LMS/MND/S10184

Sitewide Groundwater Monitoring Report Calendar Year 2012 Mound, Ohio

February 2014

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Abbreviations

BVA	Buried Valley Aquifer
DCE	dichloroethene
DOE	U.S. Department of Energy
LOC	level of concern
MCL	maximum contaminant level
µg/L	micrograms per liter
mg/L	milligrams per liter
MNA	monitored natural attenuation
nCi/L	nanocuries per liter
OU-1	Operable Unit 1
PCE	tetrachloroethene (perchloroethene)
pCi/L	picocuries per liter
Ra-226/228	radium-226 and radium-228
RIN	Report Identification Number
TCE	trichloroethene
VOC	volatile organic compound
VSP	Visual Sample Plan

1.0 Introduction

1.1 Purpose

This report was prepared in support of the selected remedies for Phase I and Parcels 6, 7, and 8 of the Mound, Ohio, Site as outlined in the *Site-Wide Operations and Maintenance Plan* (DOE 2013). It summarizes the data collected in 2012 and documents the progress of the MNA remedies for both areas of the Mound site. All sampling and data analyses were performed in accordance with the *Site-Wide Operations and Maintenance Plan* (DOE 2013), unless noted otherwise.

The *Site-Wide Operations and Maintenance Plan* is a compilation of the separate operations and maintenance and program sampling plans prepared for each remediation area at the Mound site. The *Site-Wide Operations and Maintenance Plan* replaces the *Phase I Remedy (Monitored Natural Attenuation) Groundwater Monitoring Plan* (DOE 2004) and the *Parcel 6, 7, and 8 Remedy (Monitored Natural Attenuation) Groundwater Monitoring Plan* (DOE 2006).

This report includes data collected during the groundwater sampling performed in 2012. Data are presented in both time-series and map-view plots. Trend analysis was performed on selected wells using the nonparametric Mann-Kendall test. This type of long-term trend analysis can be used to confirm trends in contaminant concentrations over time. The time-series plots will also be used to evaluate changes in data over time and to interpret the effectiveness of the MNA remedy.

This report also documents operational changes that occurred during the reporting period and identifies maintenance activities associated with the monitoring wells being sampled.

1.2 Project Description

1.2.1 Phase I

Phase I is an approximately 52-acre area made up of three distinct sections and lies on the southern border of the Mound Plant property. This area contains monitoring wells that are screened in both the Buried Valley Aquifer (BVA) and the upgradient bedrock aquifer system. Monitored natural attenuation (MNA) is being used as the remedy for a small, discrete section of the bedrock groundwater system contaminated with trichloroethene (TCE) to ensure that concentrations of TCE within the bedrock groundwater are decreasing to levels below the Safe Drinking Water Act maximum contaminant level (MCL) and do not impact the downgradient BVA.

Several wells in this area also have levels of barium, radium, chromium, and nickel that exceed MCLs established by the Safe Drinking Water Act. The elevated levels of barium and radium were evaluated and determined to be naturally occurring within the local bedrock matrix serving as the mineral source. The elevated chromium and nickel levels are the result of corrosion of the stainless-steel well casings. The U.S. Department of Energy (DOE) has committed to monitoring selected wells to confirm the results of previous investigations upon which these conclusions were based.

1.2.2 Parcels 6, 7, and 8

Parcels 6, 7, and 8 occupy approximately 101 acres of the northern portion of the Mound Plant site. The main production facilities were located within Parcels 6 and 8, and this area is called the Main Hill area. A tributary valley runs between these two parcels and Parcel 7; it contains a narrow tongue of glacial deposits that are in hydraulic communication with the BVA. Groundwater within the fractured bedrock beneath the Main Hill area, and in topographic highs within Parcel 7, flows along horizontal bedding planes and fractures and ultimately discharges to seeps or to the downgradient BVA.

Two monitoring wells in the BVA indicate volatile organic compound (VOC) impact, primarily TCE, that exceeds MCLs in the Safe Drinking Water Act. MNA is the remedy for the VOCs in groundwater associated with the Main Hill (DOE 2009). Sampling is being performed to assess the contaminant concentrations and to verify that the BVA downgradient of these wells is not being affected.

Six seeps are also associated with this area and are located along the Main Hill of the plant property. Two seeps are within the plant property boundary, and the remaining four are offsite to the north. Several seeps have elevated levels of tritium and VOCs These seeps and several downgradient wells are being monitored to verify that source removal (buildings and soil) on the Main Hill will result in decreasing concentrations over time.

1.3 Geology and Hydrology

1.3.1 Hydrogeologic Setting

The aquifer system at the Mound site consists of two distinct hydrogeologic environments: groundwater flow through the Ordovician shale and limestone bedrock beneath the hills, and groundwater flow within the unconsolidated glacial deposits and alluvium associated with the BVA in the Great Miami River valley. A thin tributary valley divides the two main portions of the Mound site and contains a narrow tongue of glacial deposits that are in hydraulic communication with the BVA. The bedrock flow system is dominated by fracture flow and is not considered a highly productive aquifer. The BVA is dominated by porous flow with interbedded gravel deposits providing the major pathway for water movement. The unconsolidated deposits are Quaternary-age sediments that consist of both glacial and fluvial deposits. The BVA is a highly productive aquifer capable of yielding a significant quantity of water, and it is designated a sole-source aquifer. The general structure and flow characteristics for these two interconnected systems are depicted on Figure 1.

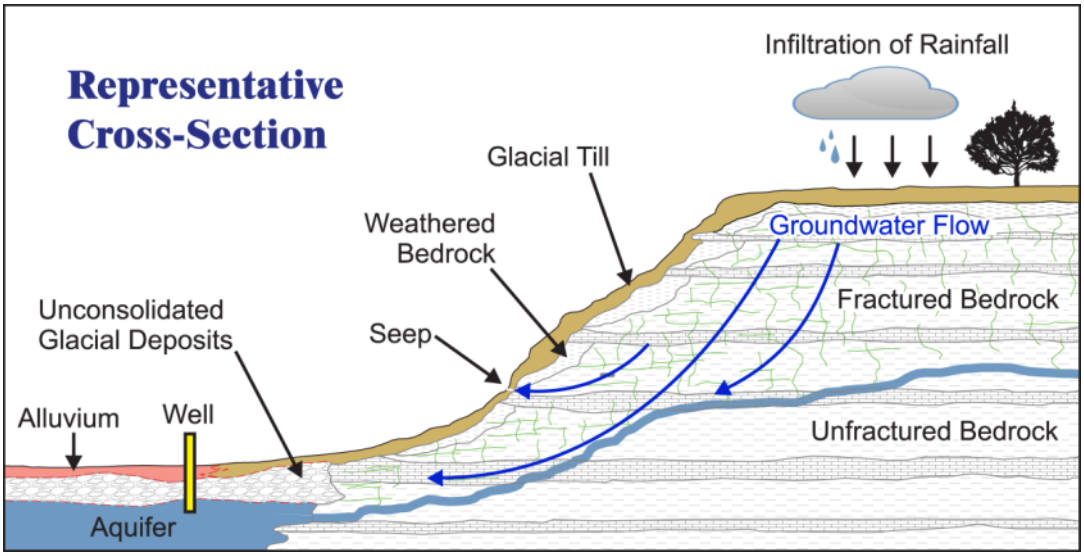

Figure 1. Generalized Cross Section Showing Flow from Bedrock to the BVA

For a detailed descriptions of the geology, lithology, and groundwater flow regimes at the Mound site and specific hydrogeologic information for each area, refer to DOE 1992, DOE 1994a, DOE 1994b, DOE 1995a, and DOE 1995b.

1.3.2 Groundwater Flow

Static water levels were measured prior to sampling at each well location. Since these measurements were made within a short time frame, the data were used to depict the general groundwater flow in the area (Figure 2). Two groundwater regimes are present at the site: groundwater in the bedrock and groundwater in the BVA. Groundwater flow in the bedrock typically mimics the topography, with groundwater discharging to the BVA or at seeps from the upper bedrock. Groundwater flow in the BVA flows south, following the downstream course of the Great Miami River.

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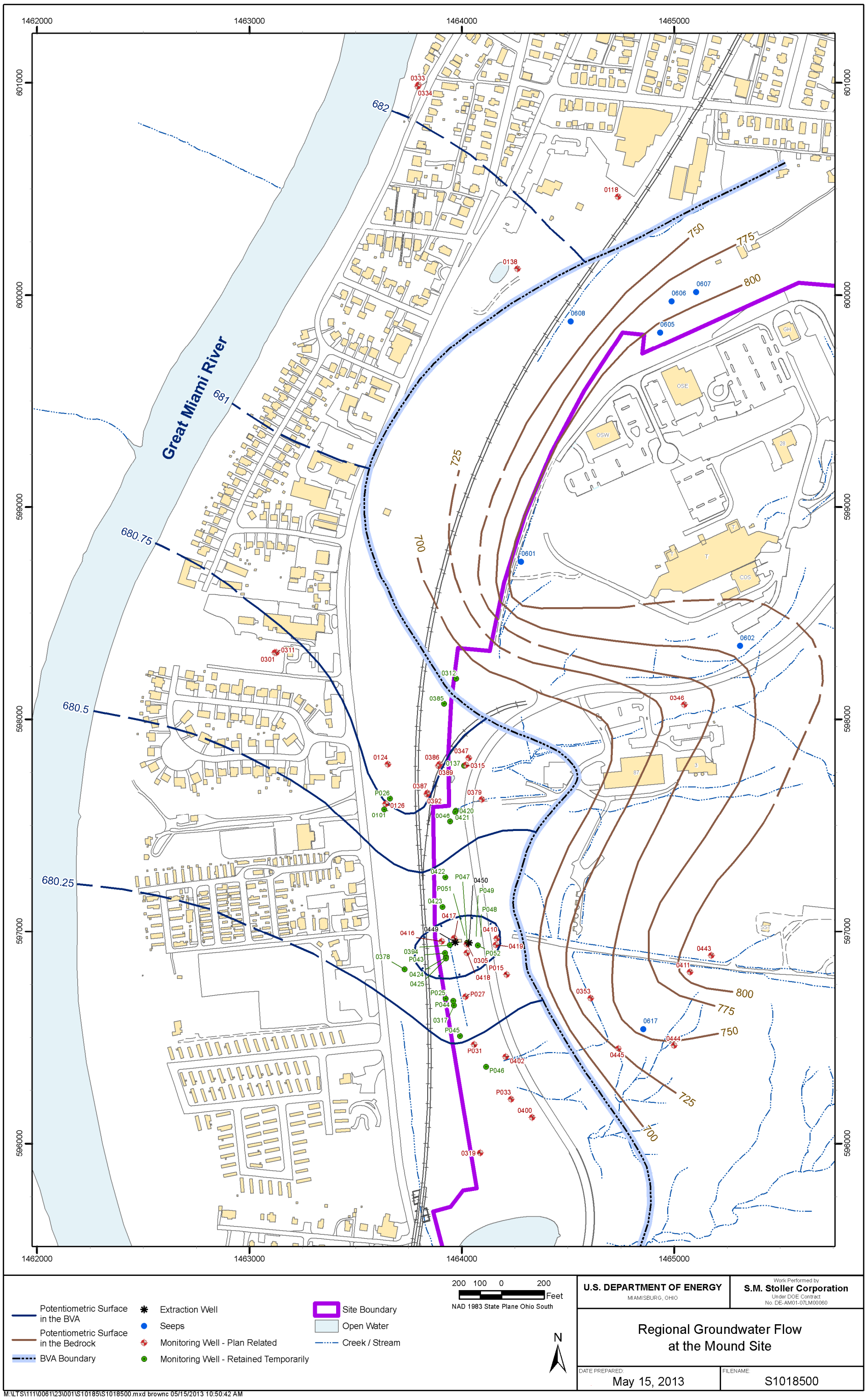

Figure 2. Regional Groundwater Flow at the Mound Site

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2.0 Monitoring Programs

2.1 Phase I

The Phase I groundwater monitoring program was established to verify that the BVA is not negatively affected by TCE-contaminated groundwater within the bedrock aquifer system. Groundwater in Phase I is monitored for TCE and its degradation products to verify that concentrations of TCE are decreasing by natural attenuation. The objective of this monitoring is to protect the BVA by verifying that the concentration of TCE near well 0411, well 0443, and seep 0617 is decreasing and to confirm that TCE is not adversely affecting the BVA. This program may be decreased or terminated when TCE concentrations in well 0411, well 0443, and seep 0617 meet conditions outlined in the monitoring plan, such as reaching the MCL for four consecutive sampling events.

Although not part of the selected remedy, barium and radium are analyzed on the Phase I groundwater to ensure a correct interpretation of the occurrence of these constituents at elevated levels. Previous investigations did not identify either constituent as a contaminant of concern in Phase I groundwater. Investigations confirmed that salt in an upgradient storage shed had been infiltrating into the bedrock formation and mobilizing naturally occurring barium and radium in a low-flow area of the bedrock aquifer. Use of the salt storage shed was discontinued in 2003.

2.1.1 Monitored Natural Attenuation of TCE

Under the Phase I MNA monitoring program, samples are collected semiannually from selected wells and a seep (Figure 3) and analyzed as outlined in Table 1. Sampling was performed in the first and third quarters of 2012.

Table 1. Remedy (MNA) Monitoring for Phase I

Monitoring Location	Area	Parameters
Well 0411	Well 0411 area	Trichloroethene Dichloroethene Vinyl chloride
Well 0443		
Well 0353	Downgradient bedrock monitoring	
Well 0444		
Well 0445		
Seep 0617		
Well 0400	Downgradient BVA monitoring	
Well 0402		
Well P033		

All locations are sampled semiannually.

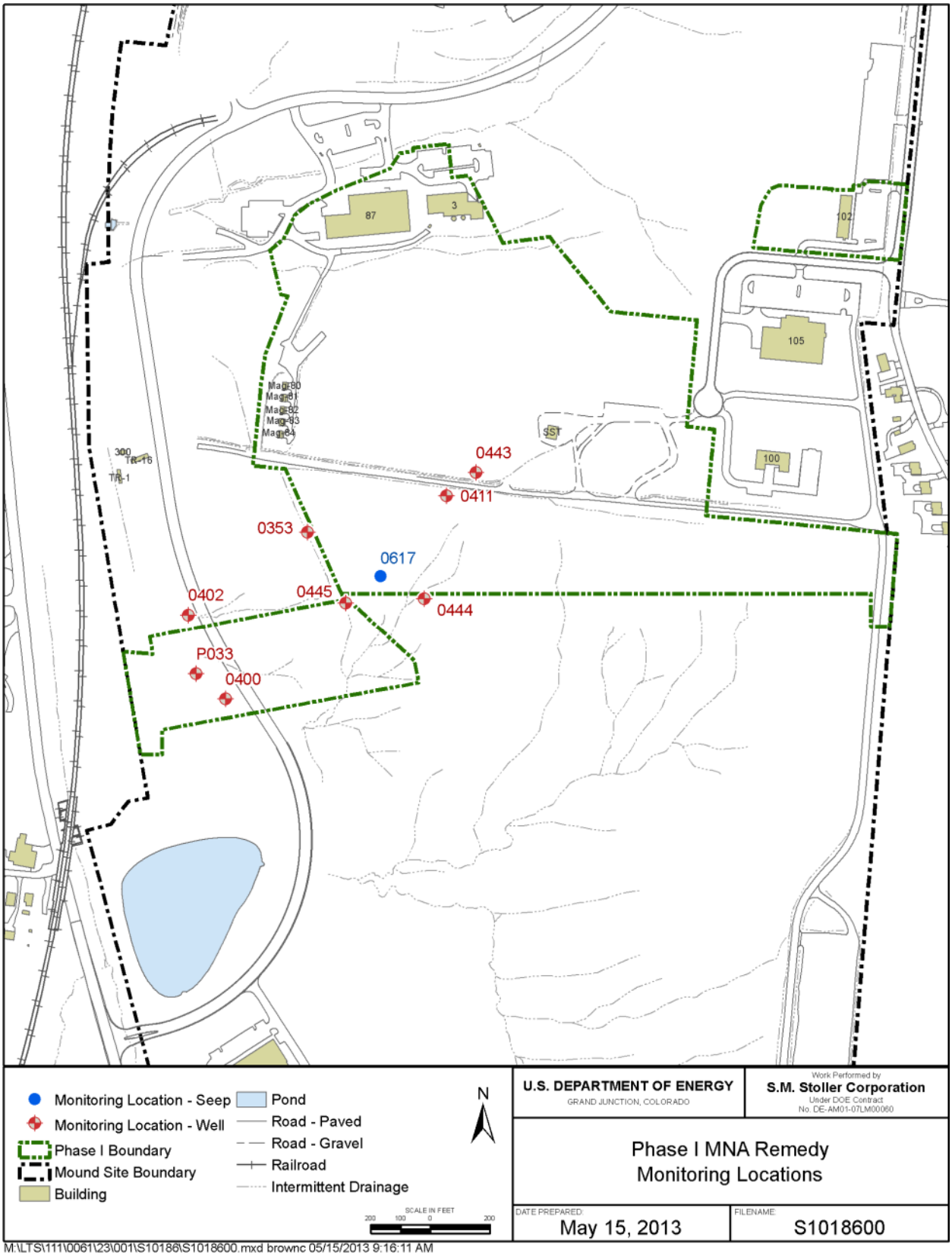

Figure 3. Phase I MNA Remedy Monitoring Locations

2.1.2 Confirmatory Sampling

Confirmatory samples to evaluate the presence of elevated barium and combined Ra-226/228 were collected quarterly for selected wells as outlined in Table 2. Sodium and chloride are also analyzed in these wells because salt is considered the mechanism that has mobilized naturally occurring radium and barium in the bedrock groundwater.

Table 2. Confirmatory Monitoring for Phase I

Barium, Ra-226/228, Chloride, and Sodium
Well 0400
Well 0402
Well 0445
Well P033

2.1.3 Triggers

The contaminant data are evaluated against previous data collected at each location to determine if MNA is adequately addressing groundwater impact and to monitor the geochemical conditions in the aquifer. Trigger levels and response actions have been established for each contaminant as presented in the *Site-wide Operations and Maintenance Plan* (DOE 2012). The triggers are summarized in Table 3.

Table 3. Trigger Levels for Phase I MNA Remedy and Confirmatory Monitoring Programs

Location	TCE (µg/L)	DCE (µg/L)	Vinyl Chloride (µg/L)	Ra-226/228 (pCi/L)	Barium (mg/L)
0353	5	70	2		
0400	5	70	2	5	1
0402	5	70	2	5	1
0411	30	70	2		
0443	30	70	2		
0444	5	70	2		
0445	5	70	2	75	15
P033	5	70	2	5	1
0617 (seep)	16	70	2		

DCE = dichloroethene
µg/L = micrograms per liter
mg/L = milligrams per liter
pCi/L = picocuries per liter

The U.S. Environmental Protection Agency (EPA) and the Ohio Environmental Protection Agency (Ohio EPA) must be notified if trigger levels are exceeded. After notification, the Core Team (EPA, Ohio EPA, and DOE) will determine an appropriate course of action.

2.2 Parcels 6, 7, and 8

Groundwater in the Parcels 6, 7, and 8 area is monitored for TCE and its degradation products to verify that the downgradient BVA is not affected and that concentrations are decreasing. In addition, groundwater discharging from seeps is monitored for TCE and its degradation products, tritium, and radioisotopes (Sr-90, Ra-226, and Ra-228) to verify that source removal will result in decreasing concentrations over time. Under the Parcels 6, 7, and 8 MNA monitoring program, samples are collected quarterly for VOCs and semiannually for tritium in selected wells and seeps (Figure 4).

The sampling is separated into two programs that relate to the following areas of impact:

- **Well 0315/0347 Area:** Wells at the edge of the BVA on the southwestern corner of Parcel 8 that have elevated concentrations of VOCs. The program consists of wells that have TCE concentrations greater than the MCL and downgradient wells to the west.
- **Main Hill Seeps:** Seeps on the northern and southern sides of the Main Hill that have elevated concentrations of VOCs and tritium. The program consists of seeps and downgradient wells to the west.

2.2.1 Well 0315/0347 Monitoring

The two source wells and other selected downgradient BVA wells are monitored for VOCs—namely, tetrachloroethene (perchloroethene, or PCE), dichloroethene (DCE) isomers, TCE, and vinyl chloride. Table 4 provides a summary of the monitoring locations.

Table 4. Monitoring for the Well 0315/0347 Area

Monitoring Location	Area	VOC
Well 0315	Source wells	TCE PCE DCE Vinyl chloride
Well 0347		
Well 0124	Downgradient BVA monitoring	
Well 0126		
Well 0386		
Well 0387		
Well 0389		
Well 0392		

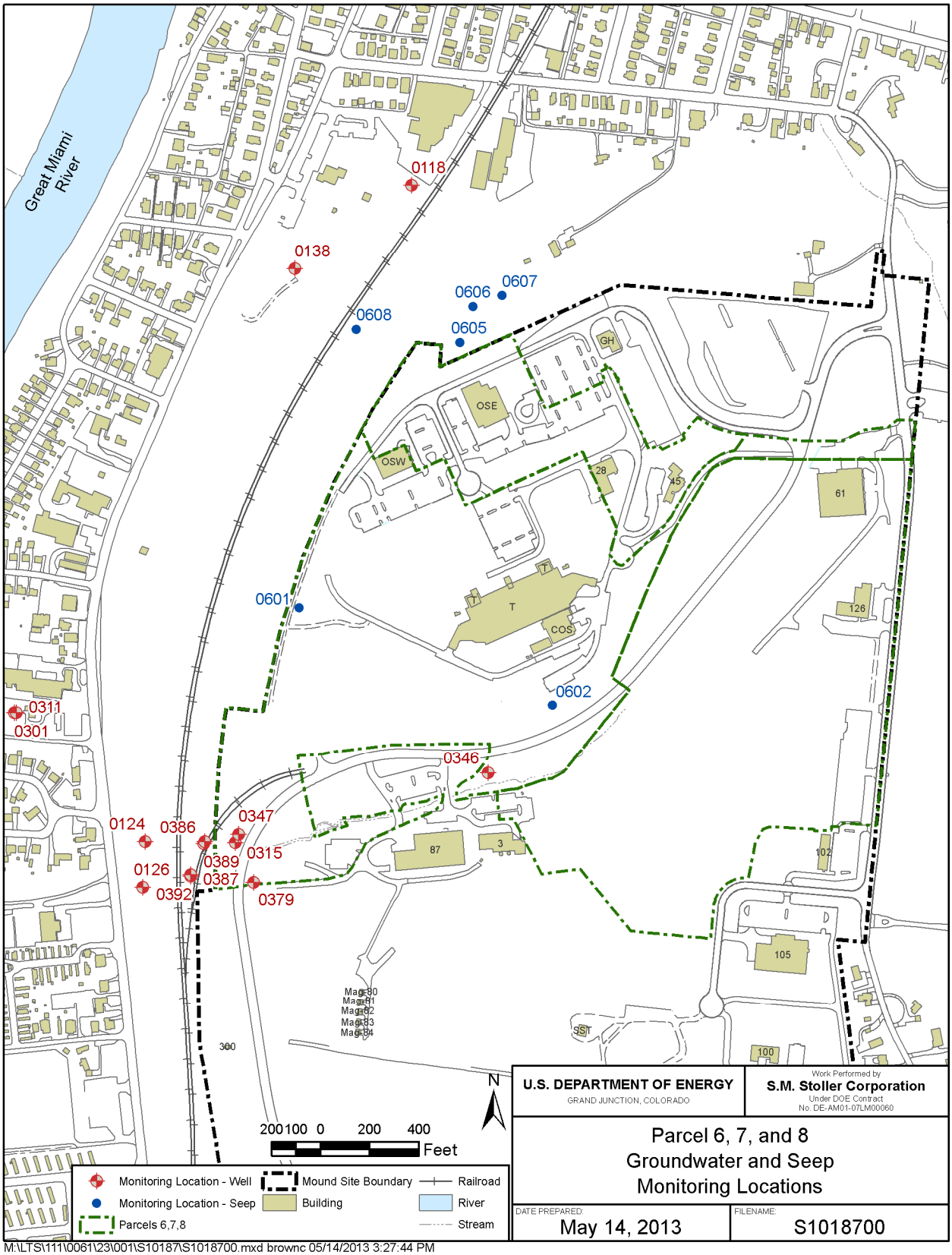

Figure 4. Parcels 6, 7, and 8 Groundwater and Seep Monitoring Locations

2.2.2 Main Hill Seep Monitoring

Water from seeps 0601, 0602, 0605, 0606, 0607, and 0608 is collected and analyzed for VOCs and the radiological constituents shown in Table 5. Wells within the BVA that are downgradient of the bedrock groundwater discharge area of the Main Hill are also sampled to monitor tritium and VOCs.

Table 5. Monitoring for the Main Hill Seeps and Groundwater

Monitoring Location	Area	Parameters
Seep 0601	Main Hill seeps	TCE PCE DCE Vinyl chloride Tritium
Seep 0602		
Seep 0605		
Seep 0606		
Seep 0607		
Seep 0608		
Well 0118	Downgradient BVA monitoring wells	
Well 0138		
Well 0301		
Well 0346		
Well 0379		

2.2.3 Triggers

The contaminant data are evaluated against previous data collected at each location to determine if downward trends are occurring. Trigger levels and response actions have been established for each contaminant as presented in the *Site-wide Operations and Maintenance Plan* (DOE 2012). The triggers are summarized in Table 6.

EPA and the Ohio EPA must be notified if these trigger levels are exceeded. After notification, the Core Team (EPA, Ohio EPA, and DOE) will determine an appropriate course of action.

Table 6. Trigger Levels for Parcels 6, 7, and 8 Monitoring Locations

Location	TCE (µg/L)	PCE (µg/L)	Tritium (nCi/L)
0315	30		
0347	30		
0124	5		
0126	5		
0386	5		
0387	5		
0389	5		
0392	5		
0601 (seep)		75	1,500
0605 (seep)	150		

µg/L = micrograms per liter
nCi/L = nanocuries per liter
pCi/L = picocuries per liter

2.3 Monitoring Network

The monitoring well and seep locations sampled under these programs were selected to provide data of sufficient quality to meet the objectives of the groundwater remedies for either Phase I or Parcels 6, 7, and 8. These wells were initially installed to support various site characterization activities and were designed and constructed to provide high-quality groundwater data. Appendix A contains construction information for each well used to support these remedies.

2.4 Deviations from the Sitewide Operations and Maintenance Plan

Sampling was performed as outlined in the *Site-wide Operations and Maintenance Plan* (DOE 2012), which compiles the sampling requirements outlined in previous plans for each area. Modifications to these monitoring programs (i.e., reduction in sampling frequency or discontinuation of monitoring locations) are also incorporated into the *Site-wide Operations and Maintenance Plan*.

Sampling was performed as follows:

- All required locations in Phase I were sampled in 2012.
- All required locations in Parcels 6, 7, and 8 were sampled in 2012 except seeps 0602 and 0605. Seep 0602 was dry during the second, third, and fourth quarters of 2012, and seep 0605 was dry during the third and fourth quarters of 2012.
- Site-specific sampling methods for the Mound site were followed during these sampling events. These methods were developed by the Mound Groundwater Technical Team and approved by the Mound Core Team.

2.5 Trend Analysis Methodology

The computer program Visual Sample Plan (VSP), developed by Battelle Memorial Institute, was used to perform trend analysis; the method used was the nonparametric Mann-Kendall test. The analyses indicate the potential presence of statistically significant downward or upward trends in concentrations at a given location.

The Mann-Kendall test is used for temporal trend identification because it can easily accommodate missing data and does not require the data to conform to a particular distribution (such as a normal or log-normal distribution). The nonparametric method is valid for data sets that have a high number of nondetect data points. Data reported as trace concentrations or less than the detection limit can be used by assigning them a common value that is smaller than the smallest measured value in the data set (i.e., one-half the specified detection limit). This approach is valid because only the relative magnitudes of the data points, rather than their measured values, are used in the method. A possible consequence of this approach is that the test can produce biased results if a large fraction of data within a time series are nondetect and if detection limits change between sampling events. The specified detection limit (on the date of analysis) was used in place of concentrations reported as nondetect.

The two-tailed version of the Mann-Kendall test was used to detect either an upward or downward trend for each data set. As part of this approach, a test statistic, Z, was calculated. A positive value of Z indicated that the data were skewed in an upward direction, and a negative value of Z indicated that the data were skewed in a downward direction. The alpha value (or false rejection rate) used to identify a significant trend was 0.05. The beta value (or false acceptance rate) was set at 0.10. A nonparametric estimate of the slope, which is calculated independently of the trend, was determined for each data set using the Sen's nonparametric estimate of the slope in the VSP program. In addition, a 95 percent (1-α) two-sided confidence interval about the true slope was obtained.

3.0 Phase I MNA Remedy

3.1 Monitoring Results

Monitoring results for 2012 (Table 7) continue to show low-level detections of TCE and *cis*-1,2-DCE, a TCE breakdown product, in wells 0411 and 0443 and in seep 0617. An estimated detection of *trans*-1,2-DCE less than 1 μg/L was reported in well 443 during the first sampling event. All VOC concentrations were below the applicable trigger levels (Table 3). Concentrations of TCE in wells 0411 and 0443 and seep 0617 continue to exceed the MCL of 5 micrograms per liter (μg/L). No detectable concentrations of vinyl chloride were reported at these three monitoring locations. An estimated detection of TCE was reported in BVA well 0402; however, the value was within historical ranges and is attributable to VOC impact in Operable Unit (OU)-1. No detectable concentrations of *cis*-1,2-DCE, *trans*-1,2-DCE, or vinyl chloride were reported in the downgradient BVA wells.

Table 7. Summary of VOC Monitoring Results in Phase I for 2012

Well ID	Location	Parameter	First Semiannual Event	Second Semiannual Event
Source Area Wells				
0411	0411 Area	TCE (μg/L)	**13.4**	**12.7**
		cis-1,2-DCE (μg/L)	1.8	2.2
		Vinyl Chloride (μg/L)	<1	<1
0443	0411 Area	TCE (μg/L)	**14.0**	**5.3**
		cis-1,2-DCE (μg/L)	0.75 (J)	0.27 (J)
		Vinyl Chloride (μg/L)	<1	<1
0617	Seep/Bedrock	TCE (μg/L)	**7.8**	1.8
		cis-1,2-DCE (μg/L)	1.7	0.59 (J)
		Vinyl Chloride (μg/L)	<1	<1
Downgradient Wells				
0353	Bedrock	TCE (μg/L)	ND (<1)	ND (<1)
		cis-1,2-DCE (μg/L)	ND (<1)	ND (<1)
		Vinyl Chloride (μg/L)	ND (<1)	ND (<1)
0444	Bedrock	TCE (μg/L)	ND (<1)	ND (<1)
		cis-1,2-DCE (μg/L)	ND (<1)	ND (<1)
		Vinyl Chloride (μg/L)	ND (<1)	ND (<1)
0445	Bedrock	TCE (μg/L)	ND (<1)	ND (<1)
		cis-1,2-DCE (μg/L)	ND (<1)	ND (<1)
		Vinyl Chloride (μg/L)	ND (<1)	ND (<1)
0400	BVA	TCE (μg/L)	ND (<1)	ND (<1)
		cis-1,2-DCE (μg/L)	ND (<1)	ND (<1)
		Vinyl Chloride (μg/L)	ND (<1)	ND (<1)
0402	BVA	TCE (μg/L)	ND (<1)	0.18 (J)
		cis-1,2-DCE (μg/L)	ND (<1)	ND (<1)
		Vinyl Chloride (μg/L)	ND (<1)	ND (<1)
P033	BVA	TCE (μg/L)	ND (<1)	ND (<1)
		cis-1,2-DCE (μg/L)	ND (<1)	ND (<1)
		Vinyl Chloride (μg/L)	ND (<1)	ND (<1)

J = estimated value less than the reporting limit
ND = not detected above reporting limit
Values in **bold** exceed the MCL of 5 μg/L for TCE

TCE concentrations in well 0411 (Figure 5) decreased since monitoring began in 1999 and leveled out between 9 and 12 µg/L starting in 2008. Concentrations increased slightly in 2012. The time-concentration plots for well 0443 and seep 0617 indicate that concentrations vary and are less than those in well 0411.

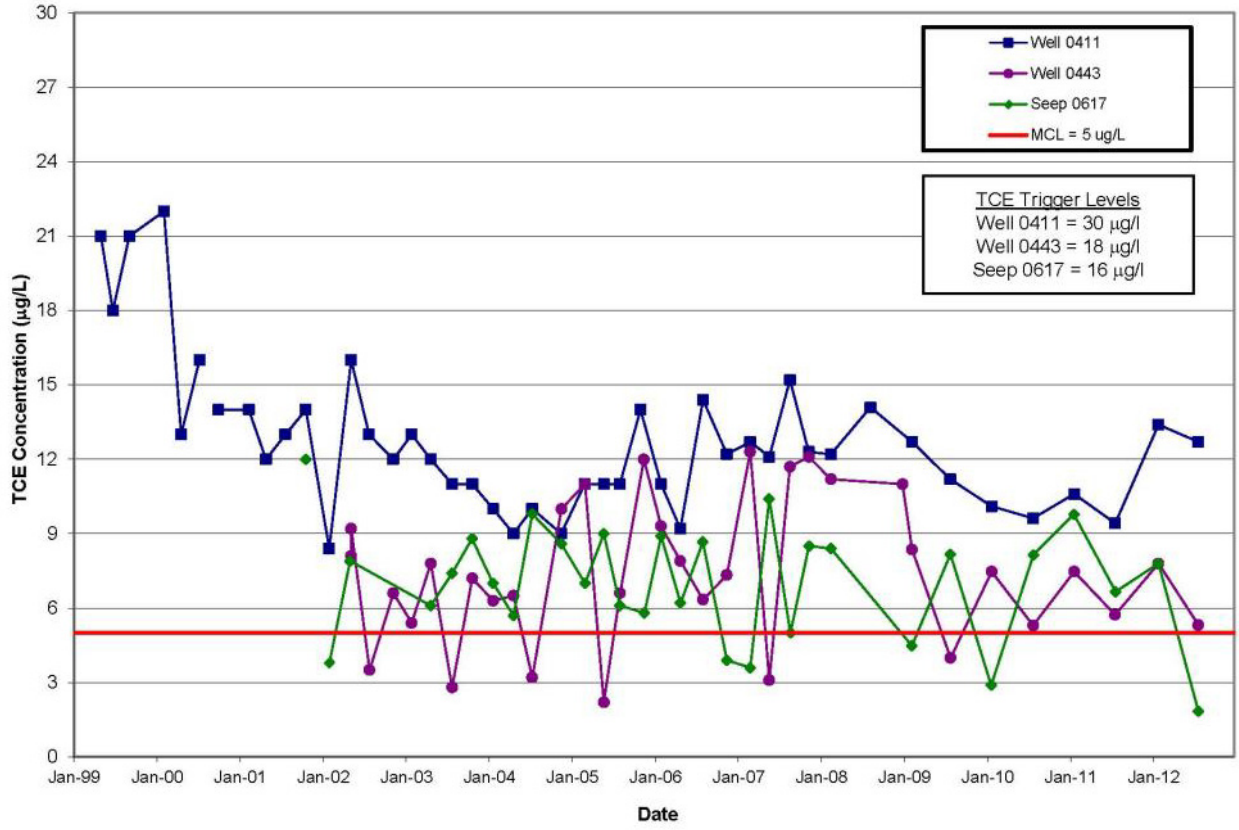

Figure 5. TCE Concentrations over Time—1999 Through 2012

The concentration of *cis*-1,2-DCE in groundwater (Figure 6) have been variable. Detectable concentrations have consistently been reported in well 0411 and seep 0617 since 2008. Estimated detections less than 1 µg/L have been reported in well 0443 during the same period. None of the locations had concentrations of *cis*-1,2-DCE that exceeded the MCL of 70 µg/L.

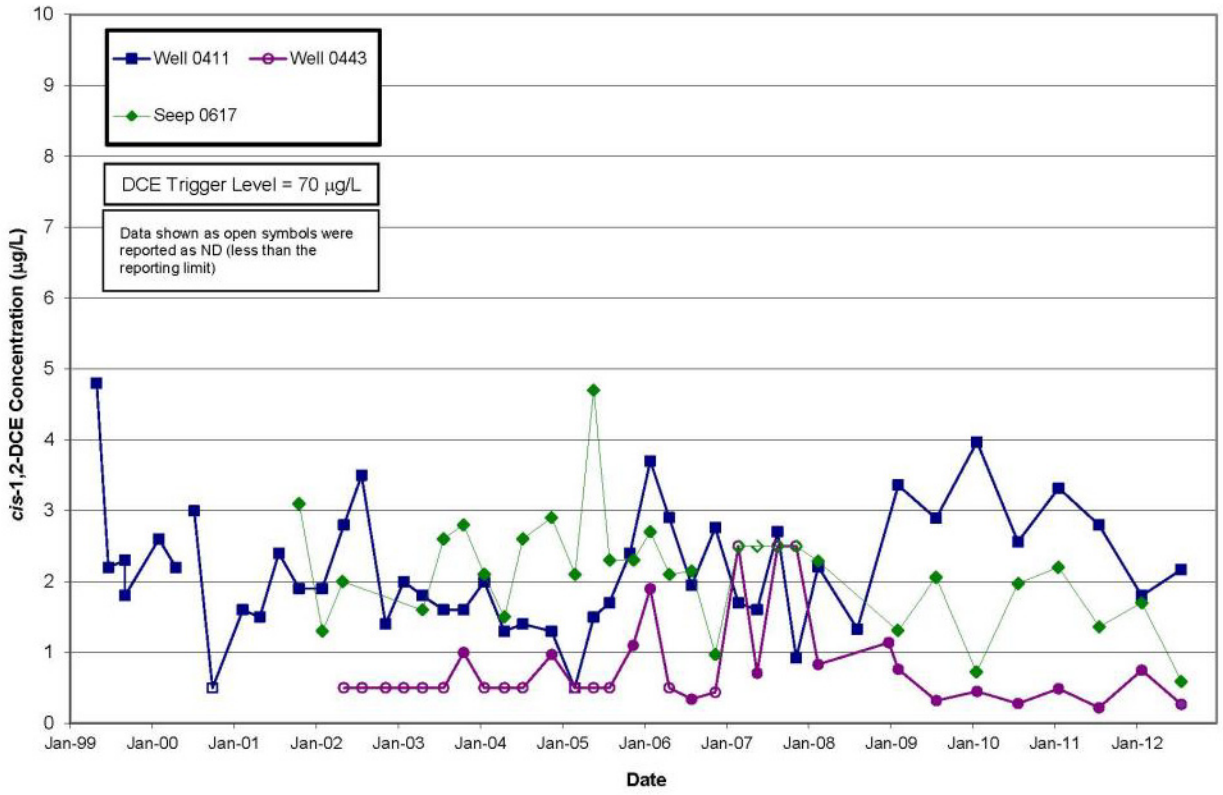

Figure 6. cis-1,2-DCE Concentrations—1999 through 2012

The distributions of TCE and DCE in groundwater (Figure 7) indicate that impact is localized in the bedrock groundwater near wells 0411 and 0443 and seep 0617. Wells screened in the bedrock and BVA that are downgradient of the area of VOC impact do not have detectable concentrations of TCE or DCE, with the exception of well 0402. It has been determined that VOC impact in well 0402 is attributable to OU-1, which is located immediately upgradient.

3.2 Trend Analysis

Trend analysis for TCE data collected since 1999 continues to indicate decreasing TCE concentrations in well 0411 and seep 0617, as indicated by negative slopes of the trend lines (Table 8). A statistical downward trend was calculated for TCE in well 0411. No statistical trend, either upward or downward, was evident in the data for TCE in well 0443 and seep 0617.

Table 8. Summary of Trend Analysis Results for TCE in Phase I for 2011

Location	Analyte	No. of Samples	Trend	Slope (µg/L/year)	Confidence Interval (µg/L/yr)	
					Lower	Upper
0411	TCE	45	**Down**	–0.31	–0.61	–0.07
0443		33	None	0.24	–0.18	0.69
0617		31	None	–0.16	–0.50	0.14
0411	*cis*-1,2-DCE	45	None	0.02	–0.05	0.01
0443		33	None	0	–0.02	0
0617		31	**Down**	–0.09	–0.16	0

µg/L/year = micrograms per liter per year

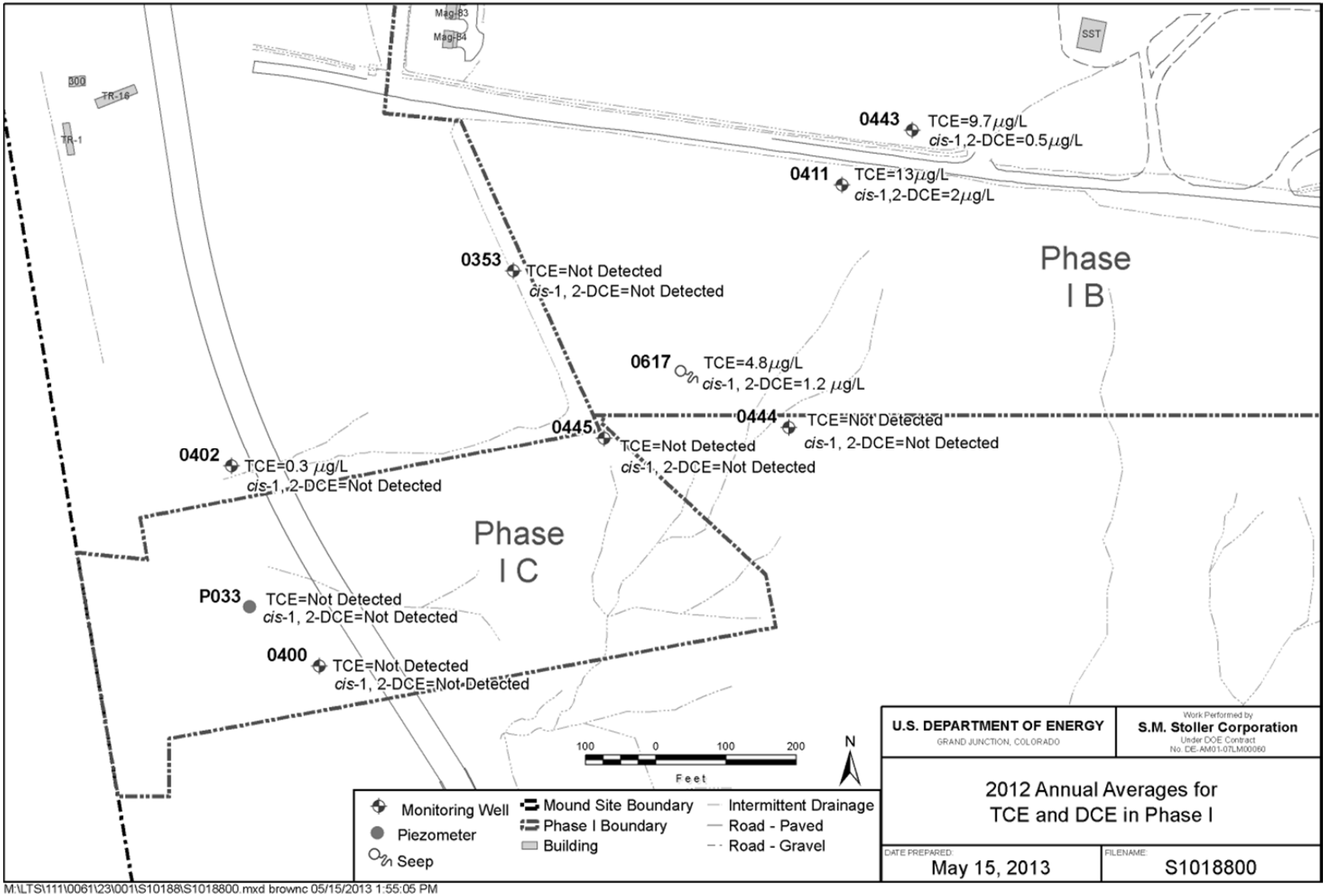

Figure 7. 2012 Annual Average for TCE and DCE in Phase I

Decreasing *cis*-1,2-DCE concentrations, although small, are present in seep 0617, as indicated by a negative slope. A statistical downward trend was calculated for *cis*-1,2-DCE in this seep. Statistically, no trends, either upward or downward, were determined for the *cis*-1,2-DCE data in the wells and seep.

Evaluation of the slope of the downward trend in TCE concentrations in well 0411 may indicate the time frame when concentrations may approach the MCL of 5 µg/L. The nonparametric slope calculated for the trend analysis continues to suggest that the MCL may be reached by 2027. The exponential curve fit to the data estimates that the MCL may be reached by 2038. The nonparametric analysis and the exponential curve fit typically represent the decrease of contaminant concentrations in groundwater over time and provide good estimates of cleanup time frames.

3.3 Groundwater Elevations

A map of the average groundwater elevations measured in the Phase I area during 2012 (Figure 8) indicates two flow regimes: bedrock and BVA. The approximate location of contact of the BVA with the bedrock is indicated on this figure. Groundwater originating from the well 0411/0443 area flows southwest within the bedrock following the bedrock topography. This groundwater enters the BVA along this contact. Flow within the BVA is generally to the south-southeast (parallel to the bedrock contact), although the groundwater elevations measured in the three wells screened in the BVA are similar. Appendix B presents a summary of the groundwater elevations measured during 2012.

3.4 Recommendations

No changes to the Phase I MNA sampling program are warranted based on data from 2012. Trend analysis continues to show that TCE concentrations have decreased in well 0411 since sampling started in 1999. Concentrations of TCE have been variable in well 0443 and seep 0617 but are generally lower than those measured in well 0411 and are approaching the MCL of 5 µg/L. *cis*-1,2-DCE concentrations vary in the wells and seep. A downward trend was calculated for *cis*-1,2-DCE in seep 0617, and the concentrations at all the locations are considerably less than the MCL of 70 µg/L. On the basis of no upward trends in TCE concentrations and TCE concentrations being considerably less than the trigger levels, monitoring frequency is recommended to remain semiannual for 2013. Sampling will continue during the first and third quarters of the year in an effort to bracket possible seasonal variations.

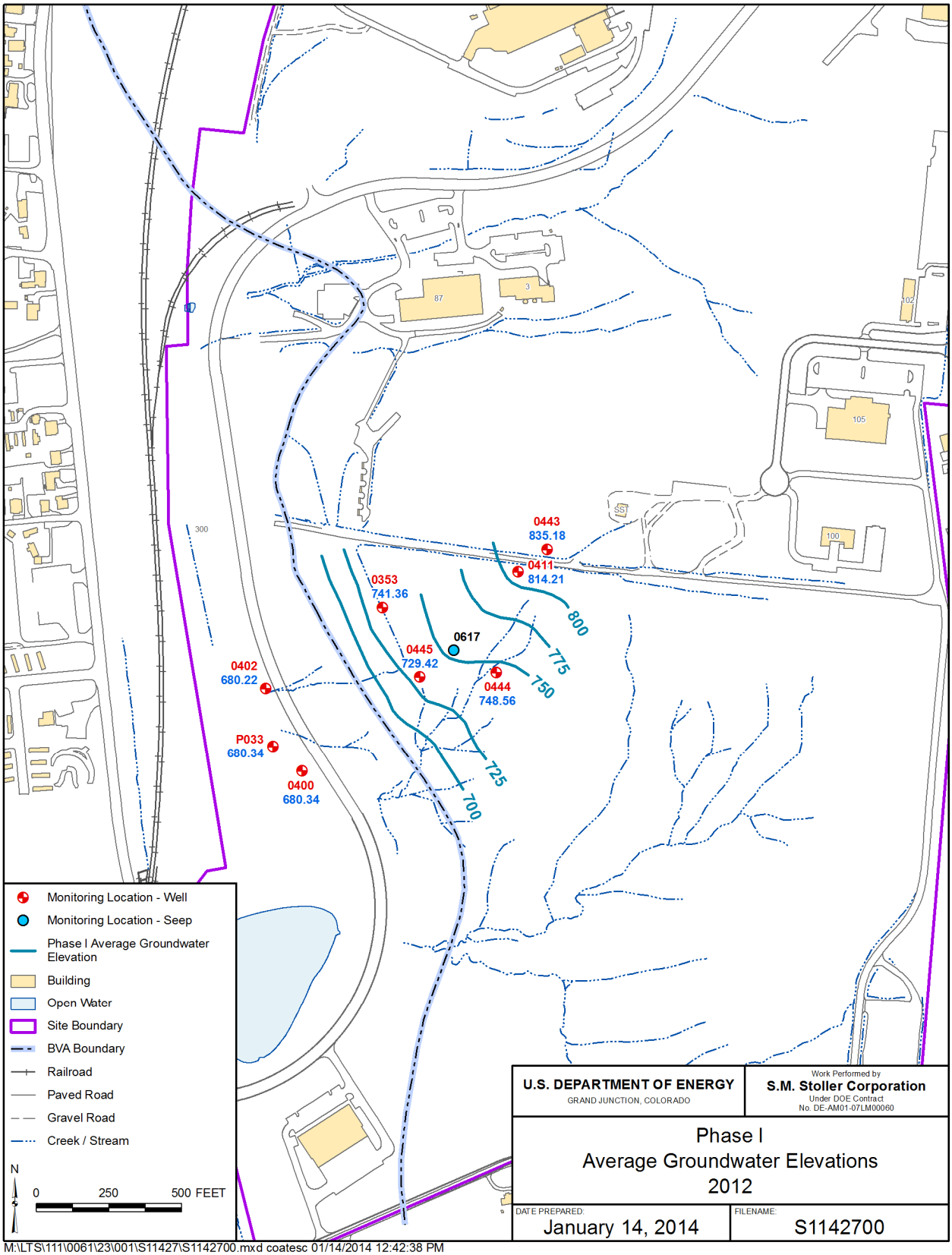

Figure 8. Average Groundwater Elevations, 2012

4.0 Phase I Confirmatory Sampling

Data collected from well 0445 have shown elevated barium concentrations and combined radium levels that exceed the MCLs. The groundwater chemistry in this well is not observed in any other bedrock or BVA well in this area and is likely due to the interaction of salt stored at the site and minerals within the underlying bedrock. Data are being collected to monitor for changes in the groundwater quality and to better understand the mechanisms for the increased mobility of barium and radium in this discrete portion of the bedrock aquifer.

In situ groundwater samples were collected from two locations of outflow from well 0445. Samples were submitted for barium, Ra-226, Ra-228, sodium, and chloride analysis. Two sampling events were conducted under this plan during 2012. Data were evaluated to determine if the BVA had been impacted by bedrock groundwater with elevated radium and barium levels. It was decided that if the barium and radium levels measured in the in situ groundwater samples were within the background ranges for the BVA, then the Core Team would agree to the recommendation to discontinue the confirmatory sampling for radium and barium, as outlined in the *Phase I Remedy (MNA) Groundwater Monitoring Plan* (DOE 2004). Background was defined as those values presented in the *Phase I Residual Risk Evaluation* (DOE 2003) and referenced in the annual report for 2011.

4.1 Monitoring Results

Monitoring results for 2012 (Table 9) show elevated combined Ra-226/228 levels greater than the MCL of 5 picocuries per liter (pCi/L). The level of concern (LOC) of 75 pCi/L was not exceeded in well 0445 in 2012 (Table 3). Concentrations of barium in well 0445 exceeded the MCL of 2,000 µg/L in 2012 but were less than the LOC of 15 milligrams per liter (mg/L). Combined Ra-226/228 and barium levels remain low in the downgradient BVA wells.

Table 9. Summary of 2012 Confirmatory Monitoring Results for Barium and Radium

Well ID	Location	Parameter	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Source Area Well						
0445	0445 Area	Radium-226 (pCi/L)	**33.1**	**37.3**	**35.9**	**27.1**
		Radium-228 (pCi/L)	**36.4**	**35.1**	**25.8**	**38.4**
		Barium (µg/L)	**6,940**	**10,700**	**10,200**	**12,300**
Downgradient Wells						
0400	BVA	Radium-226 (pCi/L)	ND (<0.33)	1.2	1.0	0.90
		Radium-228 (pCi/L)	ND (<0.93)	ND (<0.50)	ND (<0.40)	0.78
		Barium (µg/L)	72.5	100	97.9	117
0402	BVA	Radium-226 (pCi/L)	ND (<0.23)	ND (<0.30)	0.70 (J)	ND (<0.32)
		Radium-228 (pCi/L)	1.32	ND(<0.71)	ND (<0.46)	0.94 (J)
		Barium (µg/L)	42.7	45.7	64.1	83.2
P033	BVA	Radium-226 (pCi/L)	ND (<0.53)	ND (<0.52)	ND (<0.62)	ND (<0.32)
		Radium-228 (pCi/L)	0.59 (J)	ND (<0.40)	ND (<0.38)	ND (<0.41)
		Barium (µg/L)	115	110	96.7	105

Values in **bold** exceed the MCL of 2,000 µg/L for barium or 5 pCi/L for combined Ra-226/228.
ND = not detected above reporting limit

Barium concentrations vary in well 0445 (Figure 9), which is screened within the low-yielding bedrock aquifer. The concentrations of barium in this well declined starting in 2004; however, starting in 2009, concentrations were higher than in previous years. The general decrease observed from 2004 through 2008 coincides with the removal of the salt from the storage area (SST building on Figure 3) in 2003. A dramatic decrease was indicated in early 2007, but it is likely that the anomalously low data reported in 2007 were not representative of groundwater quality because these concentrations have not been replicated in subsequent sampling events. The higher concentrations reported since the end of 2008 may be the result of changing to low-flow sampling methods and using dedicated sampling equipment. Until the second half of 2008, well 0445 was typically bailed or pumped dry and then sampled the next day. During 2008, dedicated bladder pumps capable of sampling low flows (100 milliliters per minute) were installed in the Phase I monitoring wells. The samples collected since the second half of 2008 have been sampled using the low-flow method instead of being pumped dry, allowed to recharge, and sampled later. Data collected since 2009 have indicated a general decline.

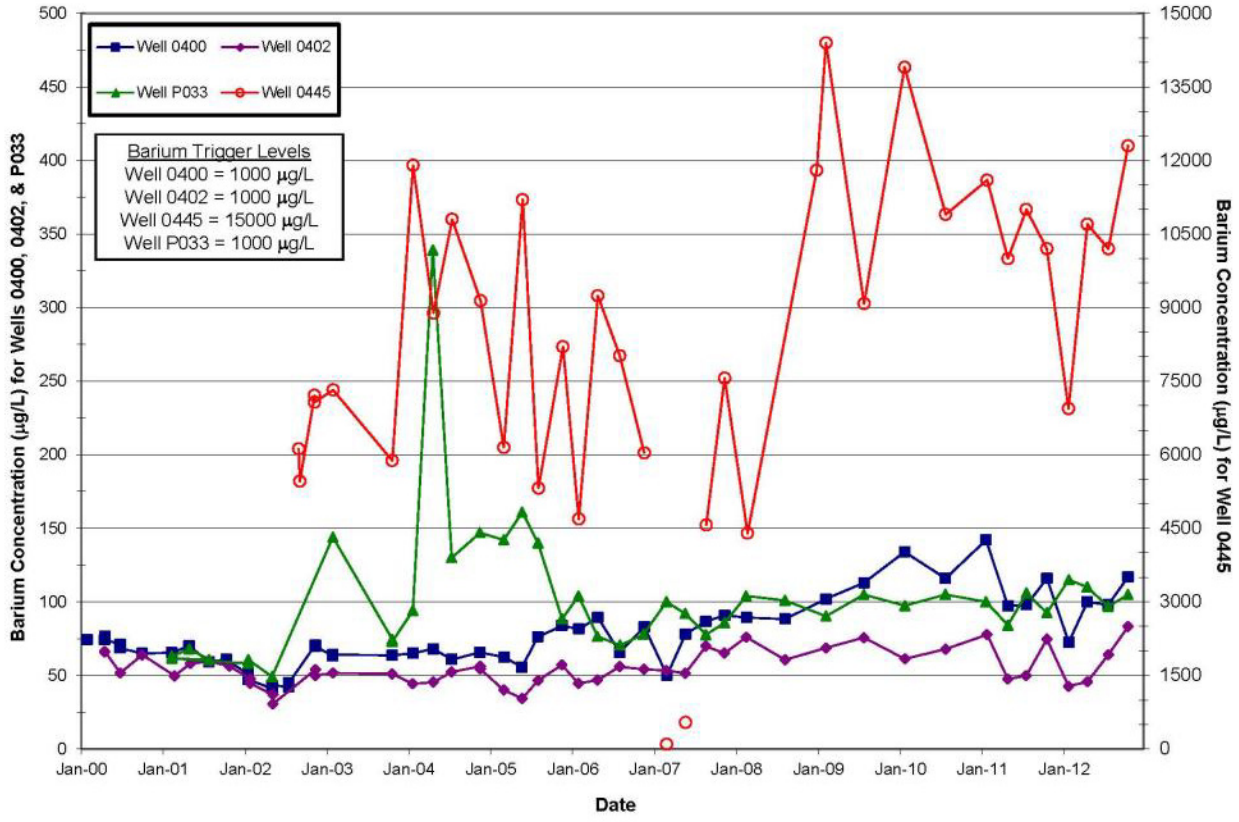

Figure 9. Barium Concentrations—2000 through 2012

Barium concentrations have been relatively stable in downgradient BVA wells 0400, 0402, and P033 since 2006, although variations have been observed in these wells in recent years. The levels of barium in the three wells are similar to background (310 µg/L). Background values were obtained from the *Phase I Residual Risk Evaluation, Miamisburg Closure Project* (Final) (DOE 2003).

Radium levels vary over time in all of the wells (Figure 10), but the highest levels and largest fluctuations occur in well 0445. The levels of combined Ra-226/228 at this location consistently exceed the MCL of 5 pCi/L and have exceeded the 75 pCi/L LOC numerous times, including once during 2012. Data from 2007 showed a dramatic decrease; however, these anomalously low data likely do not represent groundwater quality and have not been replicated in subsequent sampling events. Levels measured in 2012 are similar to those reported in previous years.

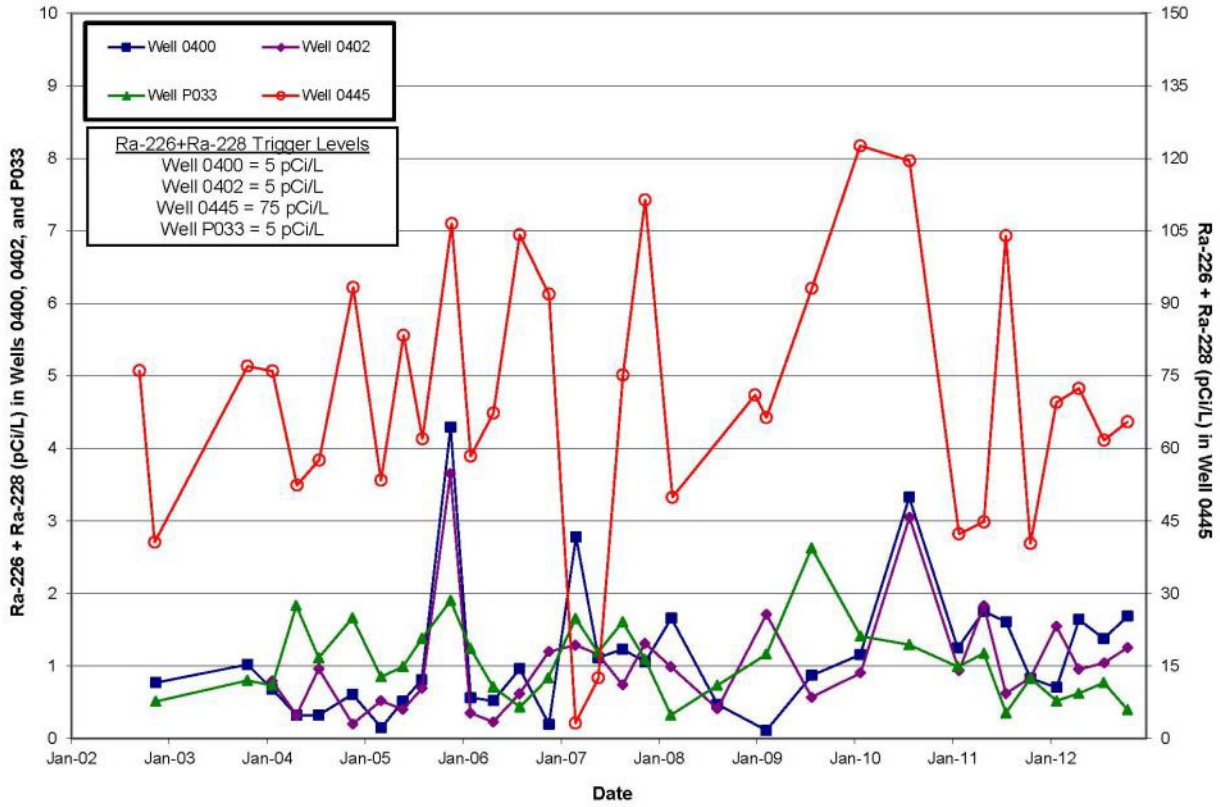

Figure 10. Ra-226/228 Levels—2002 through 2012

Radium levels have been less variable in wells 0400, 0402, and P033, which are BVA wells downgradient of well 0445. Levels measured in 2012 were similar in all three wells and are similar to background (0.996 pCi/L for radium-226). Background values were obtained from the *Phase I Residual Risk Evaluation, Miamisburg Closure Project* (Final) (DOE 2003). No background values were provided for radium-228.

The distribution of barium and radium in groundwater (Figure 11) indicates that the impact is associated with well 0445. Barium and radium levels in the downgradient BVA wells are similar to background. Figure 11 depicts the annual averages of barium and radium in the monitoring network.

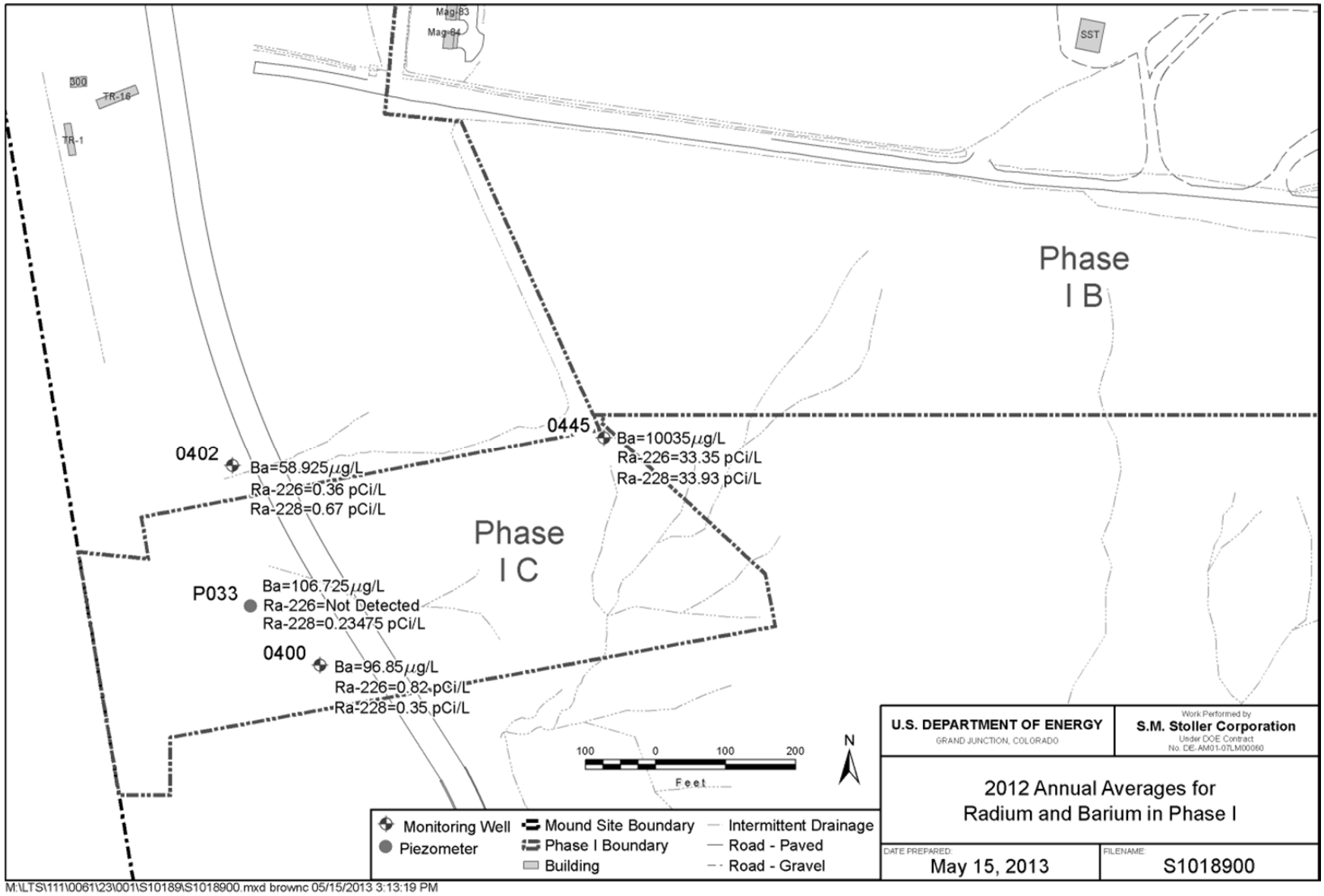

Figure 11. 2012 Annual Average for Radium and Barium in Phase I

Sodium and chloride are monitored in conjunction with radium and barium because salt is considered the mechanism that has mobilized radium and barium in the bedrock groundwater system, resulting in elevated levels of these constituents. Salt was no longer stored in the SST building after 2003. Sodium and chloride monitoring results (Table 10) indicate that the highest concentrations occur in well 0445, which is where elevated radium and barium levels are detected.

Table 10. Summary of 2012 Confirmatory Monitoring Results for Sodium and Chloride

Well ID	Location	Parameter	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Source Area Well						
0445	0445 Area	Chloride (mg/L)	8,810	8,670	7,900	14,900
		Sodium (mg/L)	3,210	4,240	4,010	4,730
Downgradient Wells						
0400	BVA	Chloride (mg/L)	30.9	56.2	57.2	87.1
		Sodium (mg/L)	28.3	49.0	42.8	62.0
0402	BVA	Chloride (mg/L)	41.7	50.6	70.4	94.2
		Sodium (mg/L)	31.0	36.3	47.1	69.8
P033	BVA	Chloride (mg/L)	175	197	101	97.2
		Sodium (mg/L)	113	132	72.8	73.2

Extremely high concentrations of sodium and chloride have been reported in well 0445 (Figure 12 and Figure 13), which also has increased radium and barium levels; however, levels vary substantially. Downgradient BVA well P033 historically exhibited elevated concentrations of sodium and chloride, which varied in a pattern similar to that observed in well 0445. Substantial decreases in sodium and chloride concentrations were reported in BVA well P033 starting in 2004 and are similar to the changes observed in barium and radium levels at this location. Sodium and chloride concentrations have been stable in BVA wells 0400 and 0402.

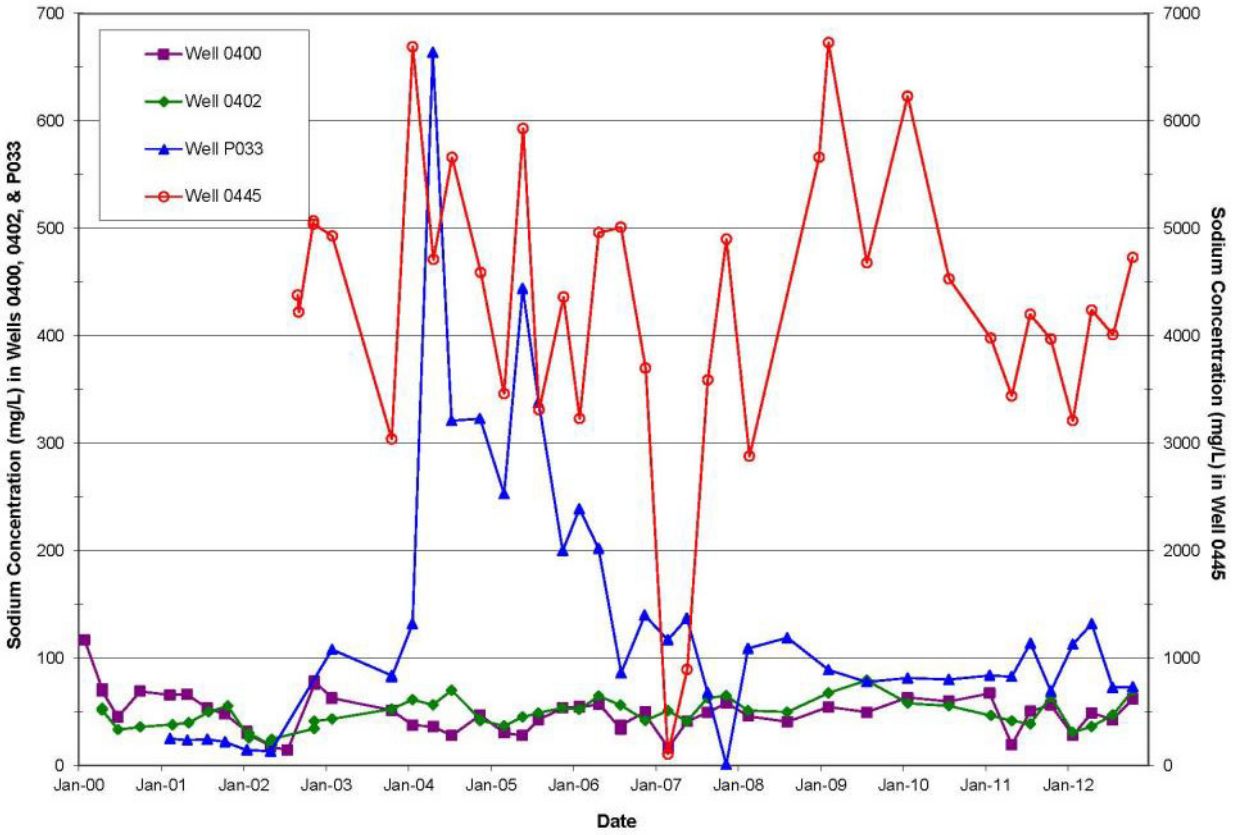

Figure 12. Sodium Concentrations—2000 through 2012

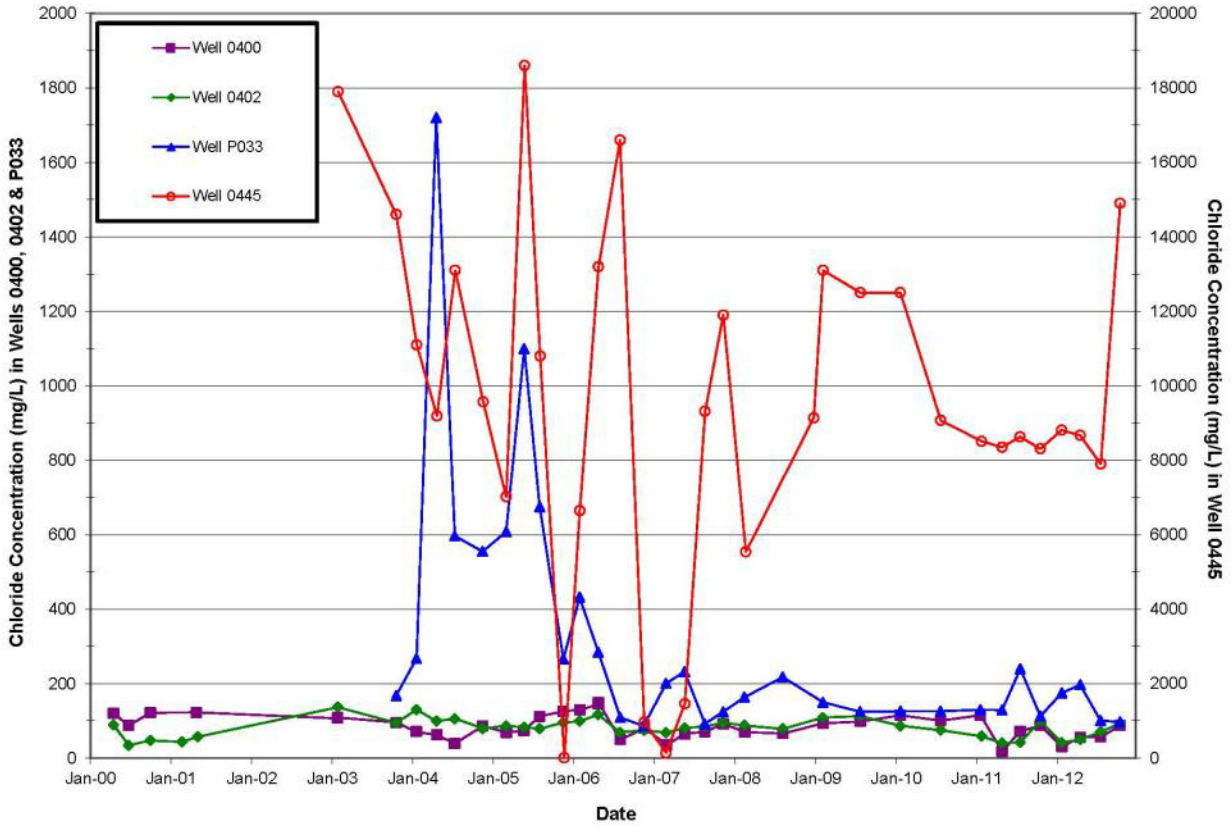

Figure 13. Chloride Concentrations—2000 through 2012

Review of the sodium and chloride data indicates that concentrations in well P033 have generally decreased since salt in the SST building was removed in 2003. The decrease indicates that less salt is entering the groundwater system and being detected in the downgradient wells. It is apparent that dissolved salt is stored in groundwater in the less-permeable bedrock near well 0445, resulting in greater contact time with the shale, which is the source of barium and radium. Naturally occurring barium and radium are leached from the bedrock, put into solution in this discrete portion of the saturated bedrock, and slowly released through the bedrock groundwater system, resulting in the detection of these constituents in the downgradient BVA at very low levels.

4.2 Trend Analysis

Trending was performed on barium, radium, sodium, and chloride data using data from 2004 through 2012 because this set of data reflects the possible influence of removing salt from the SST building. However, the two anomalously low data points reported in well 0445 in 2007 were not included in the data set because they likely do not represent actual groundwater quality.

Statistical analysis indicates increased concentrations of barium in wells 0400, 0402, and 0445, as indicated by positive slopes. Increasing concentrations of radium are indicated in wells 0400 and 0402, as indicated by positive slopes. Statistical upward trends were calculated for barium and radium in wells 0400 and 0402 (Table 11); however, increases are very small. A statistically downward trend was determined for the combined Ra-226/228 data in well P033.

Table 11. Summary of Trend Analysis Results for Barium and Combined Radium in Phase I for 2012

Location	Analyte	No. of Samples	Trend	Slope (mg/L/yr)	Confidence Interval (mg/L/yr)	
					Lower	Upper
0400	Barium	30	**Up**	0.006	0.004	0.008
0402		30	**Up**	0.003	0.001	0.005
0445		28	None	0.26	–0.18	0.63
P033		30	None	–0.001	–0.006	0.002
Location	**Analyte**	**No. of Samples**	**Trend**	**Slope (pCi/L/yr)**	**Confidence Interval (pCi/L/yr)**	
					Lower	**Upper**
0400	Ra-226/228	30	**Up**	0.12	0.05	0.18
0402		30	**Up**	0.08	0.02	0.14
0445		28	None	–0.23	–3.5	3.6
P033		30	**Down**	–0.07	–0.13	0

mg/L/yr = milligrams per liter per year
pCi/L/yr = picocuries per liter per year

Trend analysis indicates decreased chloride concentrations in wells 0400, 0402, 0445, and P033 and decreased sodium concentrations in wells 0402, 0445 and P033, as indicated by negative slopes (Table 12). Statistically downward trends were calculated for both chloride and sodium in well P033. A statistically upward trend in sodium concentrations was calculated for well 0400 and a statistical downward trend in chloride was calculated for well 0402.

Table 12. Summary of Trend Analysis Results for Sodium and Chloride in Phase I for 2012

Location	Analyte	No. of Samples	Trend	Slope (mg/L/yr)	Confidence Interval (mg/L/yr)	
					Lower	Upper
0400	Chloride	30	None	–0.31	–4.7	4.5
0402		30	**Down**	–3.9	–6.8	–0.71
0445		30	None	–117	–516	485
P033		30	**Down**	–32.8	–69.8	–15.7
0400	Sodium	30	**Up**	2.0	0.11	3.6
0402		30	None	–0.55	–2.2	1.5
0445		30	None	–84.8	–230	101
P033		30	**Down**	–22.0	–37.5	–8.7

mg/L/yr = milligrams per liter per year

4.3 Discrete Groundwater Sampling

It was recommended in the draft version of the 2011 annual report for Phase I prepared in March 2012 to discontinue monitoring for barium and radium based on the body of data collected since 2004. The data set confirmed that the unusual geochemistry in well 0445 is caused by the infiltration of water that had been impacted by salt stored onsite. The high levels of salt in the groundwater resulted in the release of naturally occurring barium and radium from the bedrock matrix.

The Mound Core Team requested that discrete groundwater samples be collected at two locations along the interface of the bedrock and the BVA downgradient of well 0445. Adequate downgradient monitoring has come into question based on recent groundwater flow maps developed for the Mound site, primarily the OU-1 area, which is immediately upgradient of the Phase I area. The Core Team expressed concern that wells 0400, 0402, and P033 may be more

cross-gradient than downgradient of outflow from well 0445. However, it was noted that well P033 has shown historical barium and radium impact.

In situ groundwater samples were collected from two locations approved by Ohio EPA (Figure 14) and were submitted for barium, Ra-226, Ra-228, sodium, and chloride analysis. Two sampling events were conducted in June and November 2012 (Table 13).

Table 13. Summary of Radium and Barium Monitoring Results for Geoprobe Samples

Sample ID	Date	Ra-226 (pCi/L)	Ra-228 (pCi/L)	Barium (µg/L)	Chloride (mg/L)	Sodium (mg/L)
GP-201	June 2012	1.07	ND (<0.47)	141	198	107
	Nov 2012	0.70 (J)	1.38 (J)	149	199	100
GP-202	June 2012	0.68 (J)	ND (<0.53)	33.9	29.5	10.4
	Nov 2012	0.87 (J)	0.65 (J)	73.5	38.2	14.3
Background		0.996	NA	310	NA	NA

ND = not detected
NA = not applicable
Background values defined in the *Phase I Residual Risk Evaluation* (DOE 2003)

Data were evaluated to determine if the BVA has been impacted by bedrock groundwater with elevated radium and barium levels. Both locations show some salt impact (as indicated by sodium and chloride values), with GP-201 having the greater levels. The presence of salt indicates that these two Geoprobe samples represented water that has been impacted by the upgradient salt storage area and is along the same flow path that is sampled at well 0445, where the highest barium and radium concentrations were detected. Since salt is present, but radium and barium levels are indistinguishable from background, it can be concluded that the radium and barium impact is isolated to a discrete area of the bedrock aquifer and does not extend into the downgradient BVA in a measureable quantity.

4.4 Recommendations

Although the levels of radium and barium in the bedrock groundwater are not decreasing to the MCL, it is recommended that Phase I confirmatory sampling program for barium and radium be discontinued. This includes discontinuing analyses for sodium and chloride. This recommendation is based on evaluation of the body of data collected since 2004, special sampling performed in 2012, and the following considerations:

- The concentrations of barium have not exceeded the LOC since well 0445 was installed in 2002. The LOC for combined Ra-226/228 is exceeded periodically in this well.
- This data set continues to confirm the interpretation that elevated barium and radium levels in the low-yield bedrock aquifer downgradient of the SST building resulted from the unusual geochemistry in the aquifer matrix around well 0445, which releases naturally occurring barium and radium in the presence of salt leached from the SST storage building.
- Discrete groundwater sampling near the bedrock/BVA interface shows that the groundwater quality in the BVA has not been affected by barium or radium in groundwater originating in the bedrock aquifer. Groundwater at both Geoprobe locations showed some salt impact (as indicated by sodium and chloride values), indicating influence from the bedrock aquifer.

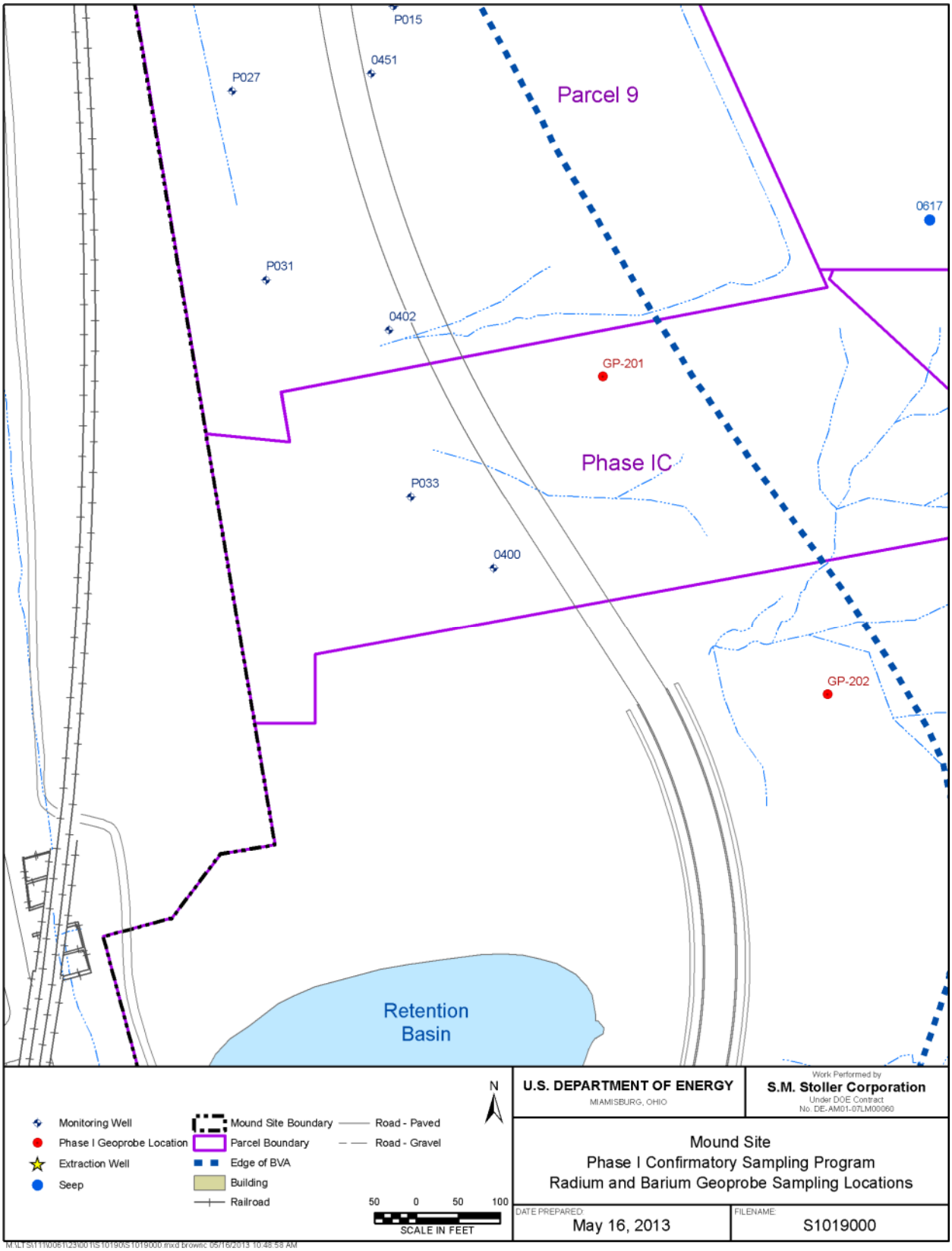

Figure 14. Phase I Confirmatory Sampling Program Radium and Barium Geoprobe Sampling Locations

5.0 Parcels 6, 7, and 8 MNA Remedy

5.1 Monitoring Results

Monitoring results for 2012 (Table 14) continue to show detections of TCE in wells 0315, 0347, and 0386; the highest concentrations are detected in wells 0315 and 0347 (source area wells), where concentrations also exceed the MCL. The concentrations of TCE reported in wells 0315 and 0347 were less than the trigger level of 30 µg/L for the source area wells, except for well 0347 during the fourth quarter. Estimated detections of TCE were reported in wells 0387, 0389, and 0392. No detectable concentrations of TCE were measured in the other wells. All TCE concentrations were below applicable trigger levels.

Table 14. Summary of VOC Results in the 0315 and 0347 Area for 2012

Well ID	Location	VOC	Q1	Q2	Q3	Q4
0124	BVA	TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0126	BVA	TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		PCE (µg/L)	0.90 (J)	0.82 (J)	0.85 (J)	1.1
0315	Source Area	TCE (µg/L)	**10.3**	**12.3**	**10.8**	**16.6**
		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0347	Source Area	TCE (µg/L)	**28.8**	**23.8**	**25.0**	**31.2**
		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0386	BVA	TCE (µg/L)	2.7	2.2	2.8	3.0
		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	0.22 (J)
0387	BVA	TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		PCE (µg/L)	0.25 (J)	0.23 (J)	0.21 (J)	0.31 (J)
0389	BVA	TCE (µg/L)	0.31 (J)	0.16 (J)	0.32 (J)	0.90 (J)
		PCE (µg/L)	ND (<1)	ND (<1)	0.19 (J)	0.36 (J)
0392	BVA	TCE (µg/L)	0.30 (J)	ND (<1)	ND (<1)	ND (<1)
		PCE (µg/L)	0.27 (J)	0.27 (J)	0.22 (J)	0.35 (J)

ND = Not detected
J = Estimated value that is less than the reporting limit
Q = Quarter
TCE trigger level for 0315 and 0347 = 30 µg/L
TCE trigger level for other wells = 5 µg/L
Values in **bold** exceed the MCL

TCE concentrations in wells 0315 and 0347 have varied. Changes in concentrations in these two wells were similar until the end of 2006, when a substantial increase was identified in well 0347, while TCE concentrations stabilized in 0315 (Figure 15). Data were highly variable in well 0347, and starting in 2008, TCE concentrations increased in this well. TCE concentrations were lower in well 0315 during 2006 and then rebounded and remained steady. Site improvements began in late 2006 on the Main Hill, and the changes in TCE concentrations may be due to surface water infiltration into exposed tritium capture pits near the location of the SW building. These pits extended into the bedrock, and surface water was infiltrating into the subsurface. The point of access into the pits was covered in October 2009. Concentrations in well 0315 appear to have stabilized since the capture pits were covered. Concentrations in well 0347 have continued to remain high. Since 2000, the concentrations in the two downgradient BVA wells (0386 and 0389) have been less than the MCL.

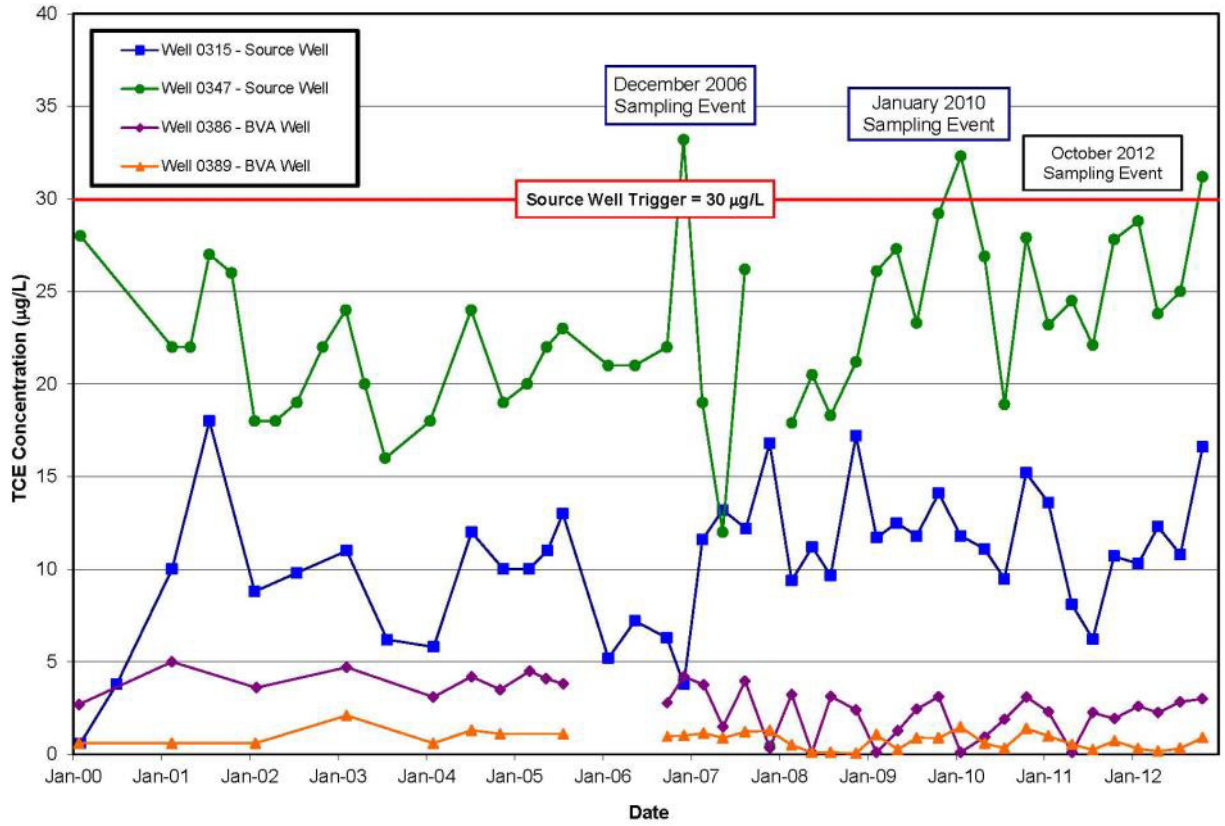

Figure 15. TCE Concentrations in Well 0315/0347 Area (2000–2012)

Estimated detections of PCE (less than 1 µg/L) were reported in wells 0126, 0387, 0389, and 0392 (Figure 15). No trigger levels are established for PCE. No *cis*-1,2-DCE, *trans*-1,2-DCE, or vinyl chloride was detected in any of these wells.

The distribution of TCE in groundwater (Figure 16) indicates that the greatest impact is still associated with wells 0315 and 0347. TCE concentrations in these wells continue to exceed the MCL. The two BVA wells immediately downgradient of this area have TCE concentrations below the MCL, with slight impact extending downgradient. Figure 16 depicts the 2012 annual averages of TCE in the monitoring network.

5.2 Trend Analysis

Statistical analysis of the TCE data collected since 2005 from wells 0315, 0347, 0386, and 0389 indicates increasing concentrations of TCE in source area wells 0315 and 0347, as implied by positive slopes (Table 15). This period was selected to represent data collected since the completion of remediation on the Main Hill. A statistical upward trend in TCE concentrations was calculated for well 0347. No statistical trend, upward or downward, was identified in well 0315. Decreasing TCE concentrations are indicated for wells 0386 and 0389, as implied by negative slopes. A downward trend was calculated for well 0386. Trend analysis was not performed on data from the remainder of the wells because results consistently showed nondetects or sporadic estimated detections.

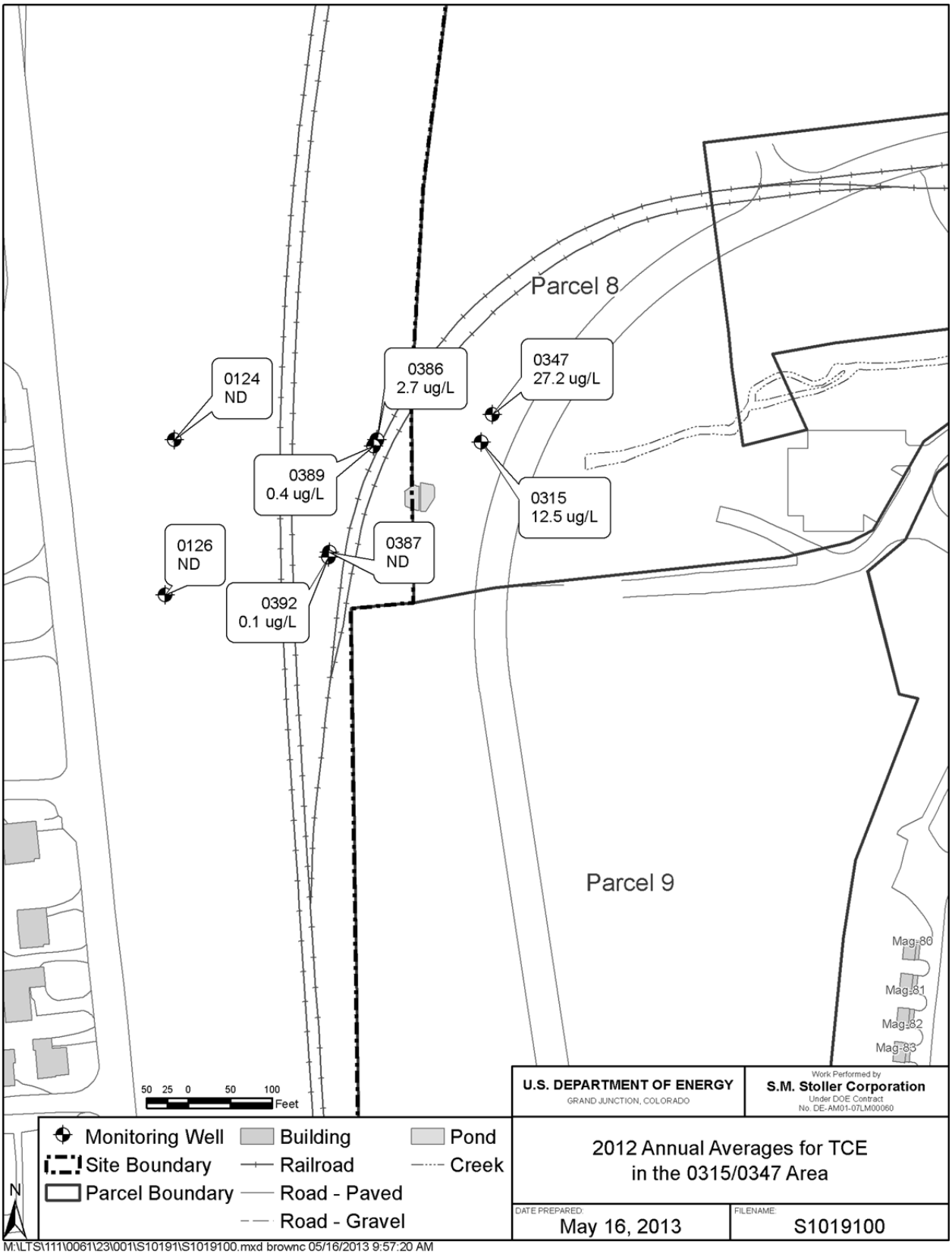

Figure 16. 2012 Annual Average TCE in the 0315/0347 Area

Table 15. Summary of Trend Analysis Results for TCE in the Source Area and Downgradient Wells (2005−2012)

Location	Number of Samples	Trend	Slope (μg/L/year)	Confidence Interval (μg/L/year)	
				Lower	Upper
0315	31	None	0.28	–0.26	0.86
0347	31	**Up**	0.98	0.30	1.7
0386	29	**Down**	–0.20	–0.37	–0.02
0389	27	None	–0.08	–0.16	0.02

μg/L/year = micrograms per liter per year

5.3 Groundwater Elevations

A map of the average groundwater elevations measured in the Parcels 6, 7 and 8 area during 2012 (Figure 17) indicates two flow regimes: bedrock and BVA. The approximate location of contact of the BVA with the bedrock is indicated on this figure. Groundwater originating from the well 0411/0443 area flows southwest within the bedrock following the bedrock topography. This groundwater enters the BVA along this contact. Flow within the BVA is parallel to the bedrock contact. Flow near wells 0315/0347 is generally to the south-southeast. Appendix B presents a summary of the groundwater elevations measured during 2012.

5.4 Recommendations

No changes to the 0315 and 0347 area monitoring program are warranted at this time. TCE concentrations in source area wells 0315 and 0347 continue to exceed the MCL. Also, the TCE concentrations have not stabilized, and at times the concentration in well 0347 exceeds the trigger value of 30 μg/L. The TCE concentrations show some seasonal variation; however, it is not been established whether the variability results from seasonal influx of surface water leaching TCE from the overlying soils and producing higher concentrations in groundwater, or whether infiltrating surface water dilutes the concentrations already present in groundwater. Data will continue to be evaluated in an effort to determine the mechanism causing changes in VOC concentrations.

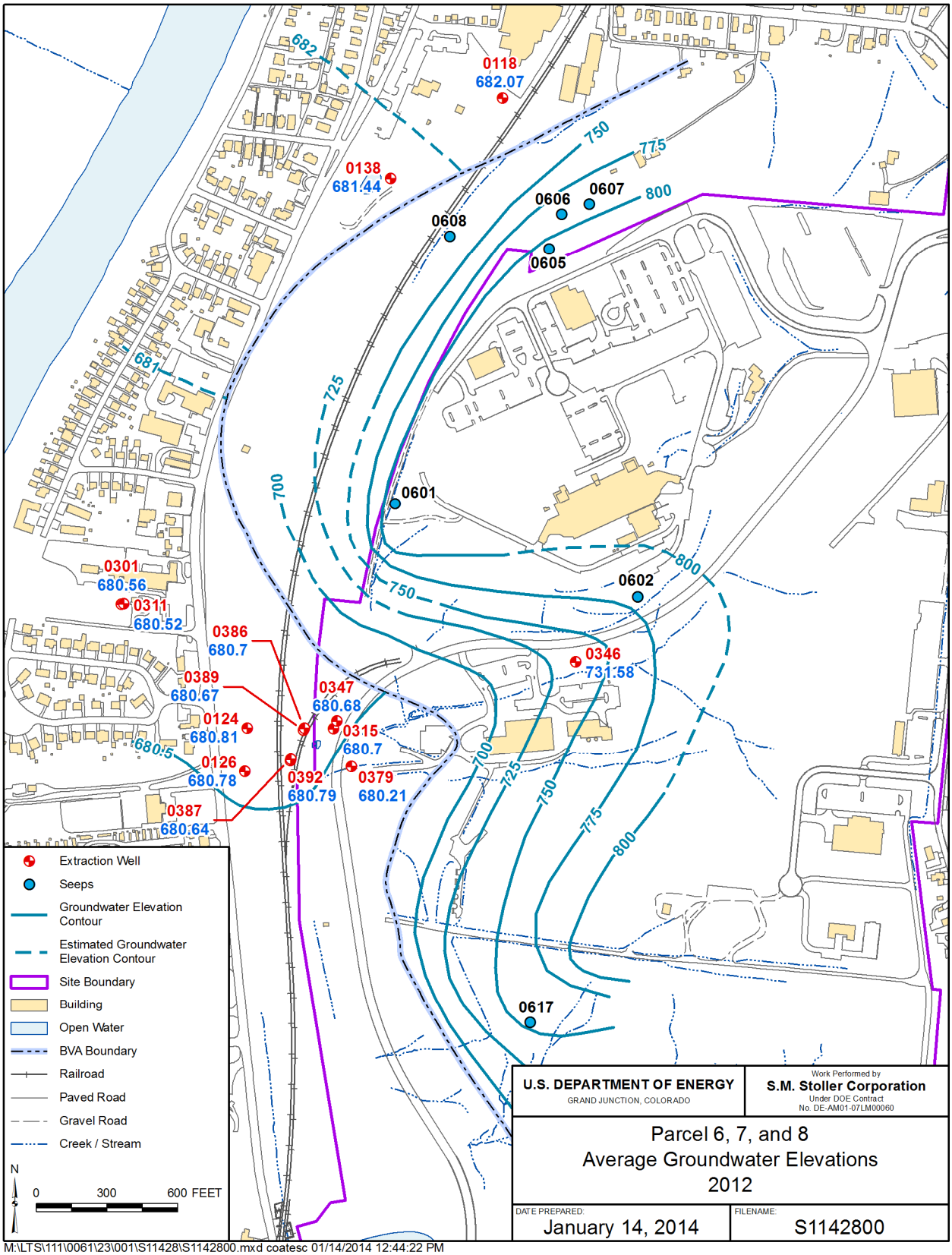

Figure 17. Parcels 6, 7, and 8 Average Groundwater Elevations

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6.0 Main Hill Seeps

6.1 Volatile Organic Compounds Results

Although TCE concentrations in some Main Hill seeps continued to exceed the MCL in 2012 (Table 16), no locations had concentrations that exceeded the trigger level of 150 µg/L (established for seep 0605). The highest concentrations were in seep 0602, which is onsite. This seep was only sampled during the first quarter and was dry the remainder of the sampling periods. PCE concentrations continued to exceed the MCL of 5 µg/L in seep 0601; however, PCE concentrations at this location did not exceed the trigger level of 75 µg/L. Estimated detections of PCE were reported in seeps 0602, 0605, and 0607. Detectable concentrations of *cis*-1,2-DCE were reported in seeps 0602, 0605, and 0606; seep 0602 had the highest concentrations. Estimated detections of *cis*-1,2-DCE (less than 1 µg/L) were reported in seeps 0601 and 0607. Estimated detections of *trans*-1,2-DCE (less than 1 µg/L) were reported in seeps 0602 and 0605. No vinyl chloride was detected in the seeps.

Monitoring results (Table 16) showed low concentrations of TCE in well 0379 downgradient of the Main Hill seeps. Elevated concentrations of TCE are reported in downgradient well 0347 (discussed in Section 3.0). Estimated detections of PCE were reported in wells 0311 and 0379. No trigger levels have been set for these locations. Only the concentrations of TCE in well 0347 exceeded the MCL of 5 µg/L. Neither DCE nor vinyl chloride was detected in the downgradient wells.

A graph of TCE concentrations in the seeps since 2005 (Figure 18) shows that, overall, the concentrations in seep 0602 have increased since the remediation of contaminated buildings and soil on the Main Hill was completed (mid-2006). Concentrations of TCE have varied significantly at this location, ranging from 15 µg/L to 139 µg/L. A possible cause for the changes and overall increases may be surface water infiltration upgradient of the seeps, resulting in flushing of residual VOCs. Site improvements started in 2006 on the Main Hill and included a new parking lot constructed where B building was located. It was discovered in late 2009 that grading in the area had exposed two manholes over a large tritium capture pit that was located along the western side of SW building. These test pits extend into the weathered bedrock. Surface water had been infiltrating into these uncovered access ports and was lost to the subsurface. The access ports were covered in October 2009. After covering the ports, the TCE concentrations decreased slightly but became more varied.

Efforts are made to collect seep samples under base flow conditions. Base flow is considered flow not impacted by surface water runoff and is representative of groundwater within the bedrock. No sampling is performed within several days of a precipitation event to reduce the influence of surface water on the sample. However, during the January sampling event, snow was melting and may have impacted the flow in the seep.

In response to the significant TCE increase in seep 0602, potential residual sources and transport mechanisms were reviewed. This included review of former building operations on the Main Hill and a field reconnaissance to determine whether additional areas were present where surface water could enter the subsurface. Several areas could be potential sources of residual VOC contamination upgradient of this seep (possibly T building, E building, or DS building).

Table 16. Summary of VOC Results in the Main Hill Area for 2012

Location	Area	VOC Concentrations				
		VOC	Q1	Q2	Q3	Q4
Seeps						
0601	Onsite	TCE (µg/L)	4.2	ND (<1)	ND (<1)	**10.3**
		PCE (µg/L)	1.02	ND (<1)	ND (<1)	**7.3**
		cis-1,2-DCE (µg/L)	0.47 (J)	ND (<1)	ND (<1)	0.94 (J)
		trans-1,2-DCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0602	Onsite	TCE (µg/L)	**22.2**	Dry	Dry	Dry
		PCE (µg/L)	0.37 (J)			
		cis-1,2-DCE (µg/L)	14.9			
		trans-1,2-DCE (µg/L)	0.34 (J)			
0605	Offsite	TCE (µg/L)	**9.2**	**15.4**	Dry	**19.8**
		PCE (µg/L)	0.23 (J)	ND (<1)		0.20 (J)
		cis-1,2-DCE (µg/L)	2.4	1.4		2.5
		trans-1,2-DCE (µg/L)	ND (< 1)	0.23 (J)		0.47 (J)
0606	Offsite	TCE (µg/L)	0.56 (J)	**5.4**	**7.0**	**9.0**
		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		cis-1,2-DCE (µg/L)	ND (<1)	0.65 (J)	1.1	0.84 (J)
		trans-1,2-DCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0607	Offsite	TCE (µg/L)	3.5	**10.0**	**5.0**	**7.4**
		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	0.17 (J)
		cis-1,2-DCE (µg/L)	0.40 (J)	0.93 (J)	0.70 (J)	0.69 (J)
		trans-1,2-DCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0608	Offsite	TCE (µg/L)	1.3	1.7	Dry	Dry
		PCE (µg/L)	ND (<1)	ND (<1)		
		cis-1,2-DCE (µg/L)	ND (<1)	ND (<1)		
		trans-1,2-DCE (µg/L)	ND (< 1)	ND (< 1)		
Downgradient Wells						
0118	Offsite	TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0138	Offsite	TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0301	Offsite	TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0311	Offsite	TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		PCE (µg/L)	0.21 (J)	0.21 (J)	0.26 (J)	0.33 (J)
0346	Onsite	TCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0347	Onsite	TCE (µg/L)	**28.8**	**23.8**	**25.0**	**31.2**
		PCE (µg/L)	ND (<1)	ND (<1)	ND (<1)	ND (<1)
0379	Onsite	TCE (µg/L)	2.0	1.6	2.2	1.9
		PCE (µg/L)	0.35 (J)	0.33 (J)	0.31 (J)	0.38 (J)

ND = Not detected
J = Estimated value that is less than the reporting limit
Q = Quarter
PCE trigger level at 0601 = 75 µg/L
TCE trigger level at the seeps = 150 µg/L
Values in **bold** exceed the MCL

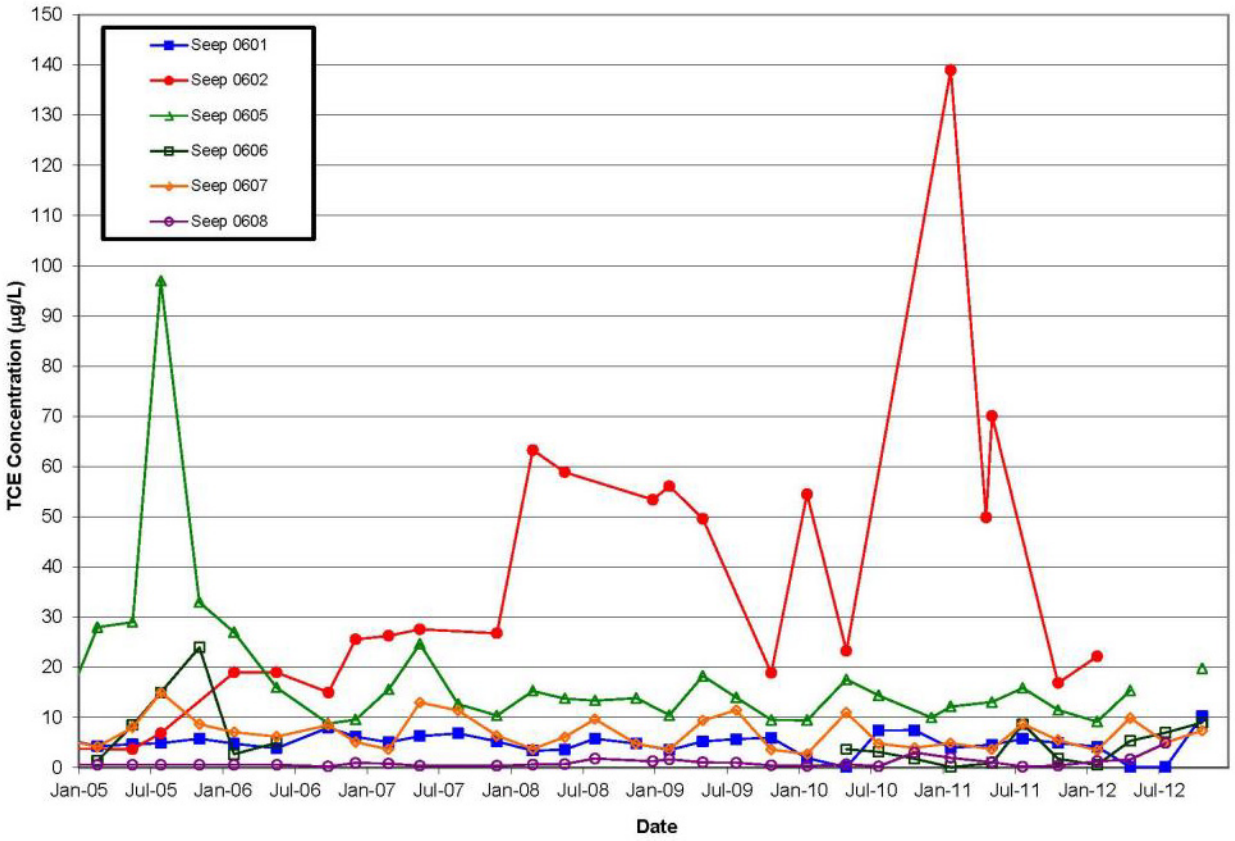

Figure 18. TCE Concentrations in the Main Hill Seeps

A large foundation system is located around T building, which is upgradient of seep 0602. This drain could intercept VOC-impacted groundwater and divert it upgradient of seep 0602. Groundwater flow within the bedrock mimics the bedrock topography. Review of the bedrock topography map indicates that groundwater to the north and east could be expressed at this seep.

A field reconnaissance was performed in April 2011 to visually inspect for locations where surface water may enter the subsurface upgradient of seep 0602. Surface erosion was observed around the east head house for T building. Water has also been observed leaking into several rooms that are on the east side of T building. A soil berm was constructed in November 2011 to divert surface water away from the east head house. Dry conditions have prevented collection of sufficient data to determine if the surface water diversion has affected VOC concentrations at this location.

In seep 0601, PCE concentrations (Figure 19) are slightly higher than TCE concentrations. The concentrations of PCE have decreased below the MCL of 5 µg/L on two occasions since 2010. The PCE concentrations have shown a general decrease and are similar to those measured prior to remediation on the Main Hill. Estimated detections of PCE (less than 1 µg/L) were reported in seeps 0602 and 0605.

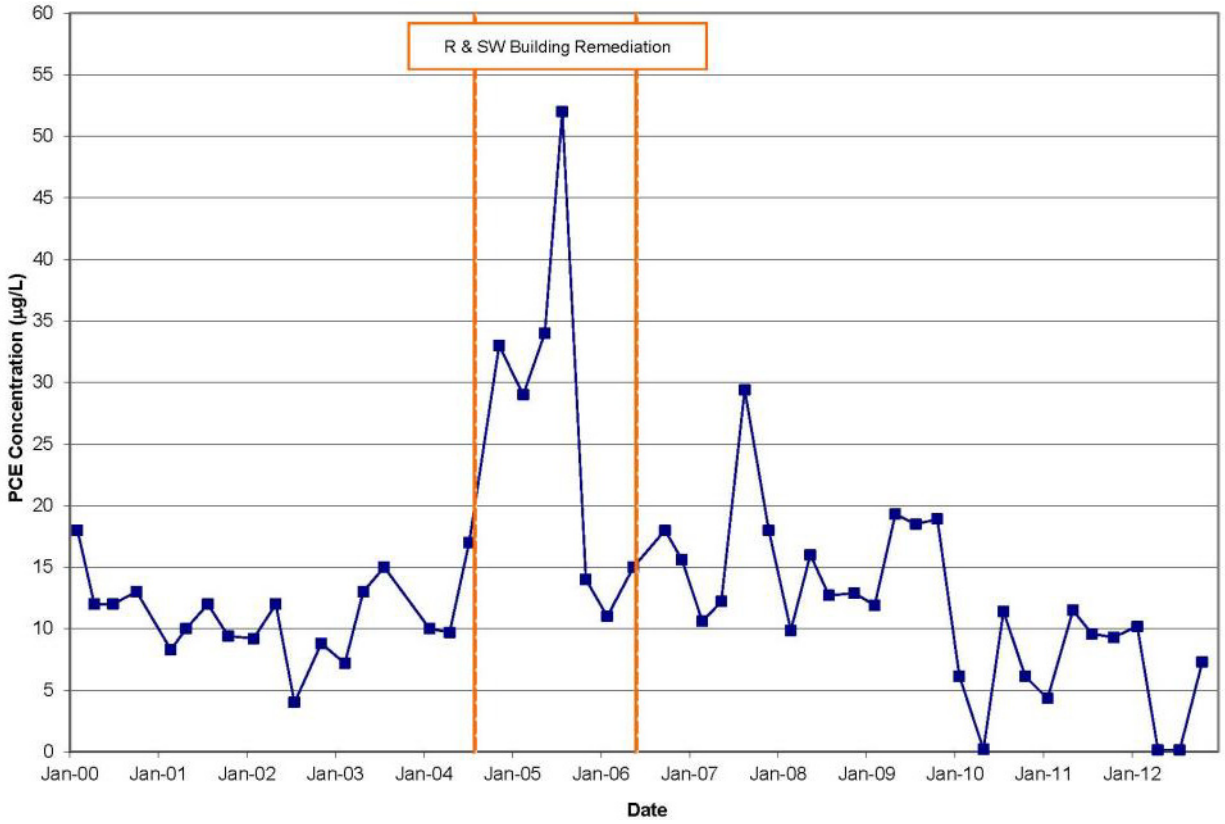

Figure 19. PCE Concentrations in Seep 0601

Detectable concentrations of *cis*-1,2-DCE were reported in seeps 0602, 0605, and 0606. The highest concentrations were reported in seeps 0602 and 0605. A comparison of TCE and *cis*-1,2-DCE concentrations (Figure 20) in these two seeps indicates that the concentration changes in the two contaminants generally behaved similarly. Although an increase in *cis*-1,2-DCE concentrations is an expected indicator of TCE degradation, in this instance, it is likely the result of flushing of residual DCE from the system. When TCE degrades, concentrations typically decrease as *cis*-1,2-DCE concentrations increase. Estimated detections of *trans*-1,2-DCE were reported in seeps 0602 and 0605. Subsequent data will continue to be evaluated for evidence of TCE degradation.

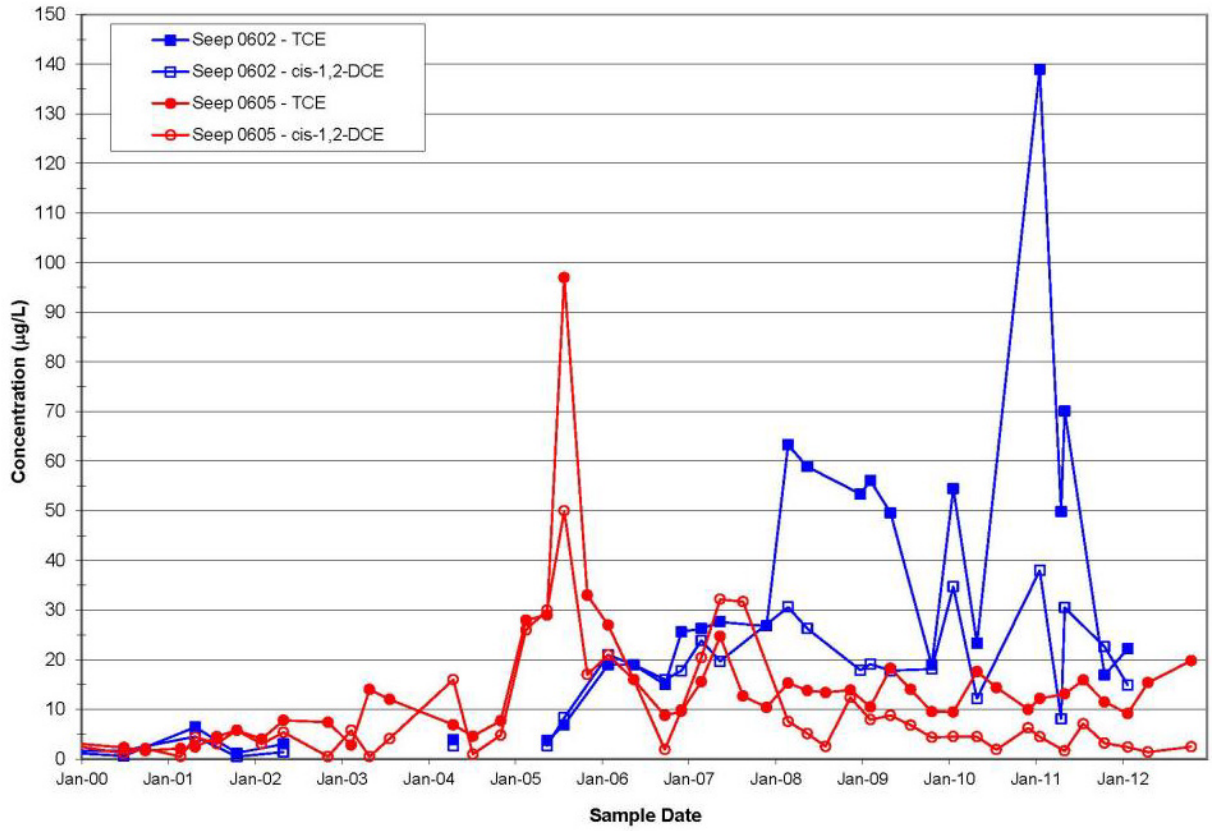

Figure 20. TCE and cis*-1,2-DCE Concentrations in Seeps 0602 and 0605*

The distribution of TCE in groundwater (Figure 21) in the Main Hill area indicates that the highest area of impact is associated with the seeps, particularly seep 0602. Downgradient well 0347 has TCE levels that exceed the MCL of 5 µg/L. Figure 21 depicts the 2012 annual averages of TCE in the monitoring network.

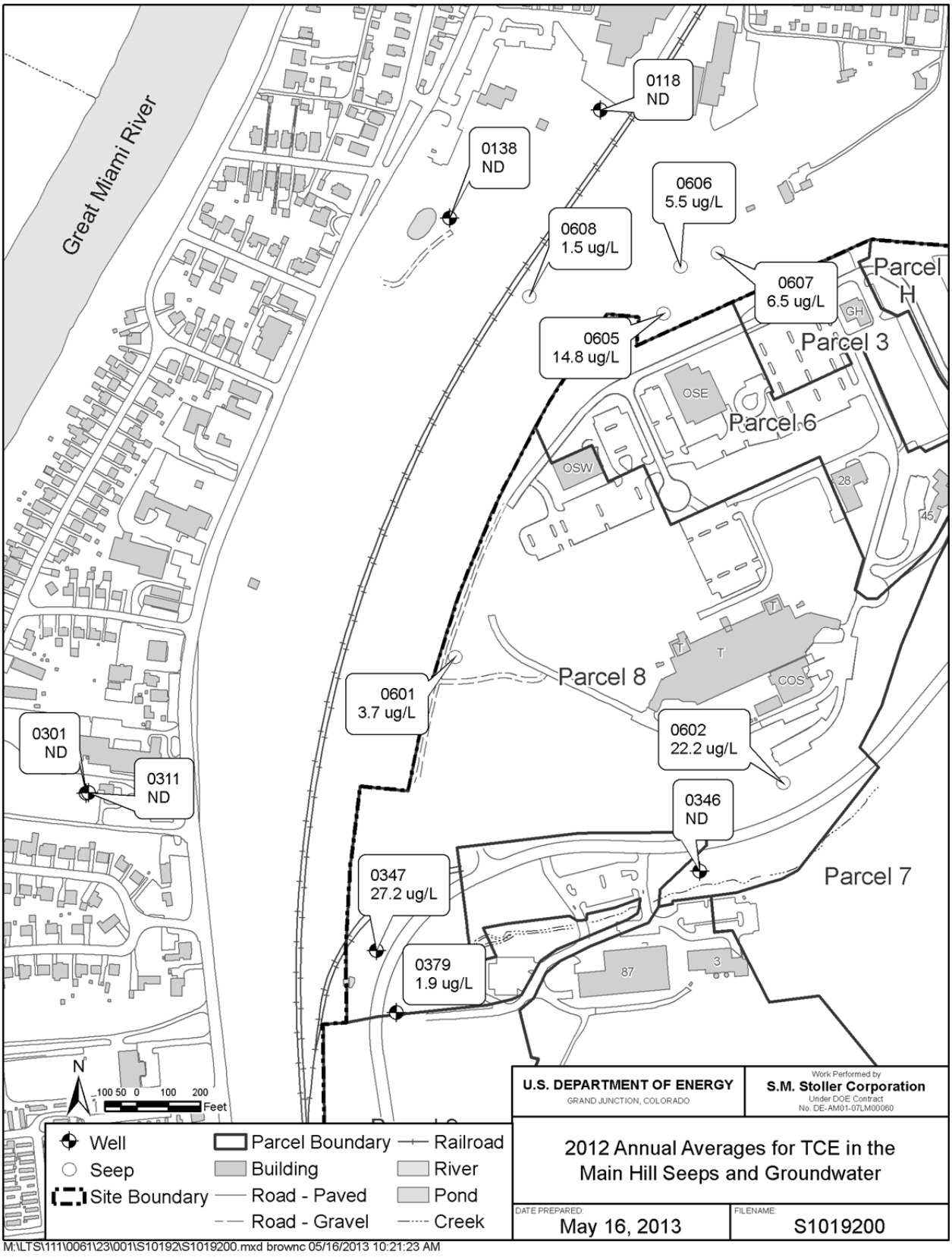

Figure 21. 2012 Annual Average for TCE in the Main Hill Seeps and Groundwater

6.2 Tritium Results

Tritium levels in the Main Hill seeps continued to be elevated in 2012 and were higher than those in the downgradient groundwater wells (Table 17). The highest tritium activity was observed in seep 0601, which is located onsite. Seep 0601 is the only location that exceeded the MCL of 20 nanocuries per liter (nCi/L) during 2012. None of the seeps had tritium levels that exceeded the trigger level of 1,500 nCi/L.

Five wells downgradient of the Main Hill area continued to show detectable levels of tritium in 2012 (Table 17). The highest levels were observed in well 0347, downgradient of seep 0601. The four remaining wells had tritium levels similar to background (1.5 nCi/L). None of the groundwater wells had tritium levels that exceeded the MCL of 20 nCi/L.

Table 17. Summary of Tritium Results in the Main Hill Area for 2012

Location	Tritium Activity (nCi/L)		
	S1		S2
Seeps			
0601	**26.8**	**49.2**	**53.2**
0602	8.1	Dry	
0605	7.8	12.0	Dry
0606	3.6	8.4	8.9
0607	3.4	5.2	6.1
0608	8.7	9.2	Dry
Downgradient Wells			
0118	ND (<0.30)	ND (<0.32)	ND (<0.32)
0138	1.2	1.2	1.0
0301	ND (<0.30)	ND (<0.31)	ND (<0.32)
0311	ND (<0.30)	ND (<0.32)	ND (<0.32)
0346	0.94	1.0	0.86
0347	3.8	4.5	4.3
0379	2.0	1.4	1.6

S = Semiannual
ND = Not detected
Tritium trigger level at the seeps = 1,500 nCi/L
Values in **bold** exceed the MCL of 20 nCi/L

Tritium levels in the seeps were highest during remediation activities on the Main Hill (2004−2006). Tritium data collected after building demolition and soil removal indicate decreasing levels in all of the seeps (Figure 22). The decreasing tritium levels from post-remediation data suggest that the majority of the source was removed from the Main Hill area and that, with continued flushing, levels should continue to decline. Starting in 2009, the tritium levels in all of the seeps except seep 0601 were less than the MCL of 20 nCi/L. Changes in tritium levels in seep 0601 indicate a seasonal effect, as levels typically increase in late summer/early fall. Comparisons of tritium concentrations in the seeps with those measured in downgradient monitoring wells indicate that the seeps responded more quickly than the wells because they are direct discharge points for groundwater originating beneath the Main Hill.

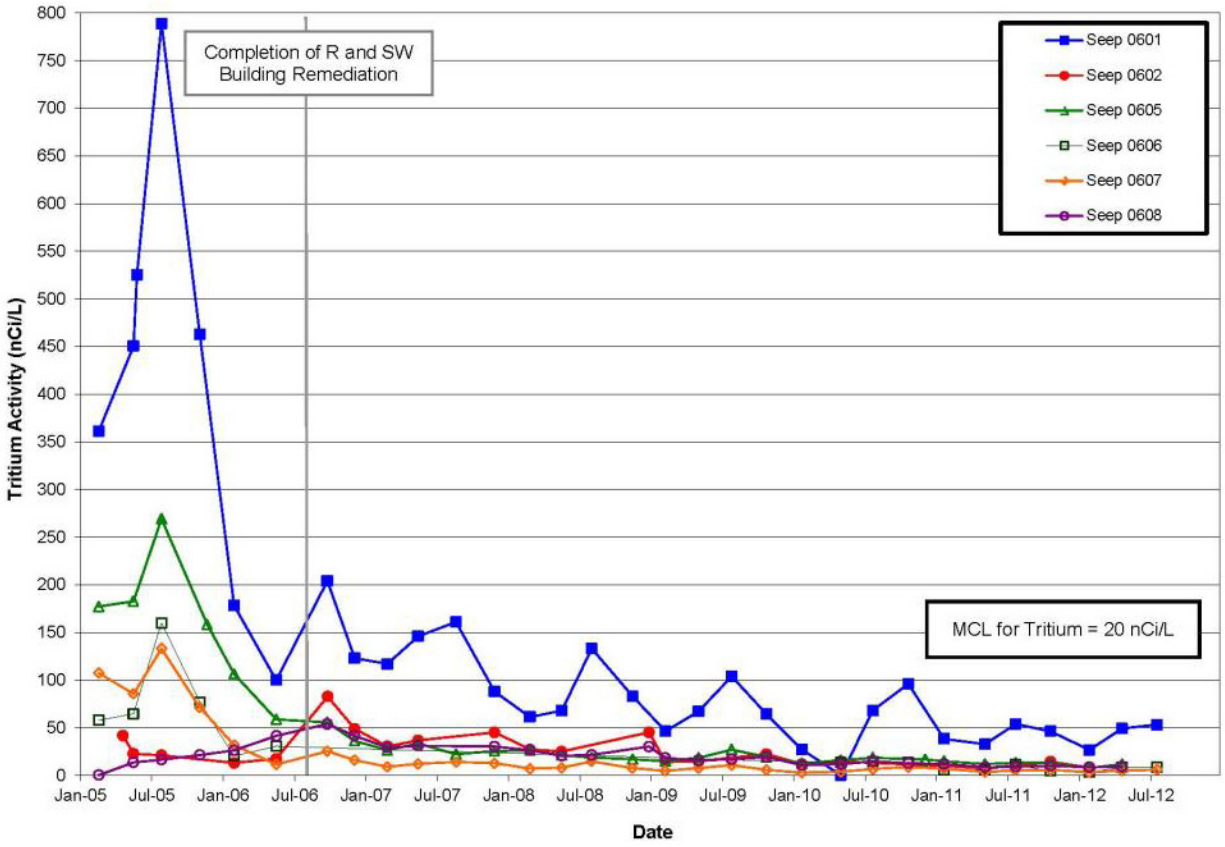

Figure 22. Tritium Activity in Main Hill Seeps

A graph of tritium levels in downgradient wells (Figure 23) illustrates that groundwater impact in the wells lagged behind impact expressed in the seeps. Groundwater impact increased near the end of remediation activities on the Main Hill, and impact in the seeps occurred as remediation activities were being performed and began to decrease as activities were completed. Wells 0138 and 0347 had the highest levels of tritium and responded rapidly to remediation activities. Tritium levels in wells 0138, 0346, and 0379 have leveled off and are similar to background.

The distribution of tritium in groundwater (Figure 24) in the Main Hill area indicates that the greatest impact is still associated with the seeps, particularly seep 0601. Downgradient well 0347 also had elevated levels of tritium. Figure 24 depicts the 2012 annual averages of tritium in the monitoring network.

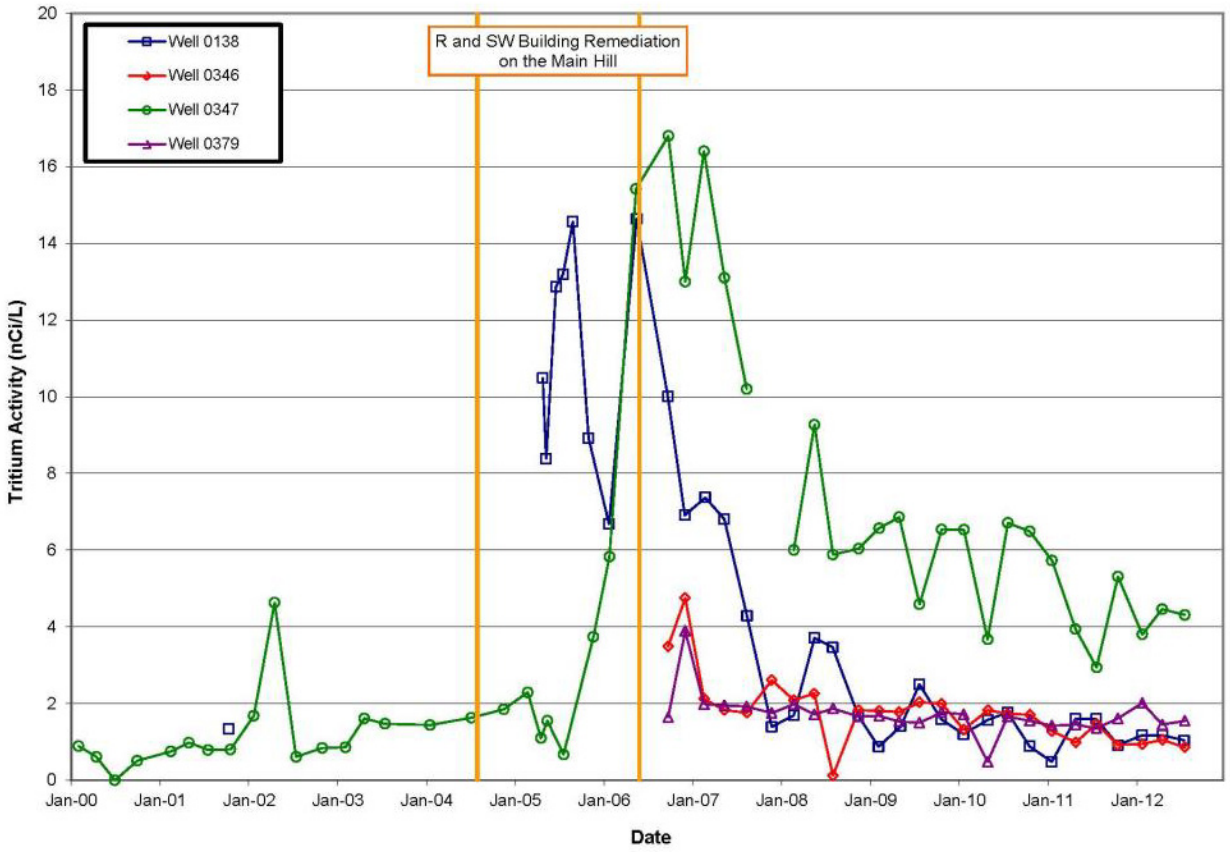

Figure 23. Tritium Activity in Wells 0138, 0346, 0347, and 0379

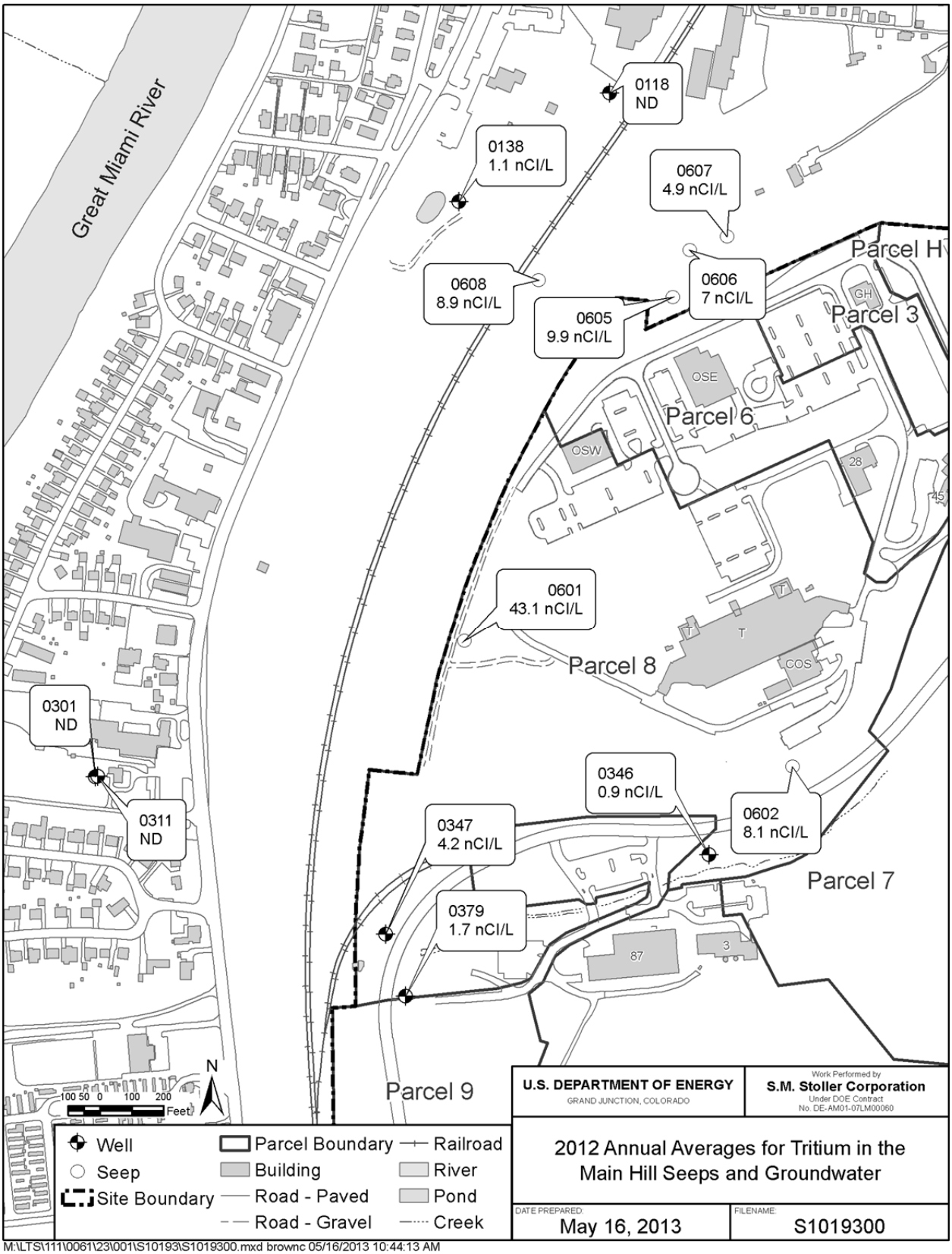

Figure 24. 2012 Annual Averages for Tritium in the Main Hill Seeps and Groundwater

6.3 Trend Analysis

Trend analysis was performed on VOC, tritium, and other radionuclide data using the nonparametric Mann-Kendall test. Trend analysis is reported for data collected since 2005. This period was selected to represent data collected since the completion of remediation activities on the Main Hill.

6.3.1 Volatile Organic Compounds

Trend analysis for TCE data collected since 2005 indicates increasing TCE concentrations in seep 0602, as indicated by positive slopes (Table 18). Although the slopes are positive for seeps 0601 and 0608, the slope values are near zero. A statistical upward trend was calculated for TCE in seep 0602. TCE concentrations are decreasing in seeps 0605, 0606, and 0607, as indicated by negative slopes. A statistical downward trend was calculated for seep 0605.

Concentrations of PCE in seep 0601 are decreasing, as implied by a negative slope (Table 18). A statistically significant downward trend was indicated in the data from this seep. Data from seeps 0602 and 0605 were evaluated for trends in *cis*-1,2-DCE concentrations (Table 18). Concentrations of *cis*-1,2-DCE are increasing in seep 0602; however, an upward trend is not indicated in the data. A statistical downward trend was calculated in the *cis*-1,2-DCE data from seep 0605.

Table 18. Summary of Trend Analysis Results for VOCs in the Main Hill Seeps (2005–2012)

Location	Number of Samples	Trend	Slope (µg/L/year)	Confidence Interval (µg/L/year)	
				Lower	Upper
TCE					
0601	28	None	0.01	–0.32	0.31
0602	21	**Up**	9.2	2.2	12.6
0605	28	**Down**	–1.6	–3.1	–0.33
0606	13	None	–0.89	–2.5	0.23
0607	28	None	–0.44	–1.0	0.12
0608	27	None	0.02	–0.04	0.13
PCE					
0601	28	**Down**	–2.0	–4.0	–0.84
cis-1,2-DCE					
0602	21	None	1.5	–0.37	4.1
0605	28	**Down**	–3.1	–4.7	–1.8

µg/L/year = micrograms per liter per year

Data from the downgradient wells were not evaluated for statistical trends. TCE concentrations have been sporadic in these wells, with the exception of well 0347, which is discussed in Section 2.0.

6.3.2 Tritium

Trend analysis for tritium data collected since 2005 indicates decreasing tritium levels in all of the seeps and the four wells with detectable tritium levels, as implied by negative slopes. Statistically significant downward trends in tritium were calculated in all of the seeps and in wells 0138, 0346, and 0379 (Table 19).

Table 19. Summary of Trend Analysis Results for Tritium in the Main Hill Seeps and Downgradient Wells (2005−2012)

Location	Number of Samples	Trend	Slope (nCi/L/year)	Confidence Interval (nCi/L/year)	
				Lower	Upper
0601	29	**Down**	–36.1	–58.3	–20.9
0602	21	**Down**	–3.8	–7.3	–1.1
0605	28	**Down**	–9.1	–18.5	–4.9
0606	13	**Down**	–8.3	–13.1	–3.4
0607	28	**Down**	–3.8	–7.3	–2.0
0608	27	**Down**	–3.4	–5.4	–1.5
0138	30	**Down**	–1.6	–2.2	–1.2
0346	22	**Down**	–0.28	–0.44	–0.14
0347	29	None	–0.11	–1.3	0.52
0379	22	**Down**	–0.12	–0.19	–0.07

nCi/L/year = nanocuries per liter per year

6.4 Recommendations

No changes to the Main Hill seeps VOC monitoring program are warranted at this time; quarterly sampling will continue in 2013. TCE concentrations greater than the MCL have continued to be measured in several seeps and downgradient monitoring well 0347. Data will continue to be evaluated in an effort to determine the mechanism causing changes in VOC concentrations. Also, data will be evaluated to determine if degradation of TCE is occurring, as indicated by the presence of the TCE breakdown products in the seeps.

No changes to the Main Hill seeps tritium monitoring program are warranted at this time; semiannual sampling will continue in 2013. Tritium data collected after building demolition and soil removal indicate decreasing levels in all of the seeps and downgradient wells, and the data suggest that remediation activities removed the majority of the source from the Main Hill area. With continued flushing, levels in the groundwater should continue to decline. Starting in 2009, the tritium levels in all of the seeps except seep 0601 were less than the MCL of 20 nCi/L. Changes in tritium levels in seep 0601 indicate a seasonal effect, as levels typically increase in late summer/early fall. It is recommended that samples be collected during the first and third quarters of the year to capture seasonal variation in the tritium levels.

7.0 Inspection of the Monitoring System

A routine maintenance program has been established for the long-term groundwater monitoring locations at the Mound site. This program includes periodic inspections that focus on the integrity of each well and the condition of the protective casing and surface pad, the surrounding area, and the route of access. These inspections are usually performed during each sampling event. If these wells were neglected, the surface seals could fail, and contamination could migrate from surface sources to the subsurface.

General maintenance was performed on the wells in March 2012. Overall, the wells were in good condition. Several had been recently repainted and vegetation removed to allow access. Photographs of the wells after maintenance are in Appendix C.

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8.0 Data Validation

All data collected was validated in accordance with procedures specified in the *Environmental Procedures Catalog*, LMS/POL/S04325, "Standard Practice for Validation of Laboratory Data." This procedure also fulfills the requirements of applicable procedures in the *Mound Methods Compendium* (MD 80045). Data validation was documented in reports prepared for each data package. All 2012 data, including data validation qualifiers, are summarized in Appendix D.

Laboratory performance is assessed by a review and evaluation of the following quality indicators:

- Sample shipping and receiving practices
- Chain of custody
- Laboratory blanks
- Preparation blanks
- Laboratory replicates
- Serial dilutions
- Detection limits
- Peak integrations
- Matrix spikes and matrix spike duplicates
- Holding times
- Instrument calibrations
- Interference check samples
- Radiochemical uncertainty
- Laboratory control samples
- Sample dilutions
- Surrogate recoveries
- Confirmation analyses
- Electronic data

A total of ten Report Identification Numbers (RINs) were established for the 2012 environmental sampling efforts at the Mound site. A RIN is a set of samples that are relinquished to the laboratory using a Chain of Custody form accompanied by a Laboratory Authorization form. Data Assessment Reports are prepared for each RIN and are presented in Appendix E.

The laboratory prepares an analytical package for each RIN, and each package includes a summary of results, a complete set of supporting analytical data for every analysis reported, and an electronic data deliverable that is used to upload analytical data into databases for validation and qualification prior to the release of the data. Every RIN received from the laboratory is thoroughly reviewed and evaluated before the data package is finalized and released to the public. Table 20 lists the RINs associated with this report.

Table 20. RINs for Calendar Year 2012 Sampling

RIN	Area	Sampling Date(s)
12014324	Phase I	January 30–31, 2012
12014325	Parcels 6, 7, and 8	January 31–February 1, 2012
12044492	Parcels 6, 7, and 8	April 23–25, 2012
12042293	Phase I	April 23, 2012
12064665	Phase I - Geoprobe	June 25, 2012
12074718	Parcels 6, 7, and 8	July 23–25, 2012
12074720	Phase I	July 25–26, 2012
12104912	Parcels 6, 7, and 8	October 23–25, 2012
12104913	Phase I	October 22, 2012
12104938	Phase I—Geoprobe	November 5–6, 2012

The data assessment reports also summarize and assess the sampling quality control for each sampling event. The following items are included:

- Sampling protocol
- Trip blanks
- Outliers
- Equipment blanks
- Field duplicates

9.0 Summary

9.1 Phase I MNA Remedy

The objective of the MNA monitoring in Phase I is to protect the BVA by verifying that the concentrations of TCE near well 0411, well 0443, and seep 0617 are decreasing to levels below the MCL. Also, monitoring provides evidence that TCE originating from the area monitored by wells 0411 and 0443 is not adversely impacting the BVA.

The distribution of TCE and *cis*-1,2-DCE in groundwater continues to indicate that VOC impact is localized in the bedrock groundwater near wells 0411 and 0443 and downgradient seep 0617. Concentrations at these three monitoring locations exceed the MCL of 5 µg/L. Overall, TCE levels in well 0411, which has the highest concentrations, have decreased since monitoring began in 1999. Low levels of *cis*-1,2-DCE continue to be present at all three locations. Statistical analysis indicates decreasing concentrations of TCE in well 0411 and seep 0617 and a downward trend in TCE concentrations in well 0411. Trend analysis estimates that the MCL of 5 µg/L for TCE in well 0411 may be reached between 2027 and 2038. No statistical trends were present in the data from well 0443 and seep 0617. TCE data show that the downgradient BVA is not affected by localized TCE in the bedrock groundwater.

Monitoring associated with the MNA remedy will continue. Evaluation of the 2012 data does not suggest that the monitoring program should be changed at this time. Semiannual sampling will continue in 2013.

9.2 Phase I Confirmatory Sampling for Radium and Barium

Groundwater is monitored for barium and radium to verify a correct understanding of the occurrence of elevated barium and radium in the bedrock groundwater. Sodium and chloride are monitored in conjunction with radium and barium because the salt is considered the mechanism that has mobilized radium and barium in the bedrock, resulting in increased concentrations of these constituents in the bedrock groundwater system.

Monitoring results for 2012 continue to show elevated combined Ra-226/228 and barium levels greater than the MCLs for both constituents in bedrock well 0445. The levels of barium and radium in the bedrock groundwater continue to vary. Barium concentrations have been less than the LOC since monitoring started in 2004. The levels of combined Ra-226/228 periodically exceed the LOC, and during 2012, levels were greater than the LOC only during the second quarter. Statistical analysis of data from well 0445 does not indicate a trend, either upward or downward, in barium or combined Ra-226/228 data collected since 2004.

Ra-226/228 and barium concentrations remain within background levels in the downgradient BVA wells. Trend analysis indicates upward trends in barium and radium in two wells, although the increases are very small.

Discrete groundwater samples were collected near the bedrock/BVA interface during two events. These samples were collected to verify that the groundwater quality in the BVA has not been affected by barium- or radium-impacted groundwater originating in the bedrock aquifer. Both locations showed that barium and radium levels were similar to background values. However,

some salt impact (as indicated by sodium and chloride values) was observed, indicating influence from the bedrock aquifer.

Sodium and chloride monitoring results continue to indicate that the highest concentrations occur in well 0445, where elevated radium and barium are also detected. Trend analysis indicates decreasing concentrations of sodium and chloride in this well. Sodium and chloride data indicate that groundwater impacted by the salt that has percolated into the bedrock aquifer is still discharging into the BVA; however, data from well P033 indicate that this impact has decreased. Evaluation of the sodium and chloride data with respect to the concentrations of barium and radium show that the presence of elevated salt in the groundwater increases concentrations of barium and radium.

Although the levels of radium and barium in the bedrock groundwater are not decreasing to the MCL, the Phase I confirmatory sampling program for barium and radium will be discontinued based on the evaluation of the body of data collected since 2004 and the results of the special sampling performed in 2012. This includes discontinuing analyses for sodium and chloride. This data set confirms the understanding regarding the presence of elevated barium and radium levels within the low-yield bedrock aquifer downgradient of the SST building. It was considered that the unusual geochemistry in well 0445 resulted in the release of naturally occurring barium and radium from the bedrock matrix.

9.3 Parcels 6, 7, and 8—Wells 0315/0347

Monitoring results for 2012 continued to show TCE in wells 0315, 0347, and 0386 with the highest concentrations in wells 0315 and 0347 (source area wells), which also exceed the MCL. The TCE concentration in well 0347 exceeded the trigger level of 30 µg/L during the fourth quarter of 2012. Estimated detections of TCE were reported in BVA wells 0387, 0389, and 0392. No detectable concentrations of TCE were reported in the remaining wells. Estimated detections of PCE were reported in wells 0126, 0387, 0389, and 0392. None of the wells had detectable concentrations of DCE or vinyl chloride.

TCE concentrations in wells 0315 and 0347 have been variable. Influence of surface water infiltration from the Main Hill into the subsurface was reflected in the data starting in 2006. The access points were addressed in October 2009. Concentrations of TCE in well 0315 appear to have decreased since the capture pits were covered. Meanwhile, concentrations of TCE in well 0347 continue to remain high.

Statistical analysis of the TCE data indicated increasing TCE concentrations in source wells 0315 and 0347. A statistical upward trend was calculated for well 0347. Decreasing TCE concentrations were indicated in wells 0386 and 0389, and a statistically significant downward trend was calculated for well 0386. Starting in 2000, the concentrations in BVA wells 0386 and 0389, which have consistently shown TCE impact, have remained below the MCL.

Monitoring associated with TCE in wells 0315 and 0347 will continue in 2013. Evaluation of the 2012 data does not suggest that the monitoring program should be changed at this time. Quarterly sampling will continue in the well 0315/0347 area.

9.4 Parcels 6, 7, and 8—Main Hill Seeps VOC Monitoring

Although TCE concentrations in some of the Main Hill seeps continued to exceed the MCL in 2012, no locations had concentrations that exceeded the trigger level of 150 µg/L (established for seep 0605). The highest concentrations were in seep 0602, which is onsite. PCE concentrations continued to exceed the MCL of 5 µg/L at seep 0601; however, concentrations at this location did not exceed the trigger level of 75 µg/L. Monitoring of downgradient wells indicated elevated concentrations of TCE in wells 0347 and 0379; however, only well 0347 had concentrations that exceeded the MCL of 5 µg/L. Estimated detections of VOCs were reported in well 0311. No DCE or vinyl chloride was detected in the downgradient wells.

Concentrations of *cis*-1,2-DCE were reported in seeps 0601, 0602, 0605, and 0606. The highest concentrations were reported for seeps 0602 and 0605. Concentrations in seep 0602 increased in 2006 and have been highly variable since that time. Concentrations in seep 0605 decreased after 2007 and have shown evidence of seasonal variation since that time. Evaluation of TCE and *cis*-1,2-DCE concentrations in these two seeps indicates that the concentrations of each contaminant vary similarly. An increase in *cis*-1,2-DCE concentrations is an expected indicator of TCE degradation; in this instance, it is likely the result of flushing of residual DCE from the system. Estimated detections of *trans*-1,2-DCE, another breakdown product, were reported in seeps 0602 and 0605. No vinyl chloride was detected in 2012.

Trend analysis for TCE data collected since 2005 indicated increasing TCE and *cis*-1,2-DCE concentrations in seep 0602. A statistically significant upward trend in TCE concentrations was calculated for this location. This seep was influenced by the infiltration of surface water through an exposed tritium capture pit on the Main Hill and may continue to be influenced by infiltration from other sources.

Statistical analysis indicates decreasing TCE concentrations in seeps 0605, 0606, and 0607. Downward trends in TCE and *cis*-1,2-DCE concentrations were calculated for seep 0605. A downward trend in PCE concentrations was calculated for data from seep 0601.

VOC monitoring associated with seeps and downgradient monitoring wells will continue in 2013. The evaluation of the 2012 data does not indicate that the monitoring program should be changed. TCE concentrations greater than the MCL have continued to be measured in several seeps and in downgradient monitoring wells. Data will continue to be evaluated in an effort to determine the mechanism causing changes in VOC concentrations. Quarterly sampling will continue at the seep and monitoring well locations.

9.5 Parcels 6, 7, and 8—Main Hill Seeps Tritium Monitoring

Elevated tritium levels are present in the Main Hill seeps, and one downgradient groundwater well 0347 showed tritium impact in 2012. Tritium levels in the Main Hill seeps continued to be higher than those in the downgradient groundwater wells. The highest tritium activity was observed in seep 0601, which is onsite. No locations had tritium levels that exceeded the trigger level of 1,500 nCi/L. Only seep 0601 had levels that exceeded the MCL of 20 nCi/L. Tritium was detected in five wells (0138, 0311, 0346, 0347, and 0379) downgradient of the seeps; however, most of the levels were similar to background. The highest tritium levels in

groundwater are in well 0347, which is downgradient of seep 0601. None of the groundwater wells had tritium levels that exceeded the MCL of 20 nCi/L.

Statistical analysis of tritium data collected since 2005 indicated decreasing levels in all of the seeps and in four downgradient wells. Downward trends were calculated for all of the seeps and wells 0138, 0346, and 0379. The downward trends determined from post-remediation data continue to support the interpretation that the majority of the source was removed from the Main Hill area during remediation and that flushing should continue to lower the levels. Also, tritium concentrations will likely decrease more rapidly than those of the VOCs because tritium does not attenuate through degradation or sorption in the natural environment; therefore, it moves more quickly in the groundwater system.

Tritium monitoring associated with seeps and downgradient monitoring wells will continue in 2013. Evaluation of the 2012 data does not suggest that the monitoring program should be changed. Tritium data collected since the completion of the Main Hill remediation indicate decreasing levels in all of the seeps and downgradient wells. This suggests that the majority of the source was removed from the Main Hill area during remediation and that, with continued flushing, levels should continue to decline. Semiannual sampling will continue at the seep and monitoring well locations.

10.0 References

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Appendix A

Well Construction Summary

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Location ID	Program	Northing	Easting	Ground Elevation	TOC Elevation	Well Depth	Top of Screen Elevation	Bottom of Screen Elevation	Screen Length	Well Material	Screened Formation
0118	Parcels 6, 7, & 8	600464.95	1464737.80	705.36	704.86	40.1	674.73	664.73	10	4-inch SS	BVA
0124	Parcels 6, 7, & 8	597789.14	1463654.10	704.18	705.12	55.9	659.18	649.18	10	4-inch SS	BVA
0126	Parcels 6, 7, & 8	597603.58	1463643.30	704.61	705.54	54.8	660.78	650.78	10	4-inch SS	BVA
0138	Parcels 6, 7, & 8	600124.02	1464263.30	698.59	697.76	40.2	667.59	657.59	10	4-inch SS	BVA
0301	Parcels 6, 7, & 8	598315.05	1463120.40	693.10	692.46	84.9	617.60	607.60	10	4-inch SS	BVA
0311	Parcels 6, 7, & 8	598316.27	1463129.30	693.58	692.91	29.8	672.38	663.08	9.3	4-inch SS	BVA
0315	Phase I	597786.28	1464020.40	722.57	723.99	54.8	679.17	669.17	10	4-inch SS	BVA
0346	Parcels 6, 7, & 8	598070.11	1465048.90	743.50	742.97	45.5	702.50	697.50	5	4-inch SS	BVA
0347	Parcels 6, 7, & 8	597819.31	1464034.10	723.76	725.20	68.4	666.76	656.76	10	4-inch SS	BVA
0353	Phase I	596686.11	1464609.40	744.04	745.33	19.3	731.04	726.04	5	4-inch SS	Bedrock
0379	Parcels 6, 7, & 8	597624.41	1464095.90	715.24	716.11	40.9	685.24	675.24	10	4-inch SS	BVA
0386	Parcels 6, 7, & 8	597789.23	1463896.00	725.16	724.79	86.6	648.16	638.16	10	4-inch SS	BVA
0387	Parcels 6, 7, & 8	597654.63	1463839.50	721.26	720.89	81.6	644.26	639.26	5	4-inch SS	BVA
0389	Parcels 6, 7, & 8	597781.29	1463891.90	724.96	724.65	51.7	682.96	672.96	10	4-inch SS	BVA
0392	Parcels 6, 7, & 8	597648.77	1463838.30	721.18	720.84	44.7	681.18	676.18	5	4-inch SS	BVA
0400	Phase I	596122.80	1464333.10	703.22	705.11	34.4	680.72	670.72	10	2-inch SS	BVA
0402	Phase I	596407.78	1464208.00	702.48	704.02	32.3	681.74	671.74	10	2-inch SS	BVA
0411	Phase I	596808.81	1465077.10	834.83	836.57	39.7	806.89	796.89	10	2-inch SS	Bedrock
0443	Phase I	596886.22	1465177.11	856.89	858.78	39.6	829.20	819.20	10	2-inch PVC	Bedrock
0444	Phase I	596463.35	1465001.58	770.71	773.00	32.8	750.20	740.20	10	2-inch PVC	Bedrock
0445	Phase I	596448.12	1464738.54	741.29	743.43	42.5	710.93	700.93	10	2-inch PVC	Bedrock
P033	Phase I	596208.15	1464233.80	706.03	705.83	24.8	686.03	681.03	5	2-inch PVC	BVA
0601	Parcels 6, 7, & 8	598743.22	1464280.80	817.52						Seep	Bedrock
0602	Parcels 6, 7, & 8	598346.65	1465311.40	779.61						Seep	Bedrock
0605	Parcels 6, 7, & 8	599824.63	1464935.40	817.70						Seep	Bedrock
0606	Parcels 6, 7, & 8	699971.45	1464989.00	789.23						Seep	Bedrock
0607	Parcels 6, 7, & 8	600015.30	1465105.70	797.00						Seep	Bedrock
0608	Parcels 6, 7, & 8	599877.40	1464513.60	726.09						Seep	Bedrock
0617	Phase I	596539.80	1464855.80	766.07						Seep	Bedrock

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Appendix B

2012 Groundwater Elevations

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Table B-1. Phase I - Groundwater Elevations Measured in 2012

Location ID	Date	Elevation Top of Casing	Depth from Top of Casing	Groundwater Elevation
0353	1/30/2012	745.33	1.08	744.25
0353	7/25/2012	745.33	6.87	738.46
0400	1/31/2012	705.11	19.98	685.13
0400	4/23/2012	705.11	24.93	680.18
0400	7/25/2012	705.11	27.42	677.69
0400	10/22/2012	705.11	26.75	678.36
0402	1/25/2012	704.02	20.99	683.03
0402	1/30/2012	704.02	18.66	685.36
0402	2/7/2012	704.02	20.33	683.69
0402	3/5/2012	704.02	22.58	681.44
0402	3/8/2012	704.02	22.53	681.49
0402	4/3/2012	704.02	22.93	681.09
0402	4/23/2012	704.02	23.75	680.27
0402	5/21/2012	704.02	23.45	680.57
0402	5/23/2012	704.02	23.58	680.44
0402	6/25/2012	704.02	25.18	678.84
0402	7/26/2012	704.02	26.22	677.8
0402	8/2/2012	704.02	26.18	677.84
0402	9/4/2012	704.02	26.4	677.62
0402	10/1/2012	704.02	25.88	678.14
0402	10/22/2012	704.02	25.5	678.52
0402	11/6/2012	704.02	25.12	678.9
0402	12/4/2012	704.02	25.4	678.62
0411	1/30/2012	836.57	14.95	821.62
0411	7/26/2012	836.57	29.77	806.8
0443	1/30/2012	858.78	23.6	835.18
0443	7/26/2012	858.78	Below pump	Not calculated
0444	1/30/2012	773	20.75	752.25

Table B-1 (continued). Phase I - Groundwater Elevations Measured in 2012

Location ID	Date	Elevation Top of Casing	Depth from Top of Casing	Groundwater Elevation
0444	7/26/2012	773	28.12	744.88
0445	1/30/2012	743.43	12.35	731.08
0445	4/23/2012	743.43	13.18	730.25
0445	7/26/2012	743.43	14.55	728.88
0445	10/22/2012	743.43	15.96	727.47
P033	1/31/2012	705.83	20.7	685.13
P033	4/23/2012	705.83	25.67	680.16
P033	7/25/2012	705.83	28.15	677.68
P033	10/22/2012	705.83	27.45	678.38

Table B-2. Parcels 6, 7, and 8 Groundwater Elevations Measured in 2012

Location ID	Date	Elevation Top of Casing	Depth from Top of Casing	Groundwater Elevation
0118	1/31/2012	704.86	18.2	686.66
0118	4/25/2012	704.86	23.3	681.56
0118	7/23/2012	704.86	25.32	679.54
0118	10/23/2012	704.86	24.35	680.51
0124	1/31/2012	705.12	19.6	685.52
0124	4/24/2012	705.12	24.55	680.57
0124	7/23/2012	705.12	26.95	678.17
0124	10/23/2012	705.12	26.15	678.97
0126	1/31/2012	705.54	20.07	685.47
0126	4/24/2012	705.54	24.98	680.56
0126	7/23/2012	705.54	27.37	678.17
0126	10/23/2012	705.54	26.6	678.94
0138	1/31/2012	697.76	12.65	685.11
0138	4/25/2012	697.76	16.52	681.24
0138	7/23/2012	697.76	18.57	679.19
0138	10/23/2012	697.76	17.55	680.21
0301	1/31/2012	692.46	7.5	684.96
0301	4/25/2012	692.46	12.18	680.28
0301	7/23/2012	692.46	14.4	678.06
0301	10/23/2012	692.46	13.5	678.96
0311	1/31/2012	692.91	8	684.91
0311	4/25/2012	692.91	12.67	680.24
0311	7/23/2012	692.91	14.88	678.03
0311	10/23/2012	692.91	14	678.91
0315	2/1/2012	723.99	38.8	685.19
0315	4/23/2012	723.99	43.41	680.58
0315	7/25/2012	723.99	45.88	678.11

Table B-2 (continued). Parcels 6, 7, and 8 Groundwater Elevations Measured in 2012

Location ID	Date	Elevation Top of Casing	Depth from Top of Casing	Groundwater Elevation
0315	10/23/2012	723.99	45.07	678.92
0346	2/1/2012	742.97	9.42	733.55
0346	4/24/2012	742.97	9.48	733.49
0346	7/25/2012	742.97	12.41	730.56
0346	10/25/2012	742.97	14.26	728.71
0347	2/1/2012	725.2	40.02	685.18
0347	4/23/2012	725.2	44.63	680.57
0347	7/25/2012	725.2	47.12	678.08
0347	10/24/2012	725.2	46.31	678.89
0379	1/25/2012	716.11	32.81	683.3
0379	4/24/2012	716.11	35.6	680.51
0379	7/25/2012	716.11	37.97	678.14
0379	10/25/2012	716.11	37.23	678.88
0386	2/1/2012	724.79	39.62	685.17
0386	4/24/2012	724.79	44.23	680.56
0386	7/24/2012	724.79	46.66	678.13
0386	10/24/2012	724.79	45.85	678.94
0387	2/1/2012	720.89	35.78	685.11
0387	4/24/2012	720.89	40.38	680.51
0387	7/24/2012	720.89	42.82	678.07
0387	10/24/2012	720.89	42.02	678.87
0389	2/1/2012	724.65	39.51	685.14
0389	4/24/2012	724.65	44.13	680.52
0389	7/24/2012	724.65	46.55	678.1
0389	10/24/2012	724.65	45.73	678.92
0392	2/1/2012	720.84	35.56	685.28
0392	4/24/2012	720.84	40.2	680.64
0392	7/24/2012	720.84	42.63	678.21
0392	10/24/2012	720.84	41.82	679.02

Appendix C

Monitoring Well Photographs

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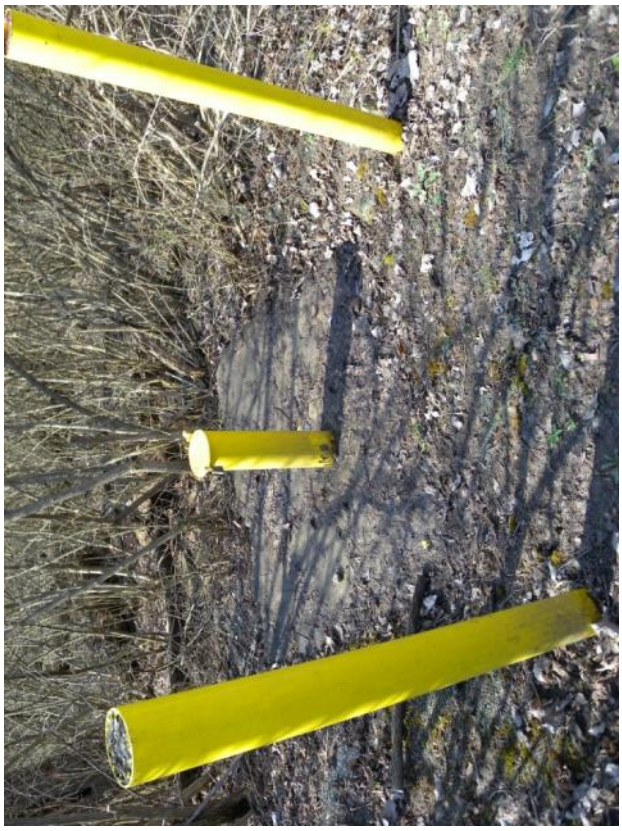
Phase I - Well 0400



Phase I – Well 0411

Phase I - Well 0353

Phase I - Well 0402

Phase I – Well 0443

Phase I – Well 0444

Phase I – Well 0445

Phase I – Well P033

Parcels 6, 7, and 8 – Well 0118

Parcels 6, 7, and 8 – Well 0124

Parcels 6, 7, and 8 – Well 0126

Parcels 6, 7, and 8 – Well 0138

Parcels 6, 7, and 8 – Wells 0301 and 0311

Parcels 6, 7, and 8 – Well 0315

Parcels 6, 7, and 8 – Well 0346

Parcels 6, 7, and 8 – Well 0347

Parcels 6, 7, and 8 – Well 0379

Parcels 6, 7 and 8 – Well 0386 and 0389

Parcels 6, 7 and 8 – Well 0387 and 0392

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Appendix D

2012 Groundwater and Seep Data Summary

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Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0353	Phase I	Dissolved Oxygen	1/30/2012	3.92	mg/L			FQ	F
0353	Phase I	Dissolved Oxygen	7/25/2012	2	mg/L			FQ	F
0353	Phase I	Oxidation Reduction Potential	1/30/2012	21.9	mV			FQ	F
0353	Phase I	Oxidation Reduction Potential	7/25/2012	45.6	mV			FQ	F
0353	Phase I	Specific Conductance	1/30/2012	1369	umhos/cm			FQ	F
0353	Phase I	Specific Conductance	7/25/2012	1370	umhos/cm			FQ	F
0353	Phase I	Temperature	1/30/2012	9.82	C			FQ	F
0353	Phase I	Temperature	7/25/2012	18.83	C			FQ	F
0353	Phase I	Tetrachloroethene	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0353	Phase I	Tetrachloroethene	7/25/2012	0.16	ug/L	0.16	U	FQ	F
0353	Phase I	Trichloroethene	1/30/2012	0.11	ug/L	0.11	U	FQ	F
0353	Phase I	Trichloroethene	7/25/2012	0.16	ug/L	0.16	U	FQ	F
0353	Phase I	Turbidity	1/30/2012	145	NTU			FQ	F
0353	Phase I	Turbidity	7/25/2012	30.9	NTU			FQ	F
0353	Phase I	Vinyl chloride	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0353	Phase I	Vinyl chloride	7/25/2012	0.16	ug/L	0.16	U	FQ	F
0353	Phase I	cis-1,2-Dichloroethene	1/30/2012	0.1	ug/L	0.1	U	FQ	F
0353	Phase I	cis-1,2-Dichloroethene	7/25/2012	0.16	ug/L	0.16	U	FQ	F
0353	Phase I	pH	1/30/2012	7.33	s.u.			FQ	F
0353	Phase I	pH	7/25/2012	7.05	s.u.			FQ	F
0353	Phase I	trans-1,2-Dichloroethene	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0353	Phase I	trans-1,2-Dichloroethene	7/25/2012	0.16	ug/L	0.16	U	FQ	F
0400	Phase I	Barium	1/31/2012	0.0725	mg/L	0.001		F	F
0400	Phase I	Barium	4/23/2012	0.1	mg/L	0.001		F	F
0400	Phase I	Barium	4/23/2012	0.0982	mg/L	0.001		F	D
0400	Phase I	Barium	7/25/2012	0.0979	mg/L	0.001		F	F
0400	Phase I	Barium	10/22/2012	0.117	mg/L	0.001			F
0400	Phase I	Barium	10/22/2012	0.262	mg/L	0.001		R	D
0400	Phase I	Chloride	1/31/2012	30.9	mg/L	0.33		F	F
0400	Phase I	Chloride	4/23/2012	56.2	mg/L	0.67		F	F
0400	Phase I	Chloride	4/23/2012	56.6	mg/L	0.67		F	D
0400	Phase I	Chloride	7/25/2012	57.2	mg/L	0.67		F	F
0400	Phase I	Chloride	10/22/2012	87.1	mg/L	3.35			F
0400	Phase I	Chloride	10/22/2012	93.4	mg/L	3.35			D
0400	Phase I	Dissolved Oxygen	1/31/2012	6.71	mg/L			F	F
0400	Phase I	Dissolved Oxygen	4/23/2012	6.83	mg/L			F	F
0400	Phase I	Dissolved Oxygen	7/25/2012	2.86	mg/L			F	F
0400	Phase I	Dissolved Oxygen	10/22/2012	1.87	mg/L				F
0400	Phase I	Oxidation Reduction Potential	1/31/2012	43.8	mV			F	F
0400	Phase I	Oxidation Reduction Potential	4/23/2012	93.6	mV			F	F
0400	Phase I	Oxidation Reduction Potential	7/25/2012	40	mV			F	F
0400	Phase I	Oxidation Reduction Potential	10/22/2012	65.8	mV				F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0400	Phase I	Radium-226	1/31/2012	0.327	pCi/L	0.587	U	F	F
0400	Phase I	Radium-226	4/23/2012	1.19	pCi/L	0.186		F	F
0400	Phase I	Radium-226	4/23/2012	1.17	pCi/L	0.39		F	D
0400	Phase I	Radium-226	7/25/2012	1	pCi/L	0.648		FJ	F
0400	Phase I	Radium-226	10/22/2012	0.904	pCi/L	0.289			F
0400	Phase I	Radium-226	10/22/2012	0.914	pCi/L	0.152			D
0400	Phase I	Radium-228	1/31/2012	0.376	pCi/L	0.933	U	F	F
0400	Phase I	Radium-228	4/23/2012	0.448	pCi/L	0.496	U	F	F
0400	Phase I	Radium-228	4/23/2012	0.215	pCi/L	0.46	U	F	D
0400	Phase I	Radium-228	7/25/2012	0.378	pCi/L	0.397	U	F	F
0400	Phase I	Radium-228	10/22/2012	0.78	pCi/L	0.477		J	F
0400	Phase I	Radium-228	10/22/2012	1.58	pCi/L	0.411			D
0400	Phase I	Sodium	1/31/2012	28.3	mg/L	0.1		F	F
0400	Phase I	Sodium	4/23/2012	49	mg/L	0.1		F	F
0400	Phase I	Sodium	4/23/2012	49.3	mg/L	0.1		F	D
0400	Phase I	Sodium	7/25/2012	42.8	mg/L	0.1		F	F
0400	Phase I	Sodium	10/22/2012	62	mg/L	0.1			F
0400	Phase I	Sodium	10/22/2012	64.3	mg/L	0.1			D
0400	Phase I	Specific Conductance	1/31/2012	777	umhos/cm			F	F
0400	Phase I	Specific Conductance	4/23/2012	1033	umhos/cm			F	F
0400	Phase I	Specific Conductance	7/25/2012	1070	umhos/cm			F	F
0400	Phase I	Specific Conductance	10/22/2012	1201	umhos/cm				F
0400	Phase I	Temperature	1/31/2012	12.46	C			F	F
0400	Phase I	Temperature	4/23/2012	12.01	C			F	F
0400	Phase I	Temperature	7/25/2012	14.34	C			F	F
0400	Phase I	Temperature	10/22/2012	12.99	C				F
0400	Phase I	Tetrachloroethene	1/31/2012	0.2	ug/L	0.2	U	F	F
0400	Phase I	Tetrachloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0400	Phase I	Trichloroethene	1/31/2012	0.11	ug/L	0.11	U	F	F
0400	Phase I	Trichloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0400	Phase I	Turbidity	1/31/2012	41.8	NTU			F	F
0400	Phase I	Turbidity	4/23/2012	48.7	NTU			F	F
0400	Phase I	Turbidity	7/25/2012	27.1	NTU			F	F
0400	Phase I	Turbidity	10/22/2012	27.1	NTU				F
0400	Phase I	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U	F	F
0400	Phase I	Vinyl chloride	7/25/2012	0.16	ug/L	0.16	U	F	F
0400	Phase I	cis-1,2-Dichloroethene	1/31/2012	0.1	ug/L	0.1	U	F	F
0400	Phase I	cis-1,2-Dichloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0400	Phase I	pH	1/31/2012	6.98	s.u.			F	F
0400	Phase I	pH	4/23/2012	6.6	s.u.			F	F
0400	Phase I	pH	7/25/2012	6.6	s.u.			F	F
0400	Phase I	pH	10/22/2012	6	s.u.				F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0400	Phase I	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U	F	F
0400	Phase I	trans-1,2-Dichloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	Barium	1/30/2012	0.0427	mg/L	0.001		F	F
0402	Phase I	Barium	4/23/2012	0.0457	mg/L	0.001		F	F
0402	Phase I	Barium	7/26/2012	0.0641	mg/L	0.001		F	F
0402	Phase I	Barium	7/26/2012	0.0702	mg/L	0.001		F	D
0402	Phase I	Barium	10/22/2012	0.0832	mg/L	0.001			F
0402	Phase I	Chloride	1/30/2012	41.7	mg/L	0.33		F	F
0402	Phase I	Chloride	4/23/2012	50.6	mg/L	0.67		F	F
0402	Phase I	Chloride	7/26/2012	70.4	mg/L	0.67		F	F
0402	Phase I	Chloride	7/26/2012	63.2	mg/L	0.67		F	D
0402	Phase I	Chloride	10/22/2012	94.2	mg/L	3.35			F
0402	Phase I	Dissolved Oxygen	1/30/2012	6.19	mg/L			F	F
0402	Phase I	Dissolved Oxygen	3/5/2012	6.57	mg/L			F	F
0402	Phase I	Dissolved Oxygen	4/3/2012	7.57	mg/L			F	F
0402	Phase I	Dissolved Oxygen	4/23/2012	7.36	mg/L			F	F
0402	Phase I	Dissolved Oxygen	6/25/2012	6.2	mg/L			F	F
0402	Phase I	Dissolved Oxygen	7/26/2012	3.6	mg/L			F	F
0402	Phase I	Dissolved Oxygen	8/2/2012	3.24	mg/L			F	F
0402	Phase I	Dissolved Oxygen	9/4/2012	5.06	mg/L			F	F
0402	Phase I	Dissolved Oxygen	10/1/2012	1.58	mg/L			F	F
0402	Phase I	Dissolved Oxygen	10/22/2012	1.6	mg/L				F
0402	Phase I	Dissolved Oxygen	11/6/2012	1.83	mg/L			F	F
0402	Phase I	Dissolved Oxygen	12/4/2012	1.42	mg/L			F	F
0402	Phase I	Oxidation Reduction Potential	1/30/2012	87.6	mV			F	F
0402	Phase I	Oxidation Reduction Potential	3/5/2012	174.9	mV			F	F
0402	Phase I	Oxidation Reduction Potential	4/3/2012	132.4	mV			F	F
0402	Phase I	Oxidation Reduction Potential	4/23/2012	201.7	mV			F	F
0402	Phase I	Oxidation Reduction Potential	6/25/2012	88.2	mV			F	F
0402	Phase I	Oxidation Reduction Potential	7/26/2012	113.3	mV			F	F
0402	Phase I	Oxidation Reduction Potential	8/2/2012	126.2	mV			F	F
0402	Phase I	Oxidation Reduction Potential	9/4/2012	208.5	mV			F	F
0402	Phase I	Oxidation Reduction Potential	10/1/2012	-85.3	mV			F	F
0402	Phase I	Oxidation Reduction Potential	10/22/2012	72.6	mV				F
0402	Phase I	Oxidation Reduction Potential	11/6/2012	79	mV			F	F
0402	Phase I	Oxidation Reduction Potential	12/4/2012	28.3	mV			F	F
0402	Phase I	Radium-226	1/30/2012	0.228	pCi/L	0.401	U	F	F
0402	Phase I	Radium-226	4/23/2012	0.467	pCi/L	0.298		UF	F
0402	Phase I	Radium-226	7/26/2012	0.703	pCi/L	0.48		FJ	F
0402	Phase I	Radium-226	7/26/2012	0.854	pCi/L	0.766		UF	D
0402	Phase I	Radium-226	10/22/2012	0.312	pCi/L	0.32	U		F
0402	Phase I	Radium-228	1/30/2012	1.32	pCi/L	0.886		FJ	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0402	Phase I	Radium-228	4/23/2012	0.487	pCi/L	0.712	U	F	F
0402	Phase I	Radium-228	7/26/2012	0.339	pCi/L	0.461	U	F	F
0402	Phase I	Radium-228	7/26/2012	0.442	pCi/L	0.391		UF	D
0402	Phase I	Radium-228	10/22/2012	0.94	pCi/L	0.417		J	F
0402	Phase I	Sodium	1/30/2012	31	mg/L	0.1		F	F
0402	Phase I	Sodium	4/23/2012	36.3	mg/L	0.1		F	F
0402	Phase I	Sodium	7/26/2012	47.1	mg/L	0.1		F	F
0402	Phase I	Sodium	7/26/2012	48.5	mg/L	0.1		F	D
0402	Phase I	Sodium	10/22/2012	69.8	mg/L	0.1			F
0402	Phase I	Specific Conductance	1/30/2012	853	umhos/cm			F	F
0402	Phase I	Specific Conductance	3/5/2012	881	umhos/cm			F	F
0402	Phase I	Specific Conductance	4/3/2012	927	umhos/cm			F	F
0402	Phase I	Specific Conductance	4/23/2012	900	umhos/cm			F	F
0402	Phase I	Specific Conductance	6/25/2012	911	umhos/cm			F	F
0402	Phase I	Specific Conductance	7/26/2012	1091	umhos/cm			F	F
0402	Phase I	Specific Conductance	8/2/2012	1089	umhos/cm			F	F
0402	Phase I	Specific Conductance	9/4/2012	1202	umhos/cm			F	F
0402	Phase I	Specific Conductance	10/1/2012	1259	umhos/cm			F	F
0402	Phase I	Specific Conductance	10/22/2012	1270	umhos/cm				F
0402	Phase I	Specific Conductance	11/6/2012	1264	umhos/cm			F	F
0402	Phase I	Specific Conductance	12/4/2012	1247	umhos/cm			F	F
0402	Phase I	Temperature	1/30/2012	9.36	C			F	F
0402	Phase I	Temperature	3/5/2012	8.5	C			F	F
0402	Phase I	Temperature	4/3/2012	10.32	C			F	F
0402	Phase I	Temperature	4/23/2012	9.8	C			F	F
0402	Phase I	Temperature	6/25/2012	12.97	C			F	F
0402	Phase I	Temperature	7/26/2012	14.23	C			F	F
0402	Phase I	Temperature	8/2/2012	13.29	C			F	F
0402	Phase I	Temperature	9/4/2012	13.85	C			F	F
0402	Phase I	Temperature	10/1/2012	12.89	C			F	F
0402	Phase I	Temperature	10/22/2012	13.94	C				F
0402	Phase I	Temperature	11/6/2012	12.25	C			F	F
0402	Phase I	Temperature	12/4/2012	13.69	C			F	F
0402	Phase I	Tetrachloroethene	1/30/2012	0.2	ug/L	0.2	U	F	F
0402	Phase I	Tetrachloroethene	3/5/2012	0.2	ug/L	0.2	U	F	F
0402	Phase I	Tetrachloroethene	4/3/2012	0.2	ug/L	0.2	U	F	F
0402	Phase I	Tetrachloroethene	5/21/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	Tetrachloroethene	6/25/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	Tetrachloroethene	7/26/2012	0.18	ug/L	0.16	J	F	F
0402	Phase I	Tetrachloroethene	7/26/2012	0.16	ug/L	0.16	U	F	D
0402	Phase I	Tetrachloroethene	8/2/2012	0.44	ug/L	0.16	J	F	F
0402	Phase I	Tetrachloroethene	9/4/2012	0.46	ug/L	0.16	J	F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0402	Phase I	Tetrachloroethene	10/1/2012	1.19	ug/L	0.16		F	F
0402	Phase I	Tetrachloroethene	11/6/2012	1.34	ug/L	0.16		F	F
0402	Phase I	Tetrachloroethene	12/4/2012	1.29	ug/L	0.16		FJ	F
0402	Phase I	Trichloroethene	1/30/2012	0.11	ug/L	0.11	U	F	F
0402	Phase I	Trichloroethene	3/5/2012	0.11	ug/L	0.11	U	F	F
0402	Phase I	Trichloroethene	4/3/2012	0.11	ug/L	0.11	U	F	F
0402	Phase I	Trichloroethene	5/21/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	Trichloroethene	6/25/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	Trichloroethene	7/26/2012	0.18	ug/L	0.16	J	F	F
0402	Phase I	Trichloroethene	7/26/2012	0.18	ug/L	0.16	J	F	D
0402	Phase I	Trichloroethene	8/2/2012	0.34	ug/L	0.16	J	F	F
0402	Phase I	Trichloroethene	9/4/2012	0.45	ug/L	0.16	J	F	F
0402	Phase I	Trichloroethene	10/1/2012	0.78	ug/L	0.16	J	F	F
0402	Phase I	Trichloroethene	11/6/2012	0.79	ug/L	0.16	J	F	F
0402	Phase I	Trichloroethene	12/4/2012	0.75	ug/L	0.16	J	F	F
0402	Phase I	Turbidity	1/30/2012	18.4	NTU			F	F
0402	Phase I	Turbidity	3/5/2012	2.22	NTU			F	F
0402	Phase I	Turbidity	4/3/2012	3.73	NTU			F	F
0402	Phase I	Turbidity	4/23/2012	3.33	NTU			F	F
0402	Phase I	Turbidity	6/25/2012	1.9	NTU			F	F
0402	Phase I	Turbidity	7/26/2012	1.54	NTU			F	F
0402	Phase I	Turbidity	8/2/2012	1.46	NTU			F	F
0402	Phase I	Turbidity	9/4/2012	1.69	NTU			F	F
0402	Phase I	Turbidity	10/1/2012	2.57	NTU			F	F
0402	Phase I	Turbidity	10/22/2012	5.14	NTU				F
0402	Phase I	Turbidity	11/6/2012	0.66	NTU			F	F
0402	Phase I	Turbidity	12/4/2012	2.13	NTU			F	F
0402	Phase I	Vinyl chloride	1/30/2012	0.2	ug/L	0.2	U	F	F
0402	Phase I	Vinyl chloride	3/5/2012	0.2	ug/L	0.2	U	F	F
0402	Phase I	Vinyl chloride	4/3/2012	0.2	ug/L	0.2	U	F	F
0402	Phase I	Vinyl chloride	5/21/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	Vinyl chloride	6/25/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	Vinyl chloride	7/26/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	Vinyl chloride	7/26/2012	0.16	ug/L	0.16	U	F	D
0402	Phase I	Vinyl chloride	8/2/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	Vinyl chloride	9/4/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	Vinyl chloride	10/1/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	Vinyl chloride	11/6/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	Vinyl chloride	12/4/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	cis-1,2-Dichloroethene	1/30/2012	0.1	ug/L	0.1	U	F	F
0402	Phase I	cis-1,2-Dichloroethene	3/5/2012	0.1	ug/L	0.1	U	F	F
0402	Phase I	cis-1,2-Dichloroethene	4/3/2012	0.1	ug/L	0.1	U	F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0402	Phase I	cis-1,2-Dichloroethene	5/21/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	cis-1,2-Dichloroethene	6/25/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	cis-1,2-Dichloroethene	7/26/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	cis-1,2-Dichloroethene	7/26/2012	0.16	ug/L	0.16	U	F	D
0402	Phase I	cis-1,2-Dichloroethene	8/2/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	cis-1,2-Dichloroethene	9/4/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	cis-1,2-Dichloroethene	10/1/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	cis-1,2-Dichloroethene	11/6/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	cis-1,2-Dichloroethene	12/4/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	pH	1/30/2012	6.52	s.u.			F	F
0402	Phase I	pH	3/5/2012	5.99	s.u.			F	F
0402	Phase I	pH	4/3/2012	6.16	s.u.			F	F
0402	Phase I	pH	4/23/2012	5.48	s.u.			F	F
0402	Phase I	pH	6/25/2012	6.9	s.u.			F	F
0402	Phase I	pH	7/26/2012	6.2	s.u.			F	F
0402	Phase I	pH	8/2/2012	6.21	s.u.			F	F
0402	Phase I	pH	9/4/2012	5.86	s.u.			F	F
0402	Phase I	pH	10/1/2012	6.08	s.u.			F	F
0402	Phase I	pH	10/22/2012	5.9	s.u.				F
0402	Phase I	pH	11/6/2012	6.48	s.u.			F	F
0402	Phase I	pH	12/4/2012	6.17	s.u.			F	F
0402	Phase I	trans-1,2-Dichloroethene	1/30/2012	0.2	ug/L	0.2	U	F	F
0402	Phase I	trans-1,2-Dichloroethene	3/5/2012	0.2	ug/L	0.2	U	F	F
0402	Phase I	trans-1,2-Dichloroethene	4/3/2012	0.2	ug/L	0.2	U	F	F
0402	Phase I	trans-1,2-Dichloroethene	5/21/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	trans-1,2-Dichloroethene	6/25/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	trans-1,2-Dichloroethene	7/26/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	trans-1,2-Dichloroethene	7/26/2012	0.16	ug/L	0.16	U	F	D
0402	Phase I	trans-1,2-Dichloroethene	8/2/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	trans-1,2-Dichloroethene	9/4/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	trans-1,2-Dichloroethene	10/1/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	trans-1,2-Dichloroethene	11/6/2012	0.16	ug/L	0.16	U	F	F
0402	Phase I	trans-1,2-Dichloroethene	12/4/2012	0.16	ug/L	0.16	U	F	F
0411	Phase I	Dissolved Oxygen	1/30/2012	0.99	mg/L			FQ	F
0411	Phase I	Dissolved Oxygen	7/26/2012	1.61	mg/L			FQ	F
0411	Phase I	Oxidation Reduction Potential	1/30/2012	24.1	mV			FQ	F
0411	Phase I	Oxidation Reduction Potential	7/26/2012	73.9	mV			FQ	F
0411	Phase I	Specific Conductance	1/30/2012	1502	umhos/cm			FQ	F
0411	Phase I	Specific Conductance	7/26/2012	1496	umhos/cm			FQ	F
0411	Phase I	Temperature	1/30/2012	11.82	C			FQ	F
0411	Phase I	Temperature	7/26/2012	16.52	C			FQ	F
0411	Phase I	Tetrachloroethene	1/30/2012	0.2	ug/L	0.2	U	FQ	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0411	Phase I	Tetrachloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0411	Phase I	Trichloroethene	1/30/2012	13.4	ug/L	0.11		FQ	F
0411	Phase I	Trichloroethene	7/26/2012	12.7	ug/L	0.16		FQ	F
0411	Phase I	Turbidity	1/30/2012	6.27	NTU			FQ	F
0411	Phase I	Turbidity	7/26/2012	2.32	NTU			FQ	F
0411	Phase I	Vinyl chloride	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0411	Phase I	Vinyl chloride	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0411	Phase I	cis-1,2-Dichloroethene	1/30/2012	1.81	ug/L	0.1		FQ	F
0411	Phase I	cis-1,2-Dichloroethene	7/26/2012	2.17	ug/L	0.16		FQ	F
0411	Phase I	pH	1/30/2012	6.92	s.u.			FQ	F
0411	Phase I	pH	7/26/2012	5.78	s.u.			FQ	F
0411	Phase I	trans-1,2-Dichloroethene	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0411	Phase I	trans-1,2-Dichloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0443	Phase I	Dissolved Oxygen	1/30/2012	3.69	mg/L			FQ	F
0443	Phase I	Dissolved Oxygen	7/26/2012	7.49	mg/L			FQ	F
0443	Phase I	Oxidation Reduction Potential	1/30/2012	56.9	mV			FQ	F
0443	Phase I	Oxidation Reduction Potential	7/26/2012	154.1	mV			FQ	F
0443	Phase I	Specific Conductance	1/30/2012	1212	umhos/cm			FQ	F
0443	Phase I	Specific Conductance	7/26/2012	1576	umhos/cm			FQ	F
0443	Phase I	Temperature	1/30/2012	12.78	C			FQ	F
0443	Phase I	Temperature	7/26/2012	21.18	C			FQ	F
0443	Phase I	Tetrachloroethene	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0443	Phase I	Tetrachloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0443	Phase I	Trichloroethene	1/30/2012	14	ug/L	0.11		FQ	F
0443	Phase I	Trichloroethene	7/26/2012	5.32	ug/L	0.16		FQ	F
0443	Phase I	Turbidity	1/30/2012	3.53	NTU			FQ	F
0443	Phase I	Turbidity	7/26/2012	90.4	NTU			FQ	F
0443	Phase I	Vinyl chloride	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0443	Phase I	Vinyl chloride	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0443	Phase I	cis-1,2-Dichloroethene	1/30/2012	0.75	ug/L	0.1	J	FQ	F
0443	Phase I	cis-1,2-Dichloroethene	7/26/2012	0.27	ug/L	0.16	J	FQ	F
0443	Phase I	pH	1/30/2012	6.99	s.u.			FQ	F
0443	Phase I	pH	7/26/2012	6.57	s.u.			FQ	F
0443	Phase I	trans-1,2-Dichloroethene	1/30/2012	0.33	ug/L	0.2	J	FQ	F
0443	Phase I	trans-1,2-Dichloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0444	Phase I	Dissolved Oxygen	1/30/2012	1.45	mg/L			FQ	F
0444	Phase I	Dissolved Oxygen	7/26/2012	3.09	mg/L			FQ	F
0444	Phase I	Oxidation Reduction Potential	1/30/2012	67.3	mV			FQ	F
0444	Phase I	Oxidation Reduction Potential	7/26/2012	49.8	mV			FQ	F
0444	Phase I	Specific Conductance	1/30/2012	1284	umhos/cm			FQ	F
0444	Phase I	Specific Conductance	7/26/2012	1274	umhos/cm			FQ	F
0444	Phase I	Temperature	1/30/2012	12.39	C			FQ	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0444	Phase I	Temperature	7/26/2012	18.09	C			FQ	F
0444	Phase I	Tetrachloroethene	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0444	Phase I	Tetrachloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0444	Phase I	Trichloroethene	1/30/2012	0.11	ug/L	0.11	U	FQ	F
0444	Phase I	Trichloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0444	Phase I	Turbidity	1/30/2012	159	NTU			FQ	F
0444	Phase I	Turbidity	7/26/2012	11.4	NTU			FQ	F
0444	Phase I	Vinyl chloride	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0444	Phase I	Vinyl chloride	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0444	Phase I	cis-1,2-Dichloroethene	1/30/2012	0.1	ug/L	0.1	U	FQ	F
0444	Phase I	cis-1,2-Dichloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0444	Phase I	pH	1/30/2012	7.05	s.u.			FQ	F
0444	Phase I	pH	7/26/2012	6.88	s.u.			FQ	F
0444	Phase I	trans-1,2-Dichloroethene	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0444	Phase I	trans-1,2-Dichloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0445	Phase I	Barium	1/30/2012	6.94	mg/L	0.001		FQ	F
0445	Phase I	Barium	4/23/2012	10.7	mg/L	0.001		FQ	F
0445	Phase I	Barium	7/26/2012	10.2	mg/L	0.001		FQ	F
0445	Phase I	Barium	10/22/2012	12.3	mg/L	0.001			F
0445	Phase I	Chloride	1/30/2012	8810	mg/L	66		FQ	F
0445	Phase I	Chloride	4/23/2012	8670	mg/L	67		FQ	F
0445	Phase I	Chloride	7/26/2012	7900	mg/L	67		FQ	F
0445	Phase I	Chloride	10/22/2012	14900	mg/L	67			F
0445	Phase I	Dissolved Oxygen	1/30/2012	2.44	mg/L			FQ	F
0445	Phase I	Dissolved Oxygen	4/23/2012	2.64	mg/L			FQ	F
0445	Phase I	Dissolved Oxygen	7/26/2012	3.29	mg/L			FQ	F
0445	Phase I	Dissolved Oxygen	10/22/2012	0.76	mg/L				F
0445	Phase I	Oxidation Reduction Potential	1/30/2012	-60.7	mV			FQ	F
0445	Phase I	Oxidation Reduction Potential	4/23/2012	-63.2	mV			FQ	F
0445	Phase I	Oxidation Reduction Potential	7/26/2012	-70.1	mV			FQ	F
0445	Phase I	Oxidation Reduction Potential	10/22/2012	-44	mV				F
0445	Phase I	Radium-226	1/30/2012	33.1	pCi/L	0.492		FQ	F
0445	Phase I	Radium-226	4/23/2012	37.3	pCi/L	0.392		FQ	F
0445	Phase I	Radium-226	7/26/2012	35.9	pCi/L	0.761		FQ	F
0445	Phase I	Radium-226	10/22/2012	27.1	pCi/L	0.331			F
0445	Phase I	Radium-228	1/30/2012	36.4	pCi/L	0.871		FQ	F
0445	Phase I	Radium-228	4/23/2012	35.1	pCi/L	0.655		FQ	F
0445	Phase I	Radium-228	7/26/2012	25.8	pCi/L	0.406		FQ	F
0445	Phase I	Radium-228	10/22/2012	38.4	pCi/L	0.429			F
0445	Phase I	Sodium	1/30/2012	3210	mg/L	1		FQ	F
0445	Phase I	Sodium	4/23/2012	4240	mg/L	2.5		FQ	F
0445	Phase I	Sodium	7/26/2012	4010	mg/L	1		FQ	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0445	Phase I	Sodium	10/22/2012	4730	mg/L	2			F
0445	Phase I	Specific Conductance	1/30/2012	22820	umhos/cm			FQ	F
0445	Phase I	Specific Conductance	4/23/2012	15960	umhos/cm			FQ	F
0445	Phase I	Specific Conductance	7/26/2012	13490	umhos/cm			FQ	F
0445	Phase I	Specific Conductance	10/22/2012	17730	umhos/cm				F
0445	Phase I	Temperature	1/30/2012	10.09	C			FQ	F
0445	Phase I	Temperature	4/23/2012	12.75	C			FQ	F
0445	Phase I	Temperature	7/26/2012	14.4	C			FQ	F
0445	Phase I	Temperature	10/22/2012	15.41	C				F
0445	Phase I	Tetrachloroethene	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0445	Phase I	Tetrachloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0445	Phase I	Trichloroethene	1/30/2012	0.11	ug/L	0.11	U	FQ	F
0445	Phase I	Trichloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0445	Phase I	Turbidity	1/30/2012	1.7	NTU			FQ	F
0445	Phase I	Turbidity	4/23/2012	3.66	NTU			FQ	F
0445	Phase I	Turbidity	7/26/2012	3.03	NTU			FQ	F
0445	Phase I	Turbidity	10/22/2012	7.62	NTU				F
0445	Phase I	Vinyl chloride	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0445	Phase I	Vinyl chloride	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0445	Phase I	cis-1,2-Dichloroethene	1/30/2012	0.1	ug/L	0.1	U	FQ	F
0445	Phase I	cis-1,2-Dichloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0445	Phase I	cis-1,2-Dichloroethene	1/30/2012	0.1	ug/L	0.1	U	FQ	F
0445	Phase I	cis-1,2-Dichloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
0445	Phase I	pH	1/30/2012	6.77	s.u.			FQ	F
0445	Phase I	pH	4/23/2012	6.72	s.u.			FQ	F
0445	Phase I	pH	7/26/2012	6.84	s.u.			FQ	F
0445	Phase I	pH	10/22/2012	6.59	s.u.				F
0445	Phase I	trans-1,2-Dichloroethene	1/30/2012	0.2	ug/L	0.2	U	FQ	F
0445	Phase I	trans-1,2-Dichloroethene	7/26/2012	0.16	ug/L	0.16	U	FQ	F
P033	Phase I	Barium	1/31/2012	0.115	mg/L	0.001		F	D
P033	Phase I	Barium	1/31/2012	0.115	mg/L	0.001		F	F
P033	Phase I	Barium	4/23/2012	0.11	mg/L	0.001		F	F
P033	Phase I	Barium	7/25/2012	0.0969	mg/L	0.001		F	F
P033	Phase I	Barium	10/22/2012	0.105	mg/L	0.001			F
P033	Phase I	Chloride	1/31/2012	176	mg/L	6.6		F	D
P033	Phase I	Chloride	1/31/2012	175	mg/L	6.6		F	F
P033	Phase I	Chloride	4/23/2012	197	mg/L	0.67		F	F
P033	Phase I	Chloride	7/25/2012	101	mg/L	0.67		F	F
P033	Phase I	Chloride	10/22/2012	97.2	mg/L	3.35			F
P033	Phase I	Dissolved Oxygen	1/31/2012	3.37	mg/L			F	F
P033	Phase I	Dissolved Oxygen	4/23/2012	3.73	mg/L			F	F
P033	Phase I	Dissolved Oxygen	7/25/2012	2.73	mg/L			F	F
P033	Phase I	Dissolved Oxygen	10/22/2012	2.1	mg/L				F
P033	Phase I	Oxidation Reduction Potential	1/31/2012	44	mV			F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
P033	Phase I	Oxidation Reduction Potential	4/23/2012	48.7	mV			F	F
P033	Phase I	Oxidation Reduction Potential	7/25/2012	60.2	mV			F	F
P033	Phase I	Oxidation Reduction Potential	10/22/2012	50.7	mV				F
P033	Phase I	Radium-226	1/31/2012	0.0855	pCi/L	0.46	U	F	D
P033	Phase I	Radium-226	1/31/2012	-0.0738	pCi/L	0.531	U	F	F
P033	Phase I	Radium-226	4/23/2012	0.323	pCi/L	0.521	U	F	F
P033	Phase I	Radium-226	7/25/2012	0.571	pCi/L	0.615	U	F	F
P033	Phase I	Radium-226	10/22/2012	0.196	pCi/L	0.317	U		F
P033	Phase I	Radium-228	1/31/2012	0.819	pCi/L	0.689		FJ	D
P033	Phase I	Radium-228	1/31/2012	0.591	pCi/L	0.499		FJ	F
P033	Phase I	Radium-228	4/23/2012	0.299	pCi/L	0.402	U	F	F
P033	Phase I	Radium-228	7/25/2012	0.198	pCi/L	0.38	U	F	F
P033	Phase I	Radium-228	10/22/2012	0.199	pCi/L	0.41	U		F
P033	Phase I	Sodium	1/31/2012	112	mg/L	0.1		F	D
P033	Phase I	Sodium	1/31/2012	113	mg/L	0.1		F	F
P033	Phase I	Sodium	4/23/2012	132	mg/L	0.1		F	F
P033	Phase I	Sodium	7/25/2012	72.8	mg/L	0.1		F	F
P033	Phase I	Sodium	10/22/2012	73.2	mg/L	0.1			F
P033	Phase I	Specific Conductance	1/31/2012	1633	umhos/cm			F	F
P033	Phase I	Specific Conductance	4/23/2012	1633	umhos/cm			F	F
P033	Phase I	Specific Conductance	7/25/2012	1302	umhos/cm			F	F
P033	Phase I	Specific Conductance	10/22/2012	1295	umhos/cm				F
P033	Phase I	Temperature	1/31/2012	12.95	C			F	F
P033	Phase I	Temperature	4/23/2012	13	C			F	F
P033	Phase I	Temperature	7/25/2012	16.3	C			F	F
P033	Phase I	Temperature	10/22/2012	14.7	C				F
P033	Phase I	Tetrachloroethene	1/31/2012	0.2	ug/L	0.2	U	F	D
P033	Phase I	Tetrachloroethene	1/31/2012	0.2	ug/L	0.2	U	F	F
P033	Phase I	Tetrachloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
P033	Phase I	Trichloroethene	1/31/2012	0.11	ug/L	0.11	U	F	D
P033	Phase I	Trichloroethene	1/31/2012	0.11	ug/L	0.11	U	F	F
P033	Phase I	Trichloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
P033	Phase I	Turbidity	1/31/2012	1.48	NTU			F	F
P033	Phase I	Turbidity	4/23/2012	1.65	NTU			F	F
P033	Phase I	Turbidity	7/25/2012	3.56	NTU			F	F
P033	Phase I	Turbidity	10/22/2012	3.08	NTU				F
P033	Phase I	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U	F	D
P033	Phase I	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U	F	F
P033	Phase I	Vinyl chloride	7/25/2012	0.16	ug/L	0.16	U	F	F
P033	Phase I	cis-1,2-Dichloroethene	1/31/2012	0.1	ug/L	0.1	U	F	D
P033	Phase I	cis-1,2-Dichloroethene	1/31/2012	0.1	ug/L	0.1	U	F	F
P033	Phase I	cis-1,2-Dichloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
P033	Phase I	pH	1/31/2012	6.64	s.u.			F	F
P033	Phase I	pH	4/23/2012	6.75	s.u.			F	F
P033	Phase I	pH	7/25/2012	6.84	s.u.			F	F
P033	Phase I	pH	10/22/2012	6.16	s.u.				F
P033	Phase I	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U	F	D
P033	Phase I	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U	F	F
P033	Phase I	trans-1,2-Dichloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0617	Phase I	Dissolved Oxygen	1/31/2012	6.9	mg/L				F
0617	Phase I	Dissolved Oxygen	7/26/2012	6.99	mg/L				F
0617	Phase I	Oxidation Reduction Potential	1/31/2012	385	mV				F
0617	Phase I	Oxidation Reduction Potential	7/26/2012	-61.2	mV				F
0617	Phase I	Specific Conductance	1/31/2012	1572	umhos/cm				F
0617	Phase I	Specific Conductance	7/26/2012	1946	umhos/cm				F
0617	Phase I	Tetrachloroethene	1/31/2012	0.2	ug/L	0.2	U		F
0617	Phase I	Tetrachloroethene	7/26/2012	0.16	ug/L	0.16	U		F
0617	Phase I	Trichloroethene	1/31/2012	7.76	ug/L	0.11			F
0617	Phase I	Trichloroethene	7/26/2012	1.84	ug/L	0.16			F
0617	Phase I	Turbidity	7/26/2012	33.2	NTU				F
0617	Phase I	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U		F
0617	Phase I	Vinyl chloride	7/26/2012	0.16	ug/L	0.16	U		F
0617	Phase I	cis-1,2-Dichloroethene	1/31/2012	1.71	ug/L	0.1			F
0617	Phase I	cis-1,2-Dichloroethene	7/26/2012	0.59	ug/L	0.16	J		F
0617	Phase I	pH	1/31/2012	4.44	s.u.				F
0617	Phase I	pH	7/26/2012	7.2	s.u.				F
0617	Phase I	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U		F
0617	Phase I	trans-1,2-Dichloroethene	7/26/2012	0.16	ug/L	0.16	U		F
GP-201	Phase I	Barium	6/25/2012	0.141	mg/L	0.001			F
GP-201	Phase I	Barium	11/6/2012	0.149	mg/L	0.001			F
GP-201	Phase I	Barium	11/6/2012	0.153	mg/L	0.001			D
GP-201	Phase I	Chloride	6/25/2012	198	mg/L	1.34			F
GP-201	Phase I	Chloride	11/6/2012	199	mg/L	1.34			F
GP-201	Phase I	Chloride	11/6/2012	202	mg/L	1.34			D
GP-201	Phase I	Radium-226	6/25/2012	1.07	pCi/L	0.204			F
GP-201	Phase I	Radium-226	11/6/2012	0.696	pCi/L	0.562		J	F
GP-201	Phase I	Radium-226	11/6/2012	1	pCi/L	0.456		J	D
GP-201	Phase I	Radium-228	6/25/2012	0.87	pCi/L	0.472		U	F
GP-201	Phase I	Radium-228	11/6/2012	1.38	pCi/L	0.605		J	F
GP-201	Phase I	Radium-228	11/6/2012	1.1	pCi/L	0.733		J	D
GP-201	Phase I	Sodium	6/25/2012	107	mg/L	0.1			F
GP-201	Phase I	Sodium	11/6/2012	100	mg/L	0.1			F
GP-201	Phase I	Sodium	11/6/2012	103	mg/L	0.1			D
GP-202	Phase I	Barium	6/25/2012	0.0354	mg/L	0.001			D

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
GP-202	Phase I	Barium	6/25/2012	0.0339	mg/L	0.001			F
GP-202	Phase I	Barium	11/5/2012	0.0735	mg/L	0.001			F
GP-202	Phase I	Chloride	6/25/2012	29	mg/L	0.67			D
GP-202	Phase I	Chloride	6/25/2012	29.5	mg/L	0.67			F
GP-202	Phase I	Chloride	11/5/2012	38.2	mg/L	0.335			F
GP-202	Phase I	Radium-226	6/25/2012	0.0317	pCi/L	0.304	U		D
GP-202	Phase I	Radium-226	6/25/2012	0.679	pCi/L	0.466		J	F
GP-202	Phase I	Radium-226	11/5/2012	0.87	pCi/L	0.611		J	F
GP-202	Phase I	Radium-228	6/25/2012	0.89	pCi/L	0.474		U	D
GP-202	Phase I	Radium-228	6/25/2012	0.322	pCi/L	0.533	U		F
GP-202	Phase I	Radium-228	11/5/2012	0.65	pCi/L	0.517		J	F
GP-202	Phase I	Sodium	6/25/2012	10.6	mg/L	0.1			D
GP-202	Phase I	Sodium	6/25/2012	10.4	mg/L	0.1			F
GP-202	Phase I	Sodium	11/5/2012	14.3	mg/L	0.1			F

LAB QUALIFIERS:

*	Replicate analysis not within control limits.
>	Result above upper detection limit.
A	TIC is a suspected aldol-condensation product.
B	Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
C	Pesticide result confirmed by GC-MS.
D	Analyte determined in diluted sample.
E	Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
H	Holding time expired, value suspect.
I	Increased detection limit due to required dilution.
J	Estimated
N	Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
P	> 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
U	Analytical result below detection limit.
W	Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X,Y,Z	Laboratory defined qualifier, see case narrative.

DATA QUALIFIERS:

F	Low flow sampling method used.	G	Possible grout contamination, pH > 9.	J	Estimated value.
L	Less than 3 bore volumes purged prior to sampling.	Q	Qualitative result due to sampling technique.	R	Unusable result.
U	Parameter analyzed for but was not detected.	X	Location is undefined.		

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0118	Parcels 6-7-8	Dissolved Oxygen	1/31/2012	6.48	mg/L			F	F
0118	Parcels 6-7-8	Dissolved Oxygen	4/25/2012	6.44	mg/L			F	F
0118	Parcels 6-7-8	Dissolved Oxygen	7/23/2012	7.52	mg/L			F	F
0118	Parcels 6-7-8	Dissolved Oxygen	10/23/2012	5.77	mg/L				F
0118	Parcels 6-7-8	Oxidation Reduction Potential	1/31/2012	71.2	mV			F	F
0118	Parcels 6-7-8	Oxidation Reduction Potential	4/25/2012	64.4	mV			F	F
0118	Parcels 6-7-8	Oxidation Reduction Potential	7/23/2012	-5.4	mV			F	F
0118	Parcels 6-7-8	Oxidation Reduction Potential	10/23/2012	272.2	mV				F
0118	Parcels 6-7-8	Specific Conductance	1/31/2012	1257	umhos/cm			F	F
0118	Parcels 6-7-8	Specific Conductance	4/25/2012	1210	umhos/cm			F	F
0118	Parcels 6-7-8	Specific Conductance	7/23/2012	1196	umhos/cm			F	F
0118	Parcels 6-7-8	Specific Conductance	10/23/2012	1144	umhos/cm				F
0118	Parcels 6-7-8	Tetrachloroethene	1/31/2012	0.2	ug/L	0.2	U	F	F
0118	Parcels 6-7-8	Tetrachloroethene	4/25/2012	0.16	ug/L	0.16	U	F	F
0118	Parcels 6-7-8	Tetrachloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0118	Parcels 6-7-8	Tetrachloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0118	Parcels 6-7-8	Trichloroethene	1/31/2012	0.11	ug/L	0.11	U	F	F
0118	Parcels 6-7-8	Trichloroethene	4/25/2012	0.16	ug/L	0.16	U	F	F
0118	Parcels 6-7-8	Trichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0118	Parcels 6-7-8	Trichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0118	Parcels 6-7-8	Tritium	1/31/2012	-16.5	pCi/L	296	U	F	F
0118	Parcels 6-7-8	Tritium	4/25/2012	-12.9	pCi/L	316	U	F	F
0118	Parcels 6-7-8	Tritium	7/23/2012	-7.45	pCi/L	325	U	F	F
0118	Parcels 6-7-8	Turbidity	1/31/2012	27.1	NTU			F	F
0118	Parcels 6-7-8	Turbidity	4/25/2012	11.8	NTU			F	F
0118	Parcels 6-7-8	Turbidity	7/23/2012	23.6	NTU			F	F
0118	Parcels 6-7-8	Turbidity	10/23/2012	10.9	NTU				F
0118	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U	F	F
0118	Parcels 6-7-8	Vinyl chloride	4/25/2012	0.16	ug/L	0.16	U	F	F
0118	Parcels 6-7-8	Vinyl chloride	7/23/2012	0.16	ug/L	0.16	U	F	F
0118	Parcels 6-7-8	Vinyl chloride	10/23/2012	0.16	ug/L	0.16	U		F
0118	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	0.1	ug/L	0.1	U	F	F
0118	Parcels 6-7-8	cis-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U	F	F
0118	Parcels 6-7-8	cis-1,2-Dichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0118	Parcels 6-7-8	cis-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0118	Parcels 6-7-8	pH	1/31/2012	7.02	s.u.			F	F
0118	Parcels 6-7-8	pH	4/25/2012	6.82	s.u.			F	F
0118	Parcels 6-7-8	pH	7/23/2012	6.87	s.u.			F	F
0118	Parcels 6-7-8	pH	10/23/2012	6.65	s.u.				F
0118	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U	F	F
0118	Parcels 6-7-8	trans-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U	F	F
0118	Parcels 6-7-8	trans-1,2-Dichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0118	Parcels 6-7-8	trans-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0124	Parcels 6-7-8	Dissolved Oxygen	1/31/2012	4.89	mg/L			F	F
0124	Parcels 6-7-8	Dissolved Oxygen	4/24/2012	2.79	mg/L			F	F
0124	Parcels 6-7-8	Dissolved Oxygen	7/23/2012	2.37	mg/L			F	F
0124	Parcels 6-7-8	Dissolved Oxygen	10/23/2012	0.44	mg/L				F
0124	Parcels 6-7-8	Oxidation Reduction Potential	1/31/2012	113.6	mV			F	F
0124	Parcels 6-7-8	Oxidation Reduction Potential	4/24/2012	62.1	mV			F	F
0124	Parcels 6-7-8	Oxidation Reduction Potential	7/23/2012	25.4	mV			F	F
0124	Parcels 6-7-8	Oxidation Reduction Potential	10/23/2012	281.7	mV				F
0124	Parcels 6-7-8	Specific Conductance	1/31/2012	1122	umhos/cm			F	F
0124	Parcels 6-7-8	Specific Conductance	4/24/2012	1143	umhos/cm			F	F
0124	Parcels 6-7-8	Specific Conductance	7/23/2012	1336	umhos/cm			F	F
0124	Parcels 6-7-8	Specific Conductance	10/23/2012	1371	umhos/cm				F
0124	Parcels 6-7-8	Tetrachloroethene	1/31/2012	0.2	ug/L	0.2	U	F	F
0124	Parcels 6-7-8	Tetrachloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0124	Parcels 6-7-8	Tetrachloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0124	Parcels 6-7-8	Tetrachloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0124	Parcels 6-7-8	Trichloroethene	1/31/2012	0.11	ug/L	0.11	U	F	F
0124	Parcels 6-7-8	Trichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0124	Parcels 6-7-8	Trichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0124	Parcels 6-7-8	Trichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0124	Parcels 6-7-8	Turbidity	1/31/2012	4.08	NTU			F	F
0124	Parcels 6-7-8	Turbidity	4/24/2012	8	NTU			F	F
0124	Parcels 6-7-8	Turbidity	7/23/2012	2.03	NTU			F	F
0124	Parcels 6-7-8	Turbidity	10/23/2012	9.56	NTU				F
0124	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U	F	F
0124	Parcels 6-7-8	Vinyl chloride	4/24/2012	0.16	ug/L	0.16	U	F	F
0124	Parcels 6-7-8	Vinyl chloride	7/23/2012	0.16	ug/L	0.16	U	F	F
0124	Parcels 6-7-8	Vinyl chloride	10/23/2012	0.16	ug/L	0.16	U		F
0124	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	0.1	ug/L	0.1	U	F	F
0124	Parcels 6-7-8	cis-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0124	Parcels 6-7-8	cis-1,2-Dichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0124	Parcels 6-7-8	cis-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0124	Parcels 6-7-8	pH	1/31/2012	6.78	s.u.			F	F
0124	Parcels 6-7-8	pH	4/24/2012	6.76	s.u.			F	F
0124	Parcels 6-7-8	pH	7/23/2012	6.92	s.u.			F	F
0124	Parcels 6-7-8	pH	10/23/2012	6.23	s.u.				F
0124	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U	F	F
0124	Parcels 6-7-8	trans-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0124	Parcels 6-7-8	trans-1,2-Dichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0124	Parcels 6-7-8	trans-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0126	Parcels 6-7-8	Dissolved Oxygen	1/31/2012	2.52	mg/L			F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0126	Parcels 6-7-8	Dissolved Oxygen	4/24/2012	2.12	mg/L			F	F
0126	Parcels 6-7-8	Dissolved Oxygen	7/23/2012	2.09	mg/L			F	F
0126	Parcels 6-7-8	Dissolved Oxygen	10/23/2012	0.69	mg/L				F
0126	Parcels 6-7-8	Oxidation Reduction Potential	1/31/2012	59.4	mV			F	F
0126	Parcels 6-7-8	Oxidation Reduction Potential	4/24/2012	50	mV			F	F
0126	Parcels 6-7-8	Oxidation Reduction Potential	7/23/2012	17.6	mV			F	F
0126	Parcels 6-7-8	Oxidation Reduction Potential	10/23/2012	258.2	mV				F
0126	Parcels 6-7-8	Specific Conductance	1/31/2012	1373	umhos/cm			F	F
0126	Parcels 6-7-8	Specific Conductance	4/24/2012	1312	umhos/cm			F	F
0126	Parcels 6-7-8	Specific Conductance	7/23/2012	1272	umhos/cm			F	F
0126	Parcels 6-7-8	Specific Conductance	10/23/2012	1239	umhos/cm				F
0126	Parcels 6-7-8	Tetrachloroethene	1/31/2012	0.9	ug/L	0.2	J	F	F
0126	Parcels 6-7-8	Tetrachloroethene	4/24/2012	0.82	ug/L	0.16	J	F	F
0126	Parcels 6-7-8	Tetrachloroethene	7/23/2012	0.85	ug/L	0.16	J	F	F
0126	Parcels 6-7-8	Tetrachloroethene	10/23/2012	1.08	ug/L	0.16			F
0126	Parcels 6-7-8	Trichloroethene	1/31/2012	0.11	ug/L	0.11	U	F	F
0126	Parcels 6-7-8	Trichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0126	Parcels 6-7-8	Trichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0126	Parcels 6-7-8	Trichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0126	Parcels 6-7-8	Turbidity	1/31/2012	8.96	NTU			F	F
0126	Parcels 6-7-8	Turbidity	4/24/2012	5.89	NTU			F	F
0126	Parcels 6-7-8	Turbidity	7/23/2012	11.7	NTU			F	F
0126	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U	F	F
0126	Parcels 6-7-8	Vinyl chloride	4/24/2012	0.16	ug/L	0.16	U	F	F
0126	Parcels 6-7-8	Vinyl chloride	7/23/2012	0.16	ug/L	0.16	U	F	F
0126	Parcels 6-7-8	Vinyl chloride	10/23/2012	0.16	ug/L	0.16	U		F
0126	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	0.1	ug/L	0.1	U	F	F
0126	Parcels 6-7-8	cis-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0126	Parcels 6-7-8	cis-1,2-Dichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0126	Parcels 6-7-8	cis-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0126	Parcels 6-7-8	pH	1/31/2012	6.78	s.u.			F	F
0126	Parcels 6-7-8	pH	4/24/2012	6.8	s.u.			F	F
0126	Parcels 6-7-8	pH	7/23/2012	6.82	s.u.			F	F
0126	Parcels 6-7-8	pH	10/23/2012	5.99	s.u.				F
0126	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U	F	F
0126	Parcels 6-7-8	trans-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0126	Parcels 6-7-8	trans-1,2-Dichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0126	Parcels 6-7-8	trans-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0138	Parcels 6-7-8	Dissolved Oxygen	1/31/2012	4.17	mg/L			F	F
0138	Parcels 6-7-8	Dissolved Oxygen	4/25/2012	4.22	mg/L			F	F
0138	Parcels 6-7-8	Dissolved Oxygen	7/23/2012	4.85	mg/L			F	F
0138	Parcels 6-7-8	Dissolved Oxygen	10/23/2012	4	mg/L				F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0138	Parcels 6-7-8	Oxidation Reduction Potential	1/31/2012	15.4	mV			F	F
0138	Parcels 6-7-8	Oxidation Reduction Potential	4/25/2012	73.8	mV			F	F
0138	Parcels 6-7-8	Oxidation Reduction Potential	7/23/2012	95.4	mV			F	F
0138	Parcels 6-7-8	Oxidation Reduction Potential	10/23/2012	242.4	mV				F
0138	Parcels 6-7-8	Specific Conductance	1/31/2012	1307	umhos/cm			F	F
0138	Parcels 6-7-8	Specific Conductance	4/25/2012	1203	umhos/cm			F	F
0138	Parcels 6-7-8	Specific Conductance	7/23/2012	1207	umhos/cm			F	F
0138	Parcels 6-7-8	Specific Conductance	10/23/2012	1168	umhos/cm				F
0138	Parcels 6-7-8	Tetrachloroethene	1/31/2012	0.2	ug/L	0.2	U	F	F
0138	Parcels 6-7-8	Tetrachloroethene	4/25/2012	0.16	ug/L	0.16	U	F	F
0138	Parcels 6-7-8	Tetrachloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0138	Parcels 6-7-8	Tetrachloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0138	Parcels 6-7-8	Trichloroethene	1/31/2012	0.11	ug/L	0.11	U	F	F
0138	Parcels 6-7-8	Trichloroethene	4/25/2012	0.16	ug/L	0.16	U	F	F
0138	Parcels 6-7-8	Trichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0138	Parcels 6-7-8	Trichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0138	Parcels 6-7-8	Tritium	1/31/2012	1170	pCi/L	309		F	F
0138	Parcels 6-7-8	Tritium	4/25/2012	1170	pCi/L	305		F	F
0138	Parcels 6-7-8	Tritium	7/23/2012	1040	pCi/L	319		F	F
0138	Parcels 6-7-8	Turbidity	1/31/2012	35.9	NTU			F	F
0138	Parcels 6-7-8	Turbidity	4/25/2012	25.1	NTU			F	F
0138	Parcels 6-7-8	Turbidity	7/23/2012	18.2	NTU			F	F
0138	Parcels 6-7-8	Turbidity	10/23/2012	13.4	NTU				F
0138	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U	F	F
0138	Parcels 6-7-8	Vinyl chloride	4/25/2012	0.16	ug/L	0.16	U	F	F
0138	Parcels 6-7-8	Vinyl chloride	7/23/2012	0.16	ug/L	0.16	U	F	F
0138	Parcels 6-7-8	Vinyl chloride	10/23/2012	0.16	ug/L	0.16	U		F
0138	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	0.1	ug/L	0.1	U	F	F
0138	Parcels 6-7-8	cis-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U	F	F
0138	Parcels 6-7-8	cis-1,2-Dichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0138	Parcels 6-7-8	cis-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0138	Parcels 6-7-8	pH	1/31/2012	6.98	s.u.			F	F
0138	Parcels 6-7-8	pH	4/25/2012	6.26	s.u.			F	F
0138	Parcels 6-7-8	pH	7/23/2012	6.12	s.u.			F	F
0138	Parcels 6-7-8	pH	10/23/2012	6	s.u.				F
0138	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U	F	F
0138	Parcels 6-7-8	trans-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U	F	F
0138	Parcels 6-7-8	trans-1,2-Dichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0138	Parcels 6-7-8	trans-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0301	Parcels 6-7-8	Dissolved Oxygen	1/31/2012	0.98	mg/L			FJ	F
0301	Parcels 6-7-8	Dissolved Oxygen	4/25/2012	1.5	mg/L			FJ	F
0301	Parcels 6-7-8	Dissolved Oxygen	7/23/2012	3.21	mg/L			F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0301	Parcels 6-7-8	Dissolved Oxygen	10/23/2012	0.76	mg/L				F
0301	Parcels 6-7-8	Oxidation Reduction Potential	1/31/2012	-23.7	mV			FJ	F
0301	Parcels 6-7-8	Oxidation Reduction Potential	4/25/2012	-98.7	mV			FJ	F
0301	Parcels 6-7-8	Oxidation Reduction Potential	7/23/2012	-120.5	mV			F	F
0301	Parcels 6-7-8	Oxidation Reduction Potential	10/23/2012	241	mV				F
0301	Parcels 6-7-8	Specific Conductance	1/31/2012	990	umhos/cm			FJ	F
0301	Parcels 6-7-8	Specific Conductance	4/25/2012	1048	umhos/cm			FJ	F
0301	Parcels 6-7-8	Specific Conductance	7/23/2012	1074	umhos/cm			F	F
0301	Parcels 6-7-8	Specific Conductance	10/23/2012	1024	umhos/cm				F
0301	Parcel 6-7-8	Tetrachloroethene	1/31/2012	0.2	ug/L	0.2	U	FJ	F
0301	Parcels 6-7-8	Tetrachloroethene	4/25/2012	0.16	ug/L	0.16	U	FJ	F
0301	Parcels 6-7-8	Tetrachloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0301	Parcels 6-7-8	Tetrachloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0301	Parcels 6-7-8	Trichloroethene	1/31/2012	0.11	ug/L	0.11	U	FJ	F
0301	Parcels 6-7-8	Trichloroethene	4/25/2012	0.16	ug/L	0.16	U	FJ	F
0301	Parcels 6-7-8	Trichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0301	Parcels 6-7-8	Trichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0301	Parcels 6-7-8	Tritium	1/31/2012	57.8	pCi/L	295	U	FJ	F
0301	Parcels 6-7-8	Tritium	4/25/2012	7.49	pCi/L	307	U	FJ	F
0301	Parcels 6-7-8	Tritium	7/23/2012	-49.3	pCi/L	323	U	F	F
0301	Parcels 6-7-8	Turbidity	1/31/2012	1.21	NTU			FJ	F
0301	Parcels 6-7-8	Turbidity	4/25/2012	2.22	NTU			FJ	F
0301	Parcels 6-7-8	Turbidity	7/23/2012	1.76	NTU			F	F
0301	Parcels 6-7-8	Turbidity	10/23/2012	3.12	NTU				F
0301	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U	FJ	F
0301	Parcels 6-7-8	Vinyl chloride	4/25/2012	0.16	ug/L	0.16	U	FJ	F
0301	Parcels 6-7-8	Vinyl chloride	7/23/2012	0.16	ug/L	0.16	U	F	F
0301	Parcels 6-7-8	Vinyl chloride	10/23/2012	0.16	ug/L	0.16	U		F
0301	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	0.1	ug/L	0.1	U	FJ	F
0301	Parcels 6-7-8	cis-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U	FJ	F
0301	Parcels 6-7-8	cis-1,2-Dichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0301	Parcels 6-7-8	cis-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0301	Parcels 6-7-8	pH	1/31/2012	8.32	s.u.			FJ	F
0301	Parcels 6-7-8	pH	4/25/2012	7.41	s.u.			FJ	F
0301	Parcels 6-7-8	pH	7/23/2012	7.4	s.u.			F	F
0301	Parcels 6-7-8	pH	10/23/2012	9.76	s.u.				F
0301	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U	FJ	F
0301	Parcels 6-7-8	trans-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U	FJ	F
0301	Parcels 6-7-8	trans-1,2-Dichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0301	Parcels 6-7-8	trans-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0311	Parcels 6-7-8	Dissolved Oxygen	1/31/2012	5.5	mg/L			F	F
0311	Parcels 6-7-8	Dissolved Oxygen	4/25/2012	4.16	mg/L			F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0311	Parcels 6-7-8	Dissolved Oxygen	7/23/2012	3.36	mg/L			F	F
0311	Parcels 6-7-8	Dissolved Oxygen	10/23/2012	2.35	mg/L				F
0311	Parcels 6-7-8	Oxidation Reduction Potential	1/31/2012	55.4	mV			F	F
0311	Parcels 6-7-8	Oxidation Reduction Potential	4/25/2012	10.6	mV			F	F
0311	Parcels 6-7-8	Oxidation Reduction Potential	7/23/2012	-13.11	mV			F	F
0311	Parcels 6-7-8	Oxidation Reduction Potential	10/23/2012	257.5	mV				F
0311	Parcels 6-7-8	Specific Conductance	1/31/2012	998	umhos/cm			F	F
0311	Parcels 6-7-8	Specific Conductance	4/25/2012	1033	umhos/cm			F	F
0311	Parcels 6-7-8	Specific Conductance	7/23/2012	1239	umhos/cm			F	F
0311	Parcels 6-7-8	Specific Conductance	10/23/2012	1125	umhos/cm				F
0311	Parcels 6-7-8	Tetrachloroethene	1/31/2012	0.21	ug/L	0.2	J	F	F
0311	Parcels 6-7-8	Tetrachloroethene	4/25/2012	0.21	ug/L	0.16	J	F	F
0311	Parcels 6-7-8	Tetrachloroethene	7/23/2012	0.26	ug/L	0.16	J	F	F
0311	Parcels 6-7-8	Tetrachloroethene	10/23/2012	0.33	ug/L	0.16	J		F
0311	Parcels 6-7-8	Trichloroethene	1/31/2012	0.11	ug/L	0.11	U	F	F
0311	Parcels 6-7-8	Trichloroethene	4/25/2012	0.16	ug/L	0.16	U	F	F
0311	Parcels 6-7-8	Trichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0311	Parcels 6-7-8	Trichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0311	Parcels 6-7-8	Tritium	1/31/2012	96.5	pCi/L	305	U	F	F
0311	Parcels 6-7-8	Tritium	4/25/2012	289	pCi/L	317	U	F	F
0311	Parcels 6-7-8	Tritium	7/23/2012	257	pCi/L	320	U	F	F
0311	Parcels 6-7-8	Turbidity	1/31/2012	35	NTU			F	F
0311	Parcels 6-7-8	Turbidity	4/25/2012	29	NTU			F	F
0311	Parcels 6-7-8	Turbidity	7/23/2012	9.1	NTU			F	F
0311	Parcels 6-7-8	Turbidity	10/23/2012	9.11	NTU				F
0311	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U	F	F
0311	Parcels 6-7-8	Vinyl chloride	4/25/2012	0.16	ug/L	0.16	U	F	F
0311	Parcels 6-7-8	Vinyl chloride	7/23/2012	0.16	ug/L	0.16	U	F	F
0311	Parcels 6-7-8	Vinyl chloride	10/23/2012	0.16	ug/L	0.16	U		F
0311	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	0.1	ug/L	0.1	U	F	F
0311	Parcels 6-7-8	cis-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U	F	F
0311	Parcels 6-7-8	cis-1,2-Dichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0311	Parcels 6-7-8	cis-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0311	Parcels 6-7-8	pH	1/31/2012	7.06	s.u.			F	F
0311	Parcels 6-7-8	pH	4/25/2012	6.96	s.u.			F	F
0311	Parcels 6-7-8	pH	7/23/2012	7.02	s.u.			F	F
0311	Parcels 6-7-8	pH	10/23/2012	6.85	s.u.				F
0311	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U	F	F
0311	Parcels 6-7-8	trans-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U	F	F
0311	Parcels 6-7-8	trans-1,2-Dichloroethene	7/23/2012	0.16	ug/L	0.16	U	F	F
0311	Parcels 6-7-8	trans-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0315	Parcels 6-7-8	Dissolved Oxygen	2/1/2012	3.77	mg/L			FJ	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0315	Parcels 6-7-8	Dissolved Oxygen	4/23/2012	2.39	mg/L			FJ	F
0315	Parcels 6-7-8	Dissolved Oxygen	7/25/2012	1.56	mg/L			F	F
0315	Parcels 6-7-8	Dissolved Oxygen	10/23/2012	0.86	mg/L				F
0315	Parcels 6-7-8	Oxidation Reduction Potential	2/1/2012	9.6	mV			FJ	F
0315	Parcels 6-7-8	Oxidation Reduction Potential	4/23/2012	49.6	mV			FJ	F
0315	Parcels 6-7-8	Oxidation Reduction Potential	7/25/2012	34.3	mV			F	F
0315	Parcels 6-7-8	Oxidation Reduction Potential	10/23/2012	121	mV				F
0315	Parcels 6-7-8	Specific Conductance	2/1/2012	1503	umhos/cm			FJ	F
0315	Parcels 6-7-8	Specific Conductance	4/23/2012	1597	umhos/cm			FJ	F
0315	Parcels 6-7-8	Specific Conductance	7/25/2012	1739	umhos/cm			F	F
0315	Parcels 6-7-8	Specific Conductance	10/23/2012	1510	umhos/cm				F
0315	Parcels 6-7-8	Tetrachloroethene	2/1/2012	0.2	ug/L	0.2	U	FJ	F
0315	Parcels 6-7-8	Tetrachloroethene	4/23/2012	0.16	ug/L	0.16	U	FJ	F
0315	Parcels 6-7-8	Tetrachloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0315	Parcels 6-7-8	Tetrachloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0315	Parcels 6-7-8	Trichloroethene	2/1/2012	10.3	ug/L	0.11		FJ	F
0315	Parcels 6-7-8	Trichloroethene	4/23/2012	12.3	ug/L	0.16		FJ	F
0315	Parcels 6-7-8	Trichloroethene	7/25/2012	10.8	ug/L	0.16		F	F
0315	Parcels 6-7-8	Trichloroethene	10/23/2012	16.6	ug/L	0.16			F
0315	Parcels 6-7-8	Turbidity	2/1/2012	90.1	NTU			FJ	F
0315	Parcels 6-7-8	Turbidity	4/23/2012	194	NTU			FJ	F
0315	Parcels 6-7-8	Turbidity	7/25/2012	55.9	NTU			F	F
0315	Parcels 6-7-8	Turbidity	10/23/2012	48.9	NTU				F
0315	Parcels 6-7-8	Vinyl chloride	2/1/2012	0.2	ug/L	0.2	U	FJ	F
0315	Parcels 6-7-8	Vinyl chloride	4/23/2012	0.16	ug/L	0.16	U	FJ	F
0315	Parcels 6-7-8	Vinyl chloride	7/25/2012	0.16	ug/L	0.16	U	F	F
0315	Parcels 6-7-8	Vinyl chloride	10/23/2012	0.16	ug/L	0.16	U		F
0315	Parcels 6-7-8	cis-1,2-Dichloroethene	2/1/2012	0.1	ug/L	0.1	U	FJ	F
0315	Parcels 6-7-8	cis-1,2-Dichloroethene	4/23/2012	0.16	ug/L	0.16	U	FJ	F
0315	Parcels 6-7-8	cis-1,2-Dichloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0315	Parcels 6-7-8	cis-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0315	Parcels 6-7-8	pH	2/1/2012	6.82	s.u.			FJ	F
0315	Parcels 6-7-8	pH	4/23/2012	6.89	s.u.			FJ	F
0315	Parcels 6-7-8	pH	7/25/2012	6.61	s.u.			F	F
0315	Parcels 6-7-8	pH	10/23/2012	6.27	s.u.				F
0315	Parcels 6-7-8	trans-1,2-Dichloroethene	2/1/2012	0.2	ug/L	0.2	U	FJ	F
0315	Parcels 6-7-8	trans-1,2-Dichloroethene	4/23/2012	0.16	ug/L	0.16	U	FJ	F
0315	Parcels 6-7-8	trans-1,2-Dichloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0315	Parcels 6-7-8	trans-1,2-Dichloroethene	10/23/2012	0.16	ug/L	0.16	U		F
0347	Parcels 6-7-8	Dissolved Oxygen	2/1/2012	0.88	mg/L			F	F
0347	Parcels 6-7-8	Dissolved Oxygen	4/23/2012	1.79	mg/L			F	F
0347	Parcels 6-7-8	Dissolved Oxygen	7/25/2012	1.15	mg/L			F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0347	Parcels 6-7-8	Dissolved Oxygen	10/24/2012	0.57	mg/L				F
0347	Parcels 6-7-8	Oxidation Reduction Potential	2/1/2012	-38	mV			F	F
0347	Parcels 6-7-8	Oxidation Reduction Potential	4/23/2012	46.5	mV			F	F
0347	Parcels 6-7-8	Oxidation Reduction Potential	7/25/2012	13.7	mV			F	F
0347	Parcels 6-7-8	Oxidation Reduction Potential	10/24/2012	-11.2	mV				F
0347	Parcels 6-7-8	Specific Conductance	2/1/2012	1487	umhos/cm			F	F
0347	Parcels 6-7-8	Specific Conductance	4/23/2012	1505	umhos/cm			F	F
0347	Parcels 6-7-8	Specific Conductance	7/25/2012	1591	umhos/cm			F	F
0347	Parcels 6-7-8	Specific Conductance	10/24/2012	1549	umhos/cm				F
0347	Parcels 6-7-8	Tetrachloroethene	2/1/2012	0.2	ug/L	0.2	U	F	F
0347	Parcels 6-7-8	Tetrachloroethene	4/23/2012	0.16	ug/L	0.16	U	F	F
0347	Parcels 6-7-8	Tetrachloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0347	Parcels 6-7-8	Tetrachloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0347	Parcels 6-7-8	Trichloroethene	2/1/2012	28.8	ug/L	0.11		F	F
0347	Parcels 6-7-8	Trichloroethene	4/23/2012	23.8	ug/L	0.16		F	F
0347	Parcels 6-7-8	Trichloroethene	7/25/2012	25	ug/L	0.16		F	F
0347	Parcels 6-7-8	Trichloroethene	10/24/2012	31.2	ug/L	0.16			F
0347	Parcels 6-7-8	Tritium	2/1/2012	3800	pCi/L	303		F	F
0347	Parcels 6-7-8	Tritium	4/23/2012	4460	pCi/L	312		F	F
0347	Parcels 6-7-8	Tritium	7/25/2012	4310	pCi/L	324		F	F
0347	Parcels 6-7-8	Turbidity	2/1/2012	46	NTU			F	F
0347	Parcels 6-7-8	Turbidity	4/23/2012	26.1	NTU			F	F
0347	Parcels 6-7-8	Turbidity	7/25/2012	19.1	NTU			F	F
0347	Parcels 6-7-8	Turbidity	10/24/2012	30.7	NTU				F
0347	Parcels 6-7-8	Vinyl chloride	2/1/2012	0.2	ug/L	0.2	U	F	F
0347	Parcels 6-7-8	Vinyl chloride	4/23/2012	0.16	ug/L	0.16	U	F	F
0347	Parcels 6-7-8	Vinyl chloride	7/25/2012	0.16	ug/L	0.16	U	F	F
0347	Parcels 6-7-8	Vinyl chloride	10/24/2012	0.16	ug/L	0.16	U		F
0347	Parcels 6-7-8	cis-1,2-Dichloroethene	2/1/2012	0.1	ug/L	0.1	U	F	F
0347	Parcels 6-7-8	cis-1,2-Dichloroethene	4/23/2012	0.16	ug/L	0.16	U	F	F
0347	Parcels 6-7-8	cis-1,2-Dichloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0347	Parcels 6-7-8	cis-1,2-Dichloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0347	Parcels 6-7-8	pH	2/1/2012	6.89	s.u.			F	F
0347	Parcels 6-7-8	pH	4/23/2012	6.81	s.u.			F	F
0347	Parcels 6-7-8	pH	7/25/2012	6.64	s.u.			F	F
0347	Parcels 6-7-8	pH	10/24/2012	6.28	s.u.				F
0347	Parcels 6-7-8	trans-1,2-Dichloroethene	2/1/2012	0.2	ug/L	0.2	U	F	F
0347	Parcels 6-7-8	trans-1,2-Dichloroethene	4/23/2012	0.16	ug/L	0.16	U	F	F
0347	Parcels 6-7-8	trans-1,2-Dichloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0347	Parcels 6-7-8	trans-1,2-Dichloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0379	Parcels 6-7-8	Dissolved Oxygen	2/1/2012	2.49	mg/L			F	F
0379	Parcels 6-7-8	Dissolved Oxygen	4/24/2012	1.7	mg/L			F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0379	Parcels 6-7-8	Dissolved Oxygen	7/25/2012	1.65	mg/L			F	F
0379	Parcels 6-7-8	Dissolved Oxygen	10/25/2012	0.81	mg/L				F
0379	Parcels 6-7-8	Oxidation Reduction Potential	2/1/2012	-23.4	mV			F	F
0379	Parcels 6-7-8	Oxidation Reduction Potential	4/24/2012	-10.3	mV			F	F
0379	Parcels 6-7-8	Oxidation Reduction Potential	7/25/2012	-16	mV			F	F
0379	Parcels 6-7-8	Oxidation Reduction Potential	10/25/2012	35.7	mV				F
0379	Parcels 6-7-8	Specific Conductance	2/1/2012	1950	umhos/cm			F	F
0379	Parcels 6-7-8	Specific Conductance	4/24/2012	2027	umhos/cm			F	F
0379	Parcels 6-7-8	Specific Conductance	7/25/2012	1977	umhos/cm			F	F
0379	Parcels 6-7-8	Specific Conductance	10/25/2012	1973	umhos/cm				F
0379	Parcels 6-7-8	Tetrachloroethene	2/1/2012	0.35	ug/L	0.2	J	F	F
0379	Parcels 6-7-8	Tetrachloroethene	4/24/2012	0.33	ug/L	0.16	J	F	F
0379	Parcels 6-7-8	Tetrachloroethene	7/25/2012	0.31	ug/L	0.16	J	F	F
0379	Parcels 6-7-8	Tetrachloroethene	10/25/2012	0.38	ug/L	0.16	J		F
0379	Parcels 6-7-8	Trichloroethene	2/1/2012	2.04	ug/L	0.11		F	F
0379	Parcels 6-7-8	Trichloroethene	4/24/2012	1.59	ug/L	0.16		F	F
0379	Parcels 6-7-8	Trichloroethene	7/25/2012	2.16	ug/L	0.16		F	F
0379	Parcels 6-7-8	Trichloroethene	10/25/2012	1.94	ug/L	0.16			F
0379	Parcels 6-7-8	Tritium	2/1/2012	2010	pCi/L	308		F	F
0379	Parcels 6-7-8	Tritium	4/24/2012	1450	pCi/L	311		F	F
0379	Parcels 6-7-8	Tritium	7/25/2012	1550	pCi/L	323		F	F
0379	Parcels 6-7-8	Turbidity	2/1/2012	9.1	NTU			F	F
0379	Parcels 6-7-8	Turbidity	4/24/2012	22	NTU			F	F
0379	Parcels 6-7-8	Turbidity	7/25/2012	38.4	NTU			F	F
0379	Parcels 6-7-8	Turbidity	10/25/2012	8.52	NTU				F
0379	Parcels 6-7-8	Vinyl chloride	2/1/2012	0.2	ug/L	0.2	U	F	F
0379	Parcels 6-7-8	Vinyl chloride	4/24/2012	0.16	ug/L	0.16	U	F	F
0379	Parcels 6-7-8	Vinyl chloride	7/25/2012	0.16	ug/L	0.16	U	F	F
0379	Parcels 6-7-8	Vinyl chloride	10/25/2012	0.16	ug/L	0.16	U		F
0379	Parcels 6-7-8	cis-1,2-Dichloroethene	2/1/2012	0.1	ug/L	0.1	U	F	F
0379	Parcels 6-7-8	cis-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0379	Parcels 6-7-8	cis-1,2-Dichloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0379	Parcels 6-7-8	cis-1,2-Dichloroethene	10/25/2012	0.16	ug/L	0.16	U		F
0379	Parcels 6-7-8	pH	2/1/2012	6.98	s.u.			F	F
0379	Parcels 6-7-8	pH	4/24/2012	6.86	s.u.			F	F
0379	Parcels 6-7-8	pH	7/25/2012	6.95	s.u.			F	F
0379	Parcels 6-7-8	pH	10/25/2012	6.24	s.u.				F
0379	Parcels 6-7-8	trans-1,2-Dichloroethene	2/1/2012	0.2	ug/L	0.2	U	F	F
0379	Parcels 6-7-8	trans-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0379	Parcels 6-7-8	trans-1,2-Dichloroethene	7/25/2012	0.16	ug/L	0.16	U	F	F
0379	Parcels 6-7-8	trans-1,2-Dichloroethene	10/25/2012	0.16	ug/L	0.16	U		F
0386	Parcels 6-7-8	Dissolved Oxygen	2/1/2012	4.87	mg/L			F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0386	Parcels 6-7-8	Dissolved Oxygen	4/24/2012	4.88	mg/L			F	F
0386	Parcels 6-7-8	Dissolved Oxygen	7/24/2012	3.94	mg/L			F	F
0386	Parcels 6-7-8	Dissolved Oxygen	10/24/2012	3.52	mg/L				F
0386	Parcels 6-7-8	Oxidation Reduction Potential	2/1/2012	14.5	mV			F	F
0386	Parcels 6-7-8	Oxidation Reduction Potential	4/24/2012	216.6	mV			F	F
0386	Parcels 6-7-8	Oxidation Reduction Potential	7/24/2012	81.9	mV			F	F
0386	Parcels 6-7-8	Oxidation Reduction Potential	10/24/2012	27.1	mV				F
0386	Parcels 6-7-8	Specific Conductance	2/1/2012	1098	umhos/cm			F	F
0386	Parcels 6-7-8	Specific Conductance	4/24/2012	1067	umhos/cm			F	F
0386	Parcels 6-7-8	Specific Conductance	7/24/2012	1059	umhos/cm			F	F
0386	Parcels 6-7-8	Specific Conductance	10/24/2012	1058	umhos/cm				F
0386	Parcels 6-7-8	Tetrachloroethene	2/1/2012	0.2	ug/L	0.2	U	F	F
0386	Parcels 6-7-8	Tetrachloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0386	Parcels 6-7-8	Tetrachloroethene	7/24/2012	0.16	ug/L	0.16	U	F	F
0386	Parcels 6-7-8	Tetrachloroethene	10/24/2012	0.22	ug/L	0.16	J		F
0386	Parcels 6-7-8	Trichloroethene	2/1/2012	2.65	ug/L	0.11		F	F
0386	Parcels 6-7-8	Trichloroethene	4/24/2012	2.25	ug/L	0.16		F	F
0386	Parcels 6-7-8	Trichloroethene	7/24/2012	2.84	ug/L	0.16		F	F
0386	Parcels 6-7-8	Trichloroethene	10/24/2012	3.04	ug/L	0.16			F
0386	Parcels 6-7-8	Turbidity	2/1/2012	19	NTU			F	F
0386	Parcels 6-7-8	Turbidity	4/24/2012	15.1	NTU			F	F
0386	Parcels 6-7-8	Turbidity	7/24/2012	5.12	NTU			F	F
0386	Parcels 6-7-8	Turbidity	10/24/2012	7.37	NTU				F
0386	Parcels 6-7-8	Vinyl chloride	2/1/2012	0.2	ug/L	0.2	U	F	F
0386	Parcels 6-7-8	Vinyl chloride	4/24/2012	0.16	ug/L	0.16	U	F	F
0386	Parcels 6-7-8	Vinyl chloride	7/24/2012	0.16	ug/L	0.16	U	F	F
0386	Parcels 6-7-8	Vinyl chloride	10/24/2012	0.16	ug/L	0.16	U		F
0386	Parcels 6-7-8	cis-1,2-Dichloroethene	2/1/2012	0.1	ug/L	0.1	U	F	F
0386	Parcels 6-7-8	cis-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0386	Parcels 6-7-8	cis-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U	F	F
0386	Parcels 6-7-8	cis-1,2-Dichloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0386	Parcels 6-7-8	pH	2/1/2012	6.79	s.u.			F	F
0386	Parcels 6-7-8	pH	4/24/2012	5.38	s.u.			F	F
0386	Parcels 6-7-8	pH	7/24/2012	6.64	s.u.			F	F
0386	Parcels 6-7-8	pH	10/24/2012	5.98	s.u.				F
0386	Parcels 6-7-8	trans-1,2-Dichloroethene	2/1/2012	0.2	ug/L	0.2	U	F	F
0386	Parcels 6-7-8	trans-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0386	Parcels 6-7-8	trans-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U	F	F
0386	Parcels 6-7-8	trans-1,2-Dichloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0387	Parcels 6-7-8	Dissolved Oxygen	2/1/2012	2.16	mg/L			F	F
0387	Parcels 6-7-8	Dissolved Oxygen	4/24/2012	2.43	mg/L			FJ	F
0387	Parcels 6-7-8	Dissolved Oxygen	7/24/2012	1.08	mg/L			F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0387	Parcels 6-7-8	Dissolved Oxygen	10/24/2012	0.62	mg/L				F
0387	Parcels 6-7-8	Oxidation Reduction Potential	2/1/2012	-2.6	mV			F	F
0387	Parcels 6-7-8	Oxidation Reduction Potential	4/24/2012	24.1	mV			FJ	F
0387	Parcels 6-7-8	Oxidation Reduction Potential	7/24/2012	42.4	mV			F	F
0387	Parcels 6-7-8	Oxidation Reduction Potential	10/24/2012	7.5	mV				F
0387	Parcels 6-7-8	Specific Conductance	2/1/2012	1316	umhos/cm			F	F
0387	Parcels 6-7-8	Specific Conductance	4/24/2012	1288	umhos/cm			FJ	F
0387	Parcels 6-7-8	Specific Conductance	7/24/2012	1269	umhos/cm			F	F
0387	Parcels 6-7-8	Specific Conductance	10/24/2012	1297	umhos/cm				F
0387	Parcels 6-7-8	Tetrachloroethene	2/1/2012	0.25	ug/L	0.2	J	F	F
0387	Parcels 6-7-8	Tetrachloroethene	4/24/2012	0.23	ug/L	0.16	J	FJ	F
0387	Parcels 6-7-8	Tetrachloroethene	7/24/2012	0.21	ug/L	0.16	J	F	F
0387	Parcels 6-7-8	Tetrachloroethene	10/24/2012	0.31	ug/L	0.16	J		F
0387	Parcels 6-7-8	Trichloroethene	2/1/2012	0.11	ug/L	0.11	U	F	F
0387	Parcels 6-7-8	Trichloroethene	4/24/2012	0.16	ug/L	0.16	U	FJ	F
0387	Parcels 6-7-8	Trichloroethene	7/24/2012	0.16	ug/L	0.16	U	F	F
0387	Parcels 6-7-8	Trichloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0387	Parcels 6-7-8	Turbidity	2/1/2012	7.26	NTU			F	F
0387	Parcels 6-7-8	Turbidity	4/24/2012	14.1	NTU			FJ	F
0387	Parcels 6-7-8	Turbidity	7/24/2012	12	NTU			F	F
0387	Parcels 6-7-8	Turbidity	10/24/2012	2.41	NTU				F
0387	Parcels 6-7-8	Vinyl chloride	2/1/2012	0.2	ug/L	0.2	U	F	F
0387	Parcels 6-7-8	Vinyl chloride	4/24/2012	0.16	ug/L	0.16	U	FJ	F
0387	Parcels 6-7-8	Vinyl chloride	7/24/2012	0.16	ug/L	0.16	U	F	F
0387	Parcels 6-7-8	Vinyl chloride	10/24/2012	0.16	ug/L	0.16	U		F
0387	Parcels 6-7-8	cis-1,2-Dichloroethene	2/1/2012	0.1	ug/L	0.1	U	F	F
0387	Parcels 6-7-8	cis-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	FJ	F
0387	Parcels 6-7-8	cis-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U	F	F
0387	Parcels 6-7-8	cis-1,2-Dichloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0387	Parcels 6-7-8	pH	2/1/2012	6.79	s.u.			F	F
0387	Parcels 6-7-8	pH	4/24/2012	6.65	s.u.			FJ	F
0387	Parcels 6-7-8	pH	7/24/2012	6.41	s.u.			F	F
0387	Parcels 6-7-8	pH	10/24/2012	6.03	s.u.				F
0387	Parcels 6-7-8	trans-1,2-Dichloroethene	2/1/2012	0.2	ug/L	0.2	U	F	F
0387	Parcels 6-7-8	trans-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	FJ	F
0387	Parcels 6-7-8	trans-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U	F	F
0387	Parcels 6-7-8	trans-1,2-Dichloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0389	Parcels 6-7-8	Dissolved Oxygen	2/1/2012	4.48	mg/L			F	F
0389	Parcels 6-7-8	Dissolved Oxygen	4/24/2012	3.25	mg/L			F	F
0389	Parcels 6-7-8	Dissolved Oxygen	7/24/2012	2.11	mg/L			F	F
0389	Parcels 6-7-8	Dissolved Oxygen	10/24/2012	1.91	mg/L				F
0389	Parcels 6-7-8	Oxidation Reduction Potential	2/1/2012	27.5	mV			F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0389	Parcels 6-7-8	Oxidation Reduction Potential	4/24/2012	136.6	mV			F	F
0389	Parcels 6-7-8	Oxidation Reduction Potential	7/24/2012	81.7	mV			F	F
0389	Parcels 6-7-8	Oxidation Reduction Potential	10/24/2012	18	mV				F
0389	Parcels 6-7-8	Specific Conductance	2/1/2012	1232	umhos/cm			F	F
0389	Parcels 6-7-8	Specific Conductance	4/24/2012	1184	umhos/cm			F	F
0389	Parcels 6-7-8	Specific Conductance	7/24/2012	1117	umhos/cm			F	F
0389	Parcels 6-7-8	Specific Conductance	10/24/2012	1059	umhos/cm				F
0389	Parcels 6-7-8	Tetrachloroethene	2/1/2012	0.2	ug/L	0.2	U	F	F
0389	Parcels 6-7-8	Tetrachloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0389	Parcels 6-7-8	Tetrachloroethene	7/24/2012	0.19	ug/L	0.16	J	F	F
0389	Parcels 6-7-8	Tetrachloroethene	10/24/2012	0.36	ug/L	0.16	J		F
0389	Parcels 6-7-8	Trichloroethene	2/1/2012	0.31	ug/L	0.11	J	F	F
0389	Parcels 6-7-8	Trichloroethene	4/24/2012	0.16	ug/L	0.16	J	F	F
0389	Parcels 6-7-8	Trichloroethene	7/24/2012	0.32	ug/L	0.16	J	F	F
0389	Parcels 6-7-8	Trichloroethene	10/24/2012	0.9	ug/L	0.16	J		F
0389	Parcels 6-7-8	Turbidity	2/1/2012	46.3	NTU			F	F
0389	Parcels 6-7-8	Turbidity	4/24/2012	45.45	NTU			F	F
0389	Parcels 6-7-8	Turbidity	7/24/2012	35.2	NTU			F	F
0389	Parcels 6-7-8	Turbidity	10/24/2012	24.3	NTU				F
0389	Parcels 6-7-8	Vinyl chloride	2/1/2012	0.2	ug/L	0.2	U	F	F
0389	Parcels 6-7-8	Vinyl chloride	4/24/2012	0.16	ug/L	0.16	U	F	F
0389	Parcels 6-7-8	Vinyl chloride	7/24/2012	0.16	ug/L	0.16	U	F	F
0389	Parcels 6-7-8	Vinyl chloride	10/24/2012	0.16	ug/L	0.16	U		F
0389	Parcels 6-7-8	cis-1,2-Dichloroethene	2/1/2012	0.1	ug/L	0.1	U	F	F
0389	Parcels 6-7-8	cis-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0389	Parcels 6-7-8	cis-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U	F	F
0389	Parcels 6-7-8	cis-1,2-Dichloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0389	Parcels 6-7-8	pH	2/1/2012	6.75	s.u.			F	F
0389	Parcels 6-7-8	pH	4/24/2012	6.53	s.u.			F	F
0389	Parcels 6-7-8	pH	7/24/2012	6.72	s.u.			F	F
0389	Parcels 6-7-8	pH	10/24/2012	6.35	s.u.				F
0389	Parcels 6-7-8	trans-1,2-Dichloroethene	2/1/2012	0.2	ug/L	0.2	U	F	F
0389	Parcels 6-7-8	trans-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0389	Parcels 6-7-8	trans-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U	F	F
0389	Parcels 6-7-8	trans-1,2-Dichloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0392	Parcels 6-7-8	Dissolved Oxygen	2/1/2012	5.6	mg/L			F	F
0392	Parcels 6-7-8	Dissolved Oxygen	4/24/2012	5.52	mg/L			F	F
0392	Parcels 6-7-8	Dissolved Oxygen	7/24/2012	2.05	mg/L			F	F
0392	Parcels 6-7-8	Dissolved Oxygen	10/24/2012	4.03	mg/L				F
0392	Parcels 6-7-8	Oxidation Reduction Potential	2/1/2012	28.8	mV			F	F
0392	Parcels 6-7-8	Oxidation Reduction Potential	4/24/2012	129.2	mV			F	F
0392	Parcels 6-7-8	Oxidation Reduction Potential	7/24/2012	114.9	mV			F	F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0392	Parcels 6-7-8	Oxidation Reduction Potential	10/24/2012	12.9	mV				F
0392	Parcels 6-7-8	Specific Conductance	2/1/2012	1128	umhos/cm			F	F
0392	Parcels 6-7-8	Specific Conductance	4/24/2012	1083	umhos/cm			F	F
0392	Parcels 6-7-8	Specific Conductance	7/24/2012	1068	umhos/cm			F	F
0392	Parcels 6-7-8	Specific Conductance	10/24/2012	1077	umhos/cm				F
0392	Parcels 6-7-8	Tetrachloroethene	2/1/2012	0.27	ug/L	0.2	J	F	F
0392	Parcels 6-7-8	Tetrachloroethene	4/24/2012	0.27	ug/L	0.16	J	F	F
0392	Parcels 6-7-8	Tetrachloroethene	7/24/2012	0.22	ug/L	0.16	J	F	F
0392	Parcels 6-7-8	Tetrachloroethene	10/24/2012	0.35	ug/L	0.16	J		F
0392	Parcels 6-7-8	Trichloroethene	2/1/2012	0.3	ug/L	0.11	J	F	F
0392	Parcels 6-7-8	Trichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0392	Parcels 6-7-8	Trichloroethene	7/24/2012	0.16	ug/L	0.16	U	F	F
0392	Parcels 6-7-8	Trichloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0392	Parcels 6-7-8	Turbidity	2/1/2012	3.09	NTU			F	F
0392	Parcels 6-7-8	Turbidity	4/24/2012	2.12	NTU			F	F
0392	Parcels 6-7-8	Turbidity	7/24/2012	2.34	NTU			F	F
0392	Parcels 6-7-8	Turbidity	10/24/2012	1.65	NTU				F
0392	Parcels 6-7-8	Vinyl chloride	2/1/2012	0.2	ug/L	0.2	U	F	F
0392	Parcels 6-7-8	Vinyl chloride	4/24/2012	0.16	ug/L	0.16	U	F	F
0392	Parcels 6-7-8	Vinyl chloride	7/24/2012	0.16	ug/L	0.16	U	F	F
0392	Parcels 6-7-8	Vinyl chloride	10/24/2012	0.16	ug/L	0.16	U		F
0392	Parcels 6-7-8	cis-1,2-Dichloroethene	2/1/2012	0.1	ug/L	0.1	U	F	F
0392	Parcels 6-7-8	cis-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0392	Parcels 6-7-8	cis-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U	F	F
0392	Parcels 6-7-8	cis-1,2-Dichloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0392	Parcels 6-7-8	pH	2/1/2012	6.69	s.u.			F	F
0392	Parcels 6-7-8	pH	4/24/2012	6.58	s.u.			F	F
0392	Parcels 6-7-8	pH	7/24/2012	6.2	s.u.			F	F
0392	Parcels 6-7-8	pH	10/24/2012	6.17	s.u.				F
0392	Parcels 6-7-8	trans-1,2-Dichloroethene	2/1/2012	0.2	ug/L	0.2	U	F	F
0392	Parcels 6-7-8	trans-1,2-Dichloroethene	4/24/2012	0.16	ug/L	0.16	U	F	F
0392	Parcels 6-7-8	trans-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U	F	F
0392	Parcels 6-7-8	trans-1,2-Dichloroethene	10/24/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	Dissolved Oxygen	1/31/2012	3.41	mg/L				F
0601	Parcels 6-7-8	Dissolved Oxygen	4/25/2012	11.17	mg/L				F
0601	Parcels 6-7-8	Dissolved Oxygen	7/24/2012	6.75	mg/L				F
0601	Parcels 6-7-8	Dissolved Oxygen	10/25/2012	7.33	mg/L				F
0601	Parcels 6-7-8	Oxidation Reduction Potential	1/31/2012	235	mV				F
0601	Parcels 6-7-8	Oxidation Reduction Potential	4/25/2012	110.8	mV				F
0601	Parcels 6-7-8	Oxidation Reduction Potential	7/24/2012	78.2	mV				F
0601	Parcels 6-7-8	Oxidation Reduction Potential	10/25/2012	58	mV				F
0601	Parcels 6-7-8	Specific Conductance	1/31/2012	1485	umhos/cm				F

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0601	Parcels 6-7-8	Specific Conductance	4/25/2012	1574	umhos/cm				F
0601	Parcels 6-7-8	Specific Conductance	7/24/2012	1720	umhos/cm				F
0601	Parcels 6-7-8	Specific Conductance	10/25/2012	1617	umhos/cm				F
0601	Parcels 6-7-8	Tetrachloroethene	1/31/2012	10.2	ug/L	0.2			F
0601	Parcels 6-7-8	Tetrachloroethene	1/31/2012	10.5	ug/L	0.2			D
0601	Parcels 6-7-8	Tetrachloroethene	4/25/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	Tetrachloroethene	4/25/2012	0.16	ug/L	0.16	U		D
0601	Parcels 6-7-8	Tetrachloroethene	7/24/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	Tetrachloroethene	10/25/2012	7.29	ug/L	0.16			F
0601	Parcels 6-7-8	Tetrachloroethene	10/25/2012	7.45	ug/L	0.16			D
0601	Parcels 6-7-8	Trichloroethene	1/31/2012	4.16	ug/L	0.11			F
0601	Parcels 6-7-8	Trichloroethene	1/31/2012	4.13	ug/L	0.11			D
0601	Parcels 6-7-8	Trichloroethene	4/25/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	Trichloroethene	4/25/2012	0.16	ug/L	0.16	U		D
0601	Parcels 6-7-8	Trichloroethene	7/24/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	Trichloroethene	10/25/2012	10.3	ug/L	0.16			F
0601	Parcels 6-7-8	Trichloroethene	10/25/2012	10.3	ug/L	0.16			D
0601	Parcels 6-7-8	Tritium	1/31/2012	26800	pCi/L	351			F
0601	Parcels 6-7-8	Tritium	1/31/2012	26400	pCi/L	306			D
0601	Parcels 6-7-8	Tritium	4/25/2012	49200	pCi/L	315			F
0601	Parcels 6-7-8	Tritium	4/25/2012	48200	pCi/L	307			D
0601	Parcels 6-7-8	Tritium	7/24/2012	53200	pCi/L	318			F
0601	Parcels 6-7-8	Turbidity	4/25/2012	25	NTU				F
0601	Parcels 6-7-8	Turbidity	7/24/2012	22.1	NTU				F
0601	Parcels 6-7-8	Turbidity	10/25/2012	4.97	NTU				F
0601	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U		F
0601	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U		D
0601	Parcels 6-7-8	Vinyl chloride	4/25/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	Vinyl chloride	4/25/2012	0.16	ug/L	0.16	U		D
0601	Parcels 6-7-8	Vinyl chloride	7/24/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	Vinyl chloride	10/25/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	Vinyl chloride	10/25/2012	0.16	ug/L	0.16	U		D
0601	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	0.47	ug/L	0.1	J		F
0601	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	0.48	ug/L	0.1	J		D
0601	Parcels 6-7-8	cis-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	cis-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U		D
0601	Parcels 6-7-8	cis-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	cis-1,2-Dichloroethene	10/25/2012	0.94	ug/L	0.16	J		F
0601	Parcels 6-7-8	cis-1,2-Dichloroethene	10/25/2012	0.92	ug/L	0.16	J		D
0601	Parcels 6-7-8	pH	1/31/2012	6.74	s.u.				F
0601	Parcels 6-7-8	pH	4/25/2012	7.9	s.u.				F
0601	Parcels 6-7-8	pH	7/24/2012	8	s.u.				F

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0601	Parcels 6-7-8	pH	10/25/2012	7.17	s.u.				F
0601	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U		F
0601	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U		D
0601	Parcels 6-7-8	trans-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	trans-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U		D
0601	Parcels 6-7-8	trans-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	trans-1,2-Dichloroethene	10/25/2012	0.16	ug/L	0.16	U		F
0601	Parcels 6-7-8	trans-1,2-Dichloroethene	10/25/2012	0.16	ug/L	0.16	U		D
0602	Parcels 6-7-8	Dissolved Oxygen	1/31/2012	7.38	mg/L				F
0602	Parcels 6-7-8	Oxidation Reduction Potential	1/31/2012	210	mV				F
0602	Parcels 6-7-8	Specific Conductance	1/31/2012	1349	umhos/cm				F
0602	Parcels 6-7-8	Tetrachloroethene	1/31/2012	0.2	ug/L	0.2	U		F
0602	Parcels 6-7-8	Trichloroethene	1/31/2012	22.2	ug/L	0.11			F
0602	Parcels 6-7-8	Tritium	1/31/2012	8120	pCi/L	304			F
0602	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U		F
0602	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	14.9	ug/L	0.1			F
0602	Parcels 6-7-8	pH	1/31/2012	6.76	s.u.				F
0602	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.34	ug/L	0.2	J		F
0605	Parcels 6-7-8	Dissolved Oxygen	1/31/2012	8.23	mg/L				F
0605	Parcels 6-7-8	Dissolved Oxygen	4/25/2012	10.5	mg/L				F
0605	Parcels 6-7-8	Dissolved Oxygen	10/25/2012	7.92	mg/L				F
0605	Parcels 6-7-8	Oxidation Reduction Potential	1/31/2012	56.9	mV				F
0605	Parcels 6-7-8	Oxidation Reduction Potential	4/25/2012	140.2	mV				F
0605	Parcels 6-7-8	Oxidation Reduction Potential	10/25/2012	33.1	mV				F
0605	Parcels 6-7-8	Specific Conductance	1/31/2012	1614	umhos/cm				F
0605	Parcels 6-7-8	Specific Conductance	4/25/2012	2085	umhos/cm				F
0605	Parcels 6-7-8	Specific Conductance	10/25/2012	1782	umhos/cm				F
0605	Parcels 6-7-8	Tetrachloroethene	1/31/2012	0.23	ug/L	0.2	J		F
0605	Parcels 6-7-8	Tetrachloroethene	4/25/2012	0.16	ug/L	0.16	U		F
0605	Parcels 6-7-8	Tetrachloroethene	10/25/2012	0.2	ug/L	0.16	J		F
0605	Parcels 6-7-8	Trichloroethene	1/31/2012	9.16	ug/L	0.11			F
0605	Parcels 6-7-8	Trichloroethene	4/25/2012	15.4	ug/L	0.16			F
0605	Parcels 6-7-8	Trichloroethene	10/25/2012	19.8	ug/L	0.16			F
0605	Parcels 6-7-8	Tritium	1/31/2012	7820	pCi/L	306			F
0605	Parcels 6-7-8	Tritium	4/25/2012	12000	pCi/L	311			F
0605	Parcels 6-7-8	Turbidity	4/25/2012	214	NTU				F
0605	Parcels 6-7-8	Turbidity	10/25/2012	289	NTU				F
0605	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U		F
0605	Parcels 6-7-8	Vinyl chloride	4/25/2012	0.16	ug/L	0.16	U		F
0605	Parcels 6-7-8	Vinyl chloride	10/25/2012	0.16	ug/L	0.16	U		F
0605	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	2.39	ug/L	0.1			F
0605	Parcels 6-7-8	cis-1,2-Dichloroethene	4/25/2012	1.41	ug/L	0.16			F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0605	Parcels 6-7-8	cis-1,2-Dichloroethene	10/25/2012	2.47	ug/L	0.16			F
0605	Parcels 6-7-8	pH	1/31/2012	6.8	s.u.				F
0605	Parcels 6-7-8	pH	4/25/2012	7.17	s.u.				F
0605	Parcels 6-7-8	pH	10/25/2012	7.64	s.u.				F
0605	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U		F
0605	Parcels 6-7-8	trans-1,2-Dichloroethene	4/25/2012	0.23	ug/L	0.16	J		F
0605	Parcels 6-7-8	trans-1,2-Dichloroethene	10/25/2012	0.47	ug/L	0.16	J		F
0606	Parcels 6-7-8	Dissolved Oxygen	1/31/2012	10.35	mg/L				F
0606	Parcels 6-7-8	Dissolved Oxygen	4/25/2012	10.44	mg/L				F
0606	Parcels 6-7-8	Dissolved Oxygen	7/24/2012	7.53	mg/L				F
0606	Parcels 6-7-8	Dissolved Oxygen	10/25/2012	8.17	mg/L				F
0606	Parcels 6-7-8	Oxidation Reduction Potential	1/31/2012	176	mV				F
0606	Parcels 6-7-8	Oxidation Reduction Potential	4/25/2012	175.2	mV				F
0606	Parcels 6-7-8	Oxidation Reduction Potential	7/24/2012	92.5	mV				F
0606	Parcels 6-7-8	Oxidation Reduction Potential	10/25/2012	48	mV				F
0606	Parcels 6-7-8	Specific Conductance	1/31/2012	932	umhos/cm				F
0606	Parcels 6-7-8	Specific Conductance	4/25/2012	1833	umhos/cm				F
0606	Parcels 6-7-8	Specific Conductance	7/24/2012	2014	umhos/cm				F
0606	Parcels 6-7-8	Specific Conductance	10/25/2012	1883	umhos/cm				F
0606	Parcels 6-7-8	Tetrachloroethene	1/31/2012	0.2	ug/L	0.2	U		F
0606	Parcels 6-7-8	Tetrachloroethene	4/25/2012	0.16	ug/L	0.16	U		F
0606	Parcels 6-7-8	Tetrachloroethene	7/24/2012	0.16	ug/L	0.16	U		F
0606	Parcels 6-7-8	Tetrachloroethene	10/25/2012	0.16	ug/L	0.16	U		F
0606	Parcels 6-7-8	Trichloroethene	1/31/2012	0.56	ug/L	0.11	J		F
0606	Parcels 6-7-8	Trichloroethene	4/25/2012	5.34	ug/L	0.16			F
0606	Parcels 6-7-8	Trichloroethene	7/24/2012	6.98	ug/L	0.16			F
0606	Parcels 6-7-8	Trichloroethene	10/25/2012	9.01	ug/L	0.16			F
0606	Parcels 6-7-8	Tritium	1/31/2012	3640	pCi/L	353			F
0606	Parcels 6-7-8	Tritium	4/25/2012	8440	pCi/L	309			F
0606	Parcels 6-7-8	Tritium	7/24/2012	8860	pCi/L	315			F
0606	Parcels 6-7-8	Turbidity	4/25/2012	203	NTU				F
0606	Parcels 6-7-8	Turbidity	7/24/2012	28.4	NTU				F
0606	Parcels 6-7-8	Turbidity	10/25/2012	135	NTU				F
0606	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U		F
0606	Parcels 6-7-8	Vinyl chloride	4/25/2012	0.16	ug/L	0.16	U		F
0606	Parcels 6-7-8	Vinyl chloride	7/24/2012	0.16	ug/L	0.16	U		F
0606	Parcels 6-7-8	Vinyl chloride	10/25/2012	0.16	ug/L	0.16	U		F
0606	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	0.1	ug/L	0.1	U		F
0606	Parcels 6-7-8	cis-1,2-Dichloroethene	4/25/2012	0.65	ug/L	0.16	J		F
0606	Parcels 6-7-8	cis-1,2-Dichloroethene	7/24/2012	1.14	ug/L	0.16			F
0606	Parcels 6-7-8	cis-1,2-Dichloroethene	10/25/2012	0.84	ug/L	0.16	J		F
0606	Parcels 6-7-8	pH	1/31/2012	6.88	s.u.				F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0606	Parcels 6-7-8	pH	4/25/2012	7.05	s.u.				F
0606	Parcels 6-7-8	pH	7/24/2012	7.38	s.u.				F
0606	Parcels 6-7-8	pH	10/25/2012	7.04	s.u.				F
0606	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U		F
0606	Parcels 6-7-8	trans-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U		F
0606	Parcels 6-7-8	trans-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U		F
0606	Parcels 6-7-8	trans-1,2-Dichloroethene	10/25/2012	0.16	ug/L	0.16	U		F
0607	Parcels 6-7-8	Dissolved Oxygen	1/31/2012	6.28	mg/L				F
0607	Parcels 6-7-8	Dissolved Oxygen	4/25/2012	8.02	mg/L				F
0607	Parcels 6-7-8	Dissolved Oxygen	7/24/2012	9.98	mg/L				F
0607	Parcels 6-7-8	Dissolved Oxygen	10/25/2012	8.41	mg/L				F
0607	Parcels 6-7-8	Oxidation Reduction Potential	1/31/2012	228.7	mV				F
0607	Parcels 6-7-8	Oxidation Reduction Potential	4/25/2012	208.9	mV				F
0607	Parcels 6-7-8	Oxidation Reduction Potential	7/24/2012	109.7	mV				F
0607	Parcels 6-7-8	Oxidation Reduction Potential	10/25/2012	55.1	mV				F
0607	Parcels 6-7-8	Specific Conductance	1/31/2012	1488	umhos/cm				F
0607	Parcels 6-7-8	Specific Conductance	4/25/2012	1634	umhos/cm				F
0607	Parcels 6-7-8	Specific Conductance	7/24/2012	1916	umhos/cm				F
0607	Parcels 6-7-8	Specific Conductance	10/25/2012	1629	umhos/cm				F
0607	Parcels 6-7-8	Tetrachloroethene	1/31/2012	0.2	ug/L	0.2	U		F
0607	Parcels 6-7-8	Tetrachloroethene	4/25/2012	0.16	ug/L	0.16	U		F
0607	Parcels 6-7-8	Tetrachloroethene	7/24/2012	0.16	ug/L	0.16	U		F
0607	Parcels 6-7-8	Tetrachloroethene	7/24/2012	0.16	ug/L	0.16	U		D
0607	Parcels 6-7-8	Tetrachloroethene	10/25/2012	0.17	ug/L	0.16	J		F
0607	Parcels 6-7-8	Trichloroethene	1/31/2012	3.46	ug/L	0.11			F
0607	Parcels 6-7-8	Trichloroethene	4/25/2012	9.95	ug/L	0.16			F
0607	Parcels 6-7-8	Trichloroethene	7/24/2012	5.05	ug/L	0.16			F
0607	Parcels 6-7-8	Trichloroethene	7/24/2012	4.9	ug/L	0.16			D
0607	Parcels 6-7-8	Trichloroethene	10/25/2012	7.45	ug/L	0.16			F
0607	Parcels 6-7-8	Tritium	1/31/2012	3430	pCi/L	307			F
0607	Parcels 6-7-8	Tritium	4/25/2012	5170	pCi/L	314			F
0607	Parcels 6-7-8	Tritium	7/24/2012	6120	pCi/L	413			F
0607	Parcels 6-7-8	Tritium	7/24/2012	6220	pCi/L	324			D
0607	Parcels 6-7-8	Turbidity	4/25/2012	53	NTU				F
0607	Parcels 6-7-8	Turbidity	7/24/2012	97.8	NTU				F
0607	Parcels 6-7-8	Turbidity	10/25/2012	209	NTU				F
0607	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U		F
0607	Parcels 6-7-8	Vinyl chloride	4/25/2012	0.16	ug/L	0.16	U		F
0607	Parcels 6-7-8	Vinyl chloride	7/24/2012	0.16	ug/L	0.16	U		F
0607	Parcels 6-7-8	Vinyl chloride	7/24/2012	0.16	ug/L	0.16	U		D
0607	Parcels 6-7-8	Vinyl chloride	10/25/2012	0.16	ug/L	0.16	U		F
0607	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	0.4	ug/L	0.1	J		F

Sample ID	Area	Analyte	Sample Date	Value	Units	DL	Lab Qualifiers	Validation Qualifiers	Sample Type
0607	Parcels 6-7-8	cis-1,2-Dichloroethene	4/25/2012	0.93	ug/L	0.16	J		F
0607	Parcels 6-7-8	cis-1,2-Dichloroethene	7/24/2012	0.7	ug/L	0.16	J		F
0607	Parcels 6-7-8	cis-1,2-Dichloroethene	7/24/2012	0.66	ug/L	0.16	J		D
0607	Parcels 6-7-8	cis-1,2-Dichloroethene	10/25/2012	0.69	ug/L	0.16	J		F
0607	Parcels 6-7-8	pH	1/31/2012	6.88	s.u.				F
0607	Parcels 6-7-8	pH	4/25/2012	5.9	s.u.				F
0607	Parcels 6-7-8	pH	7/24/2012	6.83	s.u.				F
0607	Parcels 6-7-8	pH	10/25/2012	6.55	s.u.				F
0607	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U		F
0607	Parcels 6-7-8	trans-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U		F
0607	Parcels 6-7-8	trans-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U		F
0607	Parcels 6-7-8	trans-1,2-Dichloroethene	7/24/2012	0.16	ug/L	0.16	U		D
0607	Parcels 6-7-8	trans-1,2-Dichloroethene	10/25/2012	0.16	ug/L	0.16	U		F
0608	Parcels 6-7-8	Dissolved Oxygen	1/31/2012	12.71	mg/L				F
0608	Parcels 6-7-8	Dissolved Oxygen	4/25/2012	10.38	mg/L				F
0608	Parcels 6-7-8	Oxidation Reduction Potential	1/31/2012	147.1	mV				F
0608	Parcels 6-7-8	Oxidation Reduction Potential	4/25/2012	59.8	mV				F
0608	Parcels 6-7-8	Specific Conductance	1/31/2012	1813	umhos/cm				F
0608	Parcels 6-7-8	Specific Conductance	4/25/2012	1919	umhos/cm				F
0608	Parcels 6-7-8	Tetrachloroethene	1/31/2012	0.2	ug/L	0.2	U		F
0608	Parcels 6-7-8	Tetrachloroethene	4/25/2012	0.16	ug/L	0.16	U		F
0608	Parcels 6-7-8	Trichloroethene	1/31/2012	1.34	ug/L	0.11			F
0608	Parcels 6-7-8	Trichloroethene	4/25/2012	1.68	ug/L	0.16			F
0608	Parcels 6-7-8	Tritium	1/31/2012	8660	pCi/L	352			F
0608	Parcels 6-7-8	Tritium	4/25/2012	9220	pCi/L	303			F
0608	Parcels 6-7-8	Turbidity	4/25/2012	341	NTU				F
0608	Parcels 6-7-8	Vinyl chloride	1/31/2012	0.2	ug/L	0.2	U		F
0608	Parcels 6-7-8	Vinyl chloride	4/25/2012	0.16	ug/L	0.16	U		F
0608	Parcels 6-7-8	cis-1,2-Dichloroethene	1/31/2012	0.1	ug/L	0.1	U		F
0608	Parcels 6-7-8	cis-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U		F
0608	Parcels 6-7-8	pH	1/31/2012	7.72	s.u.				F
0608	Parcels 6-7-8	pH	4/25/2012	7.48	s.u.				F
0608	Parcels 6-7-8	trans-1,2-Dichloroethene	1/31/2012	0.2	ug/L	0.2	U		F
0608	Parcels 6-7-8	trans-1,2-Dichloroethene	4/25/2012	0.16	ug/L	0.16	U		F

LAB QUALIFIERS:

*	Replicate analysis not within control limits.
>	Result above upper detection limit.
A	TIC is a suspected aldol-condensation product.
B	Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
C	Pesticide result confirmed by GC-MS.
D	Analyte determined in diluted sample.
E	Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
H	Holding time expired, value suspect.
I	Increased detection limit due to required dilution.
J	Estimated
N	Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
P	> 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
U	Analytical result below detection limit.
W	Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X,Y,Z	Laboratory defined qualifier, see case narrative.

DATA QUALIFIERS:

F	Low flow sampling method used.	G	Possible grout contamination, pH > 9.	J	Estimated value.
L	Less than 3 bore volumes purged prior to sampling.	Q	Qualitative result due to sampling technique.	R	Unusable result.
U	Parameter analyzed for but was not detected.	X	Location is undefined.		

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Appendix E

Data Assessment Reports

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U.S. DEPARTMENT OF ENERGY | Legacy Management

Data Review and Validation Report

General Information

Requisition No. (RIN):	12014324
Sample Event:	January 30–31, 2012
Site(s):	Mound, Ohio; Groundwater
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	295204
Analysis:	Chloride, Metals, Radiochemistry, Volatiles
Validator:	Steve Donivan
Review Date:	May 30, 2012

This validation was performed according to the *Environmental Procedures Catalog* (LMS/PRO/S04325), *"Standard Practice for Validation of Laboratory Data."* The procedure was applied at Level 2, Data Deliverables Verification. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Barium, Sodium	LMM-01	SW-846 3005	SW-846 6010B
Chloride	WCH-A-011	EPA 300.0	EPA 300.0
Radium-226	GPC-A-018	EPA 903.1 Mod	EPA 903.1 Mod
Radium-228	GPC-A-020	EPA 904.0 Mod	EPA 904.0 Mod
Volatile Organics, VOA	VOA-A-007	SW-846 5030B	SW-846 8260B

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
295204003	0402	Radium-228	J	Less than the Determination Limit
295204004	0411	Toluene	U	Less than 10 times the method blank
295204005	0443	Toluene	U	Less than 10 times the method blank
295204007	0445	Toluene	U	Less than 10 times the method blank
295204010	P033	Radium-228	J	Less than the Determination Limit
295204011	P033 Duplicate	Radium-228	J	Less than the Determination Limit

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 11 water samples on February 2, 2012, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions. The air waybill number was listed on the receiving documentation.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler of 3 °C which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. Sample analysis was completed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all metal, organic, and wet chemical analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), Decision Level Concentration (DLC), and Determination Limit (DL). The MDC is a measure of radiochemical method performance and was calculated and reported as specified in *Quality Systems for Analytical Services*. The DLC is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, and is estimated as 3 times the one-sigma total propagated uncertainty. Results that are greater than the MDC, but less than the DLC are qualified with a "U" flag (not detected). The DL for radiochemical results is the lowest concentration that can be reliably measured, and is defined as 3 times the MDC. Results not previously "U" qualified that are less than the DL are qualified with a "J" flag as estimated values.

The reported MDLs for all metal, organic, and wet chemical analytes; and MDCs for radiochemical analytes demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear curve. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods.

Volatiles Internal Standards and Surrogates

The volatile internal standard recoveries and surrogate recoveries were within the acceptance ranges for all samples.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All method blank results associated with the samples were below the method detection limits with the following exception. 1,2,3-Trichlorobenzene was detected in the VOA blank. 1,2,3-Trichlorobenzene was not detected in any of the associated samples.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than four times the spike concentration. The spike recoveries met the recovery and precision criteria for all analytes evaluated.

Laboratory Replicate Analysis

The relative percent difference (RPD) values for the sample duplicates, LCSD, and MSD sample results for all analytes were less than 20 percent indicating acceptable precision. The radiochemical relative error ratio (calculated using the one-sigma total propagated uncertainty) was less than three for all duplicates, indicating acceptable precision.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable for analytes.

Trip Blank

A trip blank was collected to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples. Toluene was detected in the trip blank. Sample results for toluene that are greater than

the method detection limit but less than ten times the blank concentration are qualified with a "U" flag as not detected.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates which measure only laboratory performance. A duplicate sample was collected from location P033. The radiochemical duplicate results were acceptable with relative error ratios (calculated using the 1-sigma total propagated uncertainty) of less than three indicating acceptable precision. The non-radiochemical duplicate results met the acceptance criteria of having a relative percent difference of less than 20 percent for results that are greater than five times the practical quantitation limit or for results that are less than the PQL, a range no greater than the PQL.

Detection Limits/Dilutions

Samples were diluted in a consistent and acceptable manner when required. The required detection limits were met for all analytes.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

Electronic Data Deliverable File

The EDD file arrived on March 2, 2012. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Sampling Protocol

Sample results for all monitoring wells met the Category I or III low-flow sampling criteria and were qualified with an "F" flag in the database, indicating the wells were purged and sampled using the low-flow sampling method. Sample results from wells 0353, 0411, 0443, 0444, and 0445 were further qualified with a "Q" flag because these wells were classified as Category III.

Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not "fit" with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. Identify extreme values that may be potential outliers by generating the Outliers Report using the Sample Management System from data in the SEEPro database. The application compares the new data set with historical data and lists all new data that fall outside the historical data range. Data listed in the report are highlighted if the concentration detected is not within 50 percent of historical minimum or maximum values. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.
2. Apply the appropriate statistical test. Dixon's Extreme Value test is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.
3. Scientifically review statistical outliers and decide on their disposition.

There were no potential outliers identified and the data from this sampling event are acceptable as qualified.

Report Prepared By: _____

Steve Donivan
Laboratory Coordinator

Data Validation Outliers Report - No Field Parameters
Comparison: All historical Data Beginning 1/1/1996
Laboratory: GEL Laboratories
RIN: 12014324
Report Date: 5/30/2012

					Current			Historical Maximum			Historical Minimum			Number of Data Points		Statistical Outlier
						Qualifiers			Qualifiers			Qualifiers				
Site Code	Location Code	Sample ID	Sample Date	Analyte	Result	Lab	Data	Result	Lab	Data	Result	Lab	Data	N	N Below Detect	
MND01	0443	N001	01/30/2012	Trichloroethene	14			12.3			2.2			34	0	No

Data Validation Outliers Report - Field Parameters Only
Comparison: All historical Data Beginning 1/1/1996
Laboratory: Field Measurements
RIN: 12014324
Report Date: 5/30/2012

					Current			Historical Maximum			Historical Minimum			Number of Data Points		Statistical Outlier
						Qualifiers			Qualifiers			Qualifiers				
Site Code	Location Code	Sample ID	Sample Date	Analyte	Result	Lab	Data	Result	Lab	Data	Result	Lab	Data	N	N Below Detect	
MND01	0353	N001	01/30/2012	Specific Conductance	1.369			2057			996			41	0	Yes
MND01	0402	N001	01/30/2012	pH	6.52			7.46			6.62		FJ	50	0	No
MND01	0411	N001	01/30/2012	Specific Conductance	1.502			2088			1034			48	0	Yes
MND01	0443	N001	01/30/2012	Specific Conductance	1212			1809			1368			34	0	No
MND01	0444	N001	01/30/2012	Specific Conductance	1.284			1583			914			29	0	Yes
MND01	0445	N001	01/30/2012	Turbidity	1.7			102			2.19			36	0	No
MND01	0617	N001	01/31/2012	Oxidation Reduction Potential	385			210.3			-113.4			16	0	No
MND01	0617	N001	01/31/2012	pH	4.44			7.91			5.86			33	0	No

STATISTICAL TESTS:
The distribution of the data is tested for normality or lognormality using the Shapiro-Wilk Test
Outliers are identified using Dixon's Test when there are 25 or fewer data points.
Outliers are identified using Rosner's Test when there are 26 or more data points.
See Data Quality Assessment: Statistical Methods for Practitioners, EPA QC/G-9S, February 2006.

STATISTICAL TESTS:
The distribution of the data is tested for normality or lognormality using the Shapiro-Wilk Test
Outliers are identified using Dixon's Test when there are 25 or fewer data points.
Outliers are identified using Rosner's Test when there are 26 or more data points.
See Data Quality Assessment: Statistical Methods for Practitioners, EPA QC/G-9S, February 2006.

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 12014324 **Lab Code:** GEN **Validator:** Steve Donivan **Validation Date:** 5/30/2012

Project: Mound LTS&M Ground Water **Analysis Type:** ☑ Metals ☑ General Chem ☑ Rad ☑ Organics

# of Samples: 11 **Matrix:** Water **Requested Analysis Completed:** Yes

Chain of Custody

Present: OK **Signed:** OK **Dated:** OK

Sample

Integrity: OK **Preservation:** OK **Temperature:** OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	The reported detection limits are equal to or below contract requirements.
☑ Field/Trip Blanks	There was 1 trip/equipment blank evaluated.
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12014324 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 5/30/2012

Duplicate: P933 **Sample:** P033

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
1,1,1,2-Tetrachloroethane	0.200	U		1.00	0.200	U		1.00			ug/L
1,1,1-Trichloroethane	0.200	U		1.00	0.200	U		1.00			ug/L
1,1,2,2-Tetrachloroethane	0.150	U		1.00	0.150	U		1.00			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	0.500	U		1.00	0.500	U		1.00			ug/L
1,1,2-Trichloroethane	0.250	U		1.00	0.250	U		1.00			ug/L
1,1-Dichloroethane	0.200	U		1.00	0.200	U		1.00			ug/L
1,1-Dichloroethene	0.100	U		1.00	0.100	U		1.00			ug/L
1,1-Dichloropropene	0.250	U		1.00	0.250	U		1.00			ug/L
1,2,3-Trichlorobenzene	0.100	U		1.00	0.100	U		1.00			ug/L
1,2,3-Trichloropropane	0.200	U		1.00	0.200	U		1.00			ug/L
1,2,4-Trichlorobenzene	0.250	U		1.00	0.250	U		1.00			ug/L
1,2,4-Trimethylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
1,2-Dibromo-3-chloropropane	0.250	U		1.00	0.250	U		1.00			ug/L
1,2-Dibromoethane	0.200	U		1.00	0.200	U		1.00			ug/L
1,2-Dichlorobenzene	0.200	U		1.00	0.200	U		1.00			ug/L
1,2-Dichloroethane	0.250	U		1.00	0.250	U		1.00			ug/L
1,2-Dichloropropane	0.200	U		1.00	0.200	U		1.00			ug/L
1,3,5-Trimethylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
1,3-Dichlorobenzene	0.100	U		1.00	0.100	U		1.00			ug/L
1,3-Dichloropropane	0.250	U		1.00	0.250	U		1.00			ug/L
1,4-Dichlorobenzene	0.100	U		1.00	0.100	U		1.00			ug/L
2,2-Dichloropropane	0.250	U		1.00	0.250	U		1.00			ug/L
2-Butanone	0.500	U		1.00	0.500	U		1.00			ug/L
2-Chlorotoluene	0.100	U		1.00	0.100	U		1.00			ug/L
2-Hexanone	0.500	U		1.00	0.500	U		1.00			ug/L
4-Chlorotoluene	0.100	U		1.00	0.100	U		1.00			ug/L
4-Isopropyltoluene	0.100	U		1.00	0.100	U		1.00			ug/L
4-Methyl-2-pentanone	0.500	U		1.00	0.500	U		1.00			ug/L
Acetone	0.500	U		1.00	0.500	U		1.00			ug/L
Barium	115			1.00	115			1.00	0		ug/L
Benzene	0.100	U		1.00	0.100	U		1.00			ug/L
Bromobenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Bromochloromethane	0.200	U		1.00	0.200	U		1.00			ug/L
Bromodichloromethane	0.200	U		1.00	0.200	U		1.00			ug/L
Bromoform	0.250	U		1.00	0.250	U		1.00			ug/L
Bromomethane	0.200	U		1.00	0.200	U		1.00			ug/L
Carbon Disulfide	0.250	U		1.00	0.250	U		1.00			ug/L
Carbon Tetrachloride	0.100	U		1.00	0.100	U		1.00			ug/L
Chloride	175			100.00	176			100.00	0.57		mg/L
Chlorobenzene	0.100	U		1.00	0.100	U		1.00			ug/L

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12014324 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 5/30/2012

Duplicate: P933 **Sample:** P033

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Chloroethane	0.250	U		1.00	0.250	U		1.00			ug/L
Chloroform	0.100	U		1.00	0.100	U		1.00			ug/L
Chloromethane	0.200	U		1.00	0.200	U		1.00			ug/L
cis-1,2-Dichloroethene	0.100	U		1.00	0.100	U		1.00			ug/L
cis-1,3-Dichloropropene	0.250	U		1.00	0.250	U		1.00			ug/L
Dibromochloromethane	0.200	U		1.00	0.200	U		1.00			ug/L
Dibromomethane	0.250	U		1.00	0.250	U		1.00			ug/L
Dichlorodifluoromethane	0.250	U		1.00	0.250	U		1.00			ug/L
Ethylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Hexachlorobutadiene	0.250	U		1.00	0.250	U		1.00			ug/L
Isopropylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Methylene Chloride	0.250	U		1.00	0.250	U		1.00			ug/L
Naphthalene	0.250	U		1.00	0.250	U		1.00			ug/L
n-Butylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
n-Propylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Radium-226	-0.0738	U	0.229	1.00	0.0855	U	0.244	1.00		0.9	pCi/L
Radium-228	0.591		0.380	1.00	0.819		0.527	1.00		0.7	pCi/L
sec-Butylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Sodium	113000			1.00	112000			1.00	0.89		ug/L
Styrene	0.100	U		1.00	0.100	U		1.00			ug/L
tert-Butylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Tetrachloroethene	0.200	U		1.00	0.200	U		1.00			ug/L
Toluene	0.100	U		1.00	0.100	U		1.00			ug/L
Total Xylenes	0.200	U		1.00	0.200	U		1.00			ug/L
trans-1,2-Dichloroethene	0.200	U		1.00	0.200	U		1.00			ug/L
trans-1,3-Dichloropropene	0.250	U		1.00	0.250	U		1.00			ug/L
Trichloroethene	0.110	U		1.00	0.110	U		1.00			ug/L
Trichlorofluoromethane	0.200	U		1.00	0.200	U		1.00			ug/L
Vinyl Chloride	0.200	U		1.00	0.200	U		1.00			ug/L

SAMPLE MANAGEMENT SYSTEM

Validation Report: Equipment/Trip Blanks

RIN: 12014324 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 5/30/2012

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Trip Blank	295204009	EPA 8260 Low Level	Toluene (Lab Contaminant)	0.110	J	0.100	ug/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
295204001	KCU 956	0353	1.18	1.00		
295204002	KCU 958	0400	0.100	1.00	U	
295204003	KCU 957	0402	0.100	1.00	U	
295204004	KCU 959	0411	0.710	1.00	J	U
295204005	KCU 963	0443	0.170	1.00	J	U
295204006	KCU 964	0444	0.100	1.00	U	
295204007	KCU 965	0445	0.220	1.00	J	U
295204008	KCU 966	0617	0.100	1.00	U	
295204010	KCU 962	P033	0.100	1.00	U	
295204011	KCU 961	P933	0.100	1.00	U	

SAMPLE MANAGEMENT SYSTEM

Organics Data Validation Summary

RIN: 12014324 **Project:** Mound LTS&M Ground Water **Lab Code:** GEN **Validation Date:** 5/30/2012

LCS Recovery: All LCS recoveries were within the laboratory acceptance limits.

Method Blank(s): There was 1 method blank result above the MDL.

MS/MSD Recovery: All MS/MSD recoveries were within the laboratory acceptance limits.

Surrogate Recovery: All surrogate recoveries were within the laboratory acceptance limits.

SAMPLE MANAGEMENT SYSTEM

Non-Compliance Report: Method Blanks

RIN: 12014324 **Lab Code:** GEN

Project: Mound LTS&M Ground Water

Validation Date: 5/30/2012

Method Blank	Date Analyzed	Method	Analyte	Result	Flag(s)	MDL
1202593390	2/7/2012	EPA 8260 Low Level	1,2,3-Trichlorobenzene	0.13	J	0.10

SAMPLE MANAGEMENT SYSTEM

Metals Data Validation Worksheet

RIN: 12014324 **Lab Code:** GEN **Date Due:** 3/1/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 3/2/2012

Analyte	Method Type	Date Analyzed	CALIBRATION						Method Blank	LCS %R	MS %R	MSD %R	Dup. RPD	ICSAB %R	Serial Dil. %R	CRI %R
			Int.	R^2	ICV	CCV	ICB	CCB								
Barium	ICP/ES	02/09/2012			OK	OK	OK	OK	OK	96.9	95.9		0.0	102.0	0.5	101.0
Sodium	ICP/ES	02/09/2012			OK	OK	OK	OK	OK	97.4			2.0	111.0	1.5	98.0

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 12014324 **Lab Code:** GEN **Date Due:** 3/1/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 3/2/2012

Analyte	Date Analyzed	CALIBRATION						Method	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	ICV	CCV	ICB	CCB	Blank					
Chloride	02/02/2012			OK	OK	OK	OK	OK	96.80				
Chloride	02/04/2012									95.5		0	

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U.S. DEPARTMENT OF ENERGY | Legacy Management

Data Review and Validation Report

General Information

Requisition No. (RIN):	12014325
Sample Event:	January 31–February 1, 2012
Site(s):	Mound, Ohio; Groundwater
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	295299
Analysis:	Radiochemistry, Volatiles
Validator:	Steve Donivan
Review Date:	May 31, 2012

This validation was performed according to the *Environmental Procedures Catalog* (LMS/PRO/S04325), *"Standard Practice for Validation of Laboratory Data."* The procedure was applied at Level 2, Data Deliverables Verification. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Radium-226	GPC-A-018	EPA 903.1 Mod	EPA 903.1 Mod
Radium-228	GPC-A-020	EPA 904.0 Mod	EPA 904.0 Mod
Strontium-90	GPC-A-009	EPA 905.0 Mod	EPA 905.0 Mod
Tritium	LSC-A-001	EPA 906.0 Mod	EPA 906.0 Mod
Volatile Organics, VOA	VOA-A-007	SW-846 5030B	SW-846 8260B

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
295299002	0386	Toluene	U	Less than 10 times the trip blank
295299004	0601 duplicate	Radium-226	J	Less than the Determination Limit
295299004	0601 duplicate	Radium-228	J	Less than the Determination Limit
295299011	0379	Toluene	U	Less than 10 times the trip blank
295299019	0601	Strontium-90	J	Less than the Determination Limit

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 22 water samples on February 3, 2012, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions. The air waybill number was listed on the receiving documentation.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler of 2 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. Sample analysis was completed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all organic analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), Decision Level Concentration (DLC), and Determination Limit (DL). The MDC is a measure of radiochemical method performance and was calculated and reported as specified in *Quality Systems for Analytical Services*. The DLC is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, and is estimated as 3 times the one-sigma total propagated uncertainty. Results that are greater than the MDC, but less than the DLC are qualified with a “U” flag (not detected). The DL for radiochemical results is the lowest concentration that can be reliably measured, and is defined as three times the MDC. Results not previously “U” qualified that are less than the DL are qualified with a “J” flag as estimated values.

The reported MDLs for all organic analytes; and MDCs for radiochemical analytes demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. All calibration and laboratory spike standards were prepared from independent sources.

Volatiles Internal Standards and Surrogates

The volatile internal standard recoveries and surrogate recoveries were within the acceptance ranges for all samples.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. The method blank results were below the practical quantitation limits. Methylene chloride and 1,2,3-trichlorobenzene were detected in a some of the VOA method blanks. These compounds were not detected in any of the associated field samples. The radiochemistry method blank results were less than the Decision Level Concentration.

Trip Blank

A trip blank was collected to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples. Toluene was detected in the trip blank. Sample results for toluene that are less than ten times the trip blank concentration are qualified with a “U” flag as not detected.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than four times the spike. The spike recoveries met the acceptance criteria for all analytes evaluated.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for organic replicate results were less than the laboratory-derived control limits, demonstrating acceptable laboratory precision. The relative error ratio for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) was less than 3, indicating acceptable precision.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. The relative percent difference for duplicate results that are greater than five times the practical quantitation limit (PQL) should be less than 20 percent. For results that are less than five times the PQL, the range should be no greater than the PQL. Duplicate samples were collected from location 0601 (field duplicate ID 9601). The non-radiochemical duplicate results met the criteria, demonstrating acceptable overall precision. The relative error ratio for radiochemical duplicate results (calculated using the 1-sigma total propagated uncertainty) was less than 3, indicating acceptable precision.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

Electronic Data Deliverable File

The EDD file arrived on March 3, 2012. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Sampling Protocol

Sample results for all monitoring wells met the Category I low-flow sampling criteria and were qualified with an “F” flag in the database, indicating the wells were purged and sampled using the low-flow sampling method. The pH criteria for well 0301 and the turbidity criteria for well 0315 were not met. The field data and laboratory results from these wells are further qualified with a “J” flag because Category I purging criteria were not met.

Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not "fit" with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. Identify extreme values that may be potential outliers by generating the Outliers Report using the Sample Management System from data in the SEEPro database. The application compares the new data set with historical data and lists all new data that fall outside the historical data range. Data listed in the report are highlighted if the concentration detected is not within 50 percent of historical minimum or maximum values. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.
2. Apply the appropriate statistical test. Dixon's Extreme Value test is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.
3. Scientifically review statistical outliers and decide on their disposition.

No results from this sampling event were identified as potential outliers.

Report Prepared By: _____

Steve Donivan
Laboratory Coordinator

Data Validation Outliers Report - Field Parameters Only
Comparison: All Historical Data
Laboratory: Field Measurements
RIN: 12014325
Report Date: 5/31/2012

					Current			Historical Maximum			Historical Minimum			Number of Data Points		Statistical Outlier
						Qualifiers			Qualifiers			Qualifiers				
Site Code	Location Code	Sample ID	Sample Date	Analyte	Result	Lab	Data	Result	Lab	Data	Result	Lab	Data	N	N Below Detect	
MND01	0124	N001	01/31/2012	Dissolved Oxygen	4.89			3.98		F	0.13			33	0	No
MND01	0301	N001	01/31/2012	Turbidity	1.21			1000	>		1.58			27	0	No
MND01	0606	N001	01/31/2012	Oxidation Reduction Potential	176			144.9			41.7			7	0	No

STATISTICAL TESTS:
The distribution of the data is tested for normality or lognormality using the Shapiro-Wilk Test
Outliers are identified using Dixon's Test when there are 25 or fewer data points.
Outliers are identified using Rosner's Test when there are 26 or more data points.
See Data Quality Assessment: Statistical Methods for Practitioners, EPA QC/G-9S, February 2006.

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 12014325 **Lab Code:** GEN **Validator:** Steve Donivan **Validation Date:** 5/31/2012

Project: Mound LTS&M Ground Water **Analysis Type:** ☐ Metals ☐ General Chem ☑ Rad ☑ Organics

# of Samples: 22 **Matrix:** Water **Requested Analysis Completed:** Yes

Chain of Custody

Present: OK **Signed:** OK **Dated:** OK

Sample

Integrity: OK **Preservation:** OK **Temperature:** OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	The reported detection limits are equal to or below contract requirements.
☑ Field/Trip Blanks	There was 1 trip/equipment blank evaluated.
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Equipment/Trip Blanks

RIN: 12014325 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 5/31/2012

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Trip Blank	295299008	EPA 8260 Low Level	Toluene (Lab Contaminant)	0.120	J	0.100	ug/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
295299001	KCU 967	0138	0.100	1.00	U	
295299002	KCU 968	0386	0.470	1.00	J	U
295299003	KCU 969	0387	0.100	1.00	U	
295299004	KCU 987	9601	0.100	1.00	U	
295299005	KCU 988	0602	0.100	1.00	U	
295299006	KCU 972	0301	0.100	1.00	U	
295299007	KCU 973	0311	0.100	1.00	U	
295299009	KCU 975	0118	0.100	1.00	U	
295299010	KCU 976	0346	0.100	1.00	U	
295299011	KCU 977	0379	0.190	1.00	J	U
295299012	KCU 978	0347	0.100	1.00	U	
295299013	KCU 979	0315	0.100	1.00	U	
295299014	KCU 980	0124	0.100	1.00	U	
295299015	KCU 981	0126	0.100	1.00	U	
295299016	KCU 982	0605	0.100	1.00	U	
295299017	KCU 983	0607	0.100	1.00	U	
295299018	KCU 984	0608	0.100	1.00	U	
295299019	KCU 985	0601	0.100	1.00	U	
295299020	KCU 986	0606	0.100	1.00	U	
295309001	KCU 970	0389	0.100	1.00	U	
295309002	KCU 971	0392	0.100	1.00	U	

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12014325 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 5/31/2012

Duplicate: 9601 **Sample:** 0601

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
1,1,1,2-Tetrachloroethane	0.200	U		1.00	0.200	U		1.00			ug/L
1,1,1-Trichloroethane	0.200	U		1.00	0.200	U		1.00			ug/L
1,1,2,2-Tetrachloroethane	0.150	U		1.00	0.150	U		1.00			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	0.500	U		1.00	0.500	U		1.00			ug/L
1,1,2-Trichloroethane	0.250	U		1.00	0.250	U		1.00			ug/L
1,1-Dichloroethane	0.200	U		1.00	0.200	U		1.00			ug/L
1,1-Dichloroethene	0.100	U		1.00	0.100	U		1.00			ug/L
1,1-Dichloropropene	0.250	U		1.00	0.250	U		1.00			ug/L
1,2,3-Trichlorobenzene	0.100	U		1.00	0.100	U		1.00			ug/L
1,2,3-Trichloropropane	0.200	U		1.00	0.200	U		1.00			ug/L
1,2,4-Trichlorobenzene	0.250	U		1.00	0.250	U		1.00			ug/L
1,2,4-Trimethylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
1,2-Dibromo-3-chloropropane	0.250	U		1.00	0.250	U		1.00			ug/L
1,2-Dibromoethane	0.200	U		1.00	0.200	U		1.00			ug/L
1,2-Dichlorobenzene	0.200	U		1.00	0.200	U		1.00			ug/L
1,2-Dichloroethane	0.250	U		1.00	0.250	U		1.00			ug/L
1,2-Dichloropropane	0.200	U		1.00	0.200	U		1.00			ug/L
1,3,5-Trimethylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
1,3-Dichlorobenzene	0.100	U		1.00	0.100	U		1.00			ug/L
1,3-Dichloropropane	0.250	U		1.00	0.250	U		1.00			ug/L
1,4-Dichlorobenzene	0.100	U		1.00	0.100	U		1.00			ug/L
2,2-Dichloropropane	0.250	U		1.00	0.250	U		1.00			ug/L
2-Butanone	0.500	U		1.00	0.500	U		1.00			ug/L
2-Chlorotoluene	0.100	U		1.00	0.100	U		1.00			ug/L
2-Hexanone	0.500	U		1.00	0.500	U		1.00			ug/L
4-Chlorotoluene	0.100	U		1.00	0.100	U		1.00			ug/L
4-Isopropyltoluene	0.100	U		1.00	0.100	U		1.00			ug/L
4-Methyl-2-pentanone	0.500	U		1.00	0.500	U		1.00			ug/L
Acetone	0.500	U		1.00	0.500	U		1.00			ug/L
Benzene	0.100	U		1.00	0.100	U		1.00			ug/L
Bromobenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Bromochloromethane	0.200	U		1.00	0.200	U		1.00			ug/L
Bromodichloromethane	0.200	U		1.00	0.200	U		1.00			ug/L
Bromoform	0.250	U		1.00	0.250	U		1.00			ug/L
Bromomethane	0.200	U		1.00	0.200	U		1.00			ug/L
Carbon Disulfide	0.250	U		1.00	0.250	U		1.00			ug/L
Carbon Tetrachloride	0.100	U		1.00	0.100	U		1.00			ug/L
Chlorobenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Chloroethane	0.250	U		1.00	0.250	U		1.00			ug/L
Chloroform	0.100	U		1.00	0.100	U		1.00			ug/L

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12014325 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 5/31/2012

Duplicate: 9601 **Sample:** 0601

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Chloromethane	0.200	U		1.00	0.200	U		1.00			ug/L
cis-1,2-Dichloroethene	0.470	J		1.00	0.480	J		1.00			ug/L
cis-1,3-Dichloropropene	0.250	U		1.00	0.250	U		1.00			ug/L
Dibromochloromethane	0.200	U		1.00	0.200	U		1.00			ug/L
Dibromomethane	0.250	U		1.00	0.250	U		1.00			ug/L
Dichlorodifluoromethane	0.250	U		1.00	0.250	U		1.00			ug/L
Ethylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Hexachlorobutadiene	0.250	U		1.00	0.250	U		1.00			ug/L
Isopropylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Methylene Chloride	0.350	J		1.00	0.250	U		1.00			ug/L
Naphthalene	0.250	U		1.00	0.250	U		1.00			ug/L
n-Butylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
n-Propylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Radium-226	0.188	U	0.344	1.00	0.712		0.441	1.00		1.8	pCi/L
Radium-228	0.0551	U	0.329	1.00	0.605		0.377	1.00		2.2	pCi/L
sec-Butylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Strontium-90	0.867		0.344	1.00	0.559	U	0.419	1.00		1.1	pCi/L
Styrene	0.100	U		1.00	0.100	U		1.00			ug/L
tert-Butylbenzene	0.100	U		1.00	0.100	U		1.00			ug/L
Tetrachloroethene	10.2			1.00	10.5			1.00	2.90		ug/L
Toluene	0.100	U		1.00	0.100	U		1.00			ug/L
Total Xylenes	0.200	U		1.00	0.200	U		1.00			ug/L
trans-1,2-Dichloroethene	0.200	U		1.00	0.200	U		1.00			ug/L
trans-1,3-Dichloropropene	0.250	U		1.00	0.250	U		1.00			ug/L
Trichloroethene	4.16			1.00	4.13			1.00	0.72		ug/L
Trichlorofluoromethane	0.200	U		1.00	0.200	U		1.00			ug/L
Tritium	26800		5390	1.00	26400		5300	1.00	1.50	0.1	pCi/L
Vinyl Chloride	0.200	U		1.00	0.200	U		1.00			ug/L

SAMPLE MANAGEMENT SYSTEM
Organics Data Validation Summary

RIN: 12014325 **Project:** Mound LTS&M Ground Water **Lab Code:** GEN **Validation Date:** 5/31/2012

LCS Recovery: All LCS recoveries were within the laboratory acceptance limits.

Method Blank(s): There were 3 method blank results above the MDL.

MS/MSD Recovery: All MS/MSD recoveries were within the laboratory acceptance limits.

Surrogate Recovery: All surrogate recoveries were within the laboratory acceptance limits.

SAMPLE MANAGEMENT SYSTEM

Non-Compliance Report: Method Blanks

RIN: 12014325 **Lab Code:** GEN

Project: Mound LTS&M Ground Water

Validation Date: 5/31/2012

Method Blank	Date Analyzed	Method	Analyte	Result	Flag(s)	MDL
1202593390	2/7/2012	EPA 8260 Low Level	1,2,3-Trichlorobenzene	0.13	J	0.10
1202594444	2/7/2012	EPA 8260 Low Level	1,2,3-Trichlorobenzene	0.13	J	0.10
1202599189	2/10/2012	EPA 8260 Low Level	Methylene Chloride	0.42	J	0.25

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 12014325 **Lab Code:** GEN **Date Due:** 3/2/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 3/2/2012

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate
0601	Radium-226	02/27/2012						0.38
Blank_Spike	Radium-226	02/27/2012				81.90		
0601	Radium-226	02/27/2012					86.8	
Blank	Radium-226	02/27/2012	-0.0375	U				
0601	Radium-228	02/23/2012			83.0			
9601	Radium-228	02/23/2012			92.0			
0601	Radium-228	02/23/2012			84.0			2.60
Blank_Spike	Radium-228	02/23/2012			87.0	102.00		
0601	Radium-228	02/23/2012			77.0		110.0	
Blank	Radium-228	02/23/2012	0.1970	U	85.0			
Blank_Spike	Strontium-90	02/08/2012			86.0	119.00		
0601	Strontium-90	02/08/2012			88.0		96.8	
Blank	Strontium-90	02/08/2012	0.5720	U	88.0			
9601	Strontium-90	02/13/2012			93.0			
0601	Strontium-90	02/14/2012			97.0			
0601	Strontium-90	02/14/2012			91.0			0.16
0601	Tritium	02/23/2012						0.28
Blank_Spike	Tritium	02/23/2012				85.20		
0601	Tritium	02/23/2012					57.2	
Blank	Tritium	02/23/2012	0	U				

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Data Review and Validation Report

General Information

Requisition No. (RIN):	12044492
Sample Event:	April 23–25, 2012
Site(s):	Mound, Ohio; Groundwater
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	30342, 303428
Analysis:	Radiochemistry, Volatiles
Validator:	Steve Donivan
Review Date:	June 13, 2012

This validation was performed according to the *Environmental Procedures Catalog* (LMS/PRO/S04325), *"Standard Practice for Validation of Laboratory Data."* The procedure was applied at Level 2, Data Deliverables Verification. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Radium-226	GPC-A-018	EPA 903.1 Mod	EPA 903.1 Mod
Radium-228	GPC-A-020	EPA 904.0 Mod	EPA 904.0 Mod
Strontium-90	GPC-A-009	EPA 905.0 Mod	EPA 905.0 Mod
Tritium	LSC-A-001	EPA 906.0 Mod	EPA 906.0 Mod
Volatile Organics, VOA	VOA-A-007	SW-846 5030B	SW-846 8260B

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
303425003	0387	All	J	Purge stability criteria not met
303425006	0301	All	J	Purge stability criteria not met
303425008	0601 Duplicate	Strontium-90	J	Less than the Determination Limit
303425013	0315	All	J	Purge stability criteria not met
303425019	0601	Radium-228	U	Less than the Decision Level
303425019	0601	Strontium-90	J	Less than the Determination Limit

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 21 water samples on April 27, 2012, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions. The air waybill number was listed on the receiving documentation.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler of 6 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. Sample analysis was completed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all organic analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), Decision Level Concentration (DLC), and Determination Limit (DL). The MDC is a measure of radiochemical method performance and was calculated and reported as specified in *Quality Systems for Analytical Services*. The DLC is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, and is estimated as 3 times the one-sigma total propagated uncertainty. Results that are greater than the MDC, but less than the DLC are qualified with a “U” flag (not detected). The DL for radiochemical results is the lowest concentration that can be reliably measured, and is defined as three times the MDC. Results not previously “U” qualified that are less than the DL are qualified with a “J” flag as estimated values.

The reported MDLs for all organic analytes; and MDCs for radiochemical analytes demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. All calibration and laboratory spike standards were prepared from independent sources.

Volatiles Internal Standards and Surrogates

The volatile internal standard recoveries and surrogate recoveries were within the acceptance ranges for all samples.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. The method blank results were below the practical quantitation limits. 1,2,3-Trichlorobenzene, 1,2,4-trichlorobenzene, and naphthalene were detected in a some of the VOA method blanks. These compounds were not detected in any of the associated field samples. The radiochemistry method blank results were less than the Decision Level Concentration.

Trip Blank

A trip blank was collected to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples. 2-Butanone was detected in the trip blank. 2-Butanone was not detected in any of the associated samples.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than four times the spike. The spike recoveries met the acceptance criteria for all analytes evaluated with the exception of 1,2-dichlorobenzene, dibromochloromethane, and hexachlorobutadiene. None of these analytes were detected in the associated samples.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for organic replicate results were less than the laboratory-derived control limits, demonstrating acceptable laboratory precision. The relative error ratio for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) was less than 3, indicating acceptable precision.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. The relative percent difference for duplicate results that are greater than five times the practical quantitation limit (PQL) should be less than 20 percent. For results that are less than five times the PQL, the range should be no greater than the PQL. Duplicate samples were collected from location 0601 (field duplicate ID 9601). The non-radiochemical duplicate results met the criteria, demonstrating acceptable overall precision. The relative error ratio for radiochemical duplicate results (calculated using the 1-sigma total propagated uncertainty) was less than 3, indicating acceptable precision.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

Electronic Data Deliverable File

The EDD file arrived on May 25, 2012. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Sampling Protocol

Sample results for all monitoring wells met the Category I low-flow sampling criteria and were qualified with an “F” flag in the database, indicating the wells were purged and sampled using the low-flow sampling method. The dissolved oxygen, pH, and/or turbidity stability criteria were not met prior to sampling wells 0301, 0315, and 0387. The field data and laboratory results from these wells are further qualified with a “J” flag because Category I purging criteria were not met.

Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not "fit" with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. Identify extreme values that may be potential outliers by generating the Outliers Report using the Sample Management System from data in the SEEPro database. The application compares the new data set with historical data and lists all new data that fall outside the historical data range. Data listed in the report are highlighted if the concentration detected is not within 50 percent of historical minimum or maximum values. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.
2. Apply the appropriate statistical test. Dixon's Extreme Value test is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.
3. Scientifically review statistical outliers and decide on their disposition.

No results from this sampling event were identified as potential outliers.

Report Prepared By: _____

Steve Donivan
Laboratory Coordinator

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 12044492 **Lab Code:** GEN **Validator:** Steve Donivan **Validation Date:** 6/13/2012

Project: Mound LTS&M Ground Water **Analysis Type:** ☐ Metals ☐ General Chem ☑ Rad ☑ Organics

# of Samples: 21 **Matrix:** Water **Requested Analysis Completed:** Yes

Chain of Custody

Present: OK **Signed:** OK **Dated:** OK

Sample

Integrity: OK **Preservation:** OK **Temperature:** OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	The reported detection limits are equal to or below contract requirements.
☑ Field/Trip Blanks	There was 1 trip/equipment blank evaluated.
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Equipment/Trip Blanks

RIN: 12044492 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 6/13/2012

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Trip Blank	303428001	EPA 8260 Low Level	2-Butanone (Lab Contaminant)	1.26	J	0.500	ug/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
303425001	KFS 661	0138	0.500	1.00	U	
303425002	KFS 662	0386	0.500	1.00	U	
303425003	KFS 663	0387	0.500	1.00	U	
303425004	KFS 664	0389	0.500	1.00	U	
303425005	KFS 665	0392	0.500	1.00	U	
303425006	KFS 666	0301	0.500	1.00	U	
303425007	KFS 667	0311	0.500	1.00	U	
303425008	KFS 681	9601	0.500	1.00	U	
303425009	KFS 669	0118	0.500	1.00	U	
303425010	KFS 670	0346	0.500	1.00	U	
303425011	KFS 671	0379	0.500	1.00	U	
303425012	KFS 672	0347	0.500	1.00	U	
303425013	KFS 673	0315	0.500	1.00	U	
303425014	KFS 674	0124	0.500	1.00	U	
303425015	KFS 675	0126	0.500	1.00	U	
303425016	KFS 676	0605	0.500	1.00	U	
303425017	KFS 677	0607	0.500	1.00	U	
303425018	KFS 678	0608	0.500	1.00	U	
303425019	KFS 679	0601	0.500	1.00	U	
303425020	KFS 680	0606	0.500	1.00	U	

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12044492 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 6/13/2012

Duplicate: 9601 **Sample:** 0601

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
1,1,1,2-Tetrachloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1,1-Trichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1,2,2-Tetrachloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	1.50	U		1.00	1.50	U		1.00			ug/L
1,1,2-Trichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1-Dichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1-Dichloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
1,1-Dichloropropene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2,3-Trichlorobenzene	0.200	U		1.00	0.200	U		1.00			ug/L
1,2,3-Trichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2,4-Trichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2,4-Trimethylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dibromo-3-chloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dibromoethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,3,5-Trimethylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,3-Dichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,3-Dichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,4-Dichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
2,2-Dichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
2-Butanone	0.500	U		1.00	0.500	U		1.00			ug/L
2-Chlorotoluene	0.160	U		1.00	0.160	U		1.00			ug/L
2-Hexanone	0.500	U		1.00	0.500	U		1.00			ug/L
4-Chlorotoluene	0.160	U		1.00	0.160	U		1.00			ug/L
4-Isopropyltoluene	0.160	U		1.00	0.160	U		1.00			ug/L
4-Methyl-2-pentanone	0.500	U		1.00	0.500	U		1.00			ug/L
Acetone	0.500	U		1.00	0.500	U		1.00			ug/L
Benzene	0.160	U		1.00	0.160	U		1.00			ug/L
Bromobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Bromochloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Bromodichloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Bromoform	0.160	U		1.00	0.160	U		1.00			ug/L
Bromomethane	0.160	U		1.00	0.160	U		1.00			ug/L
Carbon Disulfide	0.500	U		1.00	0.500	U		1.00			ug/L
Carbon Tetrachloride	0.160	U		1.00	0.160	U		1.00			ug/L
Chlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Chloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
Chloroform	0.160	U		1.00	0.160	U		1.00			ug/L

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12044492 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 6/13/2012

Duplicate: 9601 **Sample:** 0601

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Chloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
cis-1,2-Dichloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
cis-1,3-Dichloropropene	0.160	U		1.00	0.160	U		1.00			ug/L
Dibromochloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Dibromomethane	0.160	U		1.00	0.160	U		1.00			ug/L
Dichlorodifluoromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Ethylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Hexachlorobutadiene	0.160	U		1.00	0.160	U		1.00			ug/L
Isopropylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Methylene Chloride	0.160	U		1.00	0.160	U		1.00			ug/L
Naphthalene	0.160	U		1.00	0.160	U		1.00			ug/L
n-Butylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
n-Propylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Radium-226	0.259	U	0.301	1.00	0.200	U	0.273	1.00		0.3	pCi/L
Radium-228	0.645		0.430	1.00	1.81		0.659	1.00		2.9	pCi/L
sec-Butylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Strontium-90	1.43		0.519	1.00	1.07		0.433	1.00		1.0	pCi/L
Styrene	0.160	U		1.00	0.160	U		1.00			ug/L
tert-Butylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Tetrachloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
Toluene	0.160	U		1.00	0.160	U		1.00			ug/L
Total Xylenes	0.160	U		1.00	0.160	U		1.00			ug/L
trans-1,2-Dichloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
trans-1,3-Dichloropropene	0.160	U		1.00	0.160	U		1.00			ug/L
Trichloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
Trichlorofluoromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Tritium	49200		9570	1.00	48200		9380	1.00	2.05	0.1	pCi/L
Vinyl Chloride	0.160	U		1.00	0.160	U		1.00			ug/L

SAMPLE MANAGEMENT SYSTEM
Organics Data Validation Summary

RIN: 12044492 **Project:** Mound LTS&M Ground Water **Lab Code:** GEN **Validation Date:** 6/13/2012

LCS Recovery: All LCS recoveries were within the laboratory acceptance limits.

Method Blank(s): There were 3 method blank results above the MDL.

MS/MSD Recovery: There were 3 MS/MSD failures.

Surrogate Recovery: All surrogate recoveries were within the laboratory acceptance limits.

SAMPLE MANAGEMENT SYSTEM

Non-Compliance Report: Method Blanks

RIN: 12044492 **Lab Code:** GEN

Project: Mound LTS&M Ground Water

Validation Date: 6/13/2012

Method Blank	Date Analyzed	Method	Analyte	Result	Flag(s)	MDL
1202648244	5/3/2012	EPA 8260 Low Level	1,2,3-Trichlorobenzene	0.29	J	0.20
1202648244	5/3/2012	EPA 8260 Low Level	1,2,4-Trichlorobenzene	0.28	J	0.16
1202648244	5/3/2012	EPA 8260 Low Level	Naphthalene	0.36	J	0.16

SAMPLE MANAGEMENT SYSTEM

Non-Compliance Report: MS/MSD Performance

RIN: 12044492 **Lab Code:** GEN

Project: Mound LTS&M Ground Water

Validation Date: 6/13/2012

MS/MSD	Date Analyzed	Method	Analyte	Recovery MS	Recovery MSD	Lower Limit	Upper Limit	MSD RPD	RPD Limit
KFS 676	05/04/2012	EPA 8260 Low Level	1,2-Dichlorobenzene	107.0	121.0	77.0	120.0	13.00	20.0
KFS 676	05/04/2012	EPA 8260 Low Level	Dibromochloromethane	110.0	123.0	72.0	121.0	11.00	20.0
KFS 676	05/04/2012	EPA 8260 Low Level	Hexachlorobutadiene	94.9	119.0	74.0	126.0	23.00	20.0

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 12044492 **Lab Code:** GEN **Date Due:** 5/25/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 5/25/2012

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate
0601	Radium-226	05/09/2012						1.2
Blank_Spike	Radium-226	05/09/2012				123		
0601	Radium-226	05/09/2012					89.8	
Blank	Radium-226	05/09/2012	0.337	U				
0601	Radium-228	05/08/2012			92			
9601	Radium-228	05/08/2012			78			
0601	Radium-228	05/08/2012			85			2.32
Blank_Spike	Radium-228	05/08/2012			90	101		
0601	Radium-228	05/08/2012			98		95.8	
Blank	Radium-228	05/08/2012	0.0965	U	91			
Blank_Spike	Strontium-90	05/20/2012			90	101		
0601	Strontium-90	05/20/2012			94		93.2	
Blank	Strontium-90	05/20/2012	-0.0916	U	93			
0601	Strontium-90	05/24/2012			84			
9601	Strontium-90	05/24/2012			93			
0601	Strontium-90	05/24/2012			94			0.03
0601	Tritium	05/16/2012						0.31
Blank_Spike	Tritium	05/17/2012				86.6		
0601	Tritium	05/17/2012						
Blank	Tritium	05/17/2012	-57.7					

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Data Review and Validation Report

General Information

Requisition No. (RIN):	12044493
Sample Event:	October 25, 2011
Site(s):	Mound, Ohio; Groundwater
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	303294
Analysis:	Chloride, Metals, Radiochemistry
Validator:	Steve Donivan
Review Date:	June 14, 2012

This validation was performed according to the *Environmental Procedures Catalog* (LMS/PRO/S04325), *"Standard Practice for Validation of Laboratory Data."* The procedure was applied at Level 2, Data Deliverables Verification. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Barium, Sodium	LMM-01	SW-846 3005	SW-846 6010B
Chloride	WCH-A-011	EPA 300.0	EPA 300.0
Radium-226	GPC-A-018	EPA 903.1 Mod	EPA 903.1 Mod
Radium-228	GPC-A-020	EPA 904.0 Mod	EPA 904.0 Mod

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
303294002	0402	Radium-226	U	Less than the Decision Level Concentration

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received five water samples on April 26, 2012, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions. The air waybill number was listed on the receiving documentation.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler of 6 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. Sample analysis was completed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all metal and wet chemical analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), Decision Level Concentration (DLC), and Determination Limit (DL). The MDC is a measure of radiochemical method performance and was calculated and reported as specified in *Quality Systems for Analytical Services*. The DLC is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, and is estimated as 3 times the one-sigma total propagated uncertainty. Results that are greater than the MDC, but less than the DLC are qualified with a “U” flag (not detected). The DL for radiochemical results is the lowest concentration that can be reliably measured, and is defined as three times the MDC. Results not previously “U” qualified that are less than the DL are qualified with a “J” flag as estimated values.

The reported MDLs for all metal and wet chemical analytes; and MDCs for radiochemical analytes demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes.

Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. All calibration and laboratory spike standards were prepared from independent sources.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All metals and wet chemistry method blank results associated with the samples were below the method detection limits. The radiochemical method blank results were below the Decision Level Concentrations.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than four times the spike concentration. The spike recoveries met the recovery and precision criteria for all analytes evaluated.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for non-radiochemical replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. The replicate results met these criteria, demonstrating acceptable laboratory precision. The relative error ratio for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) was less than 3, indicating acceptable precision

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. The relative percent difference for duplicate results that are greater than five times the practical quantitation limit (PQL) should be less than 20 percent. For results that are less than five times the PQL, the range should be no greater than the PQL. Duplicate samples were collected from location 0400 (field duplicate ID 9400). The non-radiochemical duplicate results met the criteria, demonstrating acceptable overall precision. The relative error ratio for radiochemical duplicate

results (calculated using the 1-sigma total propagated uncertainty) was less than 3, indicating acceptable precision.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

Electronic Data Deliverable File

The EDD file arrived on May 25, 2012. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Sampling Protocol

Sample results for all monitoring wells met the Category I or III low-flow sampling criteria and were qualified with an “F” flag in the database, indicating the wells were purged and sampled using the low-flow sampling method. Sample results from well 0445 were further qualified with a “Q” flag because this well was classified as Category III.

Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not "fit" with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. Identify extreme values that may be potential outliers by generating the Outliers Report using the Sample Management System from data in the SEEPro database. The application compares the new data set with historical data and lists all new data that fall outside the historical data range. Data listed in the report are highlighted if the concentration detected is not within 50 percent of historical minimum or maximum values. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.
2. Apply the appropriate statistical test. Dixon's Extreme Value test is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme

values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.

3. Scientifically review statistical outliers and decide on their disposition.

No values from this sampling event were identified as potential outliers. The data for this RIN are acceptable as qualified.

Report Prepared By: _____

Steve Donivan
Laboratory Coordinator

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 12044493 **Lab Code:** GEN **Validator:** Steve Donivan **Validation Date:** 6/14/2012

Project: Mound LTS&M Ground Water **Analysis Type:** ☑ Metals ☑ General Chem ☑ Rad ☐ Organics

# of Samples: 5 **Matrix:** Water **Requested Analysis Completed:** Yes

Chain of Custody

Present: OK **Signed:** OK **Dated:** OK

Sample

Integrity: OK **Preservation:** OK **Temperature:** OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	The reported detection limits are equal to or below contract requirements.
☐ Field/Trip Blanks	
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12044493 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 6/14/2012

Duplicate: 9400 **Sample:** 0400

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Barium	100			1.00	98.2			1.00	1.82		ug/L
Chloride	56.2			10.00	56.6			10.00	0.71		mg/L
Radium-226	1.19		0.592	1.00	1.17		0.570	1.00		0	pCi/L
Radium-228	0.448	U	0.344	1.00	0.215	U	0.276	1.00		1.0	pCi/L
Sodium	49000			1.00	49300			1.00	0.61		ug/L

SAMPLE MANAGEMENT SYSTEM

Metals Data Validation Worksheet

RIN: 12044493 **Lab Code:** GEN **Date Due:** 5/24/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 5/24/2012

Analyte	Method Type	Date Analyzed	CALIBRATION						Method Blank	LCS %R	MS %R	MSD %R	Dup. RPD	ICSAB %R	Serial Dil. %R	CRI %R
			Int.	R^2	ICV	CCV	ICB	CCB								
Barium	ICP/ES	05/04/2012			OK	OK	OK	OK	OK	104.0	99.8		1.0	102.0	0.8	101.0
Sodium	ICP/ES	05/04/2012			OK	OK	OK	OK	OK	105.0	84.3		2.0	104.0	0.6	90.0

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 12044493 **Lab Code:** GEN **Date Due:** 5/24/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 5/24/2012

Analyte	Date Analyzed	CALIBRATION						Method	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	ICV	CCV	ICB	CCB	Blank					
Chloride	05/03/2012			OK	OK	OK	OK	OK	96.20	109.0		0	

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 12044493 **Lab Code:** GEN **Date Due:** 5/24/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 5/24/2012

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate
0400	Radium-226	05/02/2012						0.18
Blank_Spike	Radium-226	05/02/2012				94.10		
0400	Radium-226	05/02/2012					78.7	
Blank	Radium-226	05/02/2012	0.3790	U				
0400	Radium-228	05/02/2012			99.0			
0402	Radium-228	05/02/2012			94.0			
9400	Radium-228	05/02/2012			94.0			
P033	Radium-228	05/02/2012			95.0			
0400	Radium-228	05/02/2012			94.0			0.20
Blank_Spike	Radium-228	05/02/2012			106.0	79.40		
0400	Radium-228	05/02/2012			94.0		116.0	
Blank	Radium-228	05/02/2012	0.3100	U	97.0			
0445	Radium-228	05/10/2012			76.0			

Data Review and Validation Report

General Information

Requisition No. (RIN):	12064665
Sample Event:	June 25, 2012
Site(s):	Mound, Ohio; Groundwater
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	306817
Analysis:	Chloride, Metals, Radiochemistry
Validator:	Steve Donivan
Review Date:	October 1, 2012

This validation was performed according to the *Environmental Procedures Catalog* (LMS/PRO/S04325), *"Standard Practice for Validation of Laboratory Data."* The procedure was applied at Level 2, Data Deliverables Verification. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Barium, Sodium	LMM-01	SW-846 3005	SW-846 6010B
Chloride	WCH-A-011	EPA 300.0	EPA 300.0
Radium-226	GPC-A-018	EPA 903.1 Mod	EPA 903.1 Mod
Radium-228	GPC-A-020	EPA 904.0 Mod	EPA 904.0 Mod

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
306817001	GP-201	Radium-228	U	Less than 5 times the field blank
306817002	GP-202	Radium-226	J	Less than the Determination Limit
306817003	GP-202 Duplicate	Radium-228	U	Less than 5 times the field blank
306817004	Equipment Blank	Radium-228	J	Less than the Determination Limit

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received four water samples on June 27, 2012, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions. The air waybill number was listed on the receiving documentation.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler of 5 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. Sample analysis was completed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all metal and wet chemical analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), Decision Level Concentration (DLC), and Determination Limit (DL). The MDC is a measure of radiochemical method performance and was calculated and reported as specified in *Quality Systems for Analytical Services*. The DLC is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, and is estimated as 3 times the one-sigma total propagated uncertainty. Results that are greater than the MDC, but less than the DLC are qualified with a "U" flag (not detected). The DL for radiochemical results is the lowest concentration that can be reliably measured, and is defined as three times the MDC. Results not previously "U" qualified that are less than the DL are qualified with a "J" flag as estimated values.

The reported MDLs for all metal and wet chemical analytes; and MDCs for radiochemical analytes demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. All calibration and laboratory spike standards were prepared from independent sources.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All metals and wet chemistry method blank results associated with the samples were below the method detection limits. The radiochemical method blank results were below the DLC for radium-226, but not for radium-228. The associated sample radium-228 results have been previously qualified.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than four times the spike concentration. The spike recoveries met the recovery and precision criteria for all analytes evaluated.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for non-radiochemical replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. The replicate results met these criteria, demonstrating acceptable laboratory precision. The relative error ratio for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) was less than 3, indicating acceptable precision

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

Electronic Data Deliverable File

The EDD file arrived on July 26, 2012. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Field Blank

Equipment blanks are prepared and analyzed to document contamination attributable field activities. One field blank was submitted with these samples. Chloride and radium-228 were detected in this blank. The associated sample results for these analytes that are greater than the MDL (or MDC) but less than five times the blank concentration are qualified with a "U" flag as not detected.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. The relative percent difference for duplicate results that are greater than five times the PQL should be less than 20 percent. For results that are less than five times the PQL, the range should be no greater than the PQL. Duplicate samples were collected from location GP-202 (field duplicate ID GP-292). The non-radiochemical duplicate results met the criteria, demonstrating acceptable overall precision. The relative error ratio for radiochemical duplicate results (calculated using the 1-sigma total propagated uncertainty) was less than 3, indicating acceptable precision.

Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not "fit" with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. Identify extreme values that may be potential outliers by generating the Outliers Report using the Sample Management System from data in the SEEPro database. The application compares the new data set with historical data and lists all new data that fall outside the historical data range. Data listed in the report are highlighted if the concentration detected is not within 50 percent of historical minimum or maximum

values. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.

2. Apply the appropriate statistical test. Dixon's Extreme Value test is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.
3. Scientifically review statistical outliers and decide on their disposition.

No data from this sampling event were identified as potential outliers. The data for this RIN are acceptable as qualified.

Report Prepared By: _____

Steve Donivan
Laboratory Coordinator

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 12064665 **Lab Code:** GEN **Validator:** Steve Donivan **Validation Date:** 10/1/2012

Project: Mound LTS&M Ground Water **Analysis Type:** ☑ Metals ☑ General Chem ☑ Rad ☐ Organics

# of Samples: 4 **Matrix:** Water **Requested Analysis Completed:** Yes

Chain of Custody

Present: OK **Signed:** OK **Dated:** OK

Sample

Integrity: OK **Preservation:** OK **Temperature:** OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	The reported detection limits are equal to or below contract requirements.
☑ Field/Trip Blanks	There was 1 trip/equipment blank evaluated.
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Equipment/Trip Blanks

RIN: 12064665 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 10/1/2012

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Field Blank	306817004	\ 904.0/EPA 9320 Modi	Radium-228	0.665		0.470	pCi/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
306817001	KHQ 709	GP-201	0.870	1.00		U
306817002	KHQ 712	GP-202	0.322	1.00	U	
306817003	KHQ 710	GP-292	0.890	1.00		U

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Field Blank	306817004	EPA 300.0	Chloride	0.191	J	0.067	mg/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
306817001	KHQ 709	GP-201	198	20.00		
306817002	KHQ 712	GP-202	29.5	10.00		
306817003	KHQ 710	GP-292	29.0	10.00		

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12064665 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 10/1/2012

Duplicate: GP-292 **Sample:** GP-202

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Barium	33.9			1.00	35.4			1.00	4.33		ug/L
Chloride	29.5			10.00	29.0			10.00	1.71		mg/L
Radium-226	0.679		0.388	1.00	0.0317	U	0.139	1.00		3.1	pCi/L
Radium-228	0.322	U	0.324	1.00	0.890		0.360	1.00		2.3	pCi/L
Sodium	10400			1.00	10600			1.00	1.90		ug/L

SAMPLE MANAGEMENT SYSTEM

Metals Data Validation Worksheet

RIN: 12064665 **Lab Code:** GEN **Date Due:** 7/25/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 7/25/2012

Analyte	Method Type	Date Analyzed	CALIBRATION						Method Blank	LCS %R	MS %R	MSD %R	Dup. RPD	ICSAB %R	Serial Dil. %R	CRI %R
			Int.	R^2	ICV	CCV	ICB	CCB								
Barium	ICP/ES	07/04/2012			OK	OK	OK	OK	OK	102.0	101.0		1.0	104.0	0.3	104.0
Sodium	ICP/ES	07/04/2012			OK	OK	OK	OK	OK	112.0	113.0		1.0	109.0	3.0	84.0

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 12064665 **Lab Code:** GEN **Date Due:** 7/25/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 7/25/2012

Analyte	Date Analyzed	CALIBRATION						Method	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	ICV	CCV	ICB	CCB	Blank					
Chloride	07/04/2012			OK	OK	OK	OK	OK	100.00				
Chloride	07/05/2012									106.0		3.00	

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 12064665 **Lab Code:** GEN **Date Due:** 7/25/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 7/25/2012

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate
GP-202	Radium-226	07/23/2012						1.86
Blank	Radium-226	07/23/2012	0.1720	U		109.00		
GP-202	Radium-226	07/23/2012					81.1	
Blank_Spike	Radium-226	07/23/2012				109.00		
GP-201	Radium-228	07/10/2012			87.0			
GP-202	Radium-228	07/10/2012			96.0			
GP-292	Radium-228	07/10/2012			94.0			
GP-999	Radium-228	07/10/2012			89.0			
GP-202	Radium-228	07/10/2012			93.0			1.39
Blank_Spike	Radium-228	07/10/2012			91.0	75.50		
GP-202	Radium-228	07/10/2012			78.0		102.0	
Blank	Radium-228	07/10/2012	0.8840		92.0			

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Data Review and Validation Report

General Information

Requisition No. (RIN):	12074718
Sample Event:	July 23–25, 2012
Site(s):	Mound, Ohio; Groundwater
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	308606
Analysis:	Radiochemistry, Volatiles
Validator:	Steve Donivan
Review Date:	November 6, 2012

This validation was performed according to the *Environmental Procedures Catalog* (LMS/PRO/S04325), *"Standard Practice for Validation of Laboratory Data."* The procedure was applied at Level 2, Data Deliverables Verification. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Tritium	LSC-A-001	EPA 906.0 Mod	EPA 906.0 Mod
Volatile Organics, VOA	VOA-A-007	SW-846 5030B	SW-846 8260B

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
308606001	0118	Acetone	U	Less than 10 times the method blank
308606001	0118	Toluene	U	Less than 10 times the trip blank
308606002	0124	Acetone	U	Less than 10 times the method blank

Sample Number	Location	Analyte(s)	Flag	Reason
308606002	0124	Toluene	U	Less than 10 times the trip blank
308606003	0126	Acetone	U	Less than 10 times the method blank
308606003	0126	Toluene	U	Less than 10 times the trip blank
308606004	0138	Acetone	U	Less than 10 times the method blank
308606005	0301	Acetone	U	Less than 10 times the method blank
308606005	0301	Toluene	U	Less than 10 times the trip blank
308606006	0311	Acetone	U	Less than 10 times the method blank
308606006	0311	Toluene	U	Less than 10 times the trip blank
308606007	0386	Acetone	U	Less than 10 times the method blank
308606007	0386	Toluene	U	Less than 10 times the trip blank
308606008	0387	Acetone	U	Less than 10 times the method blank
308606008	0387	Toluene	U	Less than 10 times the trip blank
308606009	0389	Acetone	U	Less than 10 times the method blank
308606009	0389	Toluene	U	Less than 10 times the trip blank
308606009	0389	Methylene Chloride	J	LCS result bias high
308606010	0392	Acetone	U	Less than 10 times the method blank
308606010	0392	Methylene Chloride	J	LCS result bias high
308606011	0601	Acetone	U	Less than 10 times the method blank
308606011	0601	Methylene Chloride	J	LCS result bias high
308606011	0601	Toluene	U	Less than 10 times the trip blank
308606012	0606	Acetone	U	Less than 10 times the method blank
308606012	0606	Methylene Chloride	J	LCS result bias high
308606012	0606	Toluene	U	Less than 10 times the trip blank
308606013	0607	Acetone	U	Less than 10 times the method blank
308606013	0607	Methylene Chloride	J	LCS result bias high
308606013	0607	Toluene	U	Less than 10 times the trip blank
308606014	0607 Duplicate	Acetone	U	Less than 10 times the method blank
308606014	0607 Duplicate	Methylene Chloride	J	LCS result bias high
308606014	0607 Duplicate	Toluene	U	Less than 10 times the trip blank
308606016	0346	Tritium	J	Less than the Determination Limit
308606018	0379	Acetone	U	Less than 10 times the trip blank
308606018	0379	Toluene	U	Less than 10 times the trip blank

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 19 water samples on July 26, 2012, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions. The air waybill number was listed on the receiving documentation.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler of 6 °C, which complies with requirements. All samples were received in the correct container types and

had been preserved correctly for the requested analyses. Sample analysis was completed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all organic analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), Decision Level Concentration (DLC), and Determination Limit (DL). The MDC is a measure of radiochemical method performance and was calculated and reported as specified in *Quality Systems for Analytical Services*. The DLC is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, and is estimated as 3 times the one-sigma total propagated uncertainty. Results that are greater than the MDC, but less than the DLC are qualified with a "U" flag (not detected). The DL for radiochemical results is the lowest concentration that can be reliably measured, and is defined as three times the MDC. Results not previously "U" qualified that are less than the DL are qualified with a "J" flag as estimated values.

The reported MDLs for all organic analytes; and MDCs for radiochemical analytes demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. All calibration and laboratory spike standards were prepared from independent sources.

Volatiles Internal Standards and Surrogates

The volatile internal standard recoveries and surrogate recoveries were within the acceptance ranges for all samples.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. The method blank results were below the practical quantitation limits. Acetone, methylene chloride, and naphthalene were detected in a some of the VOA method blanks. Associated sample results that are greater than the MDL but less than ten times the blank

concentration are qualified with a “U” flag as not detected. The tritium method blank result was less than the Decision Level Concentration.

Trip Blank

A trip blank was collected to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples. Acetone and toluene were detected in the trip blank. The associated sample acetone and toluene results that are greater than the MDL but less than ten times the blank concentration are qualified with a “U” flag as not detected.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than four times the spike. The spike recoveries met the acceptance criteria for all analytes evaluated.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for organic replicate results were less than the laboratory-derived control limits, demonstrating acceptable laboratory precision. The relative error ratio for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) was less than 3, indicating acceptable precision.

Laboratory Control Sample

Laboratory control samples (LCS) were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable with the exception of the methylene chloride result. The associated sample methylene chloride results that are greater than the MDL are qualified with a “J” flag as estimated values.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. The relative percent difference for duplicate results that are greater than five times the practical quantitation limit (PQL) should be less than 20 percent. For results that are less than five times the PQL, the range should be no greater than the PQL. Duplicate samples were collected from location 0607 (field duplicate ID 9607). The non-radiochemical duplicate results met the criteria, demonstrating acceptable overall precision. The relative error ratio for radiochemical duplicate results (calculated using the 1-sigma total propagated uncertainty) was less than 3, indicating acceptable precision.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

Electronic Data Deliverable File

The EDD file arrived on August 24, 2012. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Sampling Protocol

Sample results for all monitoring wells met the Category I low-flow sampling criteria and were qualified with an “F” flag in the database, indicating the wells were purged and sampled using the low-flow sampling method.

Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not "fit" with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. Identify extreme values that may be potential outliers by generating the Outliers Report using the Sample Management System from data in the SEEPro database. The application compares the new data set with historical data and lists all new data that fall outside the historical data range. Data listed in the report are highlighted if the concentration detected is not within 50 percent of historical minimum or maximum values. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.
2. Apply the appropriate statistical test. Dixon's Extreme Value test is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.

3. Scientifically review statistical outliers and decide on their disposition.

No results from this sampling event were identified as potential outliers.

Report Prepared By: _____

Stephen Donivan
Laboratory Coordinator

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 12074718 **Lab Code:** GEN **Validator:** Stephen Donivan **Validation Date:** 11/6/2012

Project: Mound LTS&M Ground Water **Analysis Type:** ☐ Metals ☐ General Chem ☑ Rad ☑ Organics

# of Samples: 19 **Matrix:** Water **Requested Analysis Completed:** Yes

Chain of Custody

Present: OK **Signed:** OK **Dated:** OK

Sample

Integrity: OK **Preservation:** OK **Temperature:** OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	There are 0 detection limit failures.
☑ Field/Trip Blanks	There was 1 trip/equipment blank evaluated.
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Equipment/Trip Blanks

RIN: 12074718 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 11/6/2012

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Trip Blank	308606019	EPA 8260 Low Level	Acetone (Lab Contaminant)	1.93	J	0.500	ug/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
308606001	KIS 459	0118	1.76	1.00	BJ	U
308606002	KIS 460	0124	2.70	1.00	BJ	U
308606003	KIS 461	0126	1.02	1.00	BJ	U
308606004	KIS 462	0138	2.20	1.00	BJ	U
308606005	KIS 463	0301	1.29	1.00	BJ	U
308606006	KIS 464	0311	1.20	1.00	BJ	U
308606007	KIS 469	0386	1.77	1.00	BJ	U
308606008	KIS 470	0387	1.83	1.00	BJ	U
308606009	KIS 471	0389	1.82	1.00	BJ	U
308606010	KIS 472	0392	0.690	1.00	BJ	U
308606011	KIS 473	0601	1.93	1.00	BJ	U
308606012	KIS 476	0606	1.36	1.00	BJ	U
308606013	KIS 477	0607	1.63	1.00	BJ	U
308606014	KIS 479	9607	1.25	1.00	BJ	U
308606015	KIS 465	0315	0.500	1.00	U	
308606016	KIS 466	0346	0.500	1.00	U	
308606017	KIS 467	0347	0.500	1.00	U	
308606018	KIS 468	0379	1.53	1.00	J	U

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Trip Blank	308606019	EPA 8260 Low Level	Toluene (Lab Contaminant)	0.680	J	0.160	ug/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
308606001	KIS 459	0118	3.01	1.00		U
308606002	KIS 460	0124	1.47	1.00		U
308606003	KIS 461	0126	0.230	1.00	J	U
308606004	KIS 462	0138	0.160	1.00	U	
308606005	KIS 463	0301	1.42	1.00		U
308606006	KIS 464	0311	0.250	1.00	J	U
308606007	KIS 469	0386	5.65	1.00		U
308606008	KIS 470	0387	3.63	1.00		U

SAMPLE MANAGEMENT SYSTEM

Validation Report: Equipment/Trip Blanks

RIN: 12074718 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 11/6/2012

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Trip Blank	308606019		Toluene (Lab Contaminant)				

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
308606009	KIS 471	0389	0.200	1.00	J	U
308606010	KIS 472	0392	0.160	1.00	U	
308606011	KIS 473	0601	0.220	1.00	J	U
308606012	KIS 476	0606	0.200	1.00	J	U
308606013	KIS 477	0607	0.470	1.00	J	U
308606014	KIS 479	9607	0.280	1.00	J	U
308606015	KIS 465	0315	0.160	1.00	U	
308606016	KIS 466	0346	0.160	1.00	U	
308606017	KIS 467	0347	0.160	1.00	U	
308606018	KIS 468	0379	0.160	1.00	J	U

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12074718 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 11/6/2012

Duplicate: 9607 **Sample:** 0607

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
1,1,1,2-Tetrachloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1,1-Trichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1,2,2-Tetrachloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	1.50	U		1.00	1.50	U		1.00			ug/L
1,1,2-Trichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1-Dichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1-Dichloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
1,1-Dichloropropene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2,3-Trichlorobenzene	0.200	U		1.00	0.200	U		1.00			ug/L
1,2,3-Trichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2,4-Trichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2,4-Trimethylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dibromo-3-chloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dibromoethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,3,5-Trimethylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,3-Dichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,3-Dichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,4-Dichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
2,2-Dichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
2-Butanone	0.500	U		1.00	0.500	U		1.00			ug/L
2-Chlorotoluene	0.160	U		1.00	0.160	U		1.00			ug/L
2-Hexanone	0.500	U		1.00	0.500	U		1.00			ug/L
4-Chlorotoluene	0.160	U		1.00	0.160	U		1.00			ug/L
4-Isopropyltoluene	0.160	U		1.00	0.160	U		1.00			ug/L
4-Methyl-2-pentanone	0.500	U		1.00	0.500	U		1.00			ug/L
Acetone	1.63	BJ		1.00	1.25	BJ		1.00			ug/L
Benzene	0.160	U		1.00	0.160	U		1.00			ug/L
Bromobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Bromochloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Bromodichloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Bromoform	0.160	U		1.00	0.160	U		1.00			ug/L
Bromomethane	0.160	U		1.00	0.160	U		1.00			ug/L
Carbon Disulfide	0.500	U		1.00	0.500	U		1.00			ug/L
Carbon Tetrachloride	0.160	U		1.00	0.160	U		1.00			ug/L
Chlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Chloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
Chloroform	0.160	U		1.00	0.160	U		1.00			ug/L

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12074718 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 11/6/2012

Duplicate: 9607 **Sample:** 0607

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Chloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
cis-1,2-Dichloroethene	0.700	J		1.00	0.660	J		1.00			ug/L
cis-1,3-Dichloropropene	0.160	U		1.00	0.160	U		1.00			ug/L
Dibromochloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Dibromomethane	0.160	U		1.00	0.160	U		1.00			ug/L
Dichlorodifluoromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Ethylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Hexachlorobutadiene	0.160	U		1.00	0.160	U		1.00			ug/L
Isopropylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Methylene Chloride	3.54	J		1.00	3.47	J		1.00	2.00		ug/L
Naphthalene	0.160	U		1.00	0.160	U		1.00			ug/L
n-Butylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
n-Propylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
sec-Butylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Styrene	0.160	U		1.00	0.160	U		1.00			ug/L
tert-Butylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Tetrachloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
Toluene	0.470	J		1.00	0.280	J		1.00			ug/L
Total Xylenes	0.160	U		1.00	0.160	U		1.00			ug/L
trans-1,2-Dichloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
trans-1,3-Dichloropropene	0.160	U		1.00	0.160	U		1.00			ug/L
Trichloroethene	5.05			1.00	4.90			1.00	3.02		ug/L
Trichlorofluoromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Tritium	6120		1260	1.00	6220		1260	1.00	1.62	0.1	pCi/L
Vinyl Chloride	0.160	U		1.00	0.160	U		1.00			ug/L

SAMPLE MANAGEMENT SYSTEM
Organics Data Validation Summary

RIN: 12074718 **Project:** Mound LTS&M Ground Water **Lab Code:** GEN **Validation Date:** 11/6/2012

LCS Recovery: There was 1 LCS failure.

Method Blank(s): There were 3 method blank results above the MDL.

MS/MSD Recovery: All MS/MSD recoveries were within the laboratory acceptance limits.

Surrogate Recovery: All surrogate recoveries were within the laboratory acceptance limits.

SAMPLE MANAGEMENT SYSTEM

Non-Compliance Report: Method Blanks

RIN: 12074718 **Lab Code:** GEN

Project: Mound LTS&M Ground Water

Validation Date: 11/6/2012

Method Blank	Date Analyzed	Method	Analyte	Result	Flag(s)	MDL
1202707786	7/30/2012	EPA 8260 Low Level	Acetone	0.51	J	0.50
1202707786	7/30/2012	EPA 8260 Low Level	Naphthalene	0.18	J	0.16
1202711269	8/1/2012	EPA 8260 Low Level	Methylene Chloride	1.48	J	0.16

SAMPLE MANAGEMENT SYSTEM

Non-Compliance Report: LCS Recovery

RIN: 12074718 **Lab Code:** GEN

Project: Mound LTS&M Ground Water

Validation Date: 11/6/2012

LCS/LCSD	Date Analyzed	Method	Analyte	Recovery	Lower Limit	Upper Limit
LCS	07/30/2012	EPA 8260 Low Level	Methylene Chloride	127.0	77.0	120.0

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 12074718 **Lab Code:** GEN **Date Due:** 8/23/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 8/23/2012

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate
0607	Tritium	08/10/2012						0.33
Blank_Spike	Tritium	08/10/2012				86.50		
0607	Tritium	08/10/2012					94.9	
Blank	Tritium	08/10/2012	4.9000	U				

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Data Review and Validation Report

General Information

Requisition No. (RIN):	12074720
Sample Event:	July 25–26, 2012
Site(s):	Mound, Ohio; Groundwater
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	308679
Analysis:	Chloride, Metals, Radiochemistry, Volatiles
Validator:	Steve Donivan
Review Date:	May 30, 2012

This validation was performed according to the *Environmental Procedures Catalog* (LMS/PRO/S04325), *"Standard Practice for Validation of Laboratory Data."* The procedure was applied at Level 2, Data Deliverables Verification. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Barium, Sodium	LMM-01	SW-846 3005	SW-846 6010B
Chloride	WCH-A-011	EPA 300.0	EPA 300.0
Radium-226	GPC-A-018	EPA 903.1 Mod	EPA 903.1 Mod
Radium-228	GPC-A-020	EPA 904.0 Mod	EPA 904.0 Mod
Volatile Organics, VOA	VOA-A-007	SW-846 5030B	SW-846 8260B

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
308679001	0353	Toluene	U	Less than 10 times the method blank
308679002	0400	Toluene	U	Less than 10 times the method blank
308679002	0400	Radium-226	J	Less than the Determination Limit
308679003	0402	Radium-226	J	Less than the Determination Limit
308679008	0617	Toluene	U	Less than 10 times the method blank
308679010	0402 Duplicate	Radium-226	U	Less than the Decision Level
308679010	0402 Duplicate	Radium-228	U	Less than the Decision Level

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 11 water samples on July 27, 2012, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions. The air waybill number was listed on the receiving documentation.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler of 5 °C which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. Sample analysis was completed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all metal, organic, and wet chemical analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), Decision Level Concentration (DLC), and Determination Limit (DL). The MDC is a measure of radiochemical method performance and was calculated and reported as specified in *Quality Systems for Analytical Services*. The DLC is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, and is estimated as 3 times the one-sigma total propagated uncertainty. Results that are greater than the MDC, but less than the DLC are qualified with a “U” flag (not detected). The DL for radiochemical results is the lowest concentration that can be reliably measured, and is defined as 3 times the MDC. Results not previously “U” qualified that are less than the DL are qualified with a “J” flag as estimated values.

The reported MDLs for all metal, organic, and wet chemical analytes; and MDCs for radiochemical analytes demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear curve. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods.

Volatiles Internal Standards and Surrogates

The volatile internal standard recoveries and surrogate recoveries were within the acceptance ranges for all samples.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All method blank results associated with the samples were below the method detection limits with the following exception. Methylene chloride, naphthalene, and 1,2,4-trichlorobenzene were detected in the VOA blank. None of these analytes were detected in any of the associated samples.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than four times the spike concentration. The spike recoveries met the recovery and precision criteria for all analytes evaluated. The chloride spike recovery exceeded the laboratory upper acceptance limit but was otherwise acceptable without qualification.

Laboratory Replicate Analysis

The relative percent difference (RPD) values for the sample duplicates, LCSD, and MSD sample results for all analytes were less than 20 percent indicating acceptable precision. The radiochemical relative error ratio (calculated using the one-sigma total propagated uncertainty) was less than three for all duplicates, indicating acceptable precision.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable for analytes.

Trip Blank

A trip blank was collected to document contamination attributable to shipping and field handling procedures. This type of blank is useful in documenting contamination of volatile organic samples. Toluene was detected in the trip blank. Sample results for toluene that are greater than the method detection limit but less than ten times the blank concentration are qualified with a "U" flag as not detected.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates which measure only laboratory performance. A duplicate sample was collected from location 0402. The radiochemical duplicate results were acceptable with relative error ratios (calculated using the 1-sigma total propagated uncertainty) of less than three indicating acceptable precision. The non-radiochemical duplicate results met the acceptance criteria of having a relative percent difference of less than 20 percent for results that are greater than five times the practical quantitation limit or for results that are less than the PQL, a range no greater than the PQL.

Detection Limits/Dilutions

Samples were diluted in a consistent and acceptable manner when required. The required detection limits were met for all analytes.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

Electronic Data Deliverable File

The EDD file arrived on August 28, 2012. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Sampling Protocol

Sample results for all monitoring wells met the Category I, II, or III low-flow sampling criteria and were qualified with an "F" flag in the database, indicating the wells were purged and sampled using the low-flow sampling method. Sample results from wells 0353, 0411, 0443, 0444, and 0445 were further qualified with a "Q" flag because these wells were classified as Category II or III.

Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not "fit" with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. Identify extreme values that may be potential outliers by generating the Outliers Report using the Sample Management System from data in the SEEPro database. The application compares the new data set with historical data and lists all new data that fall outside the historical data range. Data listed in the report are highlighted if the concentration detected is not within 50 percent of historical minimum or maximum values. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.
2. Apply the appropriate statistical test. Dixon's Extreme Value test is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.
3. Scientifically review statistical outliers and decide on their disposition.

There were no potential outliers identified and the data from this sampling event are acceptable as qualified.

Report Prepared By: _____

Steve Donivan
Laboratory Coordinator

Data Validation Outliers Report - No Field Parameters
Comparison: All Historical Data
Laboratory: GEL Laboratories
RIN: 12074720
Report Date: 11/6/2012

					Current			Historical Maximum			Historical Minimum			Number of Data Points		Statistical Outlier
						Qualifiers			Qualifiers			Qualifiers				
Site Code	Location Code	Sample ID	Sample Date	Analyte	Result	Lab	Data	Result	Lab	Data	Result	Lab	Data	N	N Below Detect	
MND01	0617	N001	07/26/2012	cis-1,2-Dichloroethene	0.59	J		4.7			0.724	J		30	0	No
MND01	0617	N001	07/26/2012	Trichloroethene	1.84			12			2.89			31	0	No

STATISTICAL TESTS:
The distribution of the data is tested for normality or lognormality using the Shapiro-Wilk Test
Outliers are identified using Dixon's Test when there are 25 or fewer data points.
Outliers are identified using Rosner's Test when there are 26 or more data points.
See Data Quality Assessment: Statistical Methods for Practitioners, EPA QC/G-9S, February 2006.

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 12074720 **Lab Code:** GEN **Validator:** Stephen Donivan **Validation Date:** 11/6/2012

Project: Mound LTS&M Ground Water **Analysis Type:** ☑ Metals ☑ General Chem ☑ Rad ☑ Organics

# of Samples: 11 **Matrix:** Water **Requested Analysis Completed:** Yes

Chain of Custody

Present: OK **Signed:** OK **Dated:** OK

Sample

Integrity: OK **Preservation:** OK **Temperature:** OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	The reported detection limits are equal to or below contract requirements.
☑ Field/Trip Blanks	There was 1 trip/equipment blank evaluated.
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Equipment/Trip Blanks

RIN: 12074720 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 11/6/2012

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Trip Blank	308679009	EPA 8260 Low Level	Toluene (Lab Contaminant)	0.180	J	0.160	ug/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
308679001	KIS 481	0353	0.600	1.00	J	U
308679002	KIS 482	0400	0.360	1.00	J	U
308679003	KIS 483	0402	0.160	1.00	U	
308679004	KIS 484	0411	0.160	1.00	U	
308679005	KIS 485	0443	0.160	1.00	U	
308679006	KIS 486	0444	0.160	1.00	U	
308679007	KIS 487	0445	2.33	1.00		
308679008	KIS 488	0617	0.390	1.00	J	U
308679010	KIS 489	9402	0.160	1.00	U	
308679011	KIS 490	P033	0.160	1.00	U	

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12074720 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 11/6/2012

Duplicate: 9402 **Sample:** 0402

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
1,1,1,2-Tetrachloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1,1-Trichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1,2,2-Tetrachloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	1.50	U		1.00	1.50	U		1.00			ug/L
1,1,2-Trichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1-Dichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1-Dichloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
1,1-Dichloropropene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2,3-Trichlorobenzene	0.200	U		1.00	0.200	U		1.00			ug/L
1,2,3-Trichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2,4-Trichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2,4-Trimethylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dibromo-3-chloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dibromoethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,3,5-Trimethylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,3-Dichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,3-Dichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,4-Dichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
2,2-Dichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
2-Butanone	0.500	U		1.00	0.500	U		1.00			ug/L
2-Chlorotoluene	0.160	U		1.00	0.160	U		1.00			ug/L
2-Hexanone	0.500	U		1.00	0.500	U		1.00			ug/L
4-Chlorotoluene	0.160	U		1.00	0.160	U		1.00			ug/L
4-Isopropyltoluene	0.160	U		1.00	0.160	U		1.00			ug/L
4-Methyl-2-pentanone	0.500	U		1.00	0.500	U		1.00			ug/L
Acetone	0.500	U		1.00	1.68	J		1.00			ug/L
Barium	64.1			1.00	70.2			1.00	9.08		ug/L
Benzene	0.160	U		1.00	0.160	U		1.00			ug/L
Bromobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Bromochloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Bromodichloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Bromoform	0.160	U		1.00	0.160	U		1.00			ug/L
Bromomethane	0.160	U		1.00	0.160	U		1.00			ug/L
Carbon Disulfide	0.500	U		1.00	0.500	U		1.00			ug/L
Carbon Tetrachloride	0.160	U		1.00	0.160	U		1.00			ug/L
Chloride	70.4			10.00	63.2			10.00	10.78		mg/L
Chlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12074720 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 11/6/2012

Duplicate: 9402 **Sample:** 0402

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Chloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
Chloroform	0.160	U		1.00	0.160	U		1.00			ug/L
Chloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
cis-1,2-Dichloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
cis-1,3-Dichloropropene	0.160	U		1.00	0.160	U		1.00			ug/L
Dibromochloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Dibromomethane	0.160	U		1.00	0.160	U		1.00			ug/L
Dichlorodifluoromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Ethylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Hexachlorobutadiene	0.160	U		1.00	0.160	U		1.00			ug/L
Isopropylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Methylene Chloride	0.160	U		1.00	0.160	U		1.00			ug/L
Naphthalene	0.160	U		1.00	0.160	U		1.00			ug/L
n-Butylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
n-Propylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Radium-226	0.703		0.407	1.00	0.854		0.558	1.00		0.4	pCi/L
Radium-228	0.339	U	0.305	1.00	0.442		0.292	1.00		0.5	pCi/L
sec-Butylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Sodium	47100			1.00	48500			1.00	2.93		ug/L
Styrene	0.160	U		1.00	0.160	U		1.00			ug/L
tert-Butylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Tetrachloroethene	0.180	J		1.00	0.160	U		1.00			ug/L
Toluene	0.160	U		1.00	0.160	U		1.00			ug/L
Total Xylenes	0.160	U		1.00	0.160	U		1.00			ug/L
trans-1,2-Dichloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
trans-1,3-Dichloropropene	0.160	U		1.00	0.160	U		1.00			ug/L
Trichloroethene	0.180	J		1.00	0.180	J		1.00			ug/L
Trichlorofluoromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Vinyl Chloride	0.160	U		1.00	0.160	U		1.00			ug/L

SAMPLE MANAGEMENT SYSTEM

Organics Data Validation Summary

RIN: 12074720 **Project:** Mound LTS&M Ground Water **Lab Code:** GEN **Validation Date:** 11/6/2012

LCS Recovery: All LCS recoveries were within the laboratory acceptance limits.

Method Blank(s): There were 3 method blank results above the MDL.

MS/MSD Recovery: All MS/MSD recoveries were within the laboratory acceptance limits.

Surrogate Recovery: All surrogate recoveries were within the laboratory acceptance limits.

SAMPLE MANAGEMENT SYSTEM

Non-Compliance Report: Method Blanks

RIN: 12074720 **Lab Code:** GEN

Project: Mound LTS&M Ground Water

Validation Date: 11/6/2012

Method Blank	Date Analyzed	Method	Analyte	Result	Flag(s)	MDL
1202709997	8/1/2012	EPA 8260 Low Level	Methylene Chloride	1.48	J	0.16
1202711564	8/2/2012	EPA 8260 Low Level	1,2,4-Trichlorobenzene	0.16	J	0.16
1202711564	8/2/2012	EPA 8260 Low Level	Naphthalene	0.22	J	0.16

SAMPLE MANAGEMENT SYSTEM

Metals Data Validation Worksheet

RIN: 12074720 **Lab Code:** GEN **Date Due:** 8/24/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 8/28/2012

Analyte	Method Type	Date Analyzed	CALIBRATION						Method Blank	LCS %R	MS %R	MSD %R	Dup. RPD	ICSAB %R	Serial Dil. %R	CRI %R
			Int.	R^2	ICV	CCV	ICB	CCB								
Barium	ICP/ES	08/15/2012			OK	OK	OK	OK	OK	99.5	98.5		2.0	104.0	0.8	104.0
Sodium	ICP/ES	08/15/2012			OK	OK	OK	OK	OK	101.0	107.0		2.0	111.0	2.0	96.0

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 12074720 **Lab Code:** GEN **Date Due:** 8/24/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 8/28/2012

Analyte	Date Analyzed	CALIBRATION						Method	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	ICV	CCV	ICB	CCB	Blank					
Chloride	07/30/2012			OK	OK	OK	OK	OK	99.30				
Chloride	07/31/2012			OK	OK	OK	OK	OK		116.0		1.00	

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 12074720 **Lab Code:** GEN **Date Due:** 8/24/2012

Matrix: Water **Site Code:** MND3 **Date Completed:** 8/28/2012

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate
0402	Radium-226	08/03/2012						1.15
Blank	Radium-226	08/03/2012	0.1400	U				
0402	Radium-226	08/03/2012					79.3	
Blank_Spike	Radium-226	08/03/2012				75.70		
0400	Radium-228	08/21/2012			92.0			
0402	Radium-228	08/21/2012			93.0			
0445	Radium-228	08/21/2012			94.0			
9402	Radium-228	08/21/2012			93.0			
P033	Radium-228	08/21/2012			100.0			
0402	Radium-228	08/21/2012			87.0			0.85
Blank_Spike	Radium-228	08/21/2012			93.0	101.00		
0402	Radium-228	08/21/2012			98.0		95.0	
Blank	Radium-228	08/25/2012	0.9100	U	67.0			

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Data Review and Validation Report

General Information

Requisition No. (RIN):	12104912
Sample Event:	October 23–25, 2012
Site(s):	Mound, Ohio; LTS&M Groundwater
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	314059
Analysis:	NPDES Parameters
Validator:	Stephen Donivan
Review Date:	December 11, 2012

This validation was performed according to the *Environmental Procedures Catalog*, (LMS/PRO/S04325, continually updated) "Standard Practice for Validation of Laboratory Data." The procedure was applied at Level 2, Data Deliverables Verification. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Volatile Organic Compounds	VOA-A-007	EPA 624	SW-846 8260

Data Qualifier Summary

None of the analytical results required qualification.

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received six water samples on November 8, 2012, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The air bill number was listed on the receiving documentation.

Preservation and Holding Times

The sample shipment was received intact with a temperature within the iced cooler at 4 °C, which complies with requirements. All samples were received in the correct container types and sample analysis was completed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all metal, organic, and wet chemical analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL. The reported MDLs for analytes demonstrate compliance with contractual requirements for all analytes with the exception of methylene chloride.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear curve. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All method blank and calibration blank results associated with the samples were below the practical quantitation limits for all analytes. In cases where a blank concentration exceeds the MDL, the associated sample results are qualified with a “U” flag (not detected) when the sample result is greater than the MDL but less than five times the blank concentration.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated for metals and wet chemistry analyses when the concentration of the unspiked sample is greater than four times the spike concentration. The MS/MSD analyses results met the acceptance criteria for all analytes.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference (RPD) for replicate results that are greater than five times the PQL should be less than 20 percent. For results that are less than the PQL, the range should be no greater than the PQL. The replicate results met these criteria demonstrating acceptable laboratory precision.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

Trip Blank

Trip blanks are prepared and analyzed to document contamination attributable to shipping and field handling procedures. One trip blank was submitted with these samples. Acetone and methylene chloride were detected in this blank. Acetone and methylene chloride were not detected in the associated samples.

Field Duplicate Analysis

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. A duplicate sample was collected from location 0601. The relative percent difference for duplicate results that are greater than five times the practical quantitation limit (PQL) should be less than 20 percent. For results less than five times the PQL, the range should be no greater than the PQL. All duplicate results met these criteria demonstrating acceptable precision.

Electronic Data Deliverable (EDD) File

The EDD file arrived on November 26, 2012. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not "fit" with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. Identify extreme values that may be potential outliers by generating the Outliers Report using the Sample Management System from data in the environmental database. The application compares the new data set (in standard environmental database units) with historical data and lists the new data that fall outside the historical data range. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.

2. Apply the appropriate statistical test. Dixon's Extreme Value test is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.
3. Scientifically review statistical outliers and decide on their disposition.

The trichloroethene result from location 0601 was identified as a potential outlier. There were no errors associated with the analysis of this sample. Additionally, this location was sampled in duplicate with reproducible results. The data from this RIN are acceptable as qualified.

Report Prepared By: _____

Stephen Donivan
Laboratory Coordinator

Data Validation Outliers Report - No Field Parameters

Comparison: All historical Data Beginning 1/1/2002

Laboratory: GEL Laboratories

RIN: 12104912

Report Date: 12/11/2012

Site Code	Location Code	Sample ID	Sample Date	Analyte	Current	Qualifiers		Historical Maximum	Qualifiers		Historical Minimum	Qualifiers		Number of Data Points		Statistical Outlier
					Result	*Lab*	*Data*	Result	*Lab*	*Data*	Result	*Lab*	*Data*	N	N Below Detect	
MND01	0601	N001	10/25/2012	Trichloroethene	10.3			8.9			0.11	U		61	4	Yes
MND01	0601	N002	10/25/2012	Trichloroethene	10.3			8.9			0.11	U		61	4	Yes

STATISTICAL TESTS:

The distribution of the data is tested for normality or lognormality using the Shapiro-Wilk Test

Outliers are identified using Dixon's Test when there are 25 or fewer data points.

Outliers are identified using Rosner's Test when there are 26 or more data points.

See Data Quality Assessment: Statistical Methods for Practitioners, EPA QC/G-9S, February 2006.

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 12104912 **Lab Code:** GEN **Validator:** Stephen Donivan **Validation Date:** 12/11/2012

Project: Mound NPDES **Analysis Type:** ☐ Metals ☐ General Chem ☐ Rad ☑ Organics

# of Samples: 20 **Matrix:** Water **Requested Analysis Completed:** Yes

Chain of Custody

Present: OK **Signed:** OK **Dated:** OK

Sample

Integrity: OK **Preservation:** OK **Temperature:** OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	The reported detection limits are equal to or below contract requirements.
☑ Field/Trip Blanks	There was 1 trip/equipment blank evaluated.
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Equipment/Trip Blanks

RIN: 12104912 **Lab Code:** GEN **Project:** Mound NPDES **Validation Date:** 12/11/2012

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Trip Blank	314059008	EPA 8260 Low Level	Acetone (Lab Contaminant)	2.55	J	0.500	ug/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
314059001	KLS 031	0138	0.500	1.00	U	
314059002	KLS 032	0386	0.500	1.00	U	
314059003	KLS 033	0387	0.500	1.00	U	
314059004	KLS 034	0389	0.500	1.00	U	
314059005	KLS 035	0392	0.500	1.00	U	
314059006	KLS 036	0301	0.500	1.00	U	
314059007	KLS 037	0311	0.500	1.00	U	
314059009	KLS 039	0118	0.500	1.00	U	
314059010	KLS 040	0346	0.500	1.00	U	
314059011	KLS 041	0379	0.500	1.00	U	
314059012	KLS 042	0347	0.500	1.00	U	
314059013	KLS 043	0315	0.500	1.00	U	
314059014	KLS 044	0124	0.500	1.00	U	
314059015	KLS 045	0126	0.500	1.00	U	
314059016	KLS 046	0605	0.500	1.00	U	
314059017	KLS 047	0607	0.500	1.00	U	
314059018	KLS 049	0601	0.500	1.00	U	
314059019	KLS 050	0606	0.500	1.00	U	
314059020	KLS 051	9601	0.500	1.00	U	

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Trip Blank	314059008	EPA 8260 Low Level	Methylene Chloride (Lab Contaminant)	0.170	J	0.160	ug/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
314059001	KLS 031	0138	0.160	1.00	U	
314059002	KLS 032	0386	0.160	1.00	U	
314059003	KLS 033	0387	0.160	1.00	U	
314059004	KLS 034	0389	0.160	1.00	U	
314059005	KLS 035	0392	0.160	1.00	U	
314059006	KLS 036	0301	0.160	1.00	U	
314059007	KLS 037	0311	0.160	1.00	U	

SAMPLE MANAGEMENT SYSTEM

Validation Report: Equipment/Trip Blanks

RIN: 12104912 **Lab Code:** GEN **Project:** Mound NPDES **Validation Date:** 12/11/2012

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Trip Blank	314059008		Methylene Chloride (Lab Contaminant)				

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
314059009	KLS 039	0118	0.160	1.00	U	
314059010	KLS 040	0346	0.160	1.00	U	
314059011	KLS 041	0379	0.160	1.00	U	
314059012	KLS 042	0347	0.160	1.00	U	
314059013	KLS 043	0315	0.160	1.00	U	
314059014	KLS 044	0124	0.160	1.00	U	
314059015	KLS 045	0126	0.160	1.00	U	
314059016	KLS 046	0605	0.160	1.00	U	
314059017	KLS 047	0607	0.160	1.00	U	
314059018	KLS 049	0601	0.160	1.00	U	
314059019	KLS 050	0606	0.160	1.00	U	
314059020	KLS 051	9601	0.160	1.00	U	

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12104912 **Lab Code:** GEN **Project:** Mound NPDES **Validation Date:** 12/11/2012

Duplicate: 9601 **Sample:** 0601

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
1,1,1,2-Tetrachloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1,1-Trichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1,2,2-Tetrachloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	1.50	U		1.00	1.50	U		1.00			ug/L
1,1,2-Trichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1-Dichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,1-Dichloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
1,1-Dichloropropene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2,3-Trichlorobenzene	0.200	U		1.00	0.200	U		1.00			ug/L
1,2,3-Trichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2,4-Trichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2,4-Trimethylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dibromo-3-chloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dibromoethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dichloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
1,2-Dichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,3,5-Trimethylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,3-Dichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
1,3-Dichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
1,4-Dichlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
2,2-Dichloropropane	0.160	U		1.00	0.160	U		1.00			ug/L
2-Butanone	0.500	U		1.00	0.500	U		1.00			ug/L
2-Chlorotoluene	0.160	U		1.00	0.160	U		1.00			ug/L
2-Hexanone	0.500	U		1.00	0.500	U		1.00			ug/L
4-Chlorotoluene	0.160	U		1.00	0.160	U		1.00			ug/L
4-Isopropyltoluene	0.160	U		1.00	0.160	U		1.00			ug/L
4-Methyl-2-pentanone	0.500	U		1.00	0.500	U		1.00			ug/L
Acetone	0.500	U		1.00	0.500	U		1.00			ug/L
Benzene	0.160	U		1.00	0.160	U		1.00			ug/L
Bromobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Bromochloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Bromodichloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Bromoform	0.160	U		1.00	0.160	U		1.00			ug/L
Bromomethane	0.160	U		1.00	0.160	U		1.00			ug/L
Carbon Disulfide	0.500	U		1.00	0.500	U		1.00			ug/L
Carbon Tetrachloride	0.160	U		1.00	0.160	U		1.00			ug/L
Chlorobenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Chloroethane	0.160	U		1.00	0.160	U		1.00			ug/L
Chloroform	0.160	U		1.00	0.160	U		1.00			ug/L

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12104912 **Lab Code:** GEN **Project:** Mound NPDES **Validation Date:** 12/11/2012

Duplicate: 9601 **Sample:** 0601

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Chloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
cis-1,2-Dichloroethene	0.940	J		1.00	0.920	J		1.00	2.15		ug/L
cis-1,3-Dichloropropene	0.160	U		1.00	0.160	U		1.00			ug/L
Dibromochloromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Dibromomethane	0.160	U		1.00	0.160	U		1.00			ug/L
Dichlorodifluoromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Ethylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Hexachlorobutadiene	0.160	U		1.00	0.160	U		1.00			ug/L
Isopropylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Methylene Chloride	0.160	U		1.00	0.160	U		1.00			ug/L
Naphthalene	0.160	U		1.00	0.160	U		1.00			ug/L
n-Butylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
n-Propylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
sec-Butylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Styrene	0.160	U		1.00	0.160	U		1.00			ug/L
tert-Butylbenzene	0.160	U		1.00	0.160	U		1.00			ug/L
Tetrachloroethene	7.29			1.00	7.45			1.00	2.17		ug/L
Toluene	0.280	J		1.00	0.240	J		1.00			ug/L
Total Xylenes	0.160	U		1.00	0.160	U		1.00			ug/L
trans-1,2-Dichloroethene	0.160	U		1.00	0.160	U		1.00			ug/L
trans-1,3-Dichloropropene	0.160	U		1.00	0.160	U		1.00			ug/L
Trichloroethene	10.3			1.00	10.3			1.00	0		ug/L
Trichlorofluoromethane	0.160	U		1.00	0.160	U		1.00			ug/L
Vinyl Chloride	0.160	U		1.00	0.160	U		1.00			ug/L

SAMPLE MANAGEMENT SYSTEM
Organics Data Validation Summary

RIN: 12104912 **Project:** Mound NPDES **Lab Code:** GEN **Validation Date:** 12/11/2012

LCS Recovery: All LCS recoveries were within the laboratory acceptance limits.

Method Blank(s): All method blanks results were below the method detection limit.

MS/MSD Recovery: All MS/MSD recoveries were within the laboratory acceptance limits.

Surrogate Recovery: All surrogate recoveries were within the laboratory acceptance limits.

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Data Review and Validation Report

General Information

Requisition No. (RIN):	12104913
Sample Event:	October 22, 2012
Site(s):	Mound, Ohio; Groundwater
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	313867
Analysis:	Chloride, Metals, Radiochemistry
Validator:	Stephen Donivan
Review Date:	December 11, 2012

This validation was performed according to the *Environmental Procedures Catalog* (LMS/PRO/S04325), *"Standard Practice for Validation of Laboratory Data."* The procedure was applied at Level 2, Data Deliverables Verification. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Barium, Sodium	LMM-01	SW-846 3005	SW-846 6010B
Chloride	WCH-A-011	EPA 300.0	EPA 300.0
Radium-226	GPC-A-018	EPA 903.1 Mod	EPA 903.1 Mod
Radium-228	GPC-A-020	EPA 904.0 Mod	EPA 904.0 Mod

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
313867001	0400	Radium-228	J	Less than the Determination Limit
313867002	0402	Radium-228	J	Less than the Determination Limit
313867004	0400 Duplicate	Barium	R	Anomalous result

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received five water samples on October 24, 2012, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions. The air waybill number was listed on the receiving documentation.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler of 4 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. Sample analysis was completed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all metal and wet chemical analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), Decision Level Concentration (DLC), and Determination Limit (DL). The MDC is a measure of radiochemical method performance and was calculated and reported as specified in *Quality Systems for Analytical Services*. The DLC is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, and is estimated as 3 times the one-sigma total propagated uncertainty. Results that are greater than the MDC, but less than the DLC are qualified with a “U” flag (not detected). The DL for radiochemical results is the lowest concentration that can be reliably measured, and is defined as three times the MDC. Results not previously “U” qualified that are less than the DL are qualified with a “J” flag as estimated values.

The reported MDLs for all metal and wet chemical analytes; and MDCs for radiochemical analytes demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. All calibration and laboratory spike standards were prepared from independent sources.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All metals and wet chemistry method blank results associated with the samples were below the method detection limits. The radiochemical method blank results were below the DLC for radium-226 and radium-228.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than four times the spike concentration. The spike recoveries met the recovery and precision criteria for all analytes evaluated.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for non-radiochemical replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. The replicate results met these criteria, demonstrating acceptable laboratory precision. The relative error ratio for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) was less than 3, indicating acceptable precision

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

Electronic Data Deliverable File

The EDD file arrived on November 21, 2012. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. The relative percent difference for duplicate results that are greater than five times the PQL should be less than 20 percent. For results that are less than five times the PQL, the range should be no greater than the PQL. Duplicate samples were collected from location 0400 (field duplicate ID 9400). The barium duplicate result did not meet these criteria. This result was also identified as an anomalous value and qualified on that basis.

The relative error ratio for radiochemical duplicate results (calculated using the 1-sigma total propagated uncertainty) was less than 3, indicating acceptable precision.

Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not "fit" with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. Identify extreme values that may be potential outliers by generating the Outliers Report using the Sample Management System from data in the environmental database. The application compares the new data set (in standard environmental database units) with historical data and lists the new data that fall outside the historical data range. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.
2. Apply the appropriate statistical test. Dixon's Extreme Value test is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric

test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.

3. Scientifically review statistical outliers and decide on their disposition.

The barium result for the duplicate sample collected from location 0400 was identified as an anomalous value. This sample may have become contaminated by the adjacent sample, 0445, that has a barium concentration one hundred times the concentration expected for location 0400. Because this is a duplicate and the associated sample result is acceptable, the duplicate result is qualified with an "R" flag as rejected.

Report Prepared By: _____

Stephen Donivan
Laboratory Coordinator

Data Validation Outliers Report - No Field Parameters

Comparison: All historical Data Beginning 1/1/2002

Laboratory: GEL Laboratories

RIN: 12104913

Report Date: 12/11/2012

					Current			Historical Maximum			Historical Minimum			Number of Data Points		Statistical Outlier
						Qualifiers			Qualifiers			Qualifiers				
Site Code	Location Code	Sample ID	Sample Date	Analyte	Result	*Lab*	*Data*	Result	*Lab*	*Data*	Result	*Lab*	*Data*	N	N Below Detect	
MND01	0400	N002	10/22/2012	Barium	0.262			0.163		F	0.0411	B		56	0	Yes
MND01	0402	N001	10/22/2012	Barium	0.0832			0.0784		FJ	0.0307	B		42	0	No

STATISTICAL TESTS:

The distribution of the data is tested for normality or lognormality using the Shapiro-Wilk Test

Outliers are identified using Dixon's Test when there are 25 or fewer data points.

Outliers are identified using Rosner's Test when there are 26 or more data points.

See Data Quality Assessment: Statistical Methods for Practitioners, EPA QC/G-9S, February 2006.

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 12104913 **Lab Code:** GEN **Validator:** Stephen Donivan **Validation Date:** 12/11/2012

Project: Mound LTS&M Ground Water **Analysis Type:** ☑ Metals ☑ General Chem ☑ Rad ☐ Organics

# of Samples: 5 **Matrix:** Water **Requested Analysis Completed:** Yes

Chain of Custody

Present: OK **Signed:** OK **Dated:** OK

Sample

Integrity: OK **Preservation:** OK **Temperature:** OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	The reported detection limits are equal to or below contract requirements.
☐ Field/Trip Blanks	
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12104913 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 12/11/2012

Duplicate: 9400 **Sample:** 0400

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Barium	117			1.00	262			1.00	76.52		ug/L
Chloride	87.1			50.00	93.4			50.00	6.98		mg/L
Radium-226	0.904		0.342	1.00	0.914		0.308	1.00		0	pCi/L
Radium-228	0.780		0.419	1.00	1.58		0.573	1.00		2.2	pCi/L
Sodium	62000			1.00	64300			1.00	3.64		ug/L

SAMPLE MANAGEMENT SYSTEM

Metals Data Validation Worksheet

RIN: 12104913 **Lab Code:** GEN **Date Due:** 11/21/2012

Matrix: Water **Site Code:** MND03 **Date Completed:** 11/21/2012

Analyte	Method Type	Date Analyzed	CALIBRATION						Method Blank	LCS %R	MS %R	MSD %R	Dup. RPD	ICSAB %R	Serial Dil. %R	CRI %R
			Int.	R^2	ICV	CCV	ICB	CCB								
Barium	ICP/ES	10/31/2012			OK	OK	OK	OK	OK	97.0	97.0		1.0	106.0	2.0	99.0
Sodium	ICP/ES	11/07/2012			OK	OK	OK	OK	OK	104.0	115.0		2.0	115.0	1.0	106.0

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 12104913 **Lab Code:** GEN **Date Due:** 11/21/2012

Matrix: Water **Site Code:** MND03 **Date Completed:** 11/21/2012

Analyte	Date Analyzed	CALIBRATION						Method	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	ICV	CCV	ICB	CCB	Blank					
Chloride	10/26/2012	0.000	0.9985	OK	OK	OK	OK	OK	98.30	92.8		0	

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 12104913 **Lab Code:** GEN **Date Due:** 11/21/2012

Matrix: Water **Site Code:** MND03 **Date Completed:** 11/21/2012

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate
0400	Radium-226	11/06/2012						2.17
Blank	Radium-226	11/06/2012	0.3600	U				
0400	Radium-226	11/06/2012					108.0	
Blank_Spike	Radium-226	11/06/2012				79.90		
0400	Radium-228	11/07/2012			91.0			
0402	Radium-228	11/07/2012			97.0			
0445	Radium-228	11/07/2012			107.0			
9400	Radium-228	11/07/2012			95.0			
P033	Radium-228	11/07/2012			93.0			
0400	Radium-228	11/07/2012			99.0			0.56
Blank_Spike	Radium-228	11/07/2012			93.0	92.90		
0400	Radium-228	11/07/2012			92.0		104.0	
Blank	Radium-228	11/07/2012	0.4190	U	99.0			

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Data Review and Validation Report

General Information

Requisition No. (RIN):	12104938
Sample Event:	November 5–6, 2012
Site(s):	Mound, Ohio; Groundwater
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	314703
Analysis:	Chloride, Metals, Radiochemistry
Validator:	Stephen Donivan
Review Date:	December 11, 2012

This validation was performed according to the *Environmental Procedures Catalog* (LMS/PRO/S04325), *"Standard Practice for Validation of Laboratory Data."* The procedure was applied at Level 2, Data Deliverables Verification. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Barium, Sodium	LMM-01	SW-846 3005	SW-846 6010B
Chloride	WCH-A-011	EPA 300.0	EPA 300.0
Radium-226	GPC-A-018	EPA 903.1 Mod	EPA 903.1 Mod
Radium-228	GPC-A-020	EPA 904.0 Mod	EPA 904.0 Mod

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
314703001	GP-201	Radium-226	J	Less than the Determination Limit
314703001	GP-201	Radium-228	J	Less than the Determination Limit
314703002	GP-202	Radium-226	J	Less than the Determination Limit
314703002	GP-202	Radium-228	J	Less than the Determination Limit
314703003	GP-201 Duplicate	Radium-226	J	Less than the Determination Limit
314703003	GP-201 Duplicate	Radium-228	J	Less than the Determination Limit

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received four water samples on November 7, 2012, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions. The air waybill number was listed on the receiving documentation.

Preservation and Holding Times

The sample shipments were received intact with the temperature inside the iced cooler of 4 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. Sample analysis was completed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all metal and wet chemical analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), Decision Level Concentration (DLC), and Determination Limit (DL). The MDC is a measure of radiochemical method performance and was calculated and reported as specified in *Quality Systems for Analytical Services*. The DLC is the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero, and is estimated as 3 times the one-sigma total propagated uncertainty. Results that are greater than the MDC, but less than the DLC are qualified with a “U” flag (not detected). The DL for radiochemical results is the lowest concentration that can be reliably measured, and is defined as three times the MDC. Results not previously “U” qualified that are less than the DL are qualified with a “J” flag as estimated values.

The reported MDLs for all metal and wet chemical analytes; and MDCs for radiochemical analytes demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. All calibration and laboratory spike standards were prepared from independent sources.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All metals and wet chemistry method blank results associated with the samples were below the method detection limits. The radiochemical method blank results were below the DLC for radium-226 and radium-228.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than four times the spike concentration. The spike recoveries met the recovery and precision criteria for all analytes evaluated. The chloride matrix spike recovery was above the laboratory acceptance limit, but less than the validation criteria of 125%, not requiring qualification.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for non-radiochemical replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. The replicate results met these criteria, demonstrating acceptable laboratory precision. The relative error ratio for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) was less than 3, indicating acceptable precision

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers.

Electronic Data Deliverable File

The EDD file arrived on November 21, 2012. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Field Blank

Equipment blanks are prepared and analyzed to document contamination attributable field activities. One field blank was submitted with these samples. There were no analytes detected in this blank.

Field Duplicate

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. The relative percent difference for duplicate results that are greater than five times the PQL should be less than 20 percent. For results that are less than five times the PQL, the range should be no greater than the PQL. Duplicate samples were collected from location GP-201 (field duplicate ID GP-291). The duplicate results met these criteria indicating acceptable precision.

The relative error ratio for radiochemical duplicate results (calculated using the 1-sigma total propagated uncertainty) was less than 3, indicating acceptable precision.

Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers may result from transcription errors, data-coding errors, or measurement system problems. However, outliers may also represent true extreme values of a distribution and indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not "fit" with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. Identify extreme values that may be potential outliers by generating the Outliers Report using the Sample Management System from data in the environmental database. The application compares the new data set (in standard environmental database units) with historical data and lists the new data that fall outside the historical data range. A determination is also made if the data are normally distributed using the Shapiro-Wilk Test.
2. Apply the appropriate statistical test. Dixon's Extreme Value test is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.
3. Scientifically review statistical outliers and decide on their disposition.

The were no potential outliers identified and the data from this event are acceptable as qualified.

Report Prepared By: _____

Stephen Donivan
Laboratory Coordinator

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 12104938 **Lab Code:** GEN **Validator:** Stephen Donivan **Validation Date:** 12/11/2012

Project: Mound LTS&M Ground Water **Analysis Type:** ☑ Metals ☑ General Chem ☑ Rad ☐ Organics

# of Samples: 4 **Matrix:** Water **Requested Analysis Completed:** Yes

Chain of Custody

Present: OK **Signed:** OK **Dated:** OK

Sample

Integrity: OK **Preservation:** OK **Temperature:** OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	The reported detection limits are equal to or below contract requirements.
☑ Field/Trip Blanks	There was 1 trip/equipment blank evaluated.
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 12104938 **Lab Code:** GEN **Project:** Mound LTS&M Ground Water **Validation Date:** 12/11/2012

Duplicate: GP-291 **Sample:** GP-201

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Barium	149			1.00	153			1.00	2.65		ug/L
Chloride	199			20.00	202			20.00	1.50		mg/L
Radium-226	0.696		0.431	1.00	1.00		0.464	1.00		0.9	pCi/L
Radium-228	1.38		0.615	1.00	1.10		0.577	1.00		0.7	pCi/L
Sodium	100000			1.00	103000			1.00	2.96		ug/L

SAMPLE MANAGEMENT SYSTEM

Metals Data Validation Worksheet

RIN: 12104938 **Lab Code:** GEN **Date Due:** 11/21/2012

Matrix: Water **Site Code:** MND03 **Date Completed:** 11/21/2012

Analyte	Method Type	Date Analyzed	CALIBRATION						Method Blank	LCS %R	MS %R	MSD %R	Dup. RPD	ICSAB %R	Serial Dil. %R	CRI %R
			Int.	R^2	ICV	CCV	ICB	CCB								
Barium	ICP/ES	11/12/2012			OK	OK	OK	OK	OK	94.1	95.1		1.0	108.0	2.0	100.0
Sodium	ICP/ES	11/12/2012			OK	OK	OK	OK	OK	99.3			2.0	118.0	3.0	104.0

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 12104938 **Lab Code:** GEN **Date Due:** 11/21/2012

Matrix: Water **Site Code:** MND03 **Date Completed:** 11/21/2012

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate
GP-201	Radium-226	11/12/2012						1.68
Blank	Radium-226	11/12/2012	0.3580	U				
GP-201	Radium-226	11/12/2012					97.7	
Blank_Spike	Radium-226	11/12/2012				98.30		
GP-201	Radium-228	11/13/2012			81.0			
GP-202	Radium-228	11/13/2012			88.0			
GP-291	Radium-228	11/13/2012			83.0			
GP-999	Radium-228	11/13/2012			90.0			
GP-201	Radium-228	11/13/2012			84.0			1.47
Blank_Spike	Radium-228	11/13/2012			86.0	114.00		
GP-201	Radium-228	11/13/2012			98.0		95.0	
Blank	Radium-228	11/13/2012	0.1440	U	103.0			

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 12104938 **Lab Code:** GEN **Date Due:** 11/21/2012

Matrix: Water **Site Code:** MND03 **Date Completed:** 11/21/2012

Analyte	Date Analyzed	CALIBRATION						Method	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	ICV	CCV	ICB	CCB	Blank					
Chloride	11/09/2012			OK	OK	OK	OK	OK	97.50				
Chloride	11/12/2012									111.0		0	