

Data Validation Package

November 2012
Groundwater Sampling at the
Ambrosia Lake, New Mexico,
Disposal Site

February 2013

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Contents

Sampling Event Summary	1
Ambrosia Lake, New Mexico, Disposal Site Sample Location Map	3
Data Assessment Summary.....	5
Water Sampling Field Activities Verification Checklist	7
Laboratory Performance Assessment	9
Sampling Quality Control Assessment.....	18
Certification	20

Attachment 1—Assessment of Anomalous Data

Potential Outliers Report

Attachment 2—Data Presentation

Groundwater Quality Data
Static Water Level Data
Time-Concentration Graphs

Attachment 3—Sampling and Analysis Work Order

Attachment 4—Trip Report

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Sampling Event Summary

Site: Ambrosia Lake, New Mexico, Disposal Site

Sampling Period: November 15, 2012

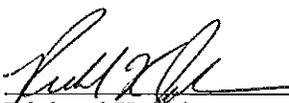
The *Long-Term Surveillance Plan for the Ambrosia Lake, New Mexico, Disposal Site* does not require groundwater monitoring because groundwater in the uppermost aquifer is of limited use, and supplemental standards have been applied to the aquifer. However, at the request of the New Mexico Environment Department, the U.S. Department of Energy conducts annual monitoring at three locations, monitoring wells 0409, 0675, and 0678. Sampling and analysis were conducted as specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PLN/S04351, continually updated). Monitoring well 0409 was not sampled during this event because it was dry. Water levels were measured at each sampled well. One duplicate sample was collected from location 0675.

Groundwater samples from the two sampled wells were analyzed for the constituents listed in Table 1. Time-concentration graphs for selected analytes are included in this report. There were no significant changes in analyte concentrations observed in well 0675, which is completed in the alluvium. When compared to 2011 data, an increase in sulfate was observed in well 0678, which is completed in the Tres Hermanos B Sandstone Unit of the Mancos Shale.

Table 1. 2012 Groundwater Monitoring Analytical Results at the Ambrosia Lake, New Mexico, Site

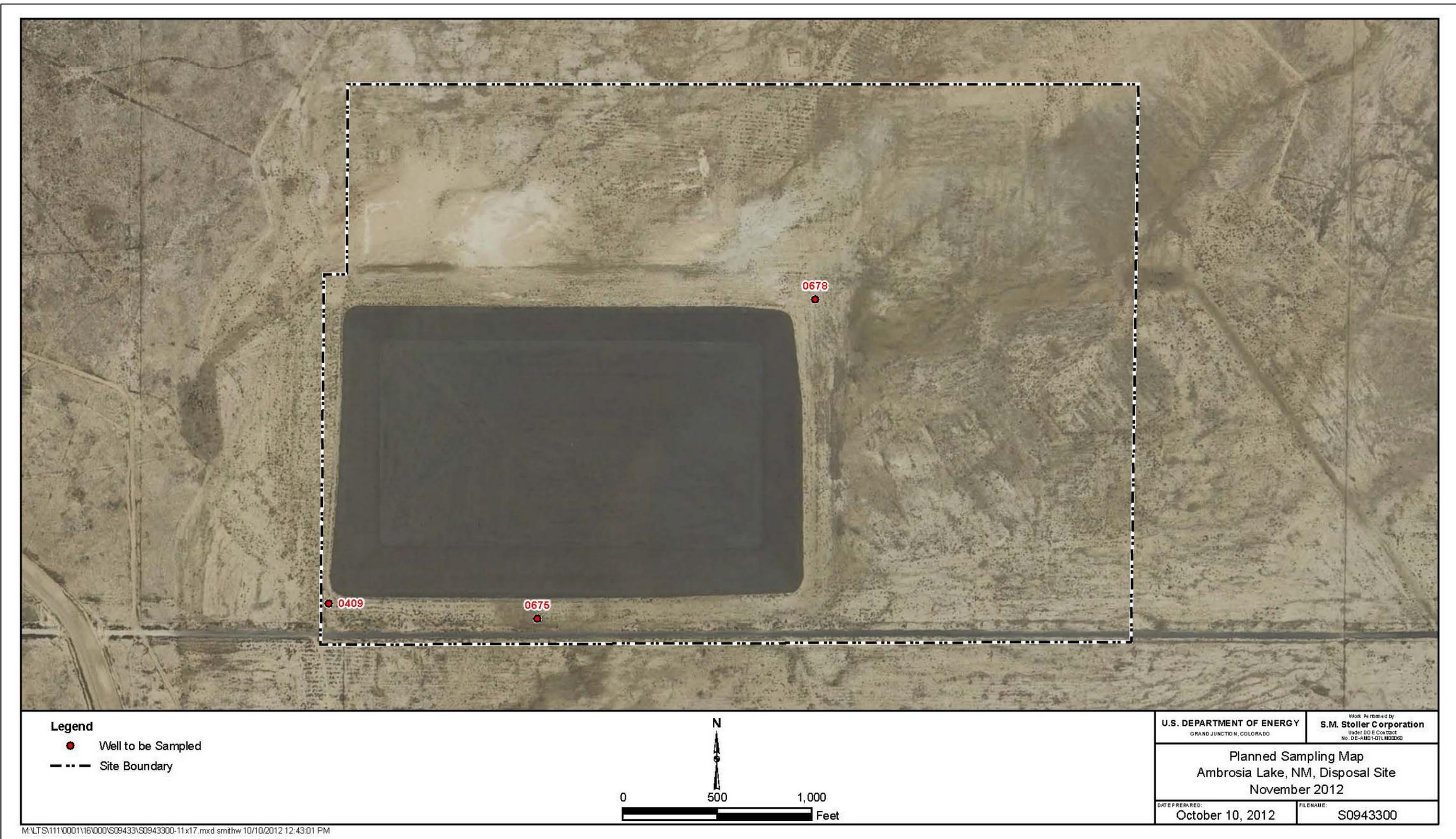
Analyte	Well 0675 mg/L	Well 0678 mg/L
Arsenic	0.0188	0.0047
Bicarbonate alkalinity (CaCO ₃)	251	731
Calcium	471	388
Carbonate alkalinity (CaCO ₃)	ND	ND
Chloride	230	281
Magnesium	254	506
Molybdenum	0.308	0.00536
Nitrate + Nitrite as Nitrogen	32.2	358
Potassium	11.2	32.6
Selenium	0.917	0.0243
Sodium	895	2940
Sulfate	2900	9650
Total Dissolved Solids	5550	14000
Uranium	0.788	0.0532

Key: mg/L = milligrams per liter; ND = not detected


Richard K. Johnson
Site Lead, S.M. Stoller Corporation

2/12/13
Date

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Ambrosia Lake, New Mexico, Disposal Site Sample Location Map

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Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	<u>Ambrosia Lake, New Mexico</u>	Date(s) of Water Sampling	<u>November 15, 2012</u>
Date(s) of Verification	<u>January 15, 2013</u>	Name of Verifier	<u>Gretchen Baer</u>

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures? List other documents, SOPs, instructions.	<u>Yes</u>	<u>Work Order letter dated October 11, 2012.</u>
2. Were the sampling locations specified in the planning documents sampled?	<u>No</u>	<u>Location 0409 was dry and not sampled.</u>
3. Was a pre-trip calibration conducted as specified in the above-named documents?	<u>Yes</u>	<u>Pre-trip calibration performed on November 8, 2012. [pH pre-trip calibration: at 181.9, the span was slightly above range (165-180), which is acceptable.]</u>
4. Was an operational check of the field equipment conducted daily? Did the operational checks meet criteria?	<u>Yes</u> <u>Yes</u>	
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	<u>Yes</u>	
6. Was the category of the well documented?	<u>Yes</u>	
7. Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged prior to sampling? Did the water level stabilize prior to sampling? Did pH, specific conductance, and turbidity measurements stabilize prior to sampling? Was the flow rate less than 500 mL/min? If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	<u>Yes</u> <u>Yes</u> <u>Yes</u> <u>Yes</u> <u>NA</u>	

Water Sampling Field Activities Verification Checklist (continued)

	Response (Yes, No, NA)	Comments
8. Were the following conditions met when purging a Category II well:		
Was the flow rate less than 500 mL/min?	NA	
Was one pump/tubing volume removed prior to sampling?	NA	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	A duplicate sample was collected for location 0675.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with nondedicated equipment?	NA	An equipment blank was not required.
11. Were trip blanks prepared and included with each shipment of VOC samples?	NA	
12. Were QC samples assigned a fictitious site identification number?	Yes	
Was the true identity of the samples recorded on the Quality Assurance Sample Log or in the Field Data Collection System (FDSC) report?	Yes	
13. Were samples collected in the containers specified?	Yes	
14. Were samples filtered and preserved as specified?	Yes	
15. Were the number and types of samples collected as specified?	Yes	
16. Were chain of custody records completed and was sample custody maintained?	Yes	
17. Are field data sheets signed and dated by both team members (hardcopies) or are dates present for the "Date Signed" fields (FDSC)?	Yes	
18. Was all other pertinent information documented on the field data sheets?	Yes	
19. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
20. Were water levels measured at the locations specified in the planning documents?	Yes	

Laboratory Performance Assessment

General Information

Report Number (RIN): 12114946
 Sample Event: November 15, 2012
 Site(s): Ambrosia Lake, New Mexico
 Laboratory: GEL Laboratories, Charleston, South Carolina
 Work Order No.: 315499 & 318420
 Analysis: Metals and Wet Chemistry
 Validator: Gretchen Baer
 Review Date: January 25, 2013

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 3, Data Validation. 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 2.

Table 2. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Alkalinity, Bicarbonate	WCH-A-003	EPA 310.1/ SM 2320B	EPA 310.1/ SM 2320B
Alkalinity, Carbonate	WCH-A-004	EPA 310.1/ SM 2320B	EPA 310.1/ SM 2320B
Chloride, Sulfate	MIS-A-045	EPA 300.0	EPA 300.0
Calcium, Magnesium, Potassium, Sodium	LMM-01	SW-846 3005A	SW-846 6010B
Arsenic, Molybdenum, Selenium, Uranium	LMM-02	SW-846 3005A	SW-846 6020A
Nitrate + Nitrite as N	WCH-A-022	EPA 353.2	EPA 353.2
Total Dissolved Solids	WCH-A-033	SM 2540C	SM 2540C

Data Qualifier Summary

Analytical results were qualified as listed in Table 3. Refer to the attached validation worksheets and the sections below for an explanation of the data qualifiers applied.

Table 3. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
All	All	Chloride	J	Exceeded holding time
All	All	Sulfate	J	Exceeded holding time; Matrix spike has positive bias

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received three water samples on November 17, 2012, accompanied by a Chain of Custody form. The air bill numbers were listed in the receiving documentation. The Chain of Custody 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 Chain of Custody form was complete with no errors or omissions.

Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced cooler at 2 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times, with the exception of the chloride and sulfate samples. These samples were initially analyzed within holding time but were reanalyzed out of holding time in response to Request for Information #13-3629. Chloride and sulfate results for all samples are qualified with a “J” flag as estimated values.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all 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 percent 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.

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. All calibration and laboratory spike standards were prepared from independent sources.

Method EPA 300.0

Calibrations for chloride and sulfate were performed using seven calibration standards on December 9, 2012. The calibration curve correlation coefficient values were greater than 0.995 and the absolute values of the intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency resulting in four verification checks. All calibration checks met the acceptance criteria.

Methods EPA 310.1/ SM 2320B, SM 2540C

There are no initial or continuing calibration requirements associated with the alkalinity or total dissolved solids methods. The laboratory noted that some total dissolved solids samples failed

the weight check criterion of 0.0005 grams. These weights were within 4 percent, however, so no further qualification is necessary.

Method EPA 353.2

Calibrations for nitrate + nitrite as N were performed using five calibration standards on November 27, 2012. The calibration curve correlation coefficient values were greater than 0.995 and the absolute values of the intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency resulting in six verification checks. All calibration check results were within the acceptance criteria.

Method SW-846 6010B

Calibrations for calcium, magnesium, potassium, and sodium were performed on December 10, 2012, using three calibration standards. The correlation coefficient values were greater than 0.995. The absolute values of the intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency resulting in six verification checks. All calibration checks met the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL and all results were within the acceptance range.

Method SW-846 6020A

Calibrations were performed for arsenic, molybdenum, selenium, and uranium on December 5-7, 2012, using four calibration standards. The calibration curve correlation coefficient values were greater than 0.995. The absolute values of the calibration curve intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency resulting in 29 verification checks. All calibration checks met the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL and all results were within the acceptance range. Mass calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure. Internal standard recoveries associated with requested analytes were stable and within acceptable ranges.

Method and Calibration Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. Methods without sample preparation do not require the analysis of a method blank. Calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis. All method blank and calibration blank results were below the PQL 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 5 times the blank concentration.

Inductively Coupled Plasma Interference Check Sample Analysis

Interference check samples were analyzed at the required frequency to verify the instrumental interelement and background correction factors. All check sample results met the acceptance criteria.

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 4 times the spike. The spike recoveries met the acceptance criteria for all analytes evaluated with the following exception. A spike recovery for sulfate was above the acceptance range with a positive bias of about 27 percent. Associated results are qualified with a “J” flag (estimated).

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 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.

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.

Metals Serial Dilution

Serial dilutions were prepared and analyzed for the metals analyses to monitor chemical or physical interferences in the sample matrix. Serial dilution data are evaluated when the concentration of the undiluted sample is greater than 50 times the MDL. All evaluated serial dilution data were acceptable.

Completeness

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

Chromatography Peak Integration

The integration of analyte peaks was reviewed for all chromatography data. All peak integrations were satisfactory.

Anion/Cation Balance

The anion/cation balance is used to determine if major ion concentrations have been quantified correctly. The total anions should balance with (be equal to) the total cations when expressed in milliequivalents per liter. Table 4 shows the total anion and cation results in groundwater samples from this event and the charge balance, which is an RPD calculation. Typically, a charge balance difference of 10 percent is considered acceptable.

Table 4. Comparison of Major Anions and Cations in Groundwater Samples

Location	Cations (meq/L)	Anions (meq/L)	Charge Balance (%)
0675	74.2	83.6	6.0
0678	249.0	189.7	13.5

The charge balance value at location 0678 is greater than 10 percent. There were no laboratory analytical errors identified during the review of the data.

Electronic Data Deliverable (EDD) File

The EDD file arrived on December, 17, 2012. An additional EDD file arrived on January 24, 2013, that was comprised of replacement values for the chloride and sulfate results (in response to Request for Information #13-3629). The Sample Management System EDD validation module was used to verify that the EDD files were 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 EDDs were manually examined to verify that the sample results accurately reflect the data contained in the sample data packages.

SAMPLE MANAGEMENT SYSTEM
General Data Validation Report

RIN: 12114946 Lab Code: GEN Validator: Gretchen Baer Validation Date: 1/15/2013

Project: Ambrosia Lake Disposal Site Analysis Type: Metals General Chem Rad Organics

of Samples: 3 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

Field Duplicates

There was 1 duplicate evaluated.

**SAMPLE MANAGEMENT SYSTEM
Metals Data Validation Worksheet**

RIN: 12114946 Lab Code: GEN Date Due: 12/15/2012
 Matrix: Water Site Code: AMB01 Date Completed: 12/14/2012

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								
Calcium	ICP/ES	12/10/2012										0.0	96.0	1.0	105.0	
Calcium	ICP/ES	12/10/2012	0.0000	1.0000	OK	OK	OK	OK	OK	98.0		1.0	92.0	1.7		
Magnesium	ICP/ES	12/10/2012	0.0000	1.0000	OK	OK	OK	OK	OK	100.0		1.0	93.0	0.4		
Magnesium	ICP/ES	12/10/2012										1.0	94.0	1.6	107.0	
Potassium	ICP/ES	12/10/2012										0.0	110.0	2.6	105.0	
Potassium	ICP/ES	12/10/2012	0.0000	1.0000	OK	OK	OK	OK	OK	98.4		1.0	107.0	3.7		
Sodium	ICP/ES	12/10/2012	0.0000	1.0000	OK	OK	OK	OK	OK	93.8		3.0	101.0	2.2		
Sodium	ICP/ES	12/10/2012										0.0	106.0	1.2	105.0	
Arsenic	ICP/MS	12/07/2012			OK	OK	OK	OK			108.0		108.0		106.0	
Arsenic	ICP/MS	12/05/2012			OK	OK	OK	OK								
Arsenic	ICP/MS	12/06/2012							OK	105.0	111.0		111.0		114.0	
Molybdenum	ICP/MS	12/07/2012			OK	OK	OK	OK			110.0		98.0		113.0	
Molybdenum	ICP/MS	12/07/2012							OK	106.0	110.0	5.0	97.0		116.0	
Molybdenum	ICP/MS	12/06/2012			OK	OK	OK	OK								
Selenium	ICP/MS	12/06/2012			OK	OK	OK	OK								
Selenium	ICP/MS	12/06/2012							OK	105.0	123.0		110.0		118.0	
Selenium	ICP/MS	12/05/2012			OK	OK	OK	OK								

**SAMPLE MANAGEMENT SYSTEM
Metals Data Validation Worksheet**

RIN: 12114946 **Lab Code:** GEN **Date Due:** 12/15/2012
Matrix: Water **Site Code:** AMB01 **Date Completed:** 12/14/2012

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								
Selenium	ICP/MS	12/07/2012			OK	OK	OK	OK		124.0			105.0		120.0	
Uranium	ICP/MS	12/07/2012						OK	109.0	103.0		3.0	102.0	2.2	100.0	
Uranium	ICP/MS	12/06/2012			OK	OK	OK	OK								
Uranium	ICP/MS	12/06/2012								105.0		5.0	105.0	0.3	114.0	
Uranium	ICP/MS	12/05/2012			OK	OK	OK	OK								

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 12114946 **Lab Code:** GEN **Date Due:** 12/15/2012
Matrix: Water **Site Code:** AMB01 **Date Completed:** 12/14/2012

Analyte	Date Analyzed	CALIBRATION						Method Blank	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	ICV	CCV	ICB	CCB						
ALKALINITY, Total as CaCO3	11/29/2012							OK	101				
ALKALINITY, Total as CaCO3	11/29/2012							OK	110				
Bicarbonate alkalinity (CaCO3)	11/29/2012										0		
Carbonate alkalinity (CaCO3)	11/29/2012												
Chloride	12/09/2012	0.210	0.9983	OK		OK							
Chloride	01/17/2013				OK		OK	OK	103.00	98.7		1.00	
NO2+NO3 as N	11/27/2012	-0.003	1.0000		OK	OK	OK	OK	102	91.6		3	
Sulfate	12/09/2012	0.320	0.9989	OK		OK							
Sulfate	01/17/2013				OK		OK	OK	105.00				
Sulfate	01/18/2013									127.0		0	
Total Dissolved Solids	11/20/2012							OK	96.7			0	

Sampling Quality Control Assessment

The following information summarizes and assesses quality control for this sampling event.

Sampling Protocol

Sample results for monitoring wells were qualified with an “F” flag in the database, indicating the wells were purged and sampled using the low-flow sampling method and Category I criteria. The dissolved oxygen field measurement value at location 0675 is qualified with a “J” flag (estimated) because the field notes stated that air bubbles were present in the water, which can bias the dissolved oxygen measurement high.

Equipment Blank Assessment

No equipment blanks were taken. All samples were collected using dedicated equipment that did not require equipment blanks.

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. Duplicate samples were collected from location 0675. The RPD for duplicate 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 duplicate results met the criteria, demonstrating acceptable overall precision.

SAMPLE MANAGEMENT SYSTEM
Validation Report: Field Duplicates

Page 1 of 1

RIN: 12114946 Lab Code: GEN Project: Ambrosia Lake Disposal Site Validation Date: 1/15/2013

Analyte	Duplicate: 2073				Sample: 0675				RPD	RER	Units
	Result	Flag	Error	Dilution	Result	Flag	Error	Dilution			
Arsenic	18.8			1.00	18.9			1.00	0.53		ug/L
Bicarbonate alkalinity (CaCO3)	251			1.00	241			1.00	4.07		mg/L
Calcium	471000			20.00	473000			20.00	0.42		ug/L
Carbonate alkalinity (CaCO3)	0.725	U		1.00	0.725	U		1.00			mg/L
Chloride	112			50.00	116			50.00	3.51		mg/L
Magnesium	254000			20.00	254000			20.00	0		ug/L
Molybdenum	308			10.00	273			10.00	12.05		ug/L
NO2+NO3 as N	32.2			50.00	33.1			50.00	2.76		mg/L
Potassium	11200			20.00	11100			20.00	0.90		ug/L
Selenium	917			10.00	965			10.00	5.10		ug/L
Sodium	895000			20.00	895000			20.00	0		ug/L
Sulfate	1500			50.00	1570			50.00	4.56		mg/L
Total Dissolved Solids	5550			1.00	5450			1.00	1.82		mg/L
Uranium	788			1.00	767			1.00	2.70		ug/L

Certification

All laboratory analytical quality control criteria were met except as qualified in this report. The data qualifiers listed on the SEEPro database reports are defined on the last page of each report. All data in this package are considered validated and available for use.

Laboratory Coordinator: Steve Donovan 2-12-2013
Steve Donovan Date

Data Validation Lead: Gretchen Baer 2-12-2013
Gretchen Baer Date

Attachment 1
Assessment of Anomalous Data

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Potential Outliers Report

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Potential 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.

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

Data Validation Outliers Report - No Field Parameters

Comparison: All Historical Data

Laboratory: GEL Laboratories

RIN: 12114946

Report Date: 1/25/2013

Site Code	Location Code	Sample ID	Sample Date	Analyte	Current	Historical Maximum			Historical Minimum			Number of Data Points		Statistical Outlier		
					Result	Qualifiers		Result	Qualifiers		Result	Qualifiers			N	N Below Detect
						Lab	Data		Lab	Data		Lab	Data			
AMB01	0675	N002	11/15/2012	Chloride	240		JF	510		F	246		F	10	0	No
AMB01	0675	N001	11/15/2012	Chloride	230		JF	510		F	246		F	10	0	No
AMB01	0675	N001	11/15/2012	Sulfate	2900		JF	4141			3040		F	16	0	No
AMB01	0678	N001	11/15/2012	Sulfate	9650		JF	8200		F	2638	H	F	14	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.

Attachment 2

Data Presentation

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Groundwater Quality Data

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Groundwater Quality Data by Location (USEE100) FOR SITE AMB01, Ambrosia Lake Disposal Site

REPORT DATE: 1/25/2013

Location: 0675 WELL

Parameter	Units	Sample		Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID			Lab	Data	QA		
Alkalinity, Bicarbonate (as CaCO ₃)	mg/L	11/15/2012	N001	22.5 - 32.5	251		F	#	0.725	
Alkalinity, Bicarbonate (as CaCO ₃)	mg/L	11/15/2012	N002	22.5 - 32.5	241		F	#	0.725	
Alkalinity, Carbonate (as CaCO ₃)	mg/L	11/15/2012	N001	22.5 - 32.5	0.725	U	F	#	0.725	
Alkalinity, Carbonate (as CaCO ₃)	mg/L	11/15/2012	N002	22.5 - 32.5	0.725	U	F	#	0.725	
Arsenic	mg/L	11/15/2012	N001	22.5 - 32.5	0.0188		F	#	0.0017	
Arsenic	mg/L	11/15/2012	N002	22.5 - 32.5	0.0189		F	#	0.0017	
Calcium	mg/L	11/15/2012	N001	22.5 - 32.5	471		F	#	1	
Calcium	mg/L	11/15/2012	N002	22.5 - 32.5	473		F	#	1	
Chloride	mg/L	11/15/2012	N001	22.5 - 32.5	230		JF	#	3.35	
Chloride	mg/L	11/15/2012	N002	22.5 - 32.5	240		JF	#	3.35	
Dissolved Oxygen	mg/L	11/15/2012	N001	22.5 - 32.5	1.37		JF	#		
Magnesium	mg/L	11/15/2012	N001	22.5 - 32.5	254		F	#	2.2	
Magnesium	mg/L	11/15/2012	N002	22.5 - 32.5	254		F	#	2.2	
Molybdenum	mg/L	11/15/2012	N001	22.5 - 32.5	0.308		F	#	0.00165	
Molybdenum	mg/L	11/15/2012	N002	22.5 - 32.5	0.273		F	#	0.00165	
Nitrate + Nitrite as Nitrogen	mg/L	11/15/2012	N001	22.5 - 32.5	32.2		F	#	0.85	
Nitrate + Nitrite as Nitrogen	mg/L	11/15/2012	N002	22.5 - 32.5	33.1		F	#	0.85	
Oxidation Reduction Potential	mV	11/15/2012	N001	22.5 - 32.5	148.2		F	#		
pH	s.u.	11/15/2012	N001	22.5 - 32.5	6.89		F	#		
Potassium	mg/L	11/15/2012	N001	22.5 - 32.5	11.2		F	#	1	
Potassium	mg/L	11/15/2012	N002	22.5 - 32.5	11.1		F	#	1	

Groundwater Quality Data by Location (USEE100) FOR SITE AMB01, Ambrosia Lake Disposal Site

REPORT DATE: 1/25/2013

Location: 0675 WELL

Parameter	Units	Sample		Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID			Lab	Data	QA		
Selenium	mg/L	11/15/2012	N001	22.5 - 32.5	0.917		F	#	0.015	
Selenium	mg/L	11/15/2012	N002	22.5 - 32.5	0.965		F	#	0.015	
Sodium	mg/L	11/15/2012	N001	22.5 - 32.5	895		F	#	2	
Sodium	mg/L	11/15/2012	N002	22.5 - 32.5	895		F	#	2	
Specific Conductance	umhos/cm	11/15/2012	N001	22.5 - 32.5	5592		F	#		
Sulfate	mg/L	11/15/2012	N001	22.5 - 32.5	2900		JF	#	13.3	
Sulfate	mg/L	11/15/2012	N002	22.5 - 32.5	3130		JF	#	13.3	
Temperature	C	11/15/2012	N001	22.5 - 32.5	13.48		F	#		
Total Dissolved Solids	mg/L	11/15/2012	N001	22.5 - 32.5	5550		F	#	3.4	
Total Dissolved Solids	mg/L	11/15/2012	N002	22.5 - 32.5	5450		F	#	3.4	
Turbidity	NTU	11/15/2012	N001	22.5 - 32.5	4.04		F	#		
Uranium	mg/L	11/15/2012	N001	22.5 - 32.5	0.788		F	#	0.000067	
Uranium	mg/L	11/15/2012	N002	22.5 - 32.5	0.767		F	#	0.000067	

Groundwater Quality Data by Location (USEE100) FOR SITE AMB01, Ambrosia Lake Disposal Site

REPORT DATE: 1/25/2013

Location: 0678 WELL

Parameter	Units	Sample		Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID			Lab	Data	QA		
Alkalinity, Bicarbonate (as CaCO ₃)	mg/L	11/15/2012	N001	261.85 - 281.85	731		F	#	0.725	
Alkalinity, Carbonate (as CaCO ₃)	mg/L	11/15/2012	N001	261.85 - 281.85	0.725	U	F	#	0.725	
Arsenic	mg/L	11/15/2012	N001	261.85 - 281.85	0.0047	B	F	#	0.0017	
Calcium	mg/L	11/15/2012	N001	261.85 - 281.85	388		F	#	1	
Chloride	mg/L	11/15/2012	N001	261.85 - 281.85	281		JF	#	3.35	
Dissolved Oxygen	mg/L	11/15/2012	N001	261.85 - 281.85	5.98		F	#		
Magnesium	mg/L	11/15/2012	N001	261.85 - 281.85	506		F	#	2.2	
Molybdenum	mg/L	11/15/2012	N001	261.85 - 281.85	0.00536		F	#	0.000165	
Nitrate + Nitrite as Nitrogen	mg/L	11/15/2012	N001	261.85 - 281.85	358		F	#	4.25	
Oxidation Reduction Potential	mV	11/15/2012	N001	261.85 - 281.85	131.4		F	#		
pH	s.u.	11/15/2012	N001	261.85 - 281.85	6.98		F	#		
Potassium	mg/L	11/15/2012	N001	261.85 - 281.85	32.6		F	#	1	
Selenium	mg/L	11/15/2012	N001	261.85 - 281.85	0.0243		F	#	0.0015	
Sodium	mg/L	11/15/2012	N001	261.85 - 281.85	2940		F	#	2	
Specific Conductance	umhos/cm	11/15/2012	N001	261.85 - 281.85	13367		F	#		
Sulfate	mg/L	11/15/2012	N001	261.85 - 281.85	9650		JF	#	33.3	
Temperature	C	11/15/2012	N001	261.85 - 281.85	13.47		F	#		
Total Dissolved Solids	mg/L	11/15/2012	N001	261.85 - 281.85	14000		F	#	3.4	
Turbidity	NTU	11/15/2012	N001	261.85 - 281.85	2.13		F	#		
Uranium	mg/L	11/15/2012	N001	261.85 - 281.85	0.0532		F	#	0.000067	

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

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. | | |

QA QUALIFIER:

- # Validated according to quality assurance guidelines.

Static Water Level Data

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STATIC WATER LEVELS (USEE700) FOR SITE AMB01, Ambrosia Lake Disposal Site
REPORT DATE: 1/16/2013

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Measurement Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0409		6966.98	11/15/2012	13:45:00			D
0675	D	6966.65	11/15/2012	14:15:07	20.00	6946.65	
0678	C	6987.94	11/15/2012	15:15:51	226.31	6761.63	

FLOW CODES: B BACKGROUND C CROSS GRADIENT D DOWN GRADIENT F OFF SITE
 N UNKNOWN O ON SITE U UPGRADIENT

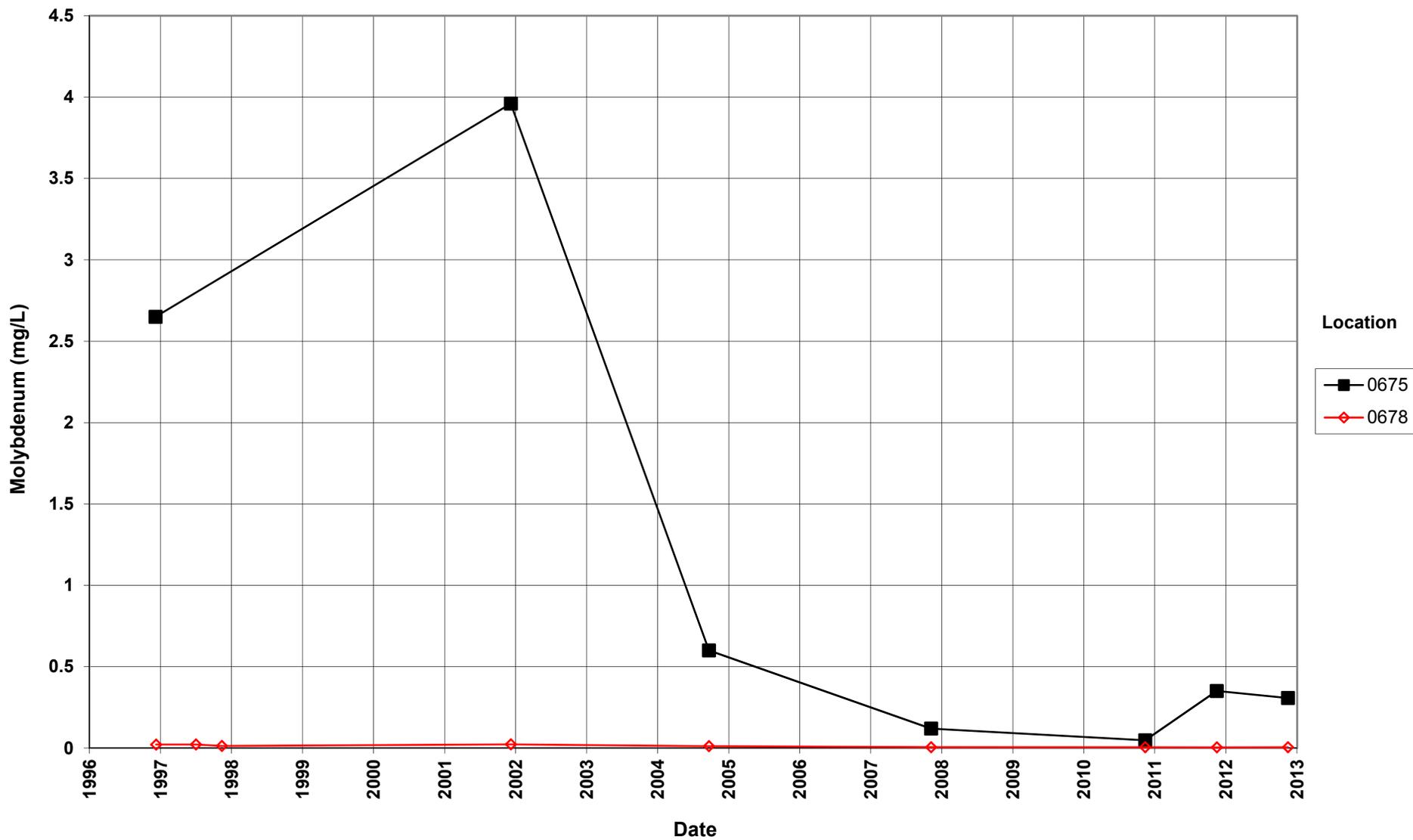
WATER LEVEL FLAGS: D Dry F Flowing B Below top of pump

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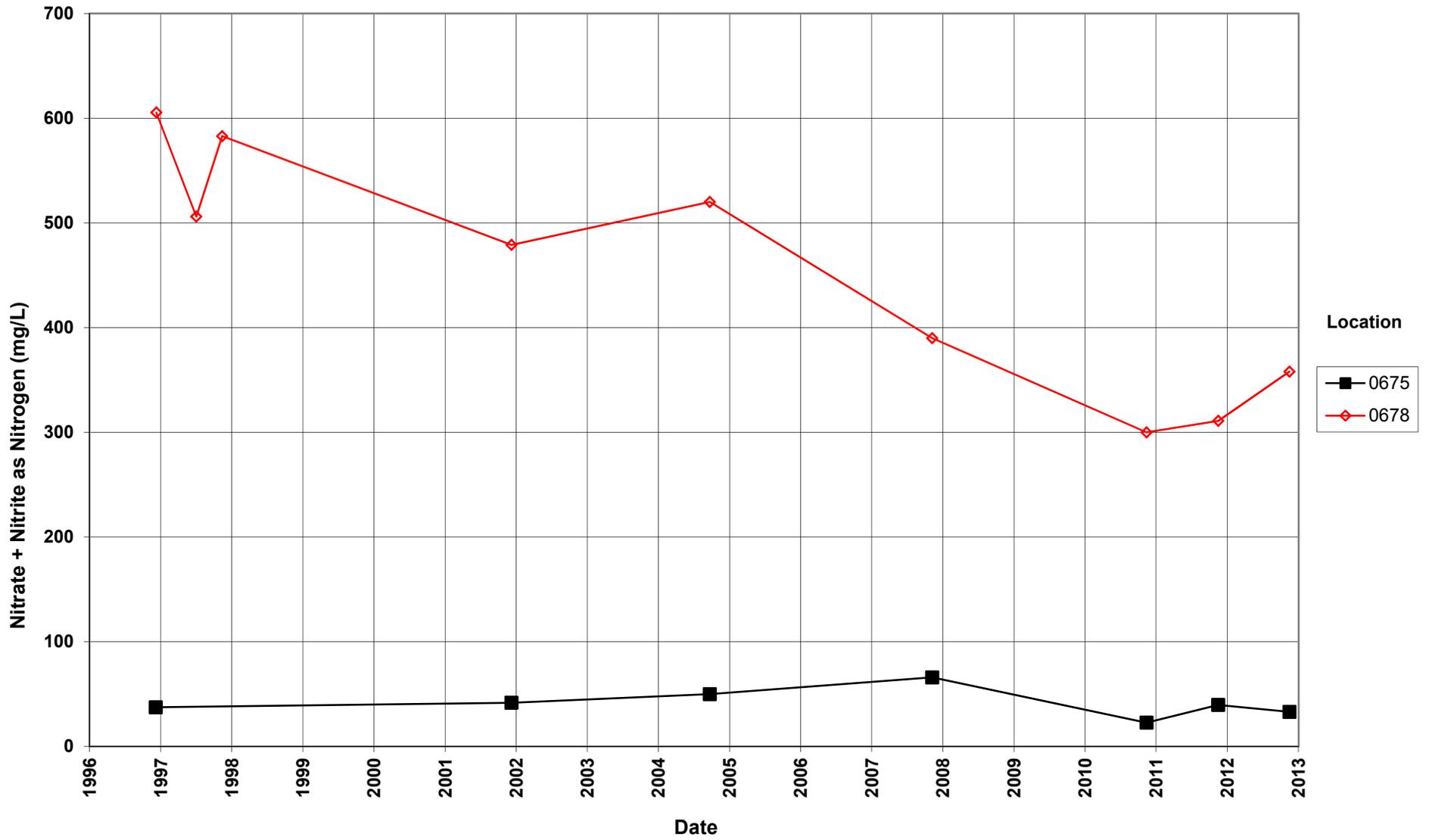
Time-Concentration Graphs

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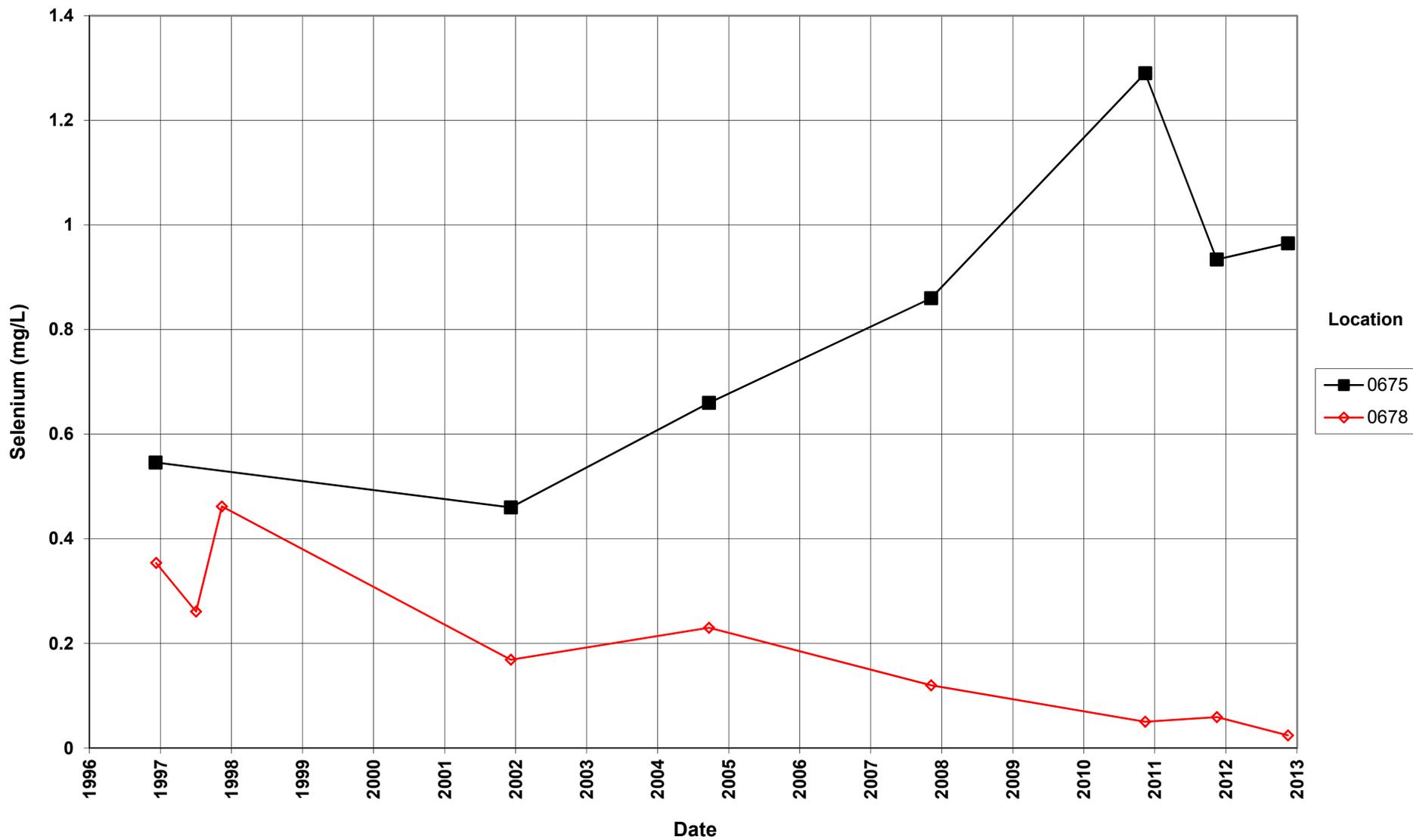
Ambrosia Lake Disposal Site Molybdenum Concentration



Ambrosia Lake Disposal Site Nitrate + Nitrite as Nitrogen Concentration



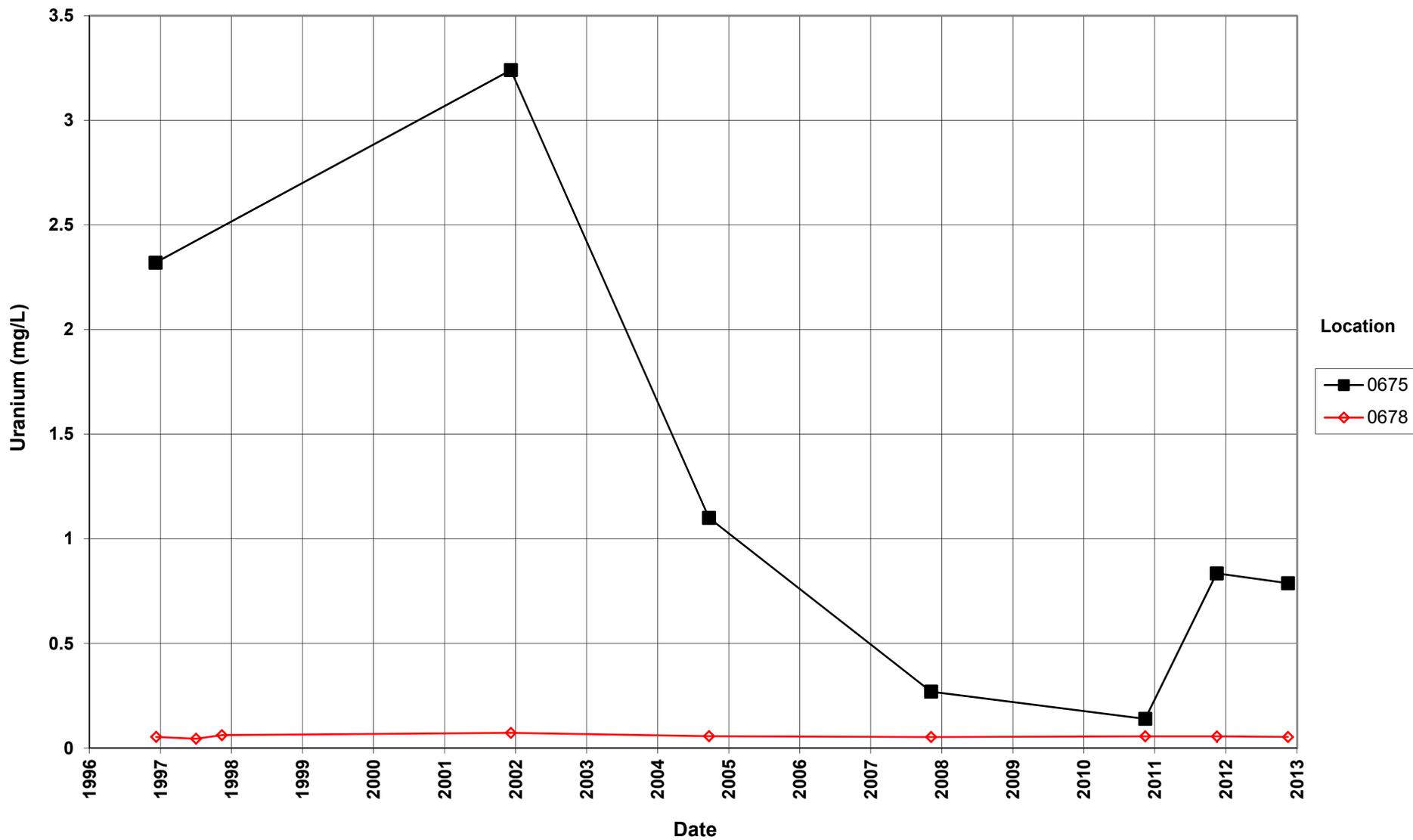
Ambrosia Lake Disposal Site Selenium Concentration



Ambrosia Lake Disposal Site Sulfate Concentration



Ambrosia Lake Disposal Site Uranium Concentration



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Attachment 3
Sampling and Analysis Work Order

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established 1959

Task Order LM00-501
Control Number 13-0030

October 12, 2012

U.S. Department of Energy
Office of Legacy Management
ATTN: Deborah Barr
Site Manager
2597 Legacy Way
Grand Junction, CO 81503

SUBJECT: Contract No. DE-AM01-07LM00060, S.M. Stoller Corporation (Stoller)
November 2012 Environmental Sampling at the Ambrosia Lake, New Mexico,
Disposal Site

REFERENCE: Task Order LM-501-02-101-402, Ambrosia Lake, New Mexico, Disposal Site

Dear Ms. Barr:

The purpose of this letter is to inform you of the upcoming sampling event at Ambrosia Lake, New Mexico. Enclosed are the map and tables specifying sample locations and analytes for monitoring at the Ambrosia Lake disposal site. Water quality data will be collected from this site as part of the routine environmental sampling currently scheduled to begin the week of November 12, 2012.

The following list shows the monitoring wells (with zone of completion) scheduled to be sampled during this event.

Monitoring Wells*

409 Al 675 Km 678 Tb

*NOTE: Al = alluvium; Km = Mancos shale; Tb = Tres Hermanos-B sandstone

All samples will be collected as directed in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*. Access agreements are being reviewed and are expected to be complete by the beginning of fieldwork.

Please contact me at (970) 248-6557 if you have any questions or concerns.

Sincerely,

Richard K. Johnson
Site Lead

The S.M. Stoller Corporation 2597 Legacy Way Grand Junction, CO 81503 (970) 248-6000 Fax (970) 248-6040

Deborah Barr
Control Number 13-0030
Page 2

RKJ/lcg/lb

Enclosures (3)

cc: (electronic)

Karl Stoeckle, DOE
Steve Donovan, Stoller
Bev Gallagher, Stoller
Lauren Goodknight, Stoller
Richard Johnson, Stoller
EDD Delivery
rc-grand.junction
File: AMB 410.02(A)

Constituent Sampling Breakdown

Site	Ambrosia Lake		Required Detection Limit (mg/L)	Analytical Method	Line Item Code
	Groundwater	Surface Water			
Approx. No. Samples/yr	2	0			
<i>Field Measurements</i>					
Alkalinity					
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Turbidity	X				
Temperature	X				
<i>Laboratory Measurements</i>					
Aluminum					
Arsenic	X		0.0001	SW-846 6020	LMM-02
Bicarbonate	X		10	SM2320 B	WCH-A-003
Calcium	X		5	SW-846 6010	LMM-01
Carbonate	X		10	SM2320 B	WCH-A-004
Chloride	X		0.5	SW-846 9056	WCH-A-039
Iron					
Lead					
Magnesium	X		5	SW-846 6010	LMM-01
Manganese					
Molybdenum	X		0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X		0.05	EPA 353.1	WCH-A-022
Potassium	X		1	SW-846 6010	LMM-01
Radium-226					
Radium-228					
Selenium	X		0.0001	SW-846 6020	LMM-02
Silica					
Sodium	X		1	SW-846 6010	LMM-01
Strontium					
Sulfate	X		0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids	X		10	SM2540 C	WCH-A-033
Total Organic Carbon					
Tritium					
Uranium	X		0.0001	SW-846 6020	LMM-02
U-234, -238					
Vanadium					
Zinc					
Total No. of Analytes	14	0			

Note: All analyte samples are considered unfiltered unless stated otherwise. All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

**Sampling Frequencies for Locations at
Ambrosia Lake, New Mexico**

Location ID	Quarterly	Semiannually	Annually	Triennially	Not Sampled	Notes
Monitoring Wells						
409			X			Usually dry; sample if water is present
675			X			
678			X			

Sampling conducted in November

Attachment 4
Trip Report

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Memorandum

DATE: January 14, 2013

TO: Dick Johnson

FROM: David Atkinson

SUBJECT: Trip Report

Site: Bluewater and Ambrosia Lake Disposal Sites.

Dates of Sampling Event: 11/12/2012 – 11/16/2012.

Team Members: David Atkinson, Jeff Walters.

Number of Locations Sampled: 2 monitoring well samples and 1 duplicate sample were collected at Ambrosia Lake; 18 monitoring well samples and 1 duplicate sample were collected at Bluewater.

Locations Not Sampled/Reason: Bluewater locations 23(M), and T(M) were dry, domestic location HMC-951 was not sampled because there was no current access agreement. Ambrosia Lake location 0409 was dry.

Location Specific Information:

Bluewater: Location X(M), which was previously dry, had been redeveloped and produced water at a flow rate of +200 ml/min. Locations OBS-3 and S(SG) were sampled using previously installed submersible pumps according to Bluewater program directive BLU-2013-01. Location OBS-3 was purged at approximately 6 gpm and went dry after approximately 84 gallons. Location S(SG) was sampled after a purge of approximately 990 gallons. (Approximately 5.5 gpm for 3 hours, minimum purge volume was approximately 810 gallons). Location 16(SG) was sampled the same day as the bladder pump was installed (at least 6 hours between installation and sample collection).

Ambrosia Lake: None.

Quality Control Sample Cross Reference: The following are the false identifications assigned to the quality control samples.

SITE	FALSE ID	TRUE ID	SAMPLE TYPE	ASSOCIATED MATRIX	TICKET NUMBER
BLU	2074	Y2(M)	Duplicate	Groundwater	KMU 298
AMB	2073	0675	Duplicate	Groundwater	KMU 316

Dick Johnson
January 14, 2013
Page 2

RIN Number Assigned: All Bluewater samples were assigned to RIN 12114945. All Ambrosia Lake samples were assigned to RIN 12114946.

Sample Shipment: Samples were shipped overnight via FedEx to GEL Laboratories in Charleston, SC from Grants, NM, on November 15, 2012.

Water Level Measurements: Water levels at all monitoring wells were measured prior to sampling.

Well Inspection Summary: N/A

Field Variance: None.

Equipment: All equipment functioned properly.

Site Issues: None

Corrective Action Required/Taken: None

cc: (electronic)
Deborah Barr, DOE
April Gil, DOE
Steve Donovan, Stoller
Dick Johnson, Stoller
EDD Delivery