293	0.00320	<0.00010	23.1
-	<i>Monitored Semiannually<sup>2</sup></i>								<i>Monitored Annually<sup>2</sup></i>			
24-Aug-16	-	-	13.40	585	9.32	410.0	8.50	7.23	<i>Monitored Annually<sup>2</sup></i>			
1-Nov-16	-	-	10.90	242	9.13	51.4	7.57	7.41	<i>Monitored Annually<sup>2</sup></i>			
31-Jan-17	-	-	8.90	663	10.87	-57.4	6.23	7.50	3390	0.00397	<0.00010	29.2
-	<i>Monitored Semiannually<sup>2</sup></i>								<i>Monitored Annually<sup>2</sup></i>			
17-Aug-17	-	-	11.40	712	9.67	-12.4	9.87	7.30	<i>Monitored Annually<sup>2</sup></i>			
10-Nov-17	<i>Monitored Semiannually<sup>2</sup></i>								<i>Monitored Annually<sup>2</sup></i>			
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.05	-

Notes:

- Not measured or not available
- < Analyte not detected above the reporting limit shown
- \* Measurement invalid and not shown
- 1 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated May 16, 2012
- 2 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated April 7, 2016. Field parameters collected semi-annually, analytical samples collected annually.
- a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest
- b Site background arsenic value to be determined (TBD)
- J Data validation code; estimated value
- °C Degrees Celsius
- µmhos/cm Micromhos per centimeter
- feet bmp Feet below measuring point
- feet msl Feet above mean sea level
- mg/L Milligrams per liter
- mV Millivolts
- NTU Nephelometric Turbidity Unit

**Table A-4f: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Well MWB-2DSP  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem. Total Dissolved Solids (mg/L)	Dissolved Metals (mg/L)		
	Depth to Water (feet broc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Arsenic	Lead	Potassium
1-Mar-02	-	-	-	542	-	-	-	7.22	467	-	-	-
1-Jun-02	197.34	731.88	12.00	750	-	-	-	7.10	459	-	-	-
1-Sep-02	199.29	729.93	14.00	660	-	-	-	6.90	499	-	-	-
2-Dec-02	200.09	729.13	10.80	675	-	-	-	6.89	440	<0.00100	<0.00050	-
3-Mar-03	190.21	739.01	11.90	763	-	-	-	6.98	450	-	-	-
3-May-03	191.78	737.44	12.30	730	-	-	233.00	6.98	550	-	-	-
3-Aug-03	199.82	729.40	16.50	848	-	-	17.00	6.92	520	-	-	-
1-Nov-03	199.97	729.25	11.60	559	-	-	9.20	7.04	522	0.00098	<0.00050	-
1-Feb-04	188.78	740.44	11.96	608	-	-	4.86	6.68	560	-	-	-
1-May-04	198.45	730.77	13.69	614	-	-	6.17	6.80	478	-	-	-
1-Aug-04	199.17	730.05	14.38	731	-	-	5.48	6.71	460	-	-	-
1-Nov-04	197.92	731.30	11.62	785	-	-	12.30	6.75	512	<0.00100	<0.00100	-
1-Feb-05	186.36	742.86	11.64	806	-	-	1.47	6.94	487	-	-	-
1-May-05	-	-	12.87	790	-	-	15.80	6.89	338	-	-	-
1-Aug-05	196.10	733.12	15.01	603	-	-	45.70	6.44	388	-	-	-
1-Nov-05	196.78	732.44	9.91	549	-	-	13.30	6.66	350	<0.00100	<0.00100	-
1-Feb-06	193.93	735.29	8.10	641	2.11	269.2	35.70	6.82	400 J	-	-	-
1-May-06	197.90	731.32	10.88	798	1.67	27.3	5.38	6.50	380	-	-	-
1-Aug-06	198.80	730.42	11.44	534	2.52	205.7	8.74	6.67	360	-	-	-
1-Nov-06	187.36	741.86	10.77	680	2.12	-19.9	18.90	7.06	430	<0.00100	<0.00100	-
28-Dec-06	192.37	736.85	-	-	-	-	-	-	-	-	-	-
7-Feb-07	197.46	731.76	10.24	621	0.64	-16.7	27.80	6.89	420	-	-	-
7-May-07	198.49	730.73	-	-	-	-	-	-	-	-	-	-
1-Aug-07	198.45	730.77	-	-	-	-	-	-	-	-	-	-
27-Nov-07	196.48	732.74	-	-	-	-	-	-	-	-	-	-
8-Feb-08	191.30	737.92	-	-	-	-	-	-	-	-	-	-
8-May-08	193.95	735.27	-	-	-	-	-	-	-	-	-	-
27-Sep-11	197.32	731.90	-	-	-	-	-	-	-	-	-	-
13-Dec-11	192.15	737.07	9.60	421	2.10	313.0	16.10	7.49	-	-	-	-
22-Mar-12	183.35	747.87	8.90	546	12.83	166.3	0.56	7.47	-	-	-	-
18-Jun-12	192.54	738.68	-	-	-	-	-	-	-	-	-	-
18-Sep-12	199.51	731.71	16.20	508	2.21	120.0	1.27	7.58	-	-	-	-
18-Dec-12	184.52	746.70	-	-	-	-	-	-	-	-	-	-
21-Feb-13	190.65	740.57	7.60	678	5.33	342.6	6.61	8.02	-	-	-	-
22-May-13	198.05	733.17	-	-	-	-	-	-	-	-	-	-

**Table A-4f: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Well MWB-2DSP  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem. Total Dissolved Solids (mg/L)	Dissolved Metals (mg/L)		
	Depth to Water (feet btrc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)		Arsenic	Lead	Potassium
20-Aug-13	200.47	730.75	13.00	488	3.26	90.2	8.47	7.42	-	-	-	-
19-Nov-13	196.59	734.63	-	-	-	-	-	-	-	-	-	-
31-Mar-14	186.78	744.44	11.40	421	7.28	195.1	1.70	7.47	-	-	-	-
21-May-14	192.27	738.95	-	-	-	-	-	-	-	-	-	-
15-Aug-14	199.97	731.25	18.90	492	0.97	1.4	52.50	7.01	-	-	-	-
14-Nov-14	196.60	734.62	-	-	-	-	-	-	-	-	-	-
10-Feb-15	183.97	747.25	10.20	450	7.65	121.4	1.02	7.34	-	-	-	-
4-May-15	194.19	737.03	-	-	-	-	-	-	-	-	-	-
4-Aug-15	198.35	732.87	13.60	432	3.07	18.6	0.27	7.47	-	-	-	-
3-Nov-15	198.25	732.97	10.30	405	2.57	106.2	7.07	7.35	-	-	-	-
8-Feb-16	188.43	742.79	12.50	536	2.77	189.8	0.25	7.78	-	-	-	-
2-May-16	195.72	735.50	Monitored Semiannually <sup>1</sup>						-	-	-	-
22-Aug-16	197.89	733.33	14.00	418	1.27	-123.1	4.36	7.32	-	-	-	-
1-Nov-16	195.49	735.73	Monitored Semiannually <sup>1</sup>						-	-	-	-
31-Jan-17	186.94	744.28	9.20	506	5.26	-45.4	0.38	7.45	-	-	-	-
30-May-17	190.62	740.60	Monitored Semiannually <sup>1</sup>						-	-	-	-
16-Aug-17	197.55	733.67	13.30	540	2.31	37.3	3.42	7.37	-	-	-	-
9-Nov-17	197.11	734.11	Monitored Semiannually <sup>1</sup>						-	-	-	-
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.05	-

Notes:

Top of casing elevation (feet msl) prior to raising casing: 929.22

Top of casing elevation (feet msl) after raising casing (December 14, 2011): 931.22

1 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated April 7, 2016. Field parameters collected semi-annually, analytical samples collected annually.

- Not measured or not available

< Analyte not detected above the reporting limit shown

a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest

b Site background arsenic value to be determined (TBD)

J Data validation code; estimated value

°C Degrees Celsius

µmhos/cm Micromhos per centimeter

feet bmp Feet below measuring point

feet msl Feet above mean sea level

mg/L Milligrams per liter

mV Millivolts

NTU Nephelometric Turbidity Unit

**Table A-4g: Summary of Dale Strip Pit - Bedrock Groundwater Sampling Results - Well MWB-4SDSP  
Ravensdale Site, Ravensdale, Washington**

Date Sampled	Field Parameters								Gen. Chem.	Dissolved Metals (mg/L)		
	Depth to Water (feet btoc)	Groundwater Elevation (feet msl)	Temperature (°C)	Conductivity (µmhos/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (Rel mV)	Turbidity (NTU)	pH (standard units)	Total Dissolved Solids (mg/L)	Arsenic	Lead	Potassium
26-Sep-11	25.77	903.04	11.40	553	0.86	197.2	-	7.21	-	-	-	-
13-Dec-11	24.94	903.87	9.70	625	1.73	658.0	22.70	7.68	-	-	-	-
22-Mar-12	23.80	905.01	9.60	785	3.71	242.6	8.14	7.30	-	-	-	-
19-Jun-12	24.09	904.72	-	-	-	-	-	-	-	-	-	-
18-Sep-12	25.68	903.13	16.50	664	2.37	150.0	19.20	7.34	-	-	-	-
18-Dec-12	23.02	905.79	-	-	-	-	-	-	-	-	-	-
21-Feb-13	23.50	905.31	10.00	840	6.55	352.4	3.42	7.42	-	-	-	-
22-May-13	23.84	904.97	-	-	-	-	-	-	-	-	-	-
20-Aug-13	25.08	903.73	13.50	539	2.91	45.1	1.87	7.22	-	-	-	-
19-Nov-13	22.76	906.05	-	-	-	-	-	-	-	-	-	-
31-Mar-14	21.39	907.42	12.20	511	6.31	197.3	1.38	7.58	-	-	-	-
21-May-14	19.82	908.99	-	-	-	-	-	-	-	-	-	-
15-Aug-14	24.00	904.81	12.81	647	0.82	7.5	5.42	6.62	-	-	-	-
14-Nov-14	22.28	906.53	-	-	-	-	-	-	-	-	-	-
10-Feb-15	21.10	907.71	12.30	636	2.56	-71.9	1.11	7.11	-	-	-	-
4-May-15	22.65	906.16	-	-	-	-	-	-	-	-	-	-
5-Aug-15	24.65	904.16	13.50	563	3.21	116.4	55.20	7.42	-	-	-	-
3-Nov-15	23.87	904.94	12.20	493	4.65	114.4	5.78	7.52	-	-	-	-
8-Feb-16	19.39	909.42	15.80	670	3.92	163.5	5.06	7.59	-	-	-	-
2-May-16	20.99	907.82	Monitored Semiannually <sup>1</sup>						-	-	-	-
22-Aug-16	24.42	904.39	17.60	527	5.01	106.0	1.39	7.44	-	-	-	-
1-Nov-16	21.31	907.50	Monitored Semiannually <sup>1</sup>						-	-	-	-
31-Jan-17	21.11	907.70	12.10	680	2.75	-146.1	1.48	7.35	-	-	-	-
30-May-17	18.49	910.32	Monitored Semiannually <sup>1</sup>						-	-	-	-
17-Aug-17	22.58	906.23	12.60	673	5.22	177.8	1.97	7.15	-	-	-	-
9-Nov-17	20.72	908.09	Monitored Semiannually <sup>1</sup>						-	-	-	-
Preliminary Standard <sup>a</sup>	-	-	-	700	-	-	-	6.5-8.5	500	TBD <sup>b</sup>	0.05	-

Notes:

Top of casing elevation (feet msl) prior to DSP Cover Upgrade: 935.82

Top of casing elevation (feet msl) after DSP Cover Upgrade (completed July 2011): 928.81

1 Reduction in monitoring frequency approved by Public Health – Seattle and King County in a letter to Golder Associates Inc. dated April 7, 2016. Field parameters collected semi-annually, analytical samples collected annually.

- Not measured or not available

a Preliminary standard is the standard listed or the site-specific (natural) background concentration, whichever is highest

b Site background arsenic value to be determined (TBD)

J Data validation code; estimated value

°C Degrees Celsius

µmhos/cm Micromhos per centimeter

feet bmp Feet below measuring point

feet msl Feet above mean sea level

mg/L Milligrams per liter

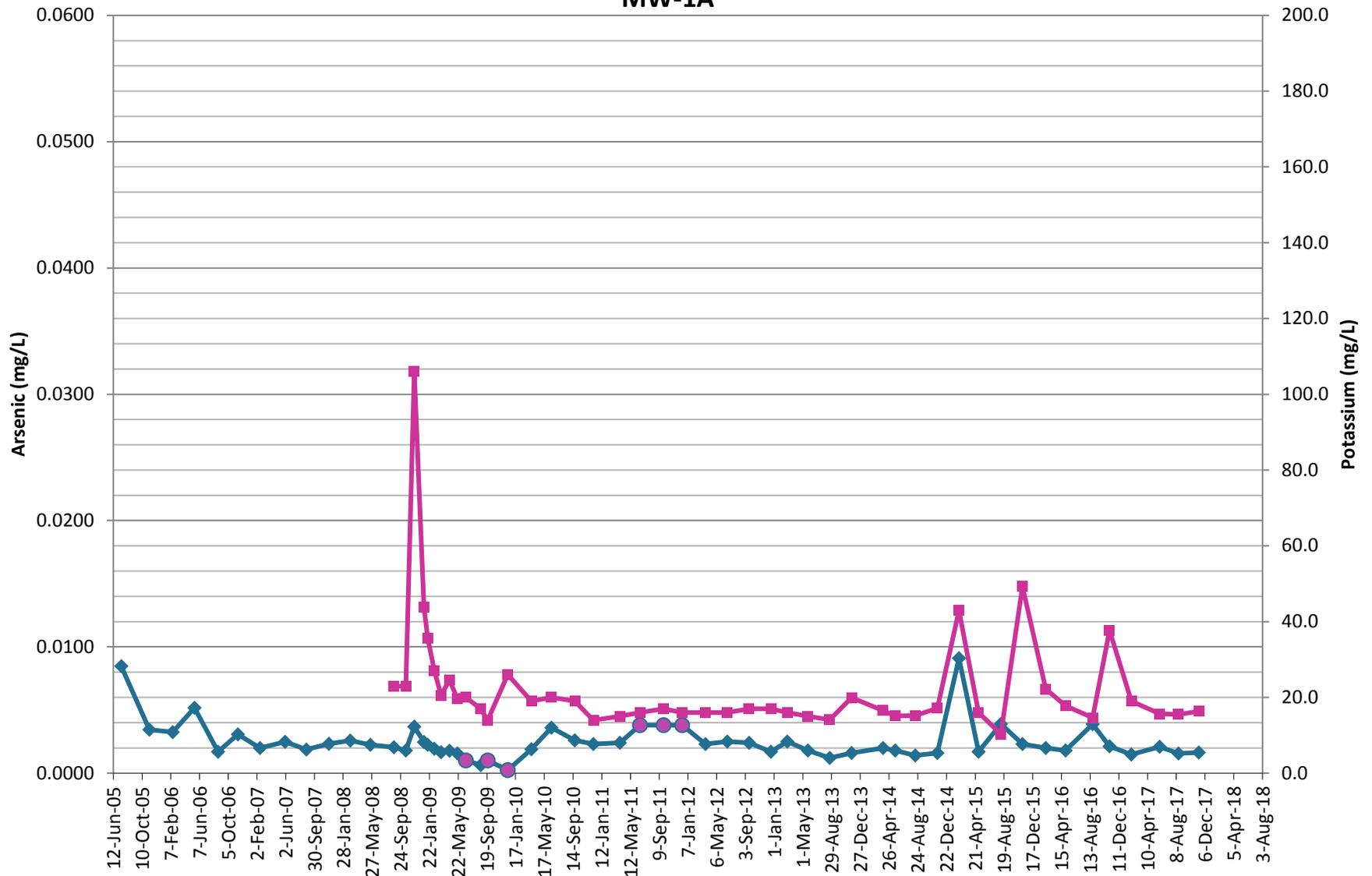
mV Millivolts

NTU Nephelometric Turbidity Unit

**APPENDIX B  
DATA GRAPHS**

**APPENDIX B-1  
LDA SHALLOW/ALLUVIAL MONITORING WELLS  
DATA GRAPHS**

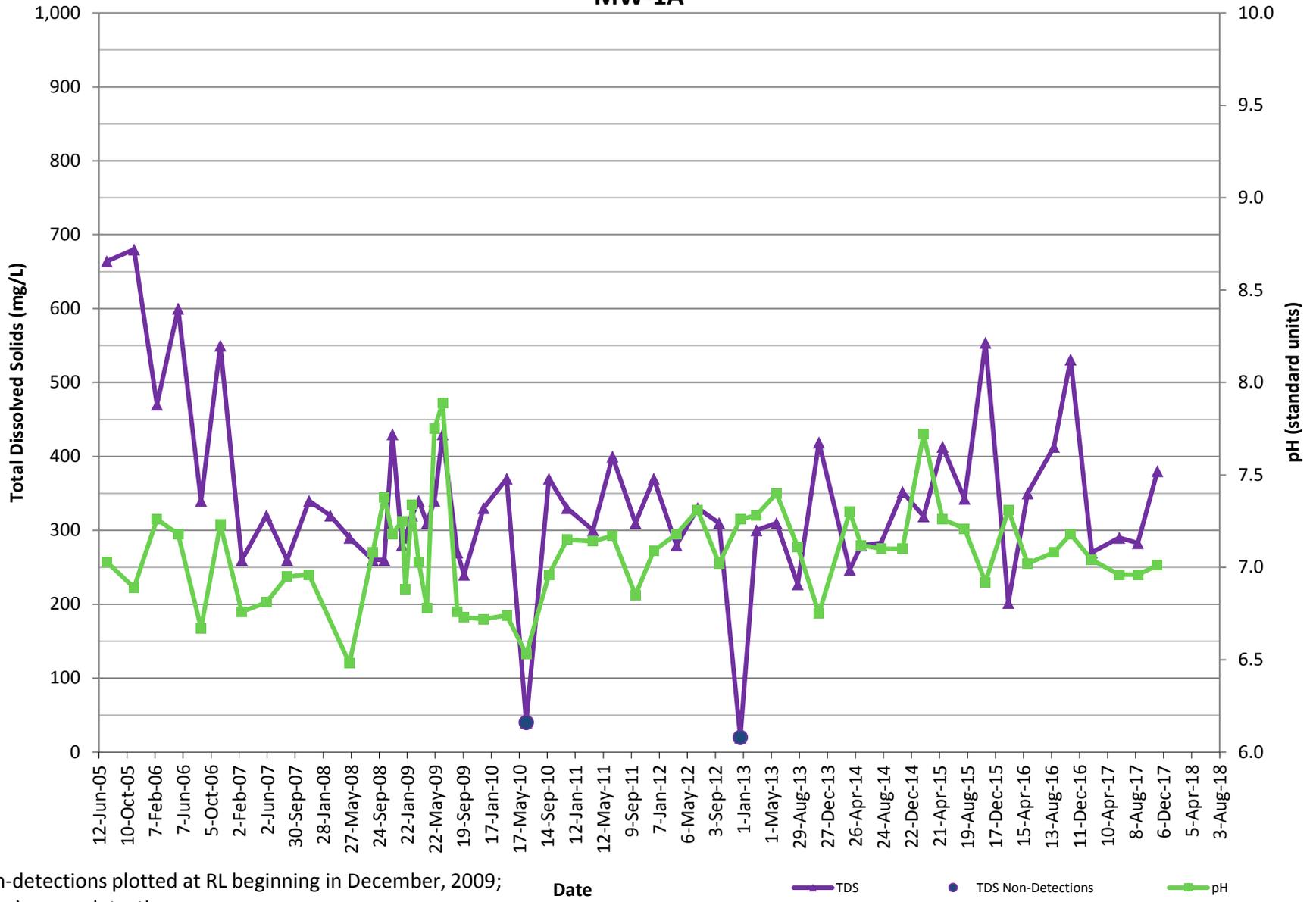
## LDA Shallow/Alluvial Monitoring Wells MW-1A



Non-detections plotted at MDL beginning in December, 2009; prior non-detections plotted at 50% of the RL

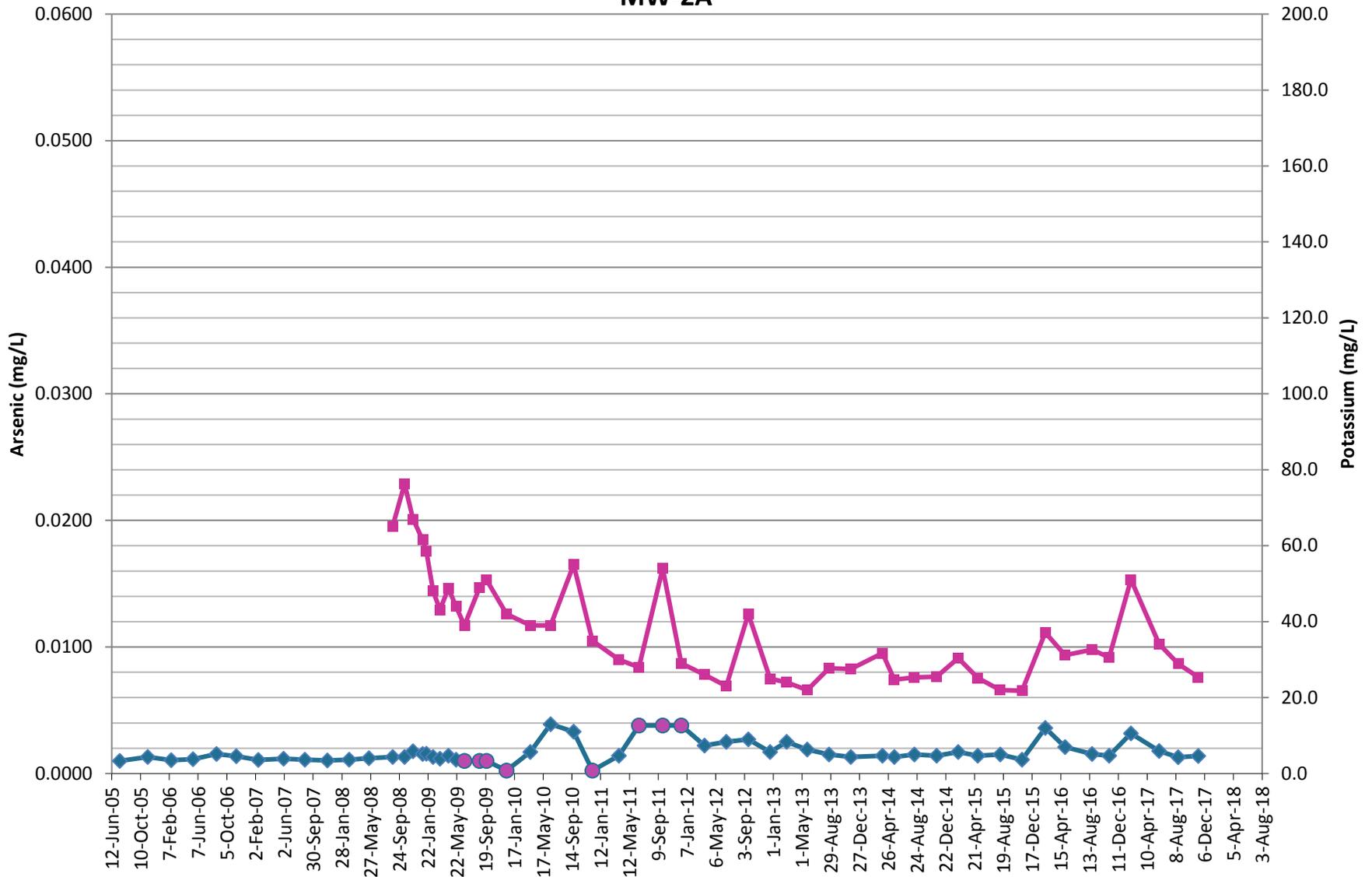
◆ Arsenic     
 ● Arsenic Non-Detections     
 ■ Potassium

## LDA Shallow/Alluvial Monitoring Wells MW-1A



Non-detections plotted at RL beginning in December, 2009;  
no prior non-detections.

## LDA Shallow/Alluvial Monitoring Wells MW-2A



Non-detections plotted at MDL beginning in December, 2009;  
prior non-detections plotted at 50% of the RL

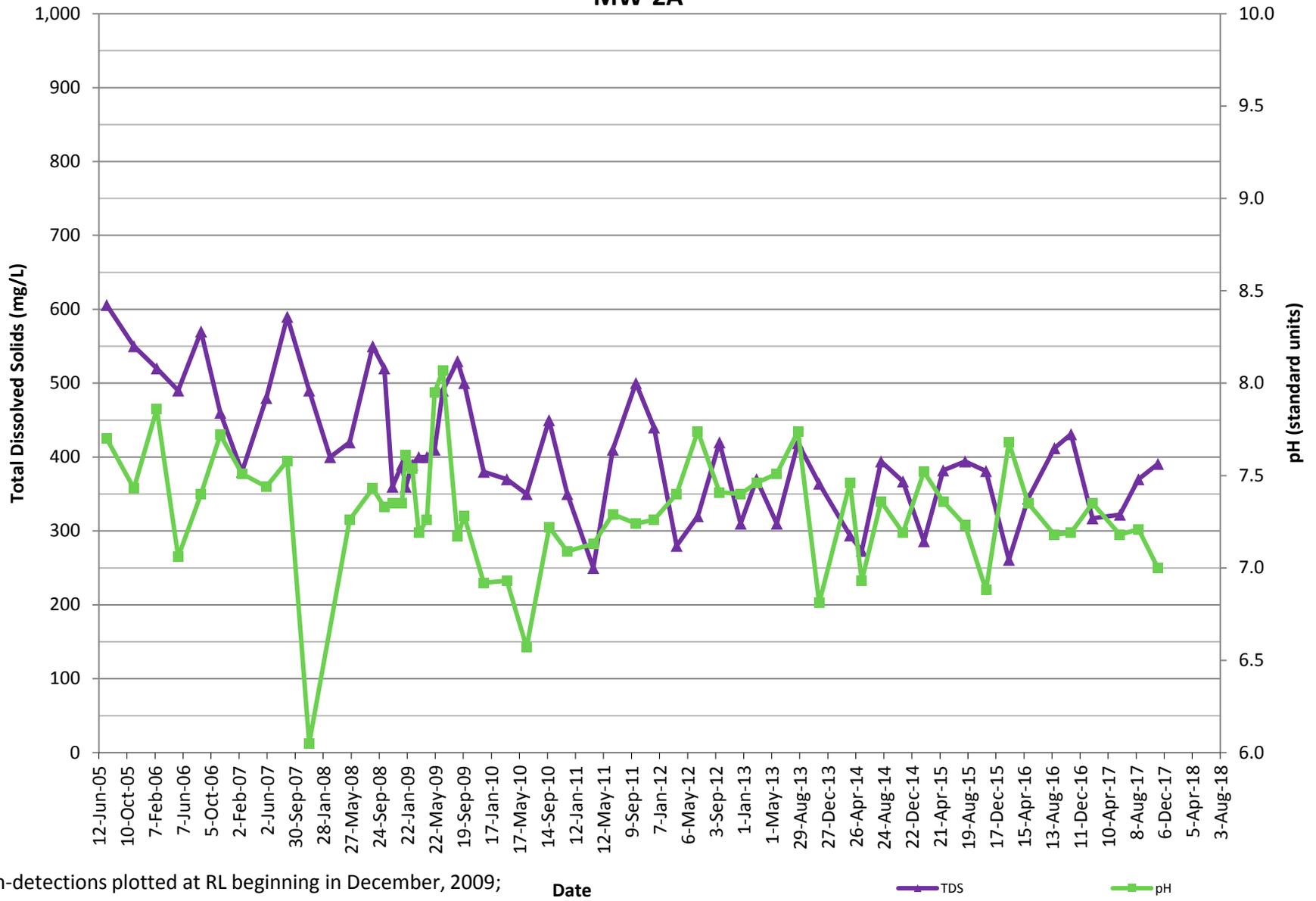
Date

—◆— Arsenic

● Arsenic Non-Detections

—■— Potassium

## LDA Shallow/Alluvial Monitoring Wells MW-2A



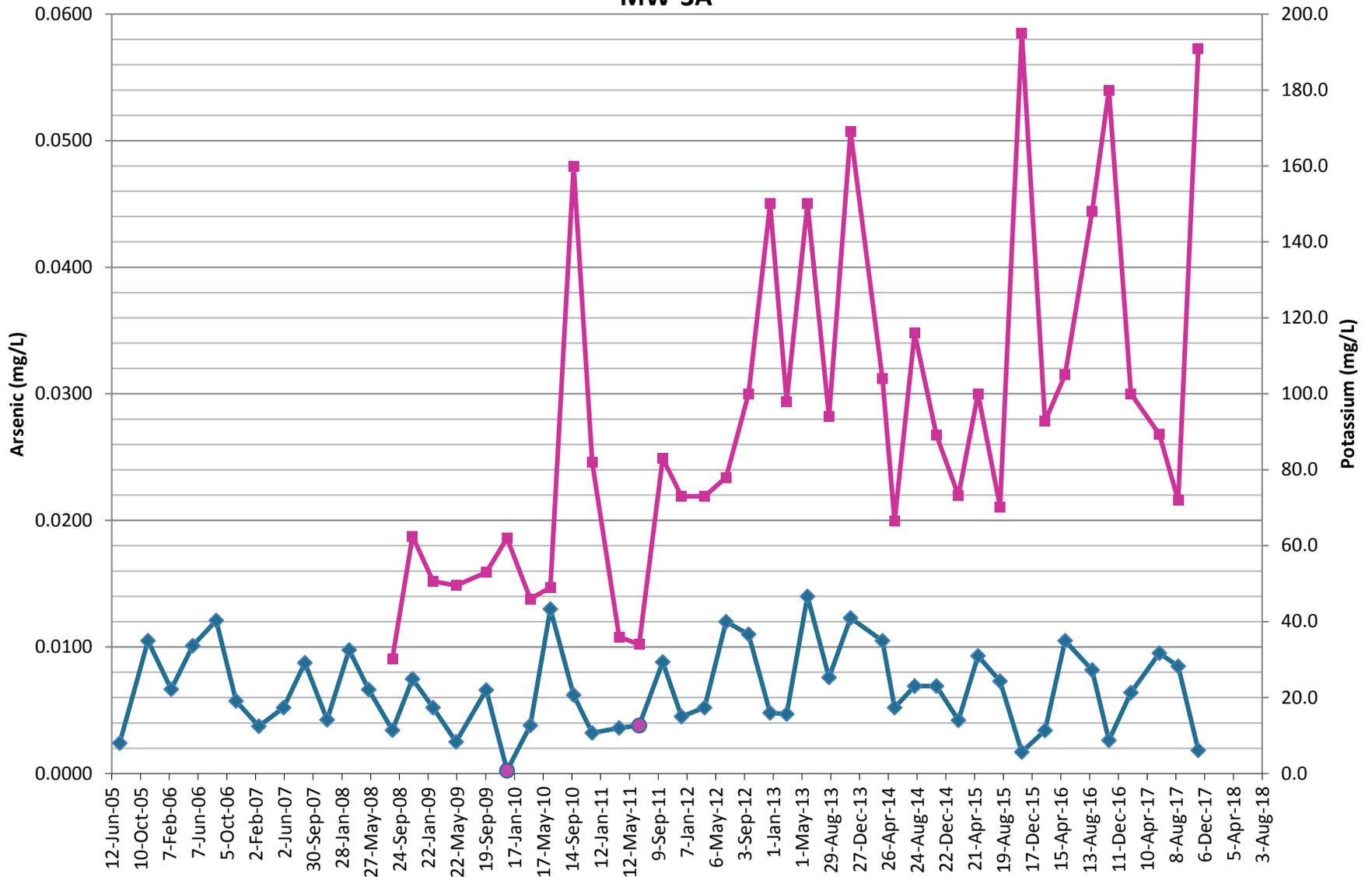
Non-detections plotted at RL beginning in December, 2009;  
no prior non-detections.

Date

—▲— TDS

—■— pH

### LDA Shallow/Alluvial Monitoring Wells MW-3A

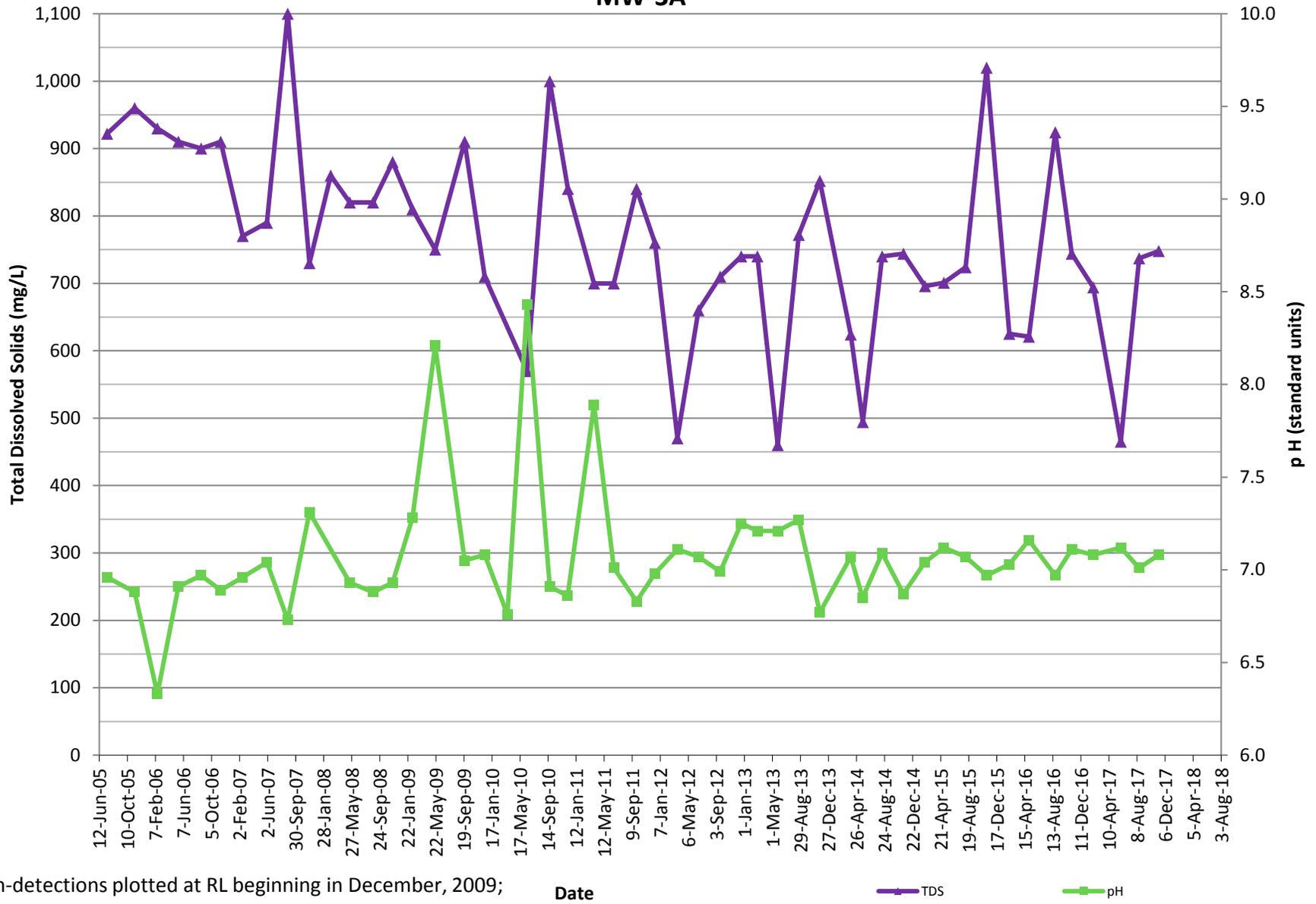


Non-detections plotted at MDL beginning in December, 2009;  
prior non-detections plotted at 50% of the RL

Date

—◆— Arsenic     
 ● Arsenic Non-Detections     
 —■— Potassium

## LDA Shallow/Alluvial Monitoring Wells MW-3A



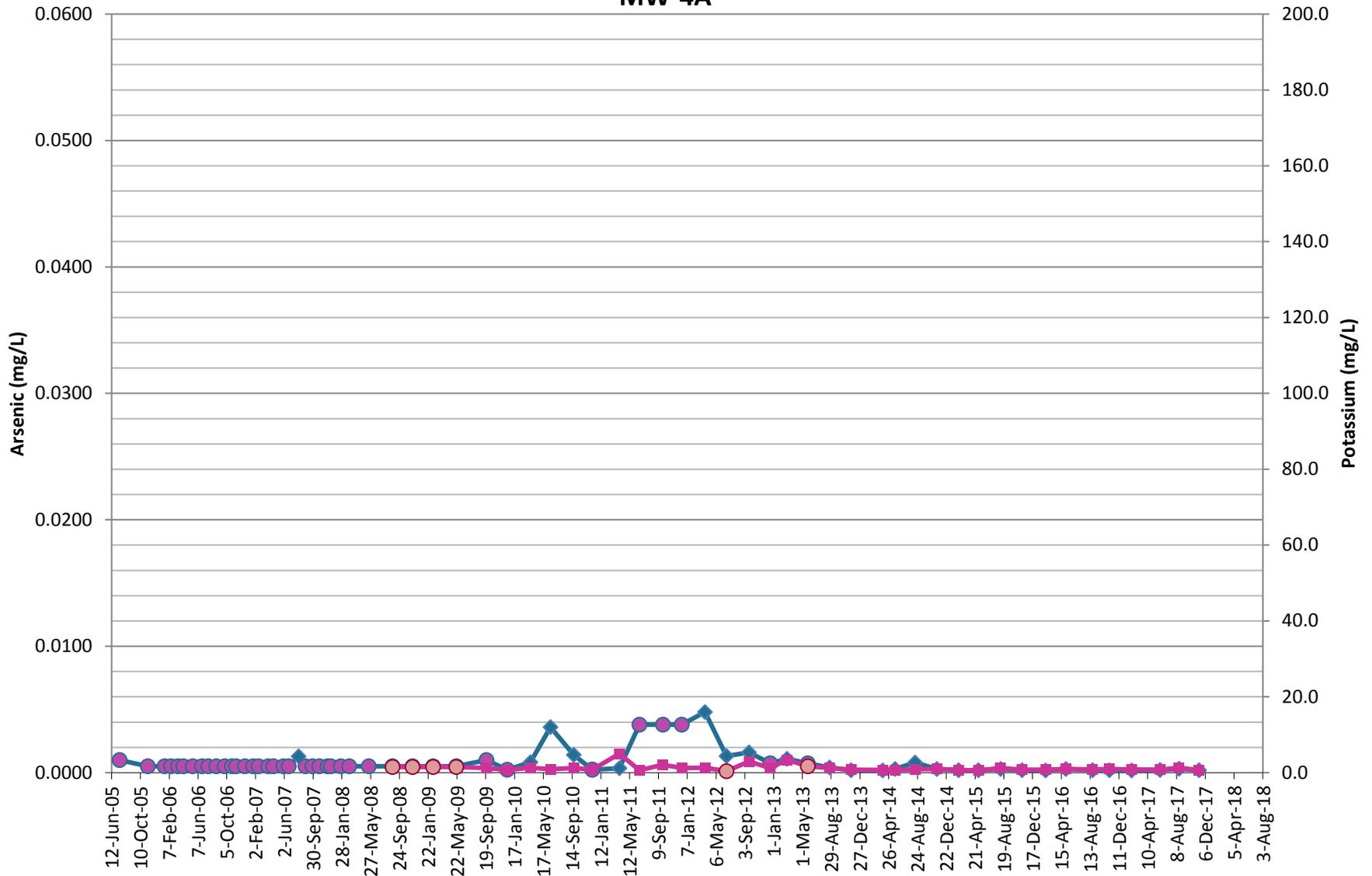
Non-detections plotted at RL beginning in December, 2009;  
no prior non-detections.

Date

▲ TDS

■ pH

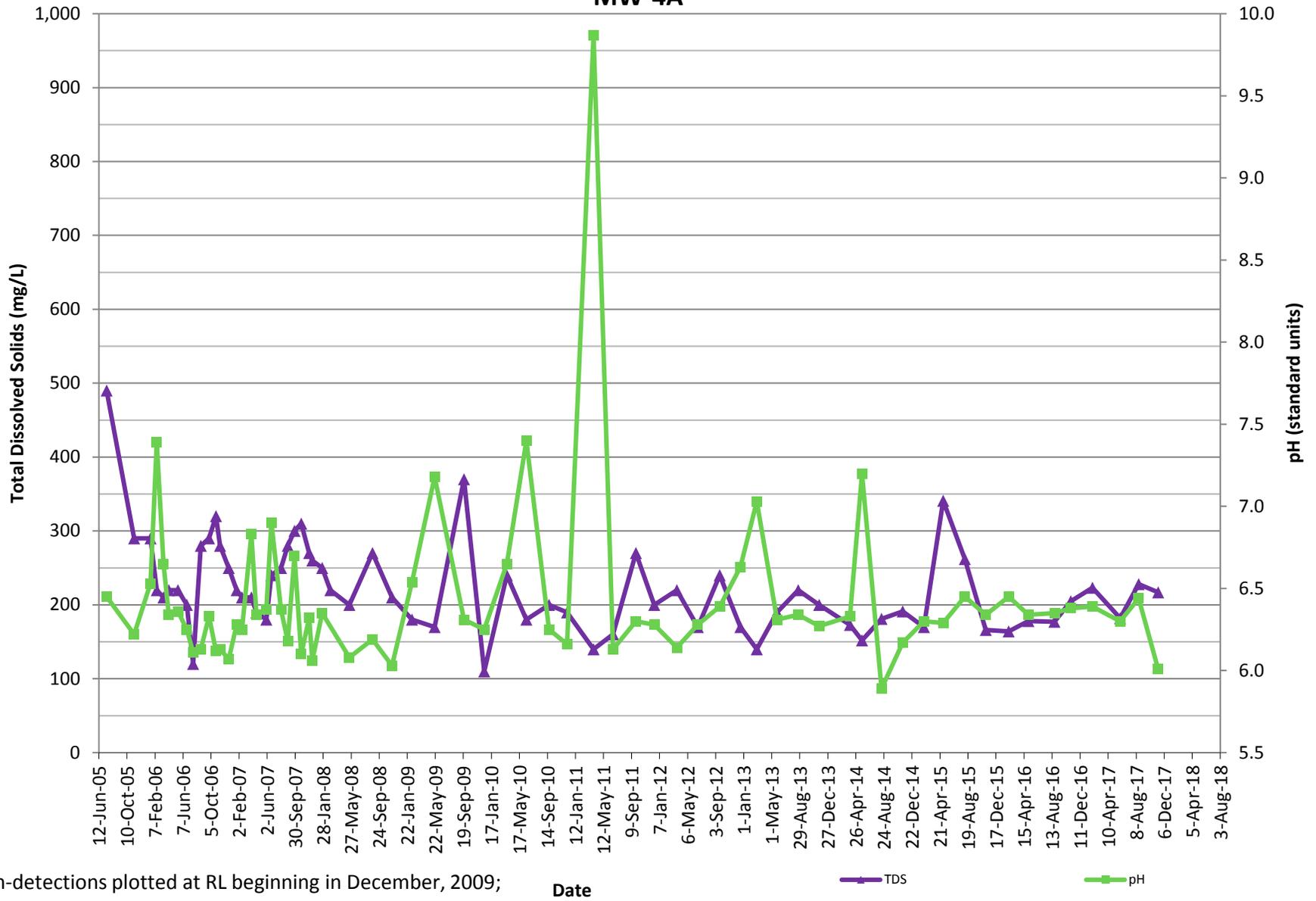
## LDA Shallow/Alluvial Monitoring Wells MW-4A



Non-detections plotted at MDL beginning in December, 2009;  
prior non-detections plotted at 50% of the RL

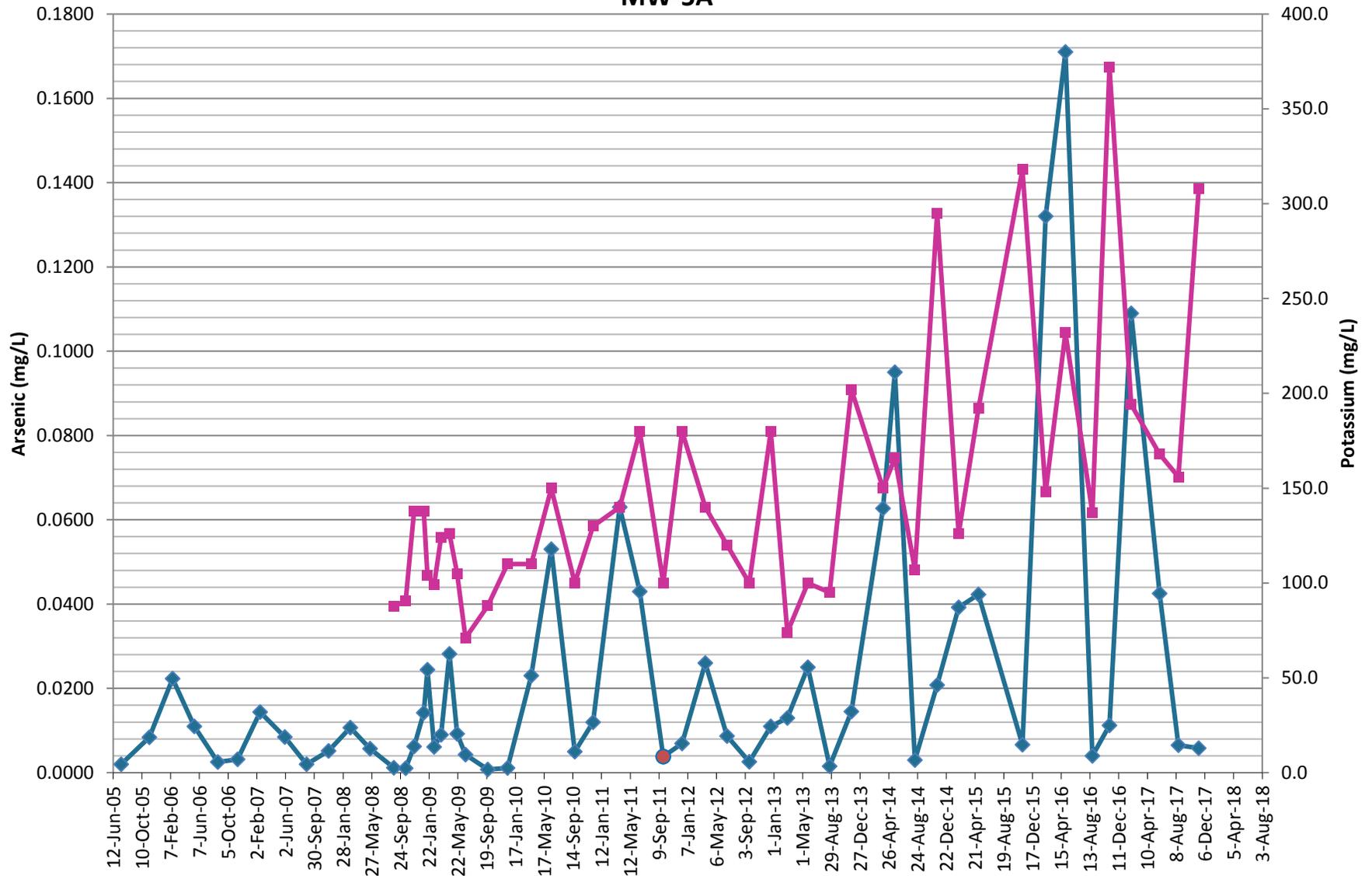
◆ Arsenic     
 ● Arsenic Non-Detections     
 ■ Potassium     
 ● Potassium Non-Detections

## LDA Shallow/Alluvial Monitoring Wells MW-4A



Non-detections plotted at RL beginning in December, 2009;  
no prior non-detections.

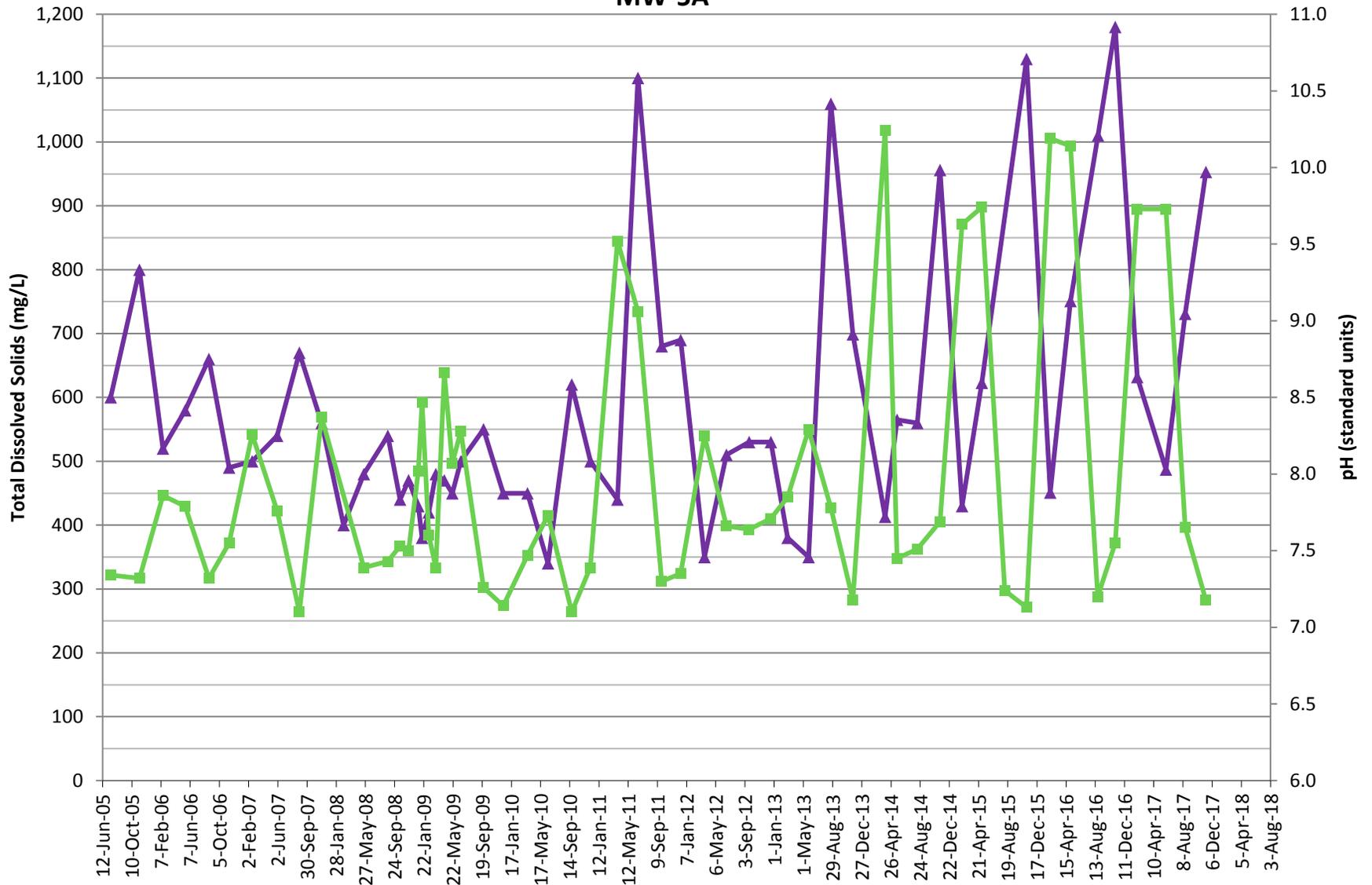
## LDA Shallow/Alluvial Monitoring Wells MW-5A



Non-detections plotted at MDL beginning in December, 2009; prior non-detections plotted at 50% of the RL

◆ Arsenic    
 ● Arsenic Non-Detections    
 ■ Potassium

## LDA Shallow/Alluvial Monitoring Wells MW-5A



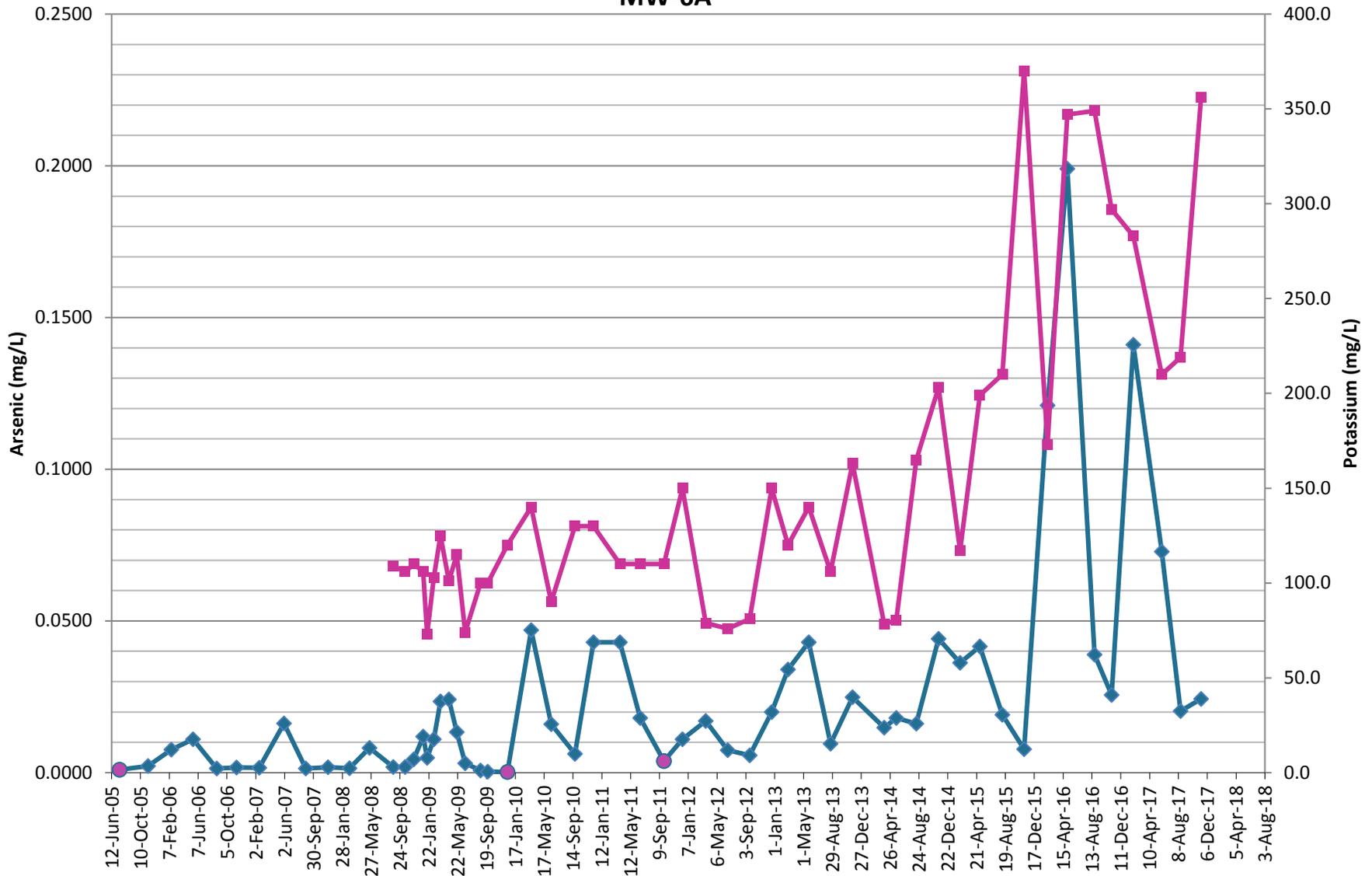
Non-detections plotted at RL beginning in December, 2009;  
no prior non-detections.

Date

—▲— TDS

—■— pH

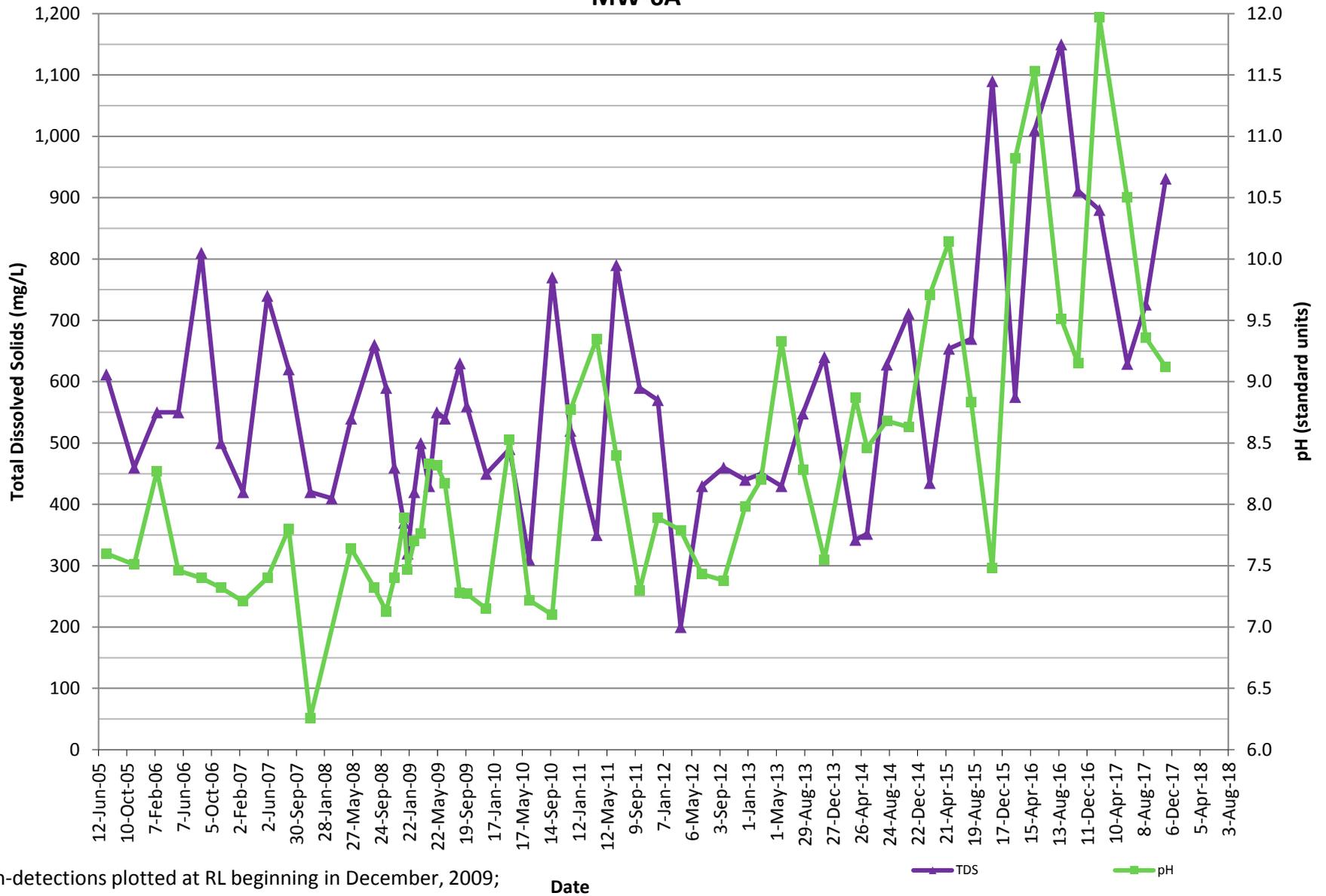
## LDA Shallow/Alluvial Monitoring Wells MW-6A



Non-detections plotted at MDL beginning in December, 2009; prior non-detections plotted at 50% of the RL

◆ Arsenic     
 ● Arsenic Non-Detections     
 ■ Potassium

## LDA Shallow/Alluvial Monitoring Wells MW-6A



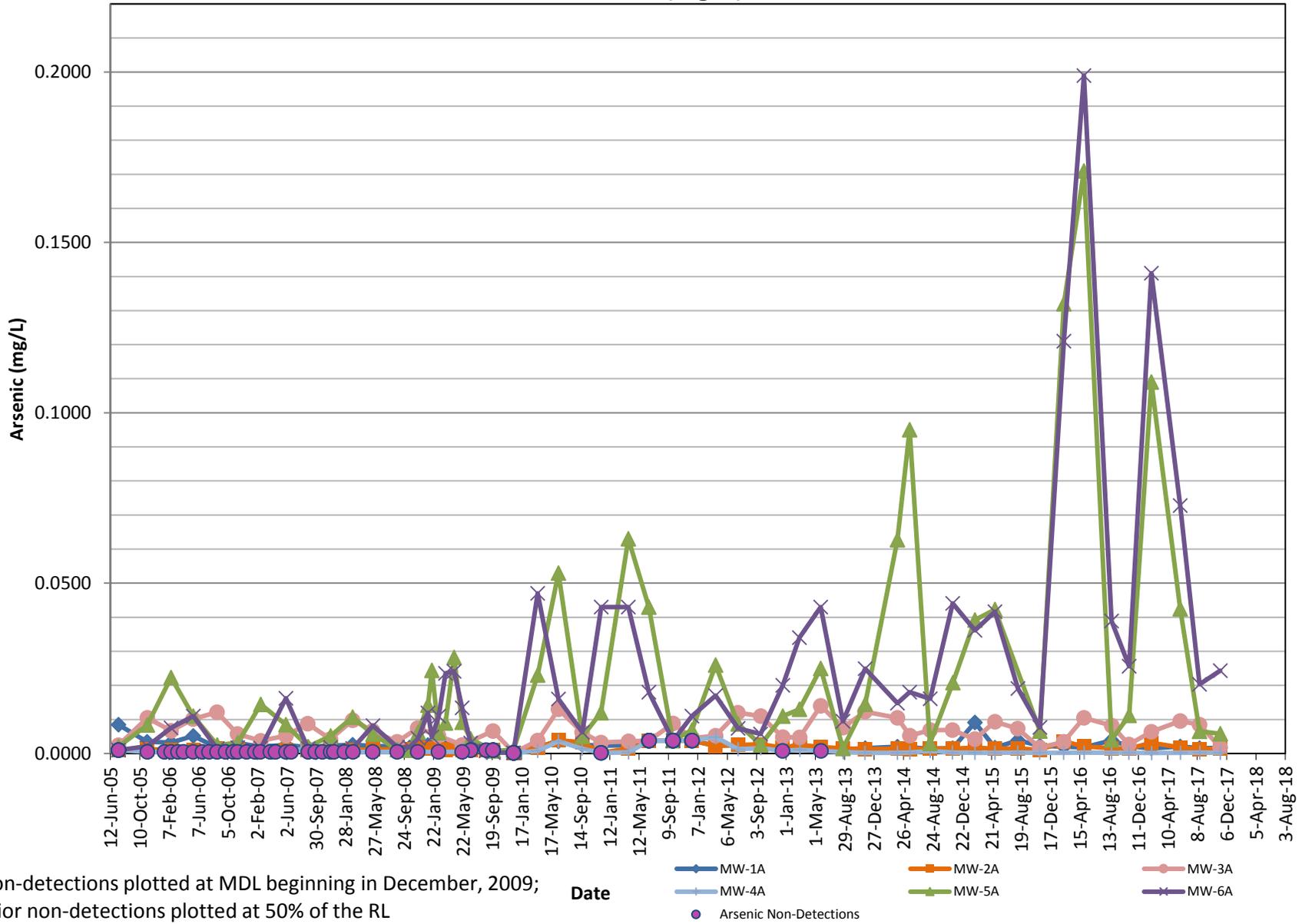
Non-detections plotted at RL beginning in December, 2009;  
no prior non-detections.

Date

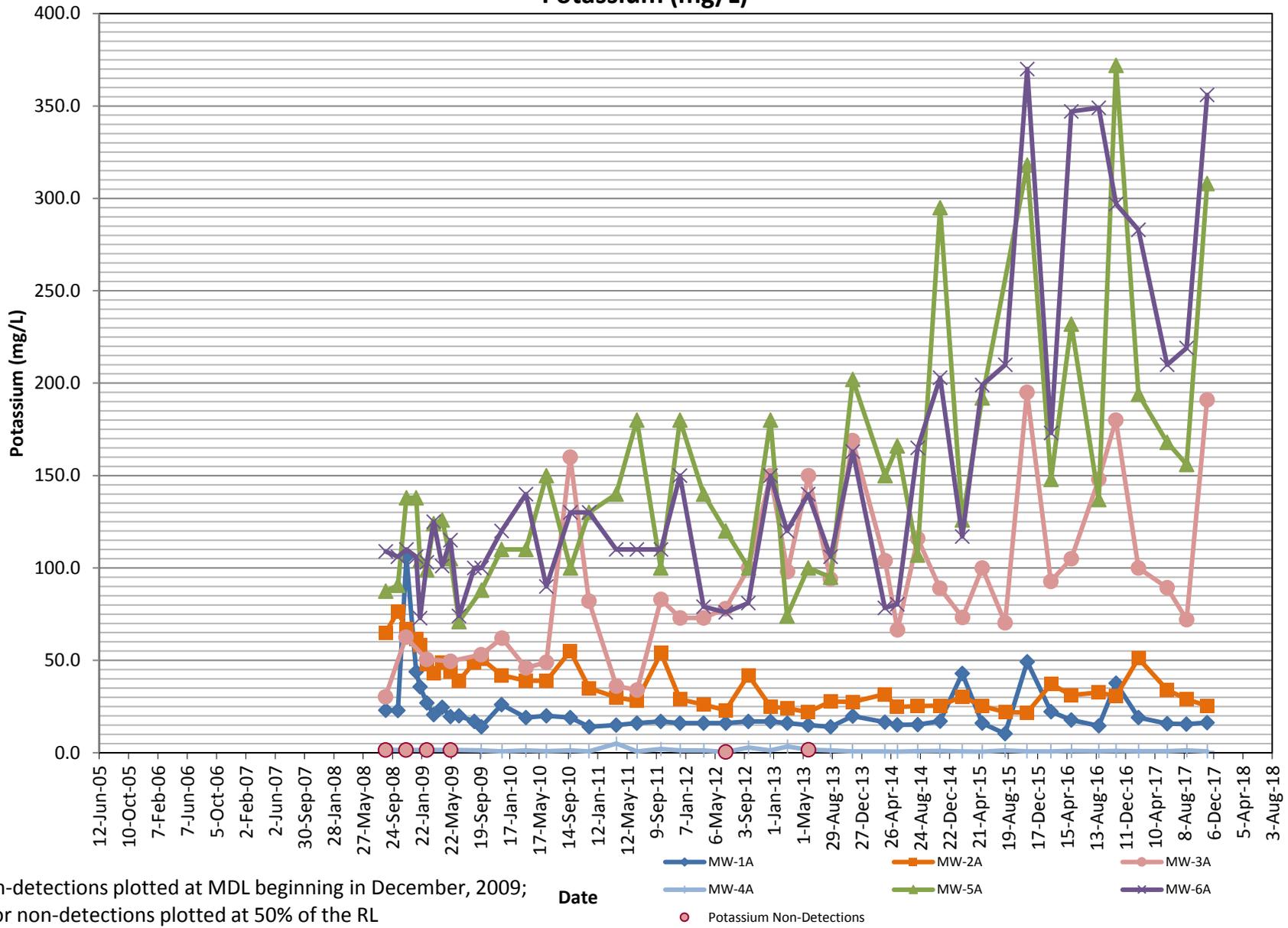
TDS

pH

## LDA Shallow/Alluvial Monitoring Wells Arsenic (mg/L)



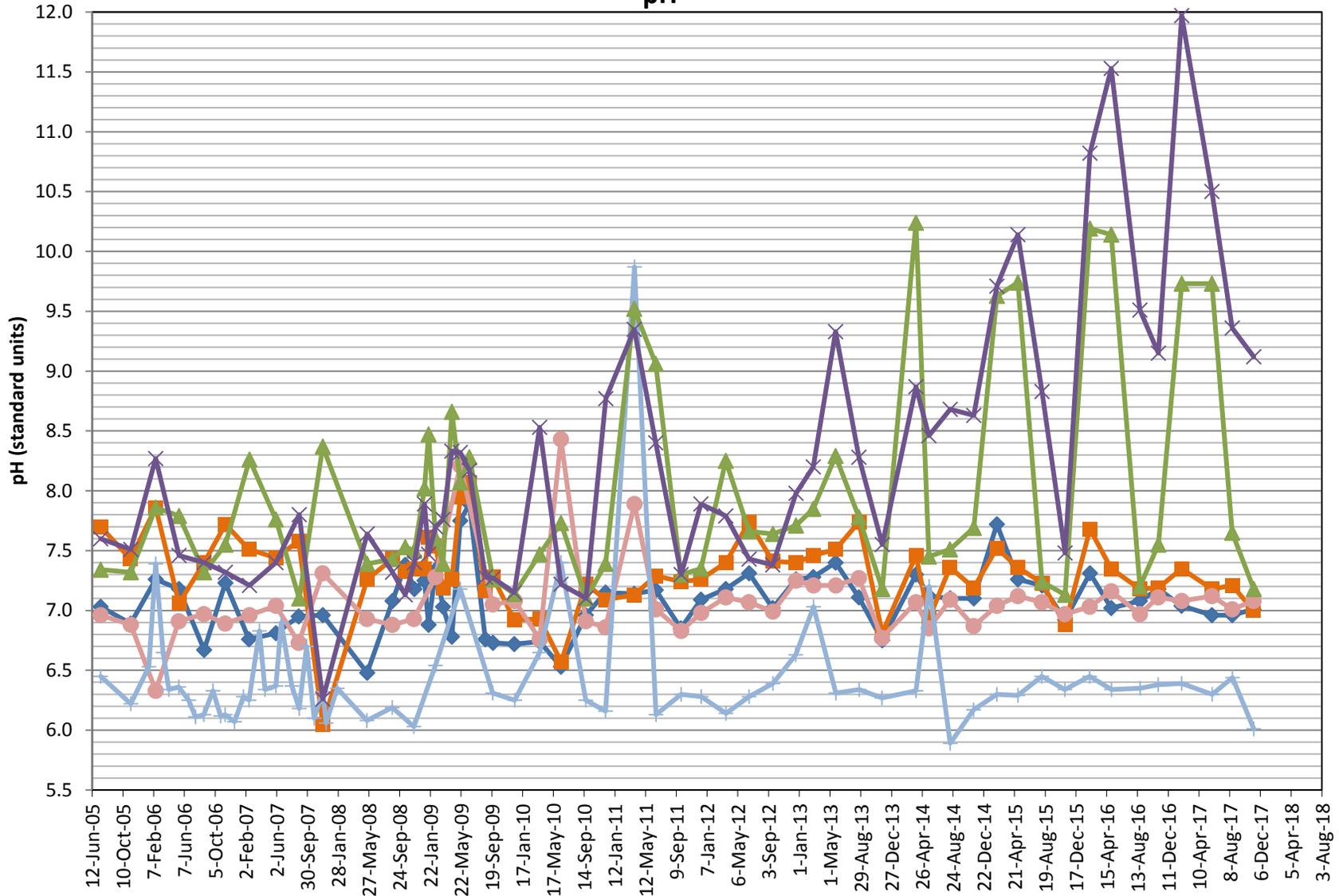
## LDA Shallow/Alluvial Monitoring Wells Potassium (mg/L)



Non-detections plotted at MDL beginning in December, 2009;  
prior non-detections plotted at 50% of the RL

## LDA Shallow/Alluvial Monitoring Wells

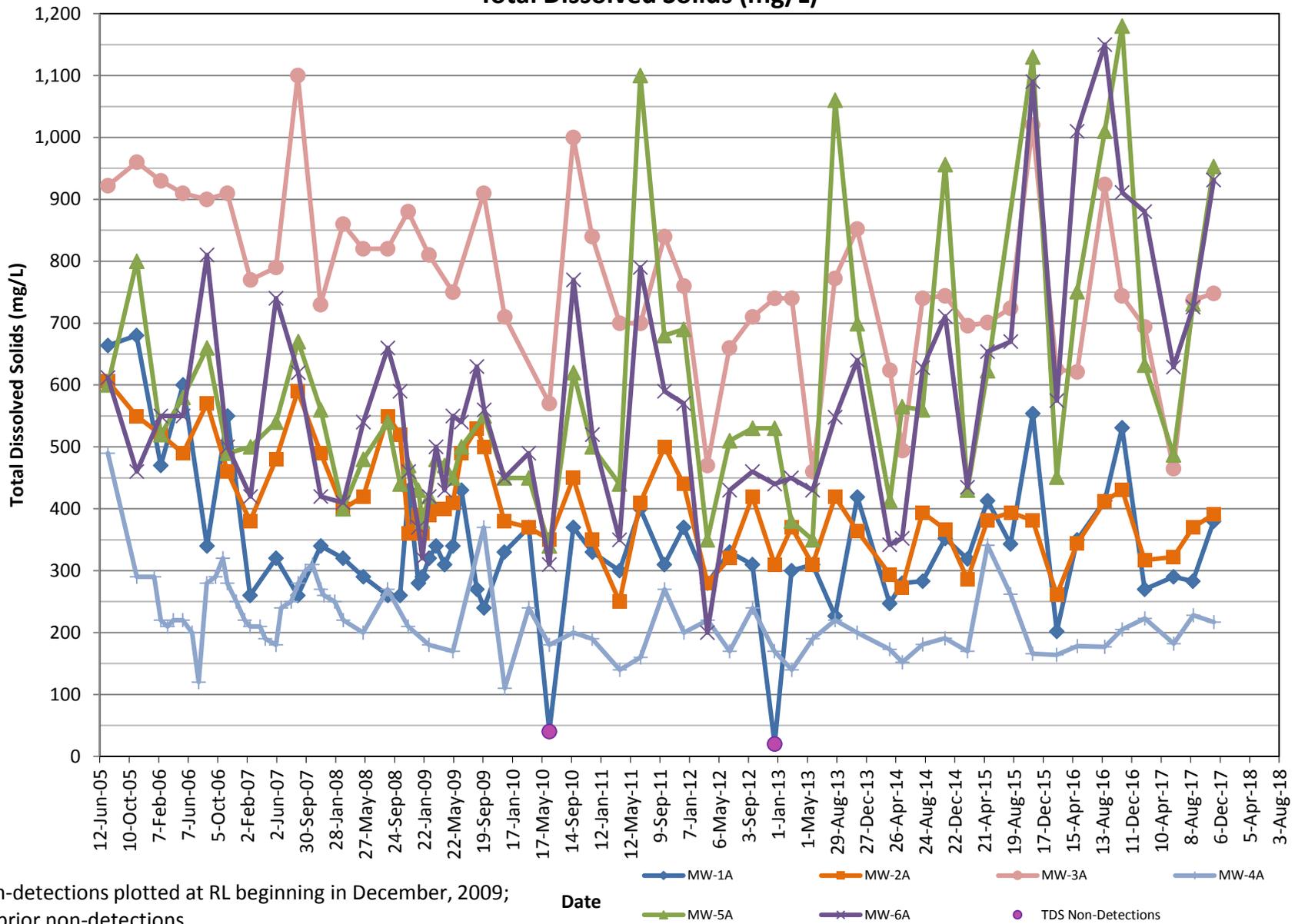
### pH



Non-detections plotted at MDL beginning in December, 2009; prior non-detections plotted at 50% of the RL

Date ◆ MW-1A ■ MW-2A ● MW-3A ◆ MW-4A ◆ MW-5A ✕ MW-6A

### LDA Shallow/Alluvial Monitoring Wells Total Dissolved Solids (mg/L)



Non-detections plotted at RL beginning in December, 2009;  
no prior non-detections.

**APPENDIX C**  
**DATA VALIDATION REPORT AND LABORATORY ANALYTICAL RESULTS**  
**(ON CD)**

**DATA VALIDATION CHECKLIST**

<b>Project Name:</b>	Ravensdale Project
<b>Project Number:</b>	15-20304.700
<b>Sample Identification(s):</b>	EB, Infiltration #1, Infiltration #2, MW-1A, MW-2A, MW-3A, MW-4A, MW-5A, MW-6A, MW-7A, South Pond, Still Well, Weir Interceptor Trench
<b>Sample Date(s):</b>	11/9, 11/10/17
<b>Sample Team:</b>	Joe Miller, Joseph Xi, Golder Associates
<b>Sample Matrix:</b>	Aqueous
<b>Analyzing Laboratory:</b>	Analytical Resources, Inc. – Tukwila, WA
<b>Analyses:</b>	TDS (SM 2540 C), Metals (EPA 6010C, 200.8): Dissolved As, Pb, K, Fe, Mn
<b>Laboratory Report No.:</b>	17K0183

**FIELD DATA PACKAGE DOCUMENTATION**

	Reported		Performance Acceptable		Not Required
	NO	YES	NO	YES	
<b>Field Sampling Logs:</b>					
1. Sampling dates noted		X		X	
2. Sampling team indicated		X		X	
3. Sampling identification traceable to location collected		X		X	
4. Sample location		X		X	
5. Collection technique (bailer, pump, etc.)		X		X	
6. Sample container type		X		X	
7. Preservation methods		X		X	
8. Chain-of-custody form completed		X		X	
9. Required analytical methods requested		X		X	
10. Field sample logs completed properly and signed		X		X	
11. Number and type of field QC samples collected		X		X	
12. Field equipment calibration		X		X	
13. Field equipment decontamination		X		X	

QC – quality control

**COMMENTS:**

Performance was acceptable, with the following exceptions and/or notes:

**ANALYTICAL DATA PACKAGE DOCUMENTATION**  
**GENERAL INFORMATION**

	Reported		Performance Acceptable		Not Required
	NO	YES	NO	YES	
1. Sample results		X		X	
2. Parameters analyzed		X		X	
3. Method of analysis		X		X	
4. Reporting limits of analysis		X		X	
5. Sample collection date		X		X	
6. Laboratory sample received date		X		X	
7. Sample preparation/extraction date		X		X	
8. Sample analysis date		X		X	
9. Copy of chain-of-custody form signed by lab sample custodian		X		X	
10. Narrative summary of QA or sample problems provided		X		X	

QA – quality assurance

**COMMENTS:**

Performance was acceptable, with the following exceptions and/or notes:

- The lab labelled samples EB, MW-4A, and Interceptor Trench as “FB” in the “Sample\_Type” column of the edd. The sample type label has been updated to the correct designation of “N”.
- The reporting limits (RLs) and method detection limits (MDLs) of Analytical Resources Inc. were reviewed to ensure data quality objectives were met. The following table is a comparison of the laboratory RLs and MDLs as compared to the preliminary standards for the site. All RLs and MDLs were less than the preliminary standards.

Parameter	Preliminary Standards		Analytical Resources Inc.		
	Method	(mg/L)	Method	RL (mg/L)	MDL (mg/L)
<b>Total Dissolved Solids</b>	EPA 160.1	500	SM 2540 C	5.0	
<b>Iron</b>	EPA 6010B	0.3	EPA 6010C	0.050	0.0013
<b>Manganese</b>	EPA 6010B	0.05	EPA 6010C	0.001	0.0003
<b>Potassium</b>	EPA 6010B	NA	EPA 6010C	0.50	0.052
<b>Arsenic</b>	EPA 6020	TBD	EPA 200.8	0.0002	0.000022
<b>Lead</b>	EPA 6020	0.05	EPA 200.8	0.0001	0.000068

## INORGANIC ANALYSES

Metals (EPA 6010C/200.8)	Reported		Performance Acceptable		Not Required
	NO	YES	NO	YES	
1. Holding times		X		X	
2. Reporting limits		X		X	
3. Blanks					
a. Method blanks		X	X		
b. Equipment rinsate blanks		X	X		
4. Laboratory control sample (LCS) %R		X		X	
5. Matrix spike (MS) %R		X	X		
6. LCS duplicate (LCSD) %R					X
7. MS duplicate (MSD) %R		X	X		
8. MS / MSD RPD		X		X	
9. LCS / LCSD RPD					X
10. Laboratory Duplicate RPD		X		X	
11. Field duplicate comparison		X		X	

%R – percent recovery

RPD – relative percent difference

### COMMENTS:

Performance was acceptable, with the following exceptions and/or notes:

- The Method Blank (BFK0639-BLK1) has a low level detection of Iron at 0.0081 J mg/L. Following the Guidelines and using professional judgment, when the blank contamination is between the MDL and RL, associated results that are between the MDL and RL are qualified as non-detect (U) and reported at the RL, while detections greater than the RL do not require qualification. The Equipment Blank is not qualified due to method blank contamination.
- The Equipment Blank (EB) has a low level detections of Iron, Manganese, and Potassium at 0.0054 J, 0.0005 J, and 0.321 J mg/L, respectively. Validation guidelines do not require qualification of equipment blank data; rather, it is advisory that low detections of Potassium may be biased high.
- The MS and MSD recoveries of Lead in South Pond sample are above acceptance criteria. Following the Guidelines and using professional judgment, the Lead result in the parent sample is qualified as estimated with high bias (J+).
- The MS and MSD recoveries of Potassium in the South Pond sample are below acceptance criteria. The results are qualified by the lab as "HC", which indicates that the concentration of the analyte in the sample is so great that accurate determination of the spike recovery is not possible. As per the guidelines, when the sample concentration is greater than 4x the spike amount, the normal acceptance criteria are not applicable and no qualification is required
- Field duplicates were collected at MW-2A (field duplicate ID is MW-7A) and Infiltration #1 (field duplicate ID is Infiltration #2). All precision is acceptable.
- The laboratory did not provide LCSD results. This QC element is not required because sufficient precision and accuracy data was provided by the lab with laboratory duplicate, MS/MSD, and LCS analyses.

**GENERAL WET CHEMISTRY**

TDS (EPA 160.1)	Reported		Performance Acceptable		Not Required
	NO	YES	NO	YES	
1. Holding times		X		X	
2. Reporting limits		X		X	
3. Blanks					
a. Method blanks		X		X	
b. Equipment rinsate blanks		X		X	
4. Laboratory control sample (LCS) %R		X		X	
5. Matrix spike (MS) %R					X
6. LCS duplicate (LCSD) %R					X
7. MS duplicate (MSD) %R					X
8. MS/MSD RPD					X
9. LCS/LCSD RPD					X
10. Laboratory Duplicate RPD		X		X	
11. Field duplicate comparison		X		X	

%R – percent recovery                      RPD – relative percent difference

**COMMENTS:**

Performance was acceptable, with the following exceptions and/or notes:

- Field duplicates were collected at MW-2A (field duplicate ID is MW-7A) and Infiltration #1 (field duplicate ID is Infiltration #2). All precision is acceptable.
- The laboratory did not provide LCSD, MS, or MSD results. These QC elements are not required because sufficient precision and accuracy data was provided by the lab with laboratory duplicate and LCS analyses.

**DATA VALIDATION CHECKLIST**  
**SUMMARY AND DATA QUALIFIER CODES**

<b>Project Name:</b>	Ravensdale Project
<b>Project Number:</b>	15-20304.700
<b>Sample Identification(s):</b>	EB, Infiltration #1, Infiltration #2, MW-1A, MW-2A, MW-3A, MW-4A, MW-5A, MW-6A, MW-7A, South Pond, Still Well, Weir Interceptor Trench
<b>Sample Date(s):</b>	11/9, 11/10/17
<b>Sample Team:</b>	Joe Miller, Joseph Xi, Golder Associates
<b>Sample Matrix:</b>	Aqueous
<b>Analyzing Laboratory:</b>	Analytical Resources, Inc. – Tukwila, WA
<b>Analyses:</b>	TDS (SM 2540 C), Metals (EPA 6010C, 200.8): Dissolved As, Pb, K, Fe, Mn
<b>Laboratory Report No.:</b>	17K0183

Sample ID	Analyte(s)	Result	Qualifier	Reason(s)
MW-3A	Iron	0.05	U	Method blank contamination
MW-2A	Iron	0.05	U	Method blank contamination
Stillwell	Iron	0.1	U	Method blank contamination
MW-1A	Iron	0.05	U	Method blank contamination
MW-7A	Iron	0.05	U	Method blank contamination
MW-4A	Iron	0.05	U	Method blank contamination
South Pond	Lead	-	J+	MS/MSD recovery above QC limits
All samples	All analytes	-	-	Remove any lab applied "D" qualifiers

<b>VALIDATION PERFORMED BY:</b>	Jason Yabandeh, Golder Associates
<b>DATE:</b>	December 3, 2017



27 November 2017

Gary Zimmerman  
Golder Associates  
18300 NE Union Hill Road Suite 200  
Redmond, WA 98052-3333

RE: Ravensdale

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)  
17K0183

Associated SDG ID(s)  
N/A

-----

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclosed Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*



# Chain of Custody Record & Laboratory Analysis Request

**Analytical Resources, Incorporated**  
 Analytical Chemists and Consultants  
 4611 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)  
 www.arilabs.com



Page: 1 of 2  
 Ice Present?   
 Cooler Temps: \_\_\_\_\_  
 Date: 11/16/17  
 No. of Coolers: \_\_\_\_\_

Turn-around Requested: Standard  
 Phone: 425-883-0777  
 Client Company: Golden  
 Client Contact: G. Zimmerman  
 Client Project Name: Ravensdale  
 Client Project #: 1520304

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested	Notes/Comments
-----------	------	------	--------	----------------	--------------------	----------------

Infiltration 1	11/9/17	1030	w	2	X	* Report to MDL * Client specific EAD * As MDL is 0.00076 µg/L
Infiltration 2	11/9/17	1035	w	2	X	
MW-3A	11/9/17	1135	w	2	X	
Southpond	11/9/17	1215	w	3	X	MS/MSD to Metals
Stillwell	11/9/17	1240 <del>1135 AM</del>	w	2	X	
Weir	11/9/17	1145	w	2	X	
MW-1A	11/9/17	1400	w	2	X	
MW-2A	11/9/17	1520	w	2	X	
MW-5A	11/10/17	1000	w	2	X	
MW-6A	11/10/17	0900	w	2	X	

Comments/Special Instructions  
 \* All metals are Field Filtered w/ 0.45µm Filter  
 \* As cc: Zimmerman@arilabs.com  
 jim.miller@arilabs.com

Received by: (Signature) Joe Miller  
 Printed Name: Joe Miller  
 Company: Golden  
 Date & Time: 11/10/17 1300

Relinquished by: (Signature) Brandon Fisk  
 Printed Name: Brandon Fisk  
 Company: ARI  
 Date & Time: 11/10/17 1300

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.





# Cooler Receipt Form

ARI Client: Golda

Project Name: \_\_\_\_\_

COC No(s): \_\_\_\_\_ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: \_\_\_\_\_

Assigned ARI Job No: 17K0183

Tracking No: \_\_\_\_\_ NA

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES NO

Were custody papers included with the cooler? YES NO

Were custody papers properly filled out (ink, signed, etc.) YES NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) YES NO

Time: 2.2 2.8

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: 17002565

Cooler Accepted by: BSF Date: 11/10/17 Time: 1300

*Complete custody forms and attach all shipping documents*

**Log-In Phase:**

Was a temperature blank included in the cooler? YES NO

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: \_\_\_\_\_

Was sufficient ice used (if appropriate)? NA YES NO

Were all bottles sealed in individual plastic bags? YES NO

Did all bottles arrive in good condition (unbroken)? YES NO

Were all bottle labels complete and legible? YES NO

Did the number of containers listed on COC match with the number of containers received? YES NO

Did all bottle labels and tags agree with custody papers? YES NO

Were all bottles used correct for the requested analyses? YES NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... NA YES NO

Were all VOC vials free of air bubbles? NA YES NO

Was sufficient amount of sample sent in each bottle? NA YES NO

Date VOC Trip Blank was made at ARI: \_\_\_\_\_ Split by: \_\_\_\_\_

Was Sample Split by ARI: NA YES Date/Time: \_\_\_\_\_ Equipment: \_\_\_\_\_

Samples Logged by: JPW Date: 11/10/2017 Time: 1515

**\*\* Notify Project Manager of discrepancies or concerns \*\***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

**Additional Notes, Discrepancies, & Resolutions:**

By: \_\_\_\_\_ Date: \_\_\_\_\_

			Small → "sm" (< 2 mm)
			Peabubbles → "pb" (2 to < 4 mm)
			Large → "lg" (4 to < 6 mm)
			Headspace → "hs" (> 6 mm)



Golder Associates  
18300 NE Union Hill Road Suite 200  
Redmond WA, 98052-3333

Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
27-Nov-2017 10:08

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Infiltration 1	17K0183-01	Water	09-Nov-2017 10:30	10-Nov-2017 13:00
Infiltration 2	17K0183-02	Water	09-Nov-2017 10:35	10-Nov-2017 13:00
MW-3A	17K0183-03	Water	09-Nov-2017 11:35	10-Nov-2017 13:00
Southpond	17K0183-04	Water	09-Nov-2017 12:15	10-Nov-2017 13:00
Stillwell	17K0183-05	Water	09-Nov-2017 12:30	10-Nov-2017 13:00
Weir	17K0183-06	Water	09-Nov-2017 11:45	10-Nov-2017 13:00
MW-1A	17K0183-07	Water	09-Nov-2017 14:00	10-Nov-2017 13:00
MW-2A	17K0183-08	Water	09-Nov-2017 15:20	10-Nov-2017 13:00
MW-5A	17K0183-09	Water	10-Nov-2017 10:00	10-Nov-2017 13:00
MW-6A	17K0183-10	Water	10-Nov-2017 09:00	10-Nov-2017 13:00
MW-7A	17K0183-11	Water	09-Nov-2017 15:25	10-Nov-2017 13:00
EB	17K0183-12	Water	10-Nov-2017 09:25	10-Nov-2017 13:00
Interceptor Trench	17K0183-13	Water	10-Nov-2017 11:20	10-Nov-2017 13:00
MW-4A	17K0183-14	Water	10-Nov-2017 11:00	10-Nov-2017 13:00



Golder Associates  
18300 NE Union Hill Road Suite 200  
Redmond WA, 98052-3333

Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

## Case Narrative

### Dissolved Metals - EPA Method 200.8 and 6010C

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The LCS percent recoveries were within control limits.

The Matrix Spike/Sample duplicate RPDs were within limits with the exception of analytes flagged on the associated forms.

### Wet Chemistry

The sample(s) were prepared and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The LCS percent recoveries were within control limits.

The Matrix Spike/Matrix Spike duplicate recoveries and RPD were within limits.



Golder Associates  
18300 NE Union Hill Road Suite 200  
Redmond WA, 98052-3333

Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**Infiltration 1**  
**17K0183-01 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8  
Instrument: ICPMS2

Sampled: 11/09/2017 10:30  
Analyzed: 15-Nov-2017 16:28

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	1	0.0680	0.100	32.2	ug/L	



Golder Associates  
18300 NE Union Hill Road Suite 200  
Redmond WA, 98052-3333

Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**Infiltration 1**  
**17K0183-01 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/09/2017 10:30  
Analyzed: 15-Nov-2017 16:28

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	<b>63.0</b>	ug/L	



Golder Associates  
18300 NE Union Hill Road Suite 200  
Redmond WA, 98052-3333

Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**Infiltration 1**  
**17K0183-01 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/09/2017 10:30  
Analyzed: 22-Nov-2017 17:10

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	2	0.0026	0.100	<b>0.156</b>	mg/L	D
Manganese, Dissolved	7439-96-5	2	0.0007	0.0020	<b>0.0141</b>	mg/L	D
Potassium, Dissolved	7440-09-7	2	0.104	1.00	<b>578</b>	mg/L	D



Golder Associates 18300 NE Union Hill Road Suite 200 Redmond WA, 98052-3333	Project: Ravensdale Project Number: Ravensdale Project Manager: Gary Zimmerman	<b>Reported:</b> 27-Nov-2017 10:08
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**Infiltration 1**  
**17K0183-01 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97  
Instrument: BAL2

Sampled: 11/09/2017 10:30  
Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 50 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	20.0	<b>1520</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
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**Infiltration 2**  
**17K0183-02 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8  
Instrument: ICPMS2

Sampled: 11/09/2017 10:35  
Analyzed: 15-Nov-2017 16:33

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	1	0.0680	0.100	37.9	ug/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
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**Infiltration 2**  
**17K0183-02 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/09/2017 10:35  
Analyzed: 15-Nov-2017 16:33

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	<b>63.6</b>	ug/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**Infiltration 2**  
**17K0183-02 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/09/2017 10:35  
Analyzed: 22-Nov-2017 17:15

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	2	0.0026	0.100	<b>0.197</b>	mg/L	D
Manganese, Dissolved	7439-96-5	2	0.0007	0.0020	<b>0.0205</b>	mg/L	D
Potassium, Dissolved	7440-09-7	2	0.104	1.00	<b>584</b>	mg/L	D



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
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**Infiltration 2**  
**17K0183-02 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97  
Instrument: BAL2

Sampled: 11/09/2017 10:35  
Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 50 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	20.0	<b>1530</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

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**MW-3A**  
**17K0183-03 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8  
Instrument: ICPMS2

Sampled: 11/09/2017 11:35  
Analyzed: 15-Nov-2017 16:37

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	1	0.0680	0.100	ND	ug/L	U



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**MW-3A**  
**17K0183-03 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/09/2017 11:35  
Analyzed: 15-Nov-2017 16:37

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	<b>1.84</b>	ug/L	



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Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**MW-3A**  
**17K0183-03 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/09/2017 11:35  
Analyzed: 22-Nov-2017 15:28

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0420</b>	mg/L	J
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.554</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>191</b>	mg/L	



Golder Associates 18300 NE Union Hill Road Suite 200 Redmond WA, 98052-3333	Project: Ravensdale Project Number: Ravensdale Project Manager: Gary Zimmerman	<b>Reported:</b> 27-Nov-2017 10:08
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**MW-3A**  
**17K0183-03 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97  
Instrument: BAL2

Sampled: 11/09/2017 11:35  
Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 75 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	13.3	<b>748</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

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**Southpond**  
**17K0183-04 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8  
Instrument: ICPMS2

Sampled: 11/09/2017 12:15  
Analyzed: 15-Nov-2017 16:58

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	5	0.340	0.500	53.4	ug/L	D



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**Southpond**  
**17K0183-04 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/09/2017 12:15  
Analyzed: 15-Nov-2017 16:58

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	5	0.110	1.00	<b>58.8</b>	ug/L	D



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**Southpond**  
**17K0183-04 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/09/2017 12:15  
Analyzed: 22-Nov-2017 15:36

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	2	0.0026	0.100	<b>1.46</b>	mg/L	D
Manganese, Dissolved	7439-96-5	2	0.0007	0.0020	<b>0.0661</b>	mg/L	D
Potassium, Dissolved	7440-09-7	2	0.104	1.00	<b>441</b>	mg/L	D



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**Southpond**  
**17K0183-04 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97 Sampled: 11/09/2017 12:15  
Instrument: BAL2 Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 75 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	13.3	<b>1260</b>	mg/L	



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**Stillwell**  
**17K0183-05 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 Sampled: 11/09/2017 12:30  
Instrument: ICPMS2 Analyzed: 15-Nov-2017 16:42

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	1	0.0680	0.100	3.52	ug/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**Stillwell**

**17K0183-05 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/09/2017 12:30  
Analyzed: 15-Nov-2017 16:42

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	<b>62.1</b>	ug/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**Stillwell**  
**17K0183-05 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/09/2017 12:30  
Analyzed: 22-Nov-2017 17:19

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	2	0.0026	0.100	<b>0.0396</b>	mg/L	J, D
Manganese, Dissolved	7439-96-5	2	0.0007	0.0020	<b>0.0025</b>	mg/L	D
Potassium, Dissolved	7440-09-7	2	0.104	1.00	<b>822</b>	mg/L	D



Golder Associates 18300 NE Union Hill Road Suite 200 Redmond WA, 98052-3333	Project: Ravensdale Project Number: Ravensdale Project Manager: Gary Zimmerman	<b>Reported:</b> 27-Nov-2017 10:08
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**Stillwell**  
**17K0183-05 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97  
Instrument: BAL2

Sampled: 11/09/2017 12:30  
Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 5 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	200	<b>2360</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
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**Weir**  
**17K0183-06 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8  
Instrument: ICPMS2

Sampled: 11/09/2017 11:45  
Analyzed: 15-Nov-2017 16:47

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	1	0.0680	0.100	<b>10.7</b>	ug/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
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**Weir**  
**17K0183-06 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/09/2017 11:45  
Analyzed: 15-Nov-2017 16:47

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	<b>36.6</b>	ug/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**Weir**  
**17K0183-06 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/09/2017 11:45  
Analyzed: 22-Nov-2017 16:19

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	2	0.0026	0.100	<b>1.33</b>	mg/L	D
Manganese, Dissolved	7439-96-5	2	0.0007	0.0020	<b>0.284</b>	mg/L	D
Potassium, Dissolved	7440-09-7	2	0.104	1.00	<b>236</b>	mg/L	D



Golder Associates 18300 NE Union Hill Road Suite 200 Redmond WA, 98052-3333	Project: Ravensdale Project Number: Ravensdale Project Manager: Gary Zimmerman	<b>Reported:</b> 27-Nov-2017 10:08
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**Weir**  
**17K0183-06 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97  
Instrument: BAL2

Sampled: 11/09/2017 11:45  
Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 75 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	13.3	<b>865</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

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**MW-1A**  
**17K0183-07 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8  
Instrument: ICPMS2

Sampled: 11/09/2017 14:00  
Analyzed: 17-Nov-2017 20:59

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	1	0.0680	0.100	ND	ug/L	U



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
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**MW-1A**  
**17K0183-07 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/09/2017 14:00  
Analyzed: 15-Nov-2017 20:58

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	<b>1.63</b>	ug/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**MW-1A**  
**17K0183-07 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/09/2017 14:00  
Analyzed: 22-Nov-2017 16:23

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0077</b>	mg/L	J
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0019</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>16.3</b>	mg/L	



Golder Associates  
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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
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**MW-1A**  
**17K0183-07 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97  
Instrument: BAL2

Sampled: 11/09/2017 14:00  
Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 100 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	10.0	<b>380</b>	mg/L	



Golder Associates  
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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**MW-2A**  
**17K0183-08 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8  
Instrument: ICPMS2

Sampled: 11/09/2017 15:20  
Analyzed: 17-Nov-2017 21:04

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	1	0.0680	0.100	ND	ug/L	U



Golder Associates  
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Redmond WA, 98052-3333

Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**MW-2A**  
**17K0183-08 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/09/2017 15:20  
Analyzed: 15-Nov-2017 21:02

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	1.39	ug/L	



Golder Associates  
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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**MW-2A**  
**17K0183-08 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/09/2017 15:20  
Analyzed: 22-Nov-2017 16:28

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0110</b>	mg/L	J
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0005</b>	mg/L	J
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>25.4</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
27-Nov-2017 10:08

**MW-2A**  
**17K0183-08 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97  
Instrument: BAL2

Sampled: 11/09/2017 15:20  
Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 100 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	10.0	<b>391</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**MW-5A**  
**17K0183-09 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8  
Instrument: ICPMS2

Sampled: 11/10/2017 10:00  
Analyzed: 17-Nov-2017 21:08

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	1	0.0680	0.100	<b>0.338</b>	ug/L	



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Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
27-Nov-2017 10:08

**MW-5A**  
**17K0183-09 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/10/2017 10:00  
Analyzed: 15-Nov-2017 21:07

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	<b>5.82</b>	ug/L	



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Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**MW-5A**  
**17K0183-09 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/10/2017 10:00  
Analyzed: 22-Nov-2017 16:32

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0685</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0042</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>308</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
27-Nov-2017 10:08

**MW-5A**  
**17K0183-09 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97  
Instrument: BAL2

Sampled: 11/10/2017 10:00  
Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 75 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	13.3	<b>953</b>	mg/L	



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Project Manager: Gary Zimmerman

**Reported:**  
27-Nov-2017 10:08

**MW-6A**  
**17K0183-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8  
Instrument: ICPMS2

Sampled: 11/10/2017 09:00  
Analyzed: 17-Nov-2017 21:13

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	1	0.0680	0.100	2.77	ug/L	



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Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**MW-6A**  
**17K0183-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/10/2017 09:00  
Analyzed: 15-Nov-2017 21:12

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	<b>24.3</b>	ug/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**MW-6A**  
**17K0183-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/10/2017 09:00  
Analyzed: 22-Nov-2017 16:36

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.251</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0161</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>356</b>	mg/L	



Golder Associates 18300 NE Union Hill Road Suite 200 Redmond WA, 98052-3333	Project: Ravensdale Project Number: Ravensdale Project Manager: Gary Zimmerman	<b>Reported:</b> 27-Nov-2017 10:08
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**MW-6A**  
**17K0183-10 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97  
Instrument: BAL2

Sampled: 11/10/2017 09:00  
Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 75 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	13.3	<b>931</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**MW-7A**  
**17K0183-11 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8  
Instrument: ICPMS2

Sampled: 11/09/2017 15:25  
Analyzed: 17-Nov-2017 21:18

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	1	0.0680	0.100	ND	ug/L	U



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Project: Ravensdale  
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Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**MW-7A**  
**17K0183-11 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/09/2017 15:25  
Analyzed: 15-Nov-2017 21:17

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	1.35	ug/L	



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Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**MW-7A**  
**17K0183-11 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/09/2017 15:25  
Analyzed: 22-Nov-2017 16:40

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0127</b>	mg/L	J
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0008</b>	mg/L	J
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>26.1</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
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**MW-7A**  
**17K0183-11 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97  
Instrument: BAL2

Sampled: 11/09/2017 15:25  
Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 100 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	10.0	<b>398</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
27-Nov-2017 10:08

**EB**  
**17K0183-12 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8  
Instrument: ICPMS2

Sampled: 11/10/2017 09:25  
Analyzed: 17-Nov-2017 21:23

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	1	0.0680	0.100	ND	ug/L	U



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
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**EB**  
**17K0183-12 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/10/2017 09:25  
Analyzed: 15-Nov-2017 20:53

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	ND	ug/L	U



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**EB**  
**17K0183-12 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/10/2017 09:25  
Analyzed: 22-Nov-2017 16:45

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0054</b>	mg/L	J
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0005</b>	mg/L	J
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>0.166</b>	mg/L	J



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**EB**  
**17K0183-12 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97 Sampled: 11/10/2017 09:25  
Instrument: BAL2 Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 200 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	5.0	ND	mg/L	U



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**Interceptor Trench**  
**17K0183-13 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97  
Instrument: BAL2

Sampled: 11/10/2017 11:20  
Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 100 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	10.0	<b>365</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**MW-4A**  
**17K0183-14 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8  
Instrument: ICPMS2

Sampled: 11/10/2017 11:00  
Analyzed: 17-Nov-2017 21:28

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Lead, Dissolved	7439-92-1	1	0.0680	0.100	ND	ug/L	U



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**MW-4A**  
**17K0183-14 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED  
Instrument: ICPMS2

Sampled: 11/10/2017 11:00  
Analyzed: 15-Nov-2017 21:21

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BFK0334 Sample Size: 25 mL  
Prepared: 13-Nov-2017 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	<b>0.186</b>	ug/L	J



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**MW-4A**  
**17K0183-14 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C  
Instrument: ICP2

Sampled: 11/10/2017 11:00  
Analyzed: 22-Nov-2017 16:49

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BFK0639  
Prepared: 22-Nov-2017

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0109</b>	mg/L	J
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0054</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>0.669</b>	mg/L	



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Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
27-Nov-2017 10:08

**MW-4A**  
**17K0183-14 (Water)**

**Wet Chemistry**

Method: SM 2540 C-97  
Instrument: BAL2

Sampled: 11/10/2017 11:00  
Analyzed: 14-Nov-2017 08:04

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BFK0370 Sample Size: 200 mL  
Prepared: 14-Nov-2017 Final Volume: 200 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Dissolved Solids		1	5.0	<b>217</b>	mg/L	



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BFK0334 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix**

Instrument: ICPMS2 Analyst: CC

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BFK0334-BLK1)</b>						Prepared: 13-Nov-2017 Analyzed: 15-Nov-2017 15:19						
Lead, Dissolved	208	ND	0.0680	0.100	ug/L							U
Arsenic, Dissolved	75a	ND	0.0220	0.200	ug/L							U
<b>LCS (BFK0334-BS1)</b>						Prepared: 13-Nov-2017 Analyzed: 15-Nov-2017 15:39						
Arsenic, Dissolved	75a	28.5	0.0220	0.200	ug/L	25.0		114	80-120			
<b>LCS (BFK0334-BS2)</b>						Prepared: 13-Nov-2017 Analyzed: 16-Nov-2017 15:58						
Lead, Dissolved	208	27.0	0.0680	0.100	ug/L	25.0		108	80-120			
<b>Duplicate (BFK0334-DUP1)</b>						Source: 17K0183-04 Prepared: 13-Nov-2017 Analyzed: 15-Nov-2017 16:53						
Lead, Dissolved	208	56.5	0.340	0.500	ug/L		53.4			5.67	20	D
Arsenic, Dissolved	75a	57.9	0.110	1.00	ug/L		58.8			1.50	20	D
<b>Matrix Spike (BFK0334-MS1)</b>						Source: 17K0183-04 Prepared: 13-Nov-2017 Analyzed: 15-Nov-2017 17:03						
Lead, Dissolved	208	91.5	0.340	0.500	ug/L	25.0	53.4	153	75-125			*, D
Arsenic, Dissolved	75a	88.7	0.110	1.00	ug/L	25.0	58.8	120	75-125			D
Recovery limits for target analytes in MS/MSD QC samples are advisory only.												
<b>Matrix Spike Dup (BFK0334-MSD1)</b>						Source: 17K0183-04 Prepared: 13-Nov-2017 Analyzed: 15-Nov-2017 17:08						
Lead, Dissolved	208	92.6	0.340	0.500	ug/L	25.0	53.4	157	75-125	1.16	20	*, D
Arsenic, Dissolved	75a	87.1	0.110	1.00	ug/L	25.0	58.8	113	75-125	1.88	20	D

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



Golder Associates  
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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

Reported:  
27-Nov-2017 10:08

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BFK0639 - WMN (No Prep)**

Instrument: ICP2 Analyst: TCH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BFK0639-BLK1)</b>						Prepared: 22-Nov-2017 Analyzed: 22-Nov-2017 15:15					
Iron, Dissolved	0.0081	0.0013	0.0500	mg/L							J
Manganese, Dissolved	ND	0.0003	0.0010	mg/L							U
Potassium, Dissolved	ND	0.0520	0.500	mg/L							U

<b>LCS (BFK0639-BS1)</b>						Prepared: 22-Nov-2017 Analyzed: 22-Nov-2017 15:52					
Iron, Dissolved	2.06	0.0013	0.0500	mg/L	2.00		103	80-120			
Manganese, Dissolved	0.494	0.0003	0.0010	mg/L	0.500		98.9	80-120			
Potassium, Dissolved	9.47	0.0520	0.500	mg/L	10.0		94.7	80-120			

<b>Duplicate (BFK0639-DUP1)</b>						Source: 17K0183-04 Prepared: 22-Nov-2017 Analyzed: 22-Nov-2017 15:32					
Iron, Dissolved	1.48	0.0026	0.100	mg/L		1.46			1.34	20	D
Manganese, Dissolved	0.0673	0.0007	0.0020	mg/L		0.0661			1.78	20	D
Potassium, Dissolved	441	0.104	1.00	mg/L		441			0.06	20	D

<b>Matrix Spike (BFK0639-MS1)</b>						Source: 17K0183-04 Prepared: 22-Nov-2017 Analyzed: 22-Nov-2017 15:40					
Iron, Dissolved	5.48	0.0026	0.100	mg/L	4.00	1.46	101	75-125			D
Manganese, Dissolved	1.04	0.0007	0.0020	mg/L	1.00	0.0661	97.8	75-125			D
Potassium, Dissolved	449	0.104	1.00	mg/L	20.0	441	39.6	75-125			HC, D

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

<b>Matrix Spike Dup (BFK0639-MSD1)</b>						Source: 17K0183-04 Prepared: 22-Nov-2017 Analyzed: 22-Nov-2017 15:46					
Iron, Dissolved	5.53	0.0026	0.100	mg/L	4.00	1.46	102	75-125	0.88	20	D
Manganese, Dissolved	1.05	0.0007	0.0020	mg/L	1.00	0.0661	98.3	75-125	0.50	20	D
Potassium, Dissolved	451	0.104	1.00	mg/L	20.0	441	48.5	75-125	0.39	20	HC, D

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



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Project: Ravensdale  
Project Number: Ravensdale  
Project Manager: Gary Zimmerman

**Reported:**  
27-Nov-2017 10:08

**Wet Chemistry - Quality Control**

**Batch BFK0370 - No Prep Wet Chem**

Instrument: BAL2 Analyst: KLE

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BFK0370-BLK1)</b>										
					Prepared: 14-Nov-2017 Analyzed: 14-Nov-2017 08:04					
Dissolved Solids	ND	5.0	mg/L							U
<b>LCS (BFK0370-BS1)</b>										
					Prepared: 14-Nov-2017 Analyzed: 14-Nov-2017 08:04					
Dissolved Solids	499	5.0	mg/L	500		99.8	90-110			
<b>Duplicate (BFK0370-DUP1)</b>										
		<b>Source: 17K0183-04</b>			Prepared: 14-Nov-2017 Analyzed: 14-Nov-2017 08:04					
Dissolved Solids	1270	13.3	mg/L		1260			0.85	20	



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**Certified Analyses included in this Report**

Analyte	Certifications
<b>EPA 200.8 in Water</b>	
Lead-208	NELAP,WADOE,WA-DW,DoD-ELAP
<b>EPA 200.8 UCT-KED in Water</b>	
Arsenic-75a	NELAP,WADOE,WA-DW,DoD-ELAP
<b>EPA 6010C in Water</b>	
Iron	WADOE,NELAP
Potassium	WADOE,NELAP
Manganese	WADOE,NELAP
<b>SM 2540 C-97 in Water</b>	
Dissolved Solids	DoD-ELAP,WADOE,WA-DW,NELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	UST-033	05/11/2018
CALAP	California Department of Public Health CAELAP	2748	02/28/2018
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/07/2019
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006	05/11/2018
WADOE	WA Dept of Ecology	C558	06/30/2018
WA-DW	Ecology - Drinking Water	C558	06/30/2018



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### Notes and Definitions

- U This analyte is not detected above the applicable reporting or detection limit.
- J Estimated concentration value detected below the reporting limit.
- HC The natural concentration of the spiked analyte is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
- D The reported value is from a dilution
- B This analyte was detected in the method blank.
- \* Flagged value is not within established control limits.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference
- [2C] Indicates this result was quantified on the second column on a dual column analysis.

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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