LMS/AMB/S01114

Data Validation Package

November 2014
Water Sampling at the Ambrosia Lake, New Mexico, Disposal Site

February 2015

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Sampling Event Summary

Site: Ambrosia Lake, New Mexico, Disposal Site

Sampling Period: November 20, 2014

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 analyses were conducted as specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/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 0678.

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 0678. Several analyte concentrations increased significantly in well 0675, most notably molybdenum.

Table 1. 2014 Groundwater Monitoring Analytical Results at the Ambrosia Lake, New Mexico, Site

Analyte	Well 0675 mg/L	Well 0678 mg/L
Arsenic	0.00665	0.00365
Calcium	437	388
Chloride	212	320
Magnesium	422	487
Molybdenum	63	0.00524
Nitrate + Nitrite as Nitrogen	7.44	244
Potassium	14.3	34.4
Selenium	0.165	ND
Sodium	1840	3020
Sulfate	5380	7760
Total Dissolved Solids	9370	13900
Uranium	11.4	0.0571

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

GEA for
Richard K. Johnson, Site Lead
Stoller Newport News Nuclear, Inc., a wholly owned subsidiary of Huntington Ingalls Industries, Inc.

2/11/15
Date

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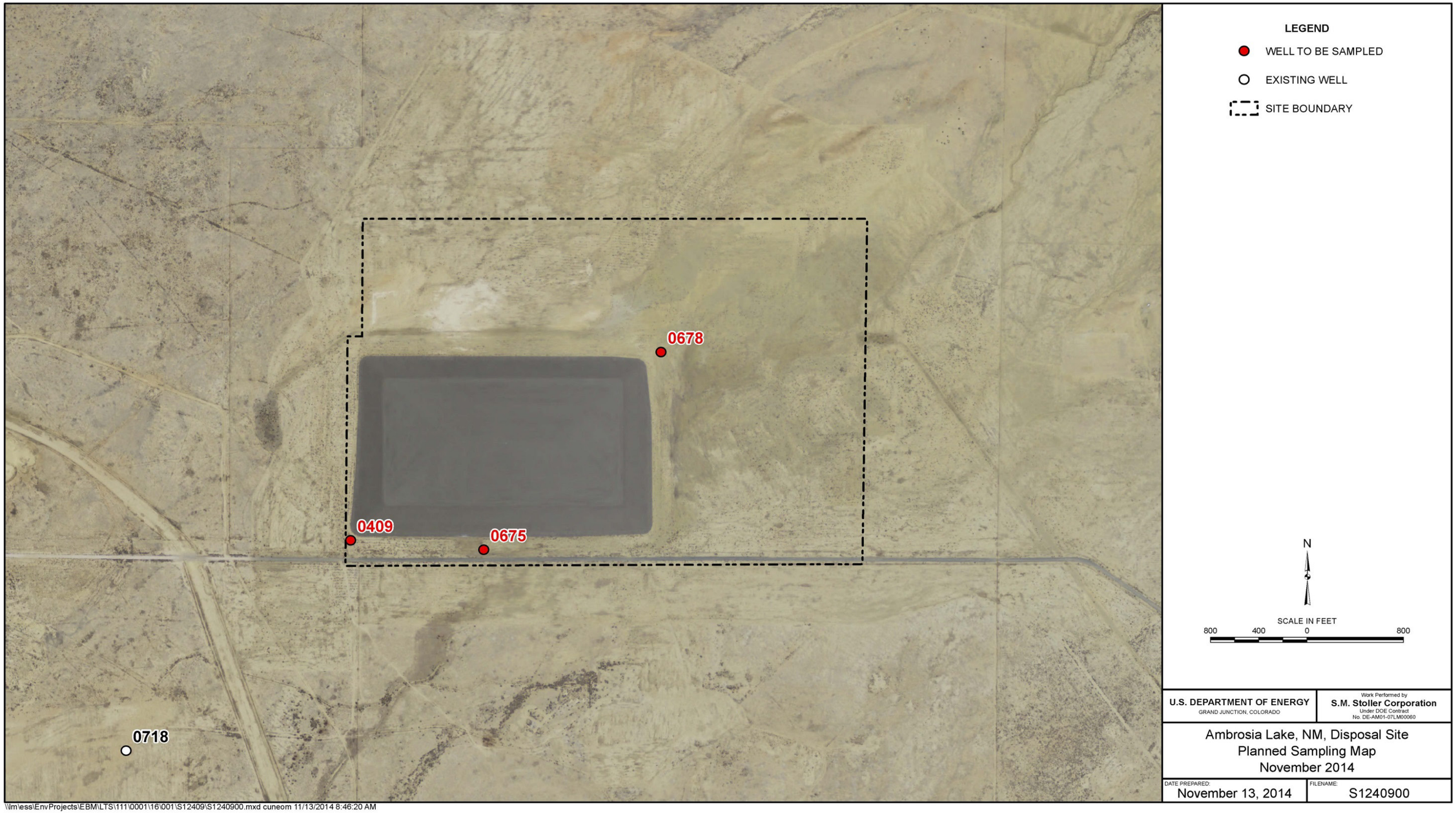

Ambrosia Lake, NM, Disposal Site Planned Sampling Map

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Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	Ambrosia Lake, New Mexico, Disposal Site	**Date(s) of Water Sampling**	November 20, 2014
Date(s) of Verification	January 23, 2015	**Name of Verifier**	Gretchen Baer

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures?	Yes	
List any Program Directives or other documents, SOPs, instructions.		Work Order letter dated November 13, 2014.
2. Were the sampling locations specified in the planning documents sampled?	No	Location 0409 was dry and not sampled.
3. Were calibrations conducted as specified in the above-named documents?	No	DO: Sensor was calibrated with incorrect barometric pressures. All DO results are qualified. pH: at 184.3, a span was above range (165-180). DO, Conductivity, ORP: calibration constants were not recorded.
4. Was an operational check of the field equipment conducted daily?	Yes	
Did the operational checks meet criteria?	No	ORP check failed low. ORP results are qualified.
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	Yes	
6. Were wells categorized correctly?	Yes	
7. Were the following conditions met when purging a Category I well:		
Was one pump/tubing volume purged prior to sampling?	Yes	
Did the water level stabilize prior to sampling?	Yes	
Did pH, specific conductance, and turbidity measurements meet criteria prior to sampling?	Yes	
Was the flow rate less than 500 mL/min?	Yes	

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	One duplicate was collected at 0678.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	NA	All equipment was dedicated.
11. Were trip blanks prepared and included with each shipment of VOC samples?	NA	
12. Were the true identities of the QC samples documented?	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. Was all pertinent information documented on the field data sheets?	Yes	
18. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
19. Were water levels measured at the locations specified in the planning documents?	Yes	

Laboratory Performance Assessment

General Information

Report Number (RIN):	14116607
Sample Event:	November 20, 2014
Site(s):	Ambrosia Lake, New Mexico
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	361854
Analysis:	Metals and Wet Chemistry
Validator:	Gretchen Baer
Review Date:	January 23, 2015

This validation was performed according to the *Environmental Procedures Catalog*, (LMS/POL/S04325, continually updated) "Standard Practice for Validation of Environmental 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
Arsenic, Molybdenum, Selenium, Uranium	LMM-02	SW-846 3005A	SW-846 6020
Calcium, Magnesium, Potassium, Sodium	LMM-01	SW-846 3005A	SW-846 6010B
Chloride, Sulfate	MIS-A-045	EPA 300.0	EPA 300.0
Nitrate + Nitrite as N	WCH-A-022	EPA 353.2	EPA 353.2
Total Dissolved Solids (TDS)	WCH-A-033	SM 2540C	SM 2540C

Data Qualifier Summary

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

Table 3. Data Qualifier Summary

Sample Number	Location	Analyte	Flag	Reason
361854-001	0675	Selenium	J	Serial dilution result

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received three water samples on November 22, 2014, 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, with the following exception. The sample time was written incorrectly on the Chain of Custody for sample 0678. The sample time on the field sheet was edited to match the time on the Chain of Custody.

Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced cooler at 3 °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.

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. The arsenic and selenium laboratory MDLs are greater than the MDLs specified in the applicable line item codes but were accepted for this RIN. The reported MDLs for all 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. 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 September 23, 2014. 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. All calibration checks met the acceptance criteria.

Method EPA 353.2
Calibrations for nitrate + nitrite as N were performed using six calibration standards on November 25, 2014. 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. All calibration check results were within the acceptance criteria.

Method SM 2540C
There are no initial or continuing calibration requirements associated with the total dissolved solids method.

Method SW-846 6010B
Calibrations for calcium, magnesium, potassium, and sodium were performed on December 2, 2014, 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. 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, with the following exceptions. Some potassium check results were above the acceptance range. All affected results were greater than 5 times the PQL, so no qualification is necessary.

Method SW-846 6020A
Calibrations were performed for arsenic, molybdenum, selenium, and uranium on December 4, 9, and 10, 2014, 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. All calibration checks associated with reported results 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. Calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis. 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. All method blank and calibration blank results were below the PQL with the exception of two calibration blanks for sodium. The samples associated with these blanks had sodium concentrations greater than 10 times the blank, requiring no qualification.

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 (MS) samples are used to measure method performance in the sample matrix. MS data are not evaluated when the concentration of the unspiked sample is greater than 4 times

the spike. MS data are not evaluated when the spike was performed on a sample that required dilution. 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 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. All replicate results met these criteria, demonstrating 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.

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 with one exception. The serial dilution for selenium did not meet the acceptance criteria. Because of the possible reduced accuracy due to matrix interference, the associated result is qualified with a “J” flag as an estimated value.

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 ion chromatography data. All peak integrations were satisfactory.

Electronic Data Deliverable (EDD) File

The EDD file arrived on December, 20, 2014. 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. An incorrect sample time for location 0678 was provided to the laboratory on the Chain of Custody.

SAMPLE MANAGEMENT SYSTEM

EDD Non-Conformance Report

Report Date: 1/21/2015

EDD File:

EDD Errors: 1

Delete Current Row

Record	Table	Error Type	Field	Error Description
11	Sample	Entry Error	Date Sampled	Incorrect date sampled.

SAMPLE MANAGEMENT SYSTEM
General Data Validation Report

RIN: 14116607 **Lab Code:** GEN **Validator:** Gretchen Baer **Validation Date:** 1/21/2015

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 6 detection limit failures.
☐ Field/Trip Blanks	
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Non-Compliance Report: Detection Limits

RIN: 14116607 **Lab Code:** GEN

Project: Ambrosia Lake Disposal Site

Validation Date: 1/21/2015

Ticket	Location	Lab Sample ID	Method Code	Lab Method	Analyte Name	Result	Qualifier	Reported Detection Limit	Required Detection Limit	Units
MMR 928	0675	361854001	LMM-02	EPA 3005/6020	Arsenic	6.65		1.7	0.1	ug/L
MMR 928	0675	361854001	LMM-02	EPA 3005/6020	Selenium	165	E	1.5	0.1	ug/L
MMR 929	0678	361854002	LMM-02	EPA 3005/6020	Selenium	1.50	UE	1.5	0.1	ug/L
MMR 929	0678	361854002	LMM-02	EPA 3005/6020	Arsenic	3.65	B	1.7	0.1	ug/L
MMR 930	2073	361854003	LMM-02	EPA 3005/6020	Arsenic	1.70	U	1.7	0.1	ug/L
MMR 930	2073	361854003	LMM-02	EPA 3005/6020	Selenium	1.50	UE	1.5	0.1	ug/L

SAMPLE MANAGEMENT SYSTEM

Metals Data Validation Worksheet

RIN: 14116607 **Lab Code:** GEN **Date Due:** 12/20/2014

Matrix: Water **Site Code:** AMB01 **Date Completed:** 12/23/2014

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	CCV	CCB								
Calcium	ICP/ES	12/02/2014	0.0000	1.0000	OK	OK	OK	103.0			1.0	95.5	0.4	118.0
Magnesium	ICP/ES	12/02/2014	0.0000	0.9999	OK	OK	OK	104.0			1.0	95.4	0.2	107.0
Potassium	ICP/ES	12/02/2014	0.0000	0.9999	OK	OK	OK	99.1			2.0	107.0	8.0	179.0
Sodium	ICP/ES	12/02/2014	0.0000	0.9999	OK	OK	OK	104.0			3.0	105.0	1.0	113.0
Arsenic	ICP/MS	12/10/2014	0.0000	1.0000	OK	OK	OK	111.0	104.0			92.2		99.0
Molybdenum	ICP/MS	12/09/2014	0.0000	1.0000	OK	OK	OK	115.0			4.0	105.0	5.0	108.0
Selenium	ICP/MS	12/04/2014	0.0000	1.0000	OK	OK	OK	99.9	125.0		3.0	108.0	16.0	103.0
Uranium	ICP/MS	12/04/2014	0.0000	1.0000	OK	OK	OK	109.0			3.0	101.0	5.0	97.0

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 14116607 **Lab Code:** GEN **Date Due:** 12/20/2014

Matrix: Water **Site Code:** AMB01 **Date Completed:** 12/23/2014

Analyte	Date Analyzed	CALIBRATION				Method Blank	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	CCV	CCB						
Chloride	09/23/2014	0.084	0.9992	OK	OK						
Chloride	12/08/2014			OK	OK	OK	99.1				
NO2+NO3 as N	11/25/2014	0.000	0.9999	OK	OK	OK	96.7	98.6		1	
Sulfate	09/23/2014	0.080	0.9997	OK	OK						
Sulfate	12/08/2014			OK	OK	OK	100				
Total Dissolved Solids	11/25/2014					OK	97.6			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 (DO) sensor was calibrated using sea-level corrected barometric pressures rather than true barometric pressures. All DO measurements collected during this event are qualified with a "J" flag (estimated). During the calibration verification for oxidation/reduction potential (ORP), the acceptance criterion was not met; all ORP measurements are qualified with a "J" flag as estimated values.

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 0678 (field duplicate ID 2073). The relative percent difference (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

RIN: 14116607 **Lab Code:** GEN **Project:** Ambrosia Lake Disposal Site **Validation Date:** 1/21/2015

Duplicate: 2073 **Sample:** 0678

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Arsenic	3.65	B		1.00	1.70	U		1.00	<PQL		ug/L
Calcium	388000			1.00	382000			1.00	1.56		ug/L
Chloride	320			100.00	313			100.00	2.21		mg/L
Magnesium	487000			1.00	487000			1.00	0		ug/L
Molybdenum	5.24			1.00	5.39			1.00	2.82		ug/L
NO2+NO3 as N	244			250.00	248			250.00	1.63		mg/L
Potassium	34400			1.00	34700			1.00	0.87		ug/L
Selenium	1.50	UE		1.00	1.50	UE		1.00			ug/L
Sodium	3020000			10.00	3040000			10.00	0.66		ug/L
Sulfate	7760			1000.00	7710			1000.00	0.65		mg/L
Total Dissolved Solids	13900			1.00	14200			1.00	2.14		mg/L
Uranium	57.1			1.00	56.9			1.00	0.35		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: Stephen Donivan — Date: 2-11-2015

Data Validation Lead: Stephen Donivan for GRB — Date: 2-11-2015

Gretchen Baer

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 can result from transcription errors, data-coding errors, or measurement system problems. However, outliers can also represent true extreme values of a distribution and can 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.** Do this 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 as to whether the data are normally distributed using the Shapiro-Wilk Test.
2. **Apply the appropriate statistical test.** Dixon's Test for extreme values 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 review should include an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

Magnesium, molybdenum, sodium, specific conductance (a field measurement), sulfate, total dissolved solids, and uranium in well 0675 were identified as exceeding historical maximums and potentially anomalous (see the Data Validation Outliers Reports, below). The data associated with these results were further reviewed. There were no errors noted. Multiple analytes trending in the same direction indicate the data are likely not outliers. The result for molybdenum was significantly higher than the historical range; this result is listed on the Anomalous Data Review Checksheet. Potential anomalies in the field parameters were also examined for patterns of repeated high or low bias, which suggest a systematic error due to instrument malfunction. No such patterns were found and all the results from this sampling event are acceptable as qualified.

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Anomalous Data Review Checksheet

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Anomalous Data Review Checksheet

Site: Ambrosia Lake, New Mexico, Disposal Site **Sampling Data:** Water

Reviewer: Gretchen Baer
Name (print) Signature Date

Site Hydrologist: Richard K. Johnson
Name (print) Signature Date

Date of Review: January 23, 2015

Loc. No.	Analyte	Type of Anomaly	Disposition
0675	Molybdenum	High	Compare to future results

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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: 1/23/2015
Location: 0675 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Arsenic	mg/L	11/20/2014	N001	22.5	-	32.5	0.00665		F	#	0.0017	
Calcium	mg/L	11/20/2014	N001	22.5	-	32.5	437		F	#	0.05	
Chloride	mg/L	11/20/2014	N001	22.5	-	32.5	212		F	#	2.68	
Dissolved Oxygen	mg/L	11/20/2014	N001	22.5	-	32.5	0.99		JF	#		
Magnesium	mg/L	11/20/2014	N001	22.5	-	32.5	422		F	#	0.11	
Molybdenum	mg/L	11/20/2014	N001	22.5	-	32.5	63		F	#	0.0165	
Nitrate + Nitrite as Nitrogen	mg/L	11/20/2014	N001	22.5	-	32.5	7.44		F	#	0.17	
Oxidation Reduction Potential	mV	11/20/2014	N001	22.5	-	32.5	112.6		JF	#		
pH	s.u.	11/20/2014	N001	22.5	-	32.5	6.77		F	#		
Potassium	mg/L	11/20/2014	N001	22.5	-	32.5	14.3		F	#	0.05	
Selenium	mg/L	11/20/2014	N001	22.5	-	32.5	0.165	E	JF	#	0.0015	
Sodium	mg/L	11/20/2014	N001	22.5	-	32.5	1840		F	#	1	
Specific Conductance	umhos /cm	11/20/2014	N001	22.5	-	32.5	9830		F	#		
Sulfate	mg/L	11/20/2014	N001	22.5	-	32.5	5380		F	#	133	
Temperature	C	11/20/2014	N001	22.5	-	32.5	12.47		F	#		
Total Dissolved Solids	mg/L	11/20/2014	N001	22.5	-	32.5	9370		F	#	3.4	
Turbidity	NTU	11/20/2014	N001	22.5	-	32.5	2.64		F	#		
Uranium	mg/L	11/20/2014	N001	22.5	-	32.5	11.4		F	#	0.000335	

Groundwater Quality Data by Location (USEE100) FOR SITE AMB01, Ambrosia Lake Disposal Site
REPORT DATE: 1/23/2015
Location: 0678 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Arsenic	mg/L	11/20/2014	N001	261.85	-	281.85	0.00365	B	F	#	0.0017	
Arsenic	mg/L	11/20/2014	N002	261.85	-	281.85	0.0017	U	F	#	0.0017	
Calcium	mg/L	11/20/2014	N001	261.85	-	281.85	388		F	#	0.05	
Calcium	mg/L	11/20/2014	N002	261.85	-	281.85	382		F	#	0.05	
Chloride	mg/L	11/20/2014	N001	261.85	-	281.85	320		F	#	6.7	
Chloride	mg/L	11/20/2014	N002	261.85	-	281.85	313		F	#	6.7	
Dissolved Oxygen	mg/L	11/20/2014	N001	261.85	-	281.85	1.38		JF	#		
Magnesium	mg/L	11/20/2014	N001	261.85	-	281.85	487		F	#	0.11	
Magnesium	mg/L	11/20/2014	N002	261.85	-	281.85	487		F	#	0.11	
Molybdenum	mg/L	11/20/2014	N001	261.85	-	281.85	0.00524		F	#	0.000165	
Molybdenum	mg/L	11/20/2014	N002	261.85	-	281.85	0.00539		F	#	0.000165	
Nitrate + Nitrite as Nitrogen	mg/L	11/20/2014	N001	261.85	-	281.85	244		F	#	4.25	
Nitrate + Nitrite as Nitrogen	mg/L	11/20/2014	N002	261.85	-	281.85	248		F	#	4.25	
Oxidation Reduction Potential	mV	11/20/2014	N001	261.85	-	281.85	115.7		JF	#		
pH	s.u.	11/20/2014	N001	261.85	-	281.85	7.16		F	#		
Potassium	mg/L	11/20/2014	N001	261.85	-	281.85	34.4		F	#	0.05	
Potassium	mg/L	11/20/2014	N002	261.85	-	281.85	34.7		F	#	0.05	
Selenium	mg/L	11/20/2014	N001	261.85	-	281.85	0.0015	UE	F	#	0.0015	

Groundwater Quality Data by Location (USEE100) FOR SITE AMB01, Ambrosia Lake Disposal Site
REPORT DATE: 1/23/2015
Location: 0678 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Selenium	mg/L	11/20/2014	N002	261.85	-	281.85	0.0015	UE	F	#	0.0015	
Sodium	mg/L	11/20/2014	N001	261.85	-	281.85	3020		F	#	1	
Sodium	mg/L	11/20/2014	N002	261.85	-	281.85	3040		F	#	1	
Specific Conductance	umhos /cm	11/20/2014	N001	261.85	-	281.85	14512		F	#		
Sulfate	mg/L	11/20/2014	N001	261.85	-	281.85	7760		F	#	133	
Sulfate	mg/L	11/20/2014	N002	261.85	-	281.85	7710		F	#	133	
Temperature	C	11/20/2014	N001	261.85	-	281.85	13.24		F	#		
Total Dissolved Solids	mg/L	11/20/2014	N001	261.85	-	281.85	13900		F	#	3.4	
Total Dissolved Solids	mg/L	11/20/2014	N002	261.85	-	281.85	14200		F	#	3.4	
Turbidity	NTU	11/20/2014	N001	261.85	-	281.85	3.89		F	#		
Uranium	mg/L	11/20/2014	N001	261.85	-	281.85	0.0571		F	#	0.000067	
Uranium	mg/L	11/20/2014	N002	261.85	-	281.85	0.0569		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: 1/23/2015

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
0675	D	6966.65	11/20/2014	14:40:19	20.79	6945.86	
0678	C	6987.94	11/20/2014	14:00:02	226.03	6761.91	

FLOW CODES: B BACKGROUND C CROSS GRADIENT D DOWNGRADIENT F OFFSITE
N UNKNOWN O ONSITE 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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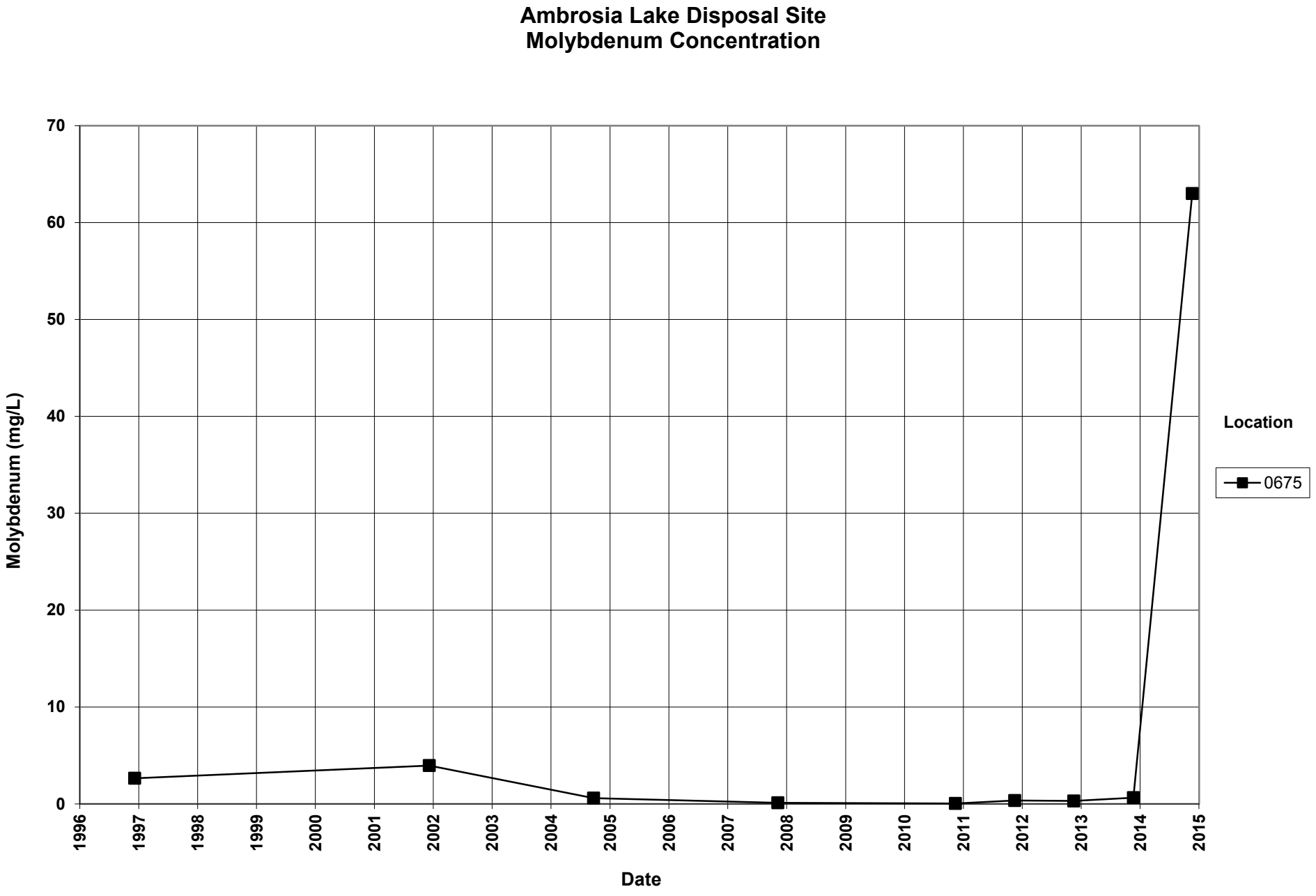
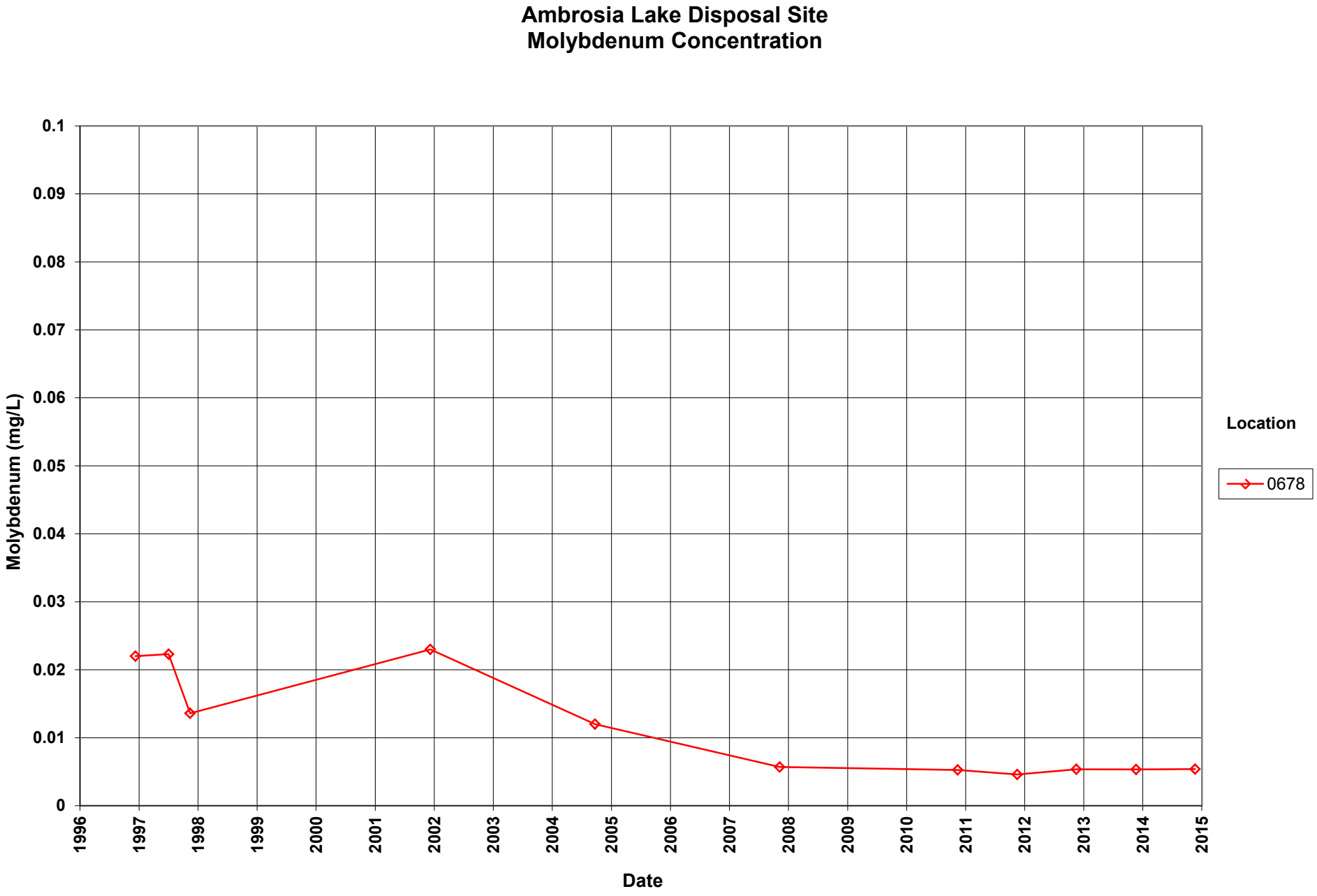
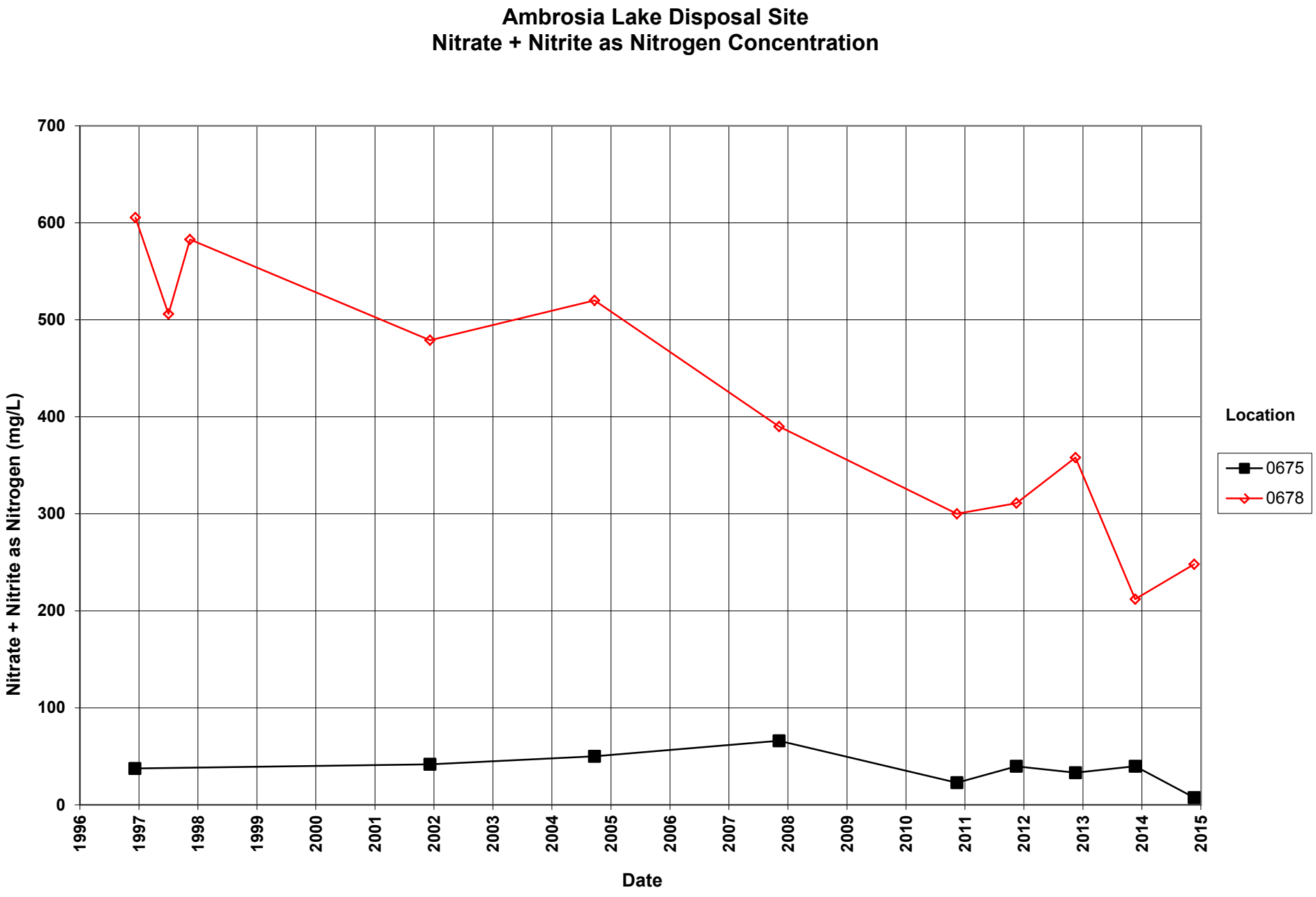
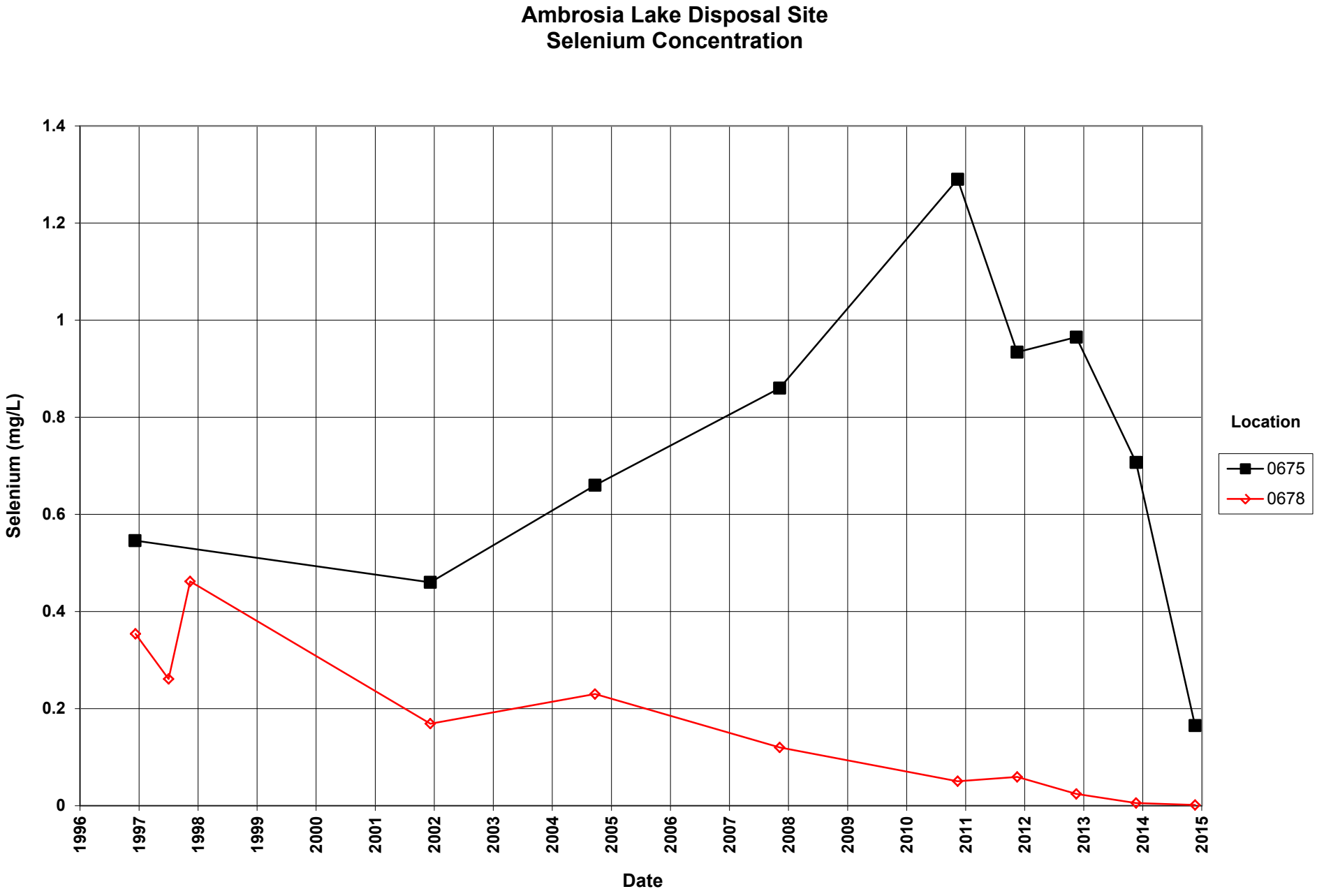
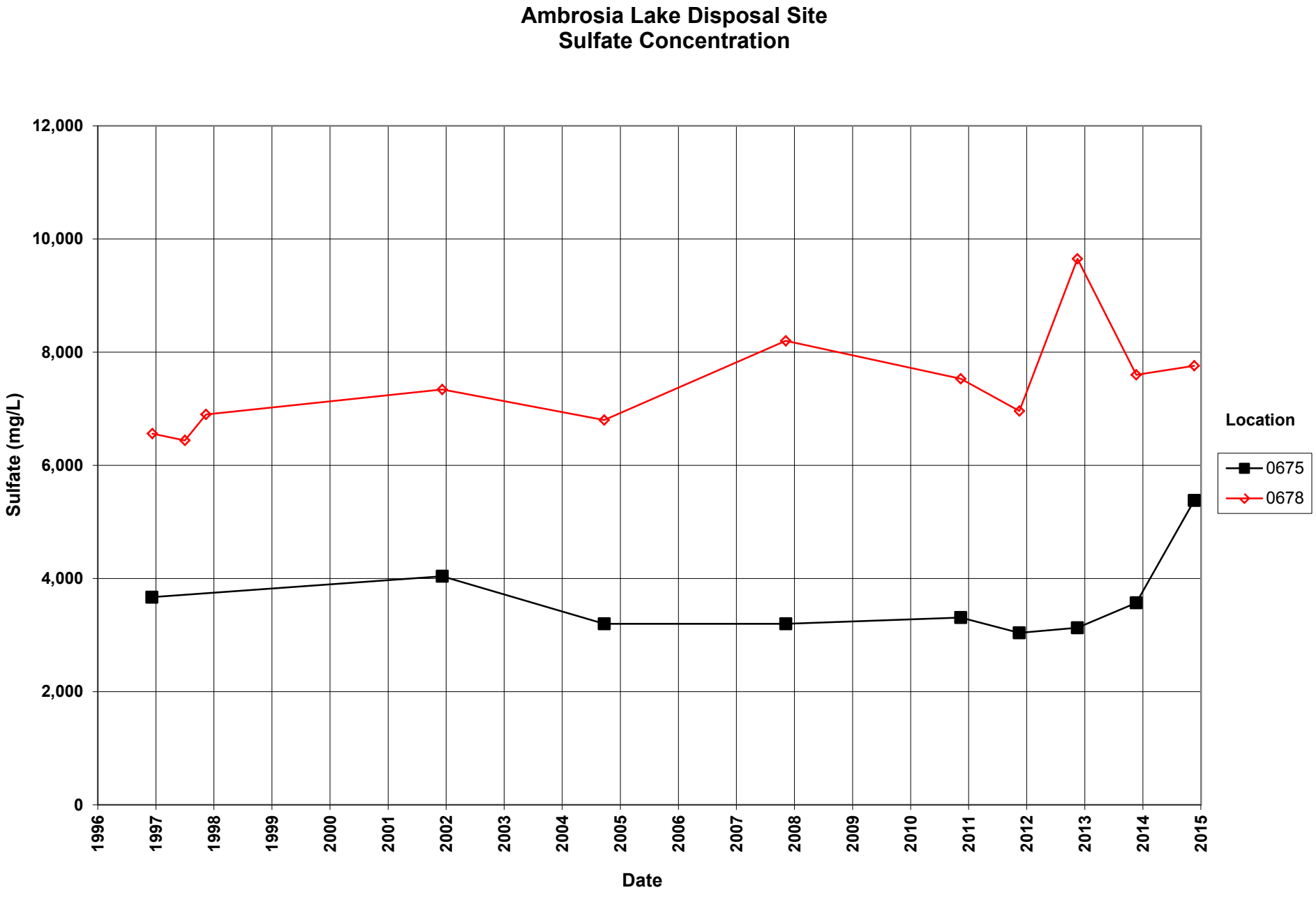
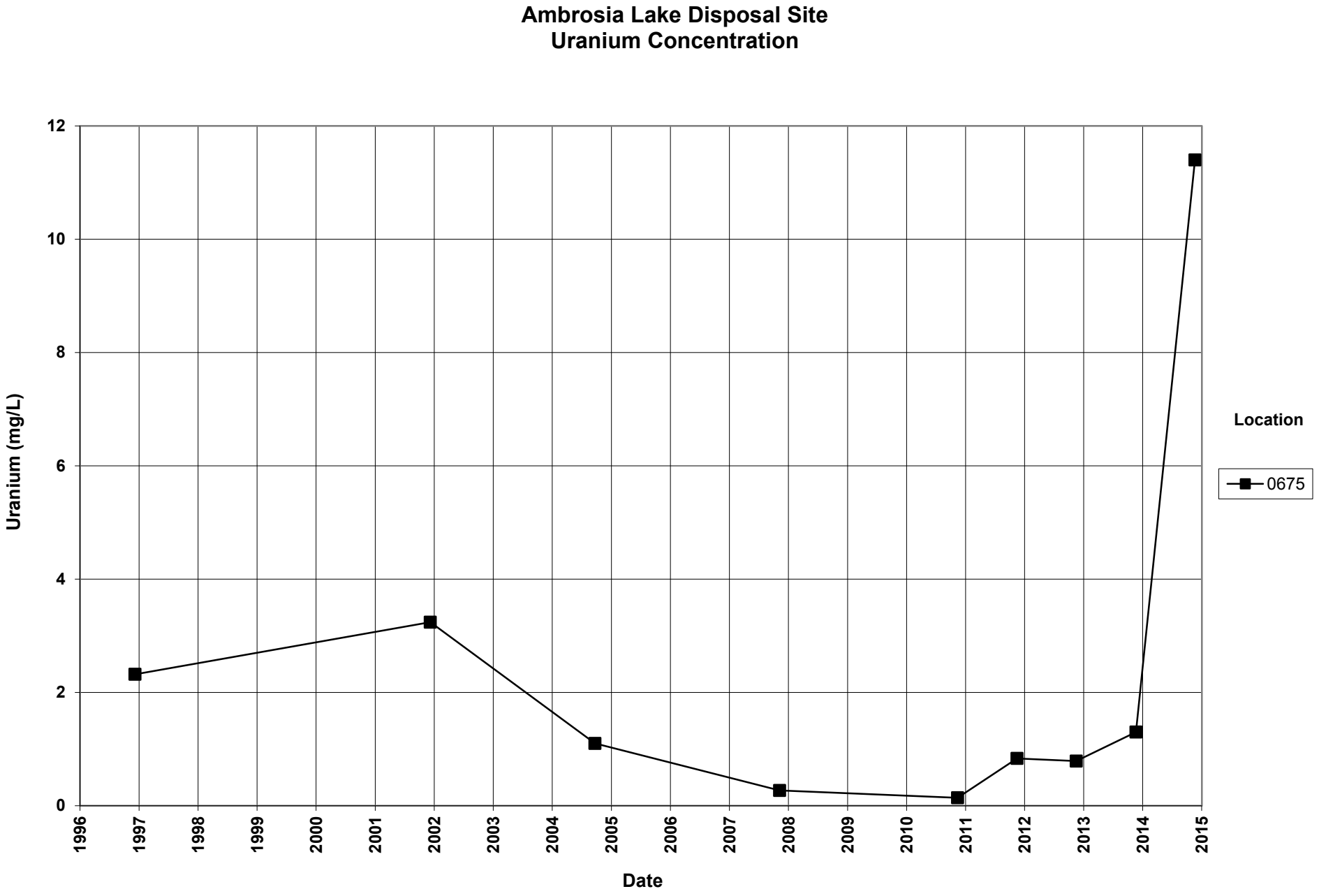

Ambrosia Lake Disposal Site
Molybdenum Concentration
Molybdenum (mg/L)
70
60
50
40
30
20
10
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
0675

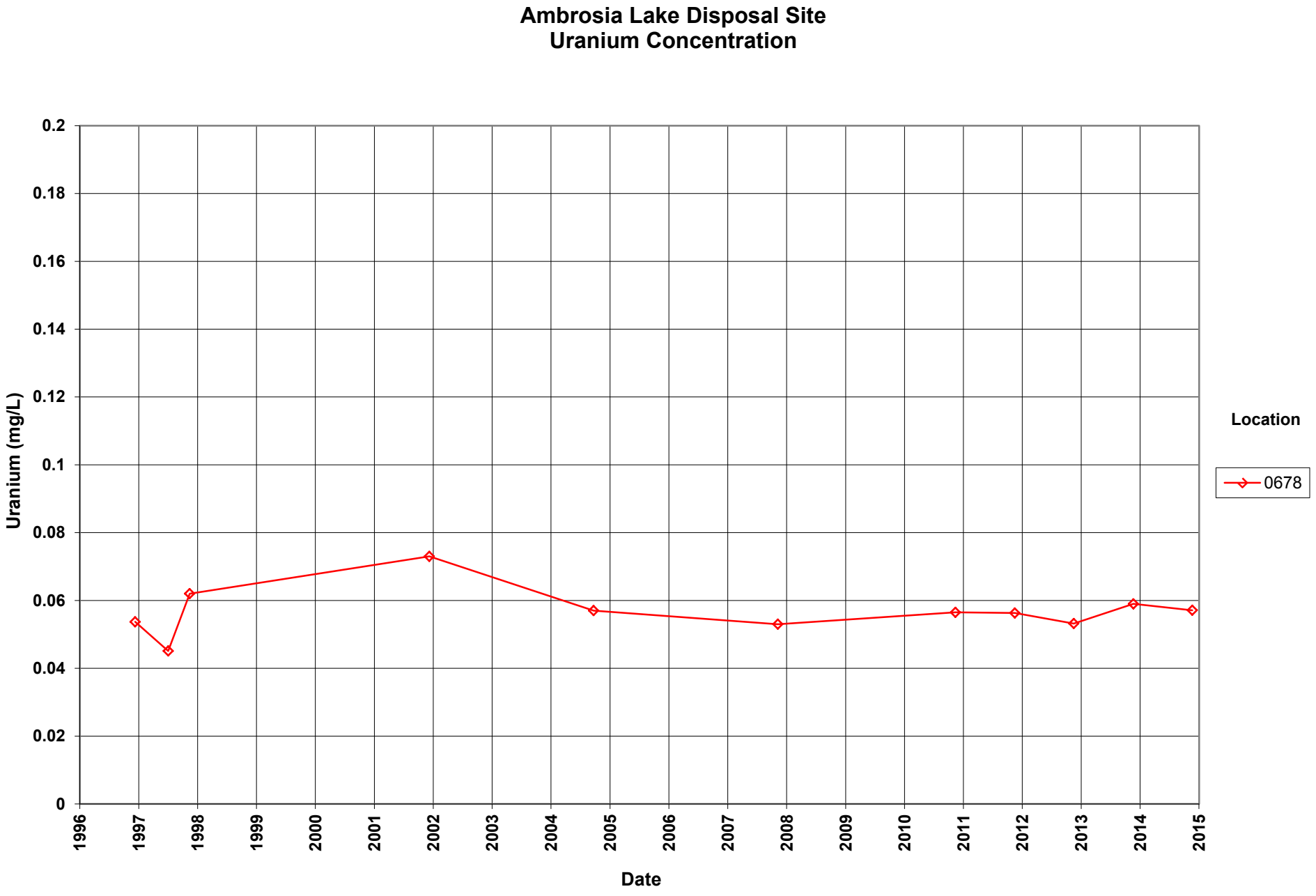

Ambrosia Lake Disposal Site
Molybdenum Concentration
Molybdenum (mg/L)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
0678


Ambrosia Lake Disposal Site
Nitrate + Nitrite as Nitrogen Concentration
Nitrate + Nitrite as Nitrogen (mg/L)
700
600
500
400
300
200
100
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
0675
0678


Ambrosia Lake Disposal Site
Selenium Concentration
Selenium (mg/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
0675
0678


Ambrosia Lake Disposal Site
Sulfate Concentration
Sulfate (mg/L)
12,000
10,000
8,000
6,000
4,000
2,000
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
0675
0678


Ambrosia Lake Disposal Site
Uranium Concentration
Uranium (mg/L)
12
10
8
6
4
2
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
0675


Ambrosia Lake Disposal Site
Uranium Concentration
Uranium (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
0678

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Attachment 3
Sampling and Analysis Work Order

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Stoller

November 13, 2014

Task Assignment 103
Control Number 15-0142

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-LM0000415, The S.M. Stoller Corporation, a wholly owned subsidiary of Huntington Ingalls Industries (Stoller)
Task Assignment 103 LTS&M - UMTRCA TI & TII, D&D, Others, and AS&T
November 2014 Environmental Sampling at the Ambrosia Lake, New Mexico, Disposal Site

REFERENCE: Task Assignment 103, 3-103-1-02-101-4-02, Ambrosia Lake, New Mexico, Disposal Site

Dear Ms. Barr:

The purpose of this letter is to inform you of the upcoming sampling event at the Ambrosia Lake, New Mexico, Disposal Site. 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 17, 2014.

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.

A SUBSIDIARY OF HUNTINGTON INGALLS INDUSTRIES
2597 Legacy Way • Grand Junction, CO 81503-1789 • Telephone (970) 248-6000 • Fax (970) 248-6040

Please contact me at (970) 248-6022 if you have any questions.

Sincerely,

Richard K. Johnson
Site Lead

RJ/lcg/lb

Enclosures (3)

cc: (electronic)
Christina Pennal, DOE
Steve Donivan, Stoller
Lauren Goodknight, Stoller
Richard Johnson, Stoller
Diana Osborne, Stoller
EDD Delivery
rc-grand.junction
File: AMB 410.02

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Constituent Sampling Breakdown

Site	Ambrosia Lake				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	2	0			
Field Measurements					
Alkalinity					
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Arsenic	X		0.0001	SW-846 6020	LMM-02
Calcium	X		5	SW-846 6010	LMM-01
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	12	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			Usally dry; sample if water is present
675			X			
678			X			

Sampling conducted in November

Attachment 4
Trip Report

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Stoller

Memorandum

DATE: December 31, 2014

TO: Dick Johnson

FROM: Rob Rice

SUBJECT: REVISED Groundwater Sampling Trip Report

Site: Bluewater, NM, and Ambrosia Lake, NM, Disposal Sites

Dates of Event: November 17 – 21, 2014

Team Members: David Atkinson, Rob Rice

Number of Locations Sampled: Samples were collected at 19 of the 20 monitoring well locations identified on the sampling notification letter for Bluewater. Samples were collected for metals testing (Ca, K, Mg, Na, As, Mo, Se, U), as well as Cl, Sulfate, TDS, and Nitrates. PCB samples were collected, in 1-L glass bottles, at 4 of the locations as well, including 2 QC duplicates from 1 location. Field testing included DO and ferrous iron. A total of 19 groundwater samples and 3 QC duplicate samples were collected.

Samples were collected at 2 of the 3 monitoring well locations identified in the notification letter for Ambrosia. Samples were collected for metals testing (Ca, K, Mg, Na, As, Mo, Se, U), as well as Cl, Sulfate, TDS, and Nitrates. Field testing included DO. A total of 2 groundwater samples and 1 QC duplicate sample were collected.

Locations Not Sampled/Reason: Location T(M) at Bluewater was dry. Location 0409 at Ambrosia was dry.

Location Specific Information:

Ticket Number	Sample Date	Location	Comments
MMR 924	11/19/14	I(SG)	Sampled with high flow procedure, 3 casing volume purge and sample.
MMR 921	11/20/14	HMC-951	Sampled using high flow procedure, calculated 3 casing volume purge, and sample (filtered).
MMR 903	11/18/14	E(M)	Additional sample taken for PCB testing.
MMR 904	11/18/14	Y2(M)	Additional sample taken for PCB testing. PCB triplicate taken for QC.
MMR 905	11/19/14	F(M)	Additional sample taken for PCB testing.
MMR 913	11/20/14	X(M)	Additional sample taken for PCB testing.
MMR 906	11/19/14	OBS-3	Purged well dry. Samples collected after well recovered.

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Quality Control Sample Cross Reference: The following are the false identifications assigned to quality control samples. No equipment blank samples were collected because all equipment (pumps, tubing, fittings, filters, etc.) was either dedicated to a single well location or disposable.

False ID	Ticket Number	True ID	Sample Type	Associated Matrix
2554	MMR 923	Y2(M)	Duplicate	Groundwater
2073	MMR 930	0678	Duplicate	Groundwater

Report Identification Number (RIN) Assigned:

RIN	Associated Lab	Comments
14116606	GEL Laboratories	Field data sheets can be found in this RIN directory in \\crow\SMS. All field data collected with the Field Data Collection System are associated with this RIN.
14116607	GEL Laboratories	Field data sheets can be found in this RIN directory in \\crow\SMS. All field data collected with the Field Data Collection System are associated with this RIN.

Sample Shipment: Water Samples for RIN 14116606 and RIN 14116607 were shipped from Grand Junction via Fed-Ex to GEL Laboratories in Charleston, SC, on November 21, 2014.

Water Level Measurements: Water levels were measured at all sampled wells prior to sampling. Locations T(M) and 0409 had levels below the screened interval, and were listed as "dry" (no aquifer recharge). Location S(SG) could not be measured, tape would not pass beyond top of pump, which is above water level.

Well Inspection Summary: All sampled wells were in good condition.

Field Variance:

Location ID	Comments
23(M)	Turbidity not met, samples were filtered.
I(SG)	Total depth measured was 331', 75' deeper than previous report shows.
HMC-951	Turbidity not met, samples were filtered.
OBS-3	Turbidity not met, samples were filtered.
S(SG)	Turbidity not met, samples were filtered. Water level below top of pump.
0675	Field alkalinity kit depleted. Additional 125 mL sample collected to test alkalinity when replenished (tested 11/21/14).
0678	Field alkalinity kit depleted. Additional 125 mL sample collected to test alkalinity when replenished (tested 11/21/14).
HMC-951	Field alkalinity kit depleted. Additional 125 mL sample collected to test alkalinity when replenished (tested 11/21/14).
21(M)	Field alkalinity kit depleted. Additional 125 mL sample collected to test alkalinity when replenished (tested 11/21/14).

Equipment: All equipment functioned properly. All wells were sampled using the low-flow procedure. Wells were sampled with dedicated bladder pumps.

Sampling Method: Samples were collected according to the *Sampling and Analysis Plan for the U. S. Department of Energy Office of Legacy Management Sites* (LMS/PLN/S04351, continually updated).

Regulatory: N/A

Institutional Controls:

Fences, Gates, Locks: All gates were locked.
Signs: No issues identified.
Trespassing/Site Disturbances: No issues.

Site Issues:

Disposal Cell/Drainage Structure Integrity: N/A
Vegetation/Noxious Weed Concerns: None.
Maintenance Requirements: None observed.
Access Issues: None
Safety Issues: None

Corrective Action Taken: None.

(RR/lcg)

cc: (electronic)
Deborah Barr, DOE
Steve Donivan, Stoller
Dick Johnson, Stoller
EDD Delivery

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