Data Validation Package

May 2014
Groundwater Sampling at the Lakeview, Oregon, Disposal Site

August 2014

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Sampling Event Summary

Site: Lakeview, Oregon, Disposal Site

Sampling Period: May 21, 2014

Groundwater monitoring at the Lakeview, Oregon, Disposal Site is performed every 5 years to demonstrate that the disposal cell is not leaching contaminants, as specified in the 1994 *Long-Term Surveillance Plan for the Collins Ranch Disposal Site, Lakeview, Oregon* (now known as the U.S. Department of Energy Lakeview Uranium Mill Tailings Disposal Site Lakeview, Oregon).

Sampling and analysis were conducted as specified in *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated). Groundwater samples could not be collected from four of the nine monitoring wells (0602, 0603, 0604, and 0605) because the wells were dry. One duplicate sample was collected from location 0608. Water levels were measured at each sampled well.

Arsenic, cadmium, and uranium concentrations are monitored in the uppermost aquifer to evaluate disposal cell performance. The concentrations of these analytes were below the Uranium Mill Tailings Remedial Action groundwater standards established in 40 CFR 192.02.

Ann Houska

Ann Houska, Site Lead
The S.M. Stoller Corporation,
a wholly owned subsidiary of
Huntington Ingalls Industries

8/14/14

Date

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Lakeview, Oregon, Disposal Site, Sample Location Map

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Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	Lakeview, Oregon	**Date(s) of Water Sampling**	May 21, 2014
Date(s) of Verification	June 24, 2014	**Name of Verifier**	Stephen Donivan

	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 May 12, 2014.
2. Were the sampling locations specified in the planning documents sampled?	No	Locations 0602, 0603, 0604, and 0605 were dry and could not be sampled.
3. Were calibrations conducted as specified in the above-named documents?	Yes	Calibrations were performed May 16, 2014.
4. Was an operational check of the field equipment conducted daily?	Yes	
Did the operational checks meet criteria?	Yes	
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	All wells were Category I.
Was one pump/tubing volume removed prior to sampling?		
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	A duplicate sample was collected at location 0608.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	NA	An equipment blank was not required.
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

Requisition No. (RIN):	14056157
Sample Event:	May 20–21, 2014
Site(s):	Lakeview, Oregon, Disposal and Processing Sites
Laboratory:	ALS Laboratory Group, Fort Collins, Colorado
Work Order No.:	1405511
Analysis:	Metals and Wet Chemistry
Validator:	Stephen Donivan
Review Date:	June 19, 2014

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 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Chloride	MIS-A-045	SW-846 9056	SW-846 9056
Metals: As, Cd, U	LMM-02	SW-846 3005A	SW-846 6020A
Metals: Ca, Fe, K, Mg, Mn, Na, SiO_2	LMM-01	SW-846 3005A	SW-846 6010B
Sulfate	MIS-A-045	SW-846 9056	SW-846 9056
Total Dissolved Solids	WCH-A-033	EPA 160.1	EPA 160.1

Data Qualifier Summary

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

Table 2. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1405511-7	0515	Manganese	U	Less than 5 times the calibration blank
1405511-8	0606	Cadmium	J	PQL check result
1405511-8	0606	Iron	U	Less than 5 times the calibration blank
1405511-8	0606	Manganese	U	Less than 5 times the calibration blank
1405511-9	0607	Iron	U	Less than 5 times the calibration blank
1405511-10	0608	Cadmium	J	PQL check result
1405511-10	0608	Iron	U	Less than 5 times the calibration blank
1405511-10	0608	Manganese	U	Less than 5 times the calibration blank
1405511-11	0609	Iron	U	Less than 5 times the calibration blank
1405511-11	0609	Manganese	U	Less than 5 times the calibration blank
1405511-12	0608 Duplicate	Iron	U	Less than 5 times the calibration blank
1405511-12	0608 Duplicate	Manganese	U	Less than 5 times the calibration blank

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received 12 water samples on May 23, 2014, accompanied by a Chain of Custody form. The Chain of Custody 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 was complete with no errors or omissions. A copy of the air bill was included in the receiving documentation.

Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced cooler at 1.8 °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 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. 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 SW-846 6010B, Metals
Calibrations were performed on May 29, 2014, using three calibration standards. The calibration curve correlation coefficient value was greater than 0.995. The absolute value of the intercept was greater than 3 times the MDL, but was less than 3 times the reporting limit and all results were above the reporting limit. Initial and continuing calibration verification checks were made at the required frequency resulting in four 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, Metals
Calibrations were performed on May 29, 2014, using four calibration standards. 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 with all checks meeting the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL; the arsenic and cadmium results were not within the acceptance range. Associated sample results that are greater than the MDL but less than 5 times the PQL are qualified with a "J" flag as estimated values. Mass calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure. Internal standard recoveries were stable and within acceptable ranges.

Method SW-846 9056, Chloride and Sulfate
Initial calibrations were performed using five calibration standards on April 21, 2014. The 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 checks were made at the required frequency with all checks meeting the acceptance criteria.

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. All method blank and calibration blank results associated with the samples were below the MDL for all analytes.

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 concentration (as was the case with the manganese spikes). 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 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 Samples

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 ion chromatography data. There were no manual integrations performed and 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 3 shows the total anion and cation results in the samples from this event and the charge balance, which is a relative percent difference calculation. Typically, a charge balance difference of 10 percent is considered acceptable.

Table 3. Comparison of Major Anions and Cations

Location	Location Type	Cations (meq/L)	Anions (meq/L)	Charge Balance (%)
0515	Groundwater	3.38	3.26	1.70
0606	Groundwater	5.58	5.80	1.96
0607	Groundwater	2.62	2.39	4.55
0608	Groundwater	2.54	2.74	3.92
0609	Groundwater	1.39	1.49	3.53

meq/L = milliequivalents per liter

The charge balance difference was below 10 percent indicating that there are no significant errors associated with the measurement of major ion concentrations for all locations.

Electronic Data Deliverable File

The electronic data deliverable (EDD) file arrived on June 2, 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.

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 14056157 **Lab Code:** PAR **Validator:** Stephen Donivan **Validation Date:** 06/19/2014

Project: Lakeview Disposal and Processing Sites **Analysis Type:** ☑ Metals ☑ General Chem ☐ Rad ☐ Organics

# of Samples: 12 **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 were 2 duplicates evaluated.

SAMPLE MANAGEMENT SYSTEM

Metals Data Validation Worksheet

RIN: 14056157 **Lab Code:** PAR **Date Due:** 06/20/2014

Matrix: Water **Site Code:** LKV01 **Date Completed:** 06/03/2014

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								
Arsenic	ICP/MS	05/29/2014	0.0000	1.0000	OK	OK	OK	98.0	105.0	106.0	1.0	100.0	10.0	65.0
Cadmium	ICP/MS	05/29/2014	0.0000	1.0000	OK	OK	OK	107.0	106.0	106.0	0.0	103.0		133.0
Calcium	ICP/ES	05/29/2014	0.0000	1.0000	OK	OK	OK	102.0	103.0	105.0	1.0	107.0	3.0	105.0
Iron	ICP/ES	05/29/2014	0.0000	1.0000	OK	OK	OK	105.0	97.0	88.0	10.0	108.0		100.0
Magnesium	ICP/ES	05/29/2014	0.0000	1.0000	OK	OK	OK	99.0	97.0	98.0	1.0	104.0	0.0	102.0
Manganese	ICP/ES	05/29/2014	0.0000	1.0000	OK	OK	OK	104.0	99.0	101.0	2.0	94.0		106.0
Potassium	ICP/ES	05/29/2014	0.0000	1.0000	OK	OK	OK	103.0	108.0	109.0	1.0			83.0
Silicon	ICP/ES	05/29/2014	0.0000	1.0000	OK	OK	OK	104.0	93.0	89.0	0.0	93.0	0.0	88.0
Sodium	ICP/ES	05/29/2014	0.0000	1.0000	OK	OK	OK	104.0	113.0	114.0	1.0		1.0	85.0
Uranium	ICP/MS	05/29/2014	0.0000	1.0000	OK	OK	OK	104.0	111.0	110.0	1.0	103.0		90.0

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 14056157 **Lab Code:** PAR **Date Due:** 06/20/2014

Matrix: Water **Site Code:** LKV01 **Date Completed:** 06/03/2014

Analyte	Date Analyzed	CALIBRATION				Method Blank	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	CCV	CCB						
CHLORIDE	05/28/2014	0.000	0.9999	OK	OK	OK	98.00				
CHLORIDE	05/29/2014							100.0	99.0	0	
SULFATE	05/28/2014	0.000	0.9998	OK	OK	OK	98.00				
SULFATE	05/29/2014							97.0	97.0	0	
TOTAL DISSOLVED SOLIDS	05/28/2014					OK	101.00			3.00	

Sampling Quality Control Assessment

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

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.

Equipment Blank Assessment

Dedicated equipment was used for all sampling and an equipment blank was not required.

Field Duplicate Assessment

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 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. A duplicate sample was collected from location 0608. The duplicate results met the criteria demonstrating acceptable overall precision.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 14056157 **Lab Code:** PAR **Project:** Lakeview Disposal and Processing Sites **Validation Date:** 06/24/2014

Duplicate: 2793 **Sample:** 0608

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Arsenic	4.7			10	4.2			10	11.24		UG/L
Cadmium	0.74			10	0.12	U		10			UG/L
Calcium	31000			1	31000			1	0		UG/L
CHLORIDE	14			1	14			1	0		MG/L
Iron	12	B		1	28	B		1			UG/L
Magnesium	6200			1	6200			1	0		UG/L
Manganese	1.1	B		1	0.83	B		1	NA		UG/L
Potassium	3800			1	3800			1	0		UG/L
Silica	60000			1	60000			1	0		UG/L
Silicon	28000			1	28000			1	0		UG/L
Sodium	8800			1	8800			1	0		UG/L
SULFATE	11			1	11			1	0		MG/L
TOTAL DISSOLVED SOLIDS	210			1	200			1	4.88		MG/L
Uranium	0.44			10	0.46			10	4.44		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: 8-15-2014

Data Validation Lead: Stephen Donivan — Date: 8-15-2014

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. The review should include an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

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

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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 LKV02, Lakeview Disposal Site
REPORT DATE: 06/24/2014
Location: 0515 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	05/21/2014	N001	18.47	-	23.47	139		F	#		
Arsenic	mg/L	05/21/2014	N001	18.47	-	23.47	0.0093		F	#	0.00015	
Cadmium	mg/L	05/21/2014	N001	18.47	-	23.47	0.00012	U	F	#	0.00012	
Calcium	mg/L	05/21/2014	N001	18.47	-	23.47	42		F	#	0.012	
Chloride	mg/L	05/21/2014	N001	18.47	-	23.47	5.3		F	#	0.2	
Iron	mg/L	05/21/2014	N001	18.47	-	23.47	0.19		F	#	0.0049	
Magnesium	mg/L	05/21/2014	N001	18.47	-	23.47	8.9		F	#	0.013	
Manganese	mg/L	05/21/2014	N001	18.47	-	23.47	0.0023	B	UF	#	0.00011	
Oxidation Reduction Potential	mV	05/21/2014	N001	18.47	-	23.47	119.1		F	#		
pH	s.u.	05/21/2014	N001	18.47	-	23.47	6.65		F	#		
Potassium	mg/L	05/21/2014	N001	18.47	-	23.47	4.4		F	#	0.11	
Silica	mg/L	05/21/2014	N001	18.47	-	23.47	66		F	#	0.0095	
Silicon	mg/L	05/21/2014	N001	18.47	-	23.47	31		F	#	0.0044	
Sodium	mg/L	05/21/2014	N001	18.47	-	23.47	10		F	#	0.0066	
Specific Conductance	umhos /cm	05/21/2014	N001	18.47	-	23.47	317		F	#		
Sulfate	mg/L	05/21/2014	N001	18.47	-	23.47	16		F	#	0.5	
Temperature	C	05/21/2014	N001	18.47	-	23.47	16.18		F	#		
Total Dissolved Solids	mg/L	05/21/2014	N001	18.47	-	23.47	260		F	#	20	
Turbidity	NTU	05/21/2014	N001	18.47	-	23.47	0.45		F	#		
Uranium	mg/L	05/21/2014	N001	18.47	-	23.47	0.00053		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 06/24/2014
Location: 0606 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	05/21/2014	N001	136 - 146	125		F	#		
Arsenic	mg/L	05/21/2014	N001	136 - 146	0.011		F	#	0.00015	
Cadmium	mg/L	05/21/2014	N001	136 - 146	0.00012	B	FJ	#	0.00012	
Calcium	mg/L	05/21/2014	N001	136 - 146	73		F	#	0.012	
Chloride	mg/L	05/21/2014	N001	136 - 146	61		F	#	1	
Iron	mg/L	05/21/2014	N001	136 - 146	0.073	B	UF	#	0.0049	
Magnesium	mg/L	05/21/2014	N001	136 - 146	15		F	#	0.013	
Manganese	mg/L	05/21/2014	N001	136 - 146	0.00061	B	UF	#	0.00011	
Oxidation Reduction Potential	mV	05/21/2014	N001	136 - 146	115.5		F	#		
pH	s.u.	05/21/2014	N001	136 - 146	7.5		F	#		
Potassium	mg/L	05/21/2014	N001	136 - 146	5.4		F	#	0.11	
Silica	mg/L	05/21/2014	N001	136 - 146	55		F	#	0.0095	
Silicon	mg/L	05/21/2014	N001	136 - 146	26		F	#	0.0044	
Sodium	mg/L	05/21/2014	N001	136 - 146	13		F	#	0.0066	
Specific Conductance	umhos /cm	05/21/2014	N001	136 - 146	554		F	#		
Sulfate	mg/L	05/21/2014	N001	136 - 146	76		F	#	2.5	
Temperature	C	05/21/2014	N001	136 - 146	12.59		F	#		
Total Dissolved Solids	mg/L	05/21/2014	N001	136 - 146	400		F	#	20	
Turbidity	NTU	05/21/2014	N001	136 - 146	0.47		F	#		
Uranium	mg/L	05/21/2014	N001	136 - 146	0.0012		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 06/24/2014
Location: 0607 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	05/21/2014	N001	148 - 158	108		F	#		
Arsenic	mg/L	05/21/2014	N001	148 - 158	0.0081		F	#	0.00015	
Cadmium	mg/L	05/21/2014	N001	148 - 158	0.00012	U	F	#	0.00012	
Calcium	mg/L	05/21/2014	N001	148 - 158	31		F	#	0.012	
Chloride	mg/L	05/21/2014	N001	148 - 158	4.2		F	#	0.2	
Iron	mg/L	05/21/2014	N001	148 - 158	0.026	B	UF	#	0.0049	
Magnesium	mg/L	05/21/2014	N001	148 - 158	6.7		F	#	0.013	
Manganese	mg/L	05/21/2014	N001	148 - 158	0.00011	U	F	#	0.00011	
Oxidation Reduction Potential	mV	05/21/2014	N001	148 - 158	108.9		F	#		
pH	s.u.	05/21/2014	N001	148 - 158	7.44		F	#		
Potassium	mg/L	05/21/2014	N001	148 - 158	3.6		F	#	0.11	
Silica	mg/L	05/21/2014	N001	148 - 158	57		F	#	0.0095	
Silicon	mg/L	05/21/2014	N001	148 - 158	27		F	#	0.0044	
Sodium	mg/L	05/21/2014	N001	148 - 158	9.9		F	#	0.0066	
Specific Conductance	umhos /cm	05/21/2014	N001	148 - 158	246		F	#		
Sulfate	mg/L	05/21/2014	N001	148 - 158	5.5		F	#	0.5	
Temperature	C	05/21/2014	N001	148 - 158	11.98		F	#		
Total Dissolved Solids	mg/L	05/21/2014	N001	148 - 158	190		F	#	20	
Turbidity	NTU	05/21/2014	N001	148 - 158	0.67		F	#		
Uranium	mg/L	05/21/2014	N001	148 - 158	0.00088		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 06/24/2014
Location: 0608 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	05/21/2014	N001	158.21 - 168.21	106		F	#		
Arsenic	mg/L	05/21/2014	N001	158.21 - 168.21	0.0047		F	#	0.00015	
Arsenic	mg/L	05/21/2014	N002	158.21 - 168.21	0.0042		F	#	0.00015	
Cadmium	mg/L	05/21/2014	N001	158.21 - 168.21	0.00074		FJ	#	0.00012	
Cadmium	mg/L	05/21/2014	N002	158.21 - 168.21	0.00012	U	F	#	0.00012	
Calcium	mg/L	05/21/2014	N001	158.21 - 168.21	31		F	#	0.012	
Calcium	mg/L	05/21/2014	N002	158.21 - 168.21	31		F	#	0.012	
Chloride	mg/L	05/21/2014	N001	158.21 - 168.21	14		F	#	0.2	
Chloride	mg/L	05/21/2014	N002	158.21 - 168.21	14		F	#	0.2	
Iron	mg/L	05/21/2014	N001	158.21 - 168.21	0.012	B	UF	#	0.0049	
Iron	mg/L	05/21/2014	N002	158.21 - 168.21	0.028	B	UF	#	0.0049	
Magnesium	mg/L	05/21/2014	N001	158.21 - 168.21	6.2		F	#	0.013	
Magnesium	mg/L	05/21/2014	N002	158.21 - 168.21	6.2		F	#	0.013	
Manganese	mg/L	05/21/2014	N001	158.21 - 168.21	0.0011	B	UF	#	0.00011	
Manganese	mg/L	05/21/2014	N002	158.21 - 168.21	0.00083	B	UF	#	0.00011	
Oxidation Reduction Potential	mV	05/21/2014	N001	158.21 - 168.21	107.8		F	#		
pH	s.u.	05/21/2014	N001	158.21 - 168.21	7.61		F	#		
Potassium	mg/L	05/21/2014	N001	158.21 - 168.21	3.8		F	#	0.11	

Groundwater Quality Data by Location (USEE100) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 06/24/2014
Location: 0608 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Potassium	mg/L	05/21/2014	N002	158.21	-	168.21	3.8		F	#	0.11	
Silica	mg/L	05/21/2014	N001	158.21	-	168.21	60		F	#	0.0095	
Silica	mg/L	05/21/2014	N002	158.21	-	168.21	60		F	#	0.0095	
Silicon	mg/L	05/21/2014	N001	158.21	-	168.21	28		F	#	0.0044	
Silicon	mg/L	05/21/2014	N002	158.21	-	168.21	28		F	#	0.0044	
Sodium	mg/L	05/21/2014	N001	158.21	-	168.21	8.8		F	#	0.0066	
Sodium	mg/L	05/21/2014	N002	158.21	-	168.21	8.8		F	#	0.0066	
Specific Conductance	umhos /cm	05/21/2014	N001	158.21	-	168.21	245		F	#		
Sulfate	mg/L	05/21/2014	N001	158.21	-	168.21	11		F	#	0.5	
Sulfate	mg/L	05/21/2014	N002	158.21	-	168.21	11		F	#	0.5	
Temperature	C	05/21/2014	N001	158.21	-	168.21	11.9		F	#		
Total Dissolved Solids	mg/L	05/21/2014	N001	158.21	-	168.21	210		F	#	20	
Total Dissolved Solids	mg/L	05/21/2014	N002	158.21	-	168.21	200		F	#	20	
Turbidity	NTU	05/21/2014	N001	158.21	-	168.21	1.56		F	#		
Uranium	mg/L	05/21/2014	N001	158.21	-	168.21	0.00044		F	#	0.000029	
Uranium	mg/L	05/21/2014	N002	158.21	-	168.21	0.00046		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 06/24/2014
Location: 0609 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Total (as $CaCO_3$)	mg/L	05/21/2014	N001	144.65 - 154.65	72		F	#		
Arsenic	mg/L	05/21/2014	N001	144.65 - 154.65	0.0011		F	#	0.00015	
Cadmium	mg/L	05/21/2014	N001	144.65 - 154.65	0.00012	U	F	#	0.00012	
Calcium	mg/L	05/21/2014	N001	144.65 - 154.65	13		F	#	0.012	
Chloride	mg/L	05/21/2014	N001	144.65 - 154.65	1.2		F	#	0.2	
Iron	mg/L	05/21/2014	N001	144.65 - 154.65	0.039	B	UF	#	0.0049	
Magnesium	mg/L	05/21/2014	N001	144.65 - 154.65	4.5		F	#	0.013	
Manganese	mg/L	05/21/2014	N001	144.65 - 154.65	0.00072	B	UF	#	0.00011	
Oxidation Reduction Potential	mV	05/21/2014	N001	144.65 - 154.65	112.4		F	#		
pH	s.u.	05/21/2014	N001	144.65 - 154.65	7.22		F	#		
Potassium	mg/L	05/21/2014	N001	144.65 - 154.65	3		F	#	0.11	
Silica	mg/L	05/21/2014	N001	144.65 - 154.65	61		F	#	0.0095	
Silicon	mg/L	05/21/2014	N001	144.65 - 154.65	29		F	#	0.0044	
Sodium	mg/L	05/21/2014	N001	144.65 - 154.65	6.8		F	#	0.0066	
Specific Conductance	umhos /cm	05/21/2014	N001	144.65 - 154.65	136		F	#		
Sulfate	mg/L	05/21/2014	N001	144.65 - 154.65	0.96		F	#	0.5	
Temperature	C	05/21/2014	N001	144.65 - 154.65	12.08		F	#		
Total Dissolved Solids	mg/L	05/21/2014	N001	144.65 - 154.65	140		F	#	20	
Turbidity	NTU	05/21/2014	N001	144.65 - 154.65	0.59		F	#		
Uranium	mg/L	05/21/2014	N001	144.65 - 154.65	0.00013		F	#	0.000029	

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.

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Static Water Level Data

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STATIC WATER LEVELS (USEE700) FOR SITE LKV02, Lakeview Disposal Site
REPORT DATE: 06/24/2014

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Time	Date	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0515	N	4875.81	05/21/2014	16:25:11	15.23	4860.58	
0602	D	4965.02	05/20/2014	14:40:00			D
0603	D	4968.9	05/20/2014	14:35:00			D
0604	D	4962.82	05/20/2014	14:29:00			D
0605	D	4955.58	05/20/2014	14:47:00			D
0606	D	4955.56	05/21/2014	15:45:16	106.57	4848.99	
0607	D	4963.2	05/21/2014	14:15:08	114.51	4848.69	
0608	D	4968.7	05/21/2014	14:45:20	120.34	4848.36	
0609	D	4965.56	05/21/2014	15:15:49	115.6	4849.96	

FLOW CODES: B BACKGROUND C CROSS GRADIENT D DOWN GRADIENT F OFFSITE
N UNKNOWN O ONSITE U UPGRADIENT

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

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Hydrograph

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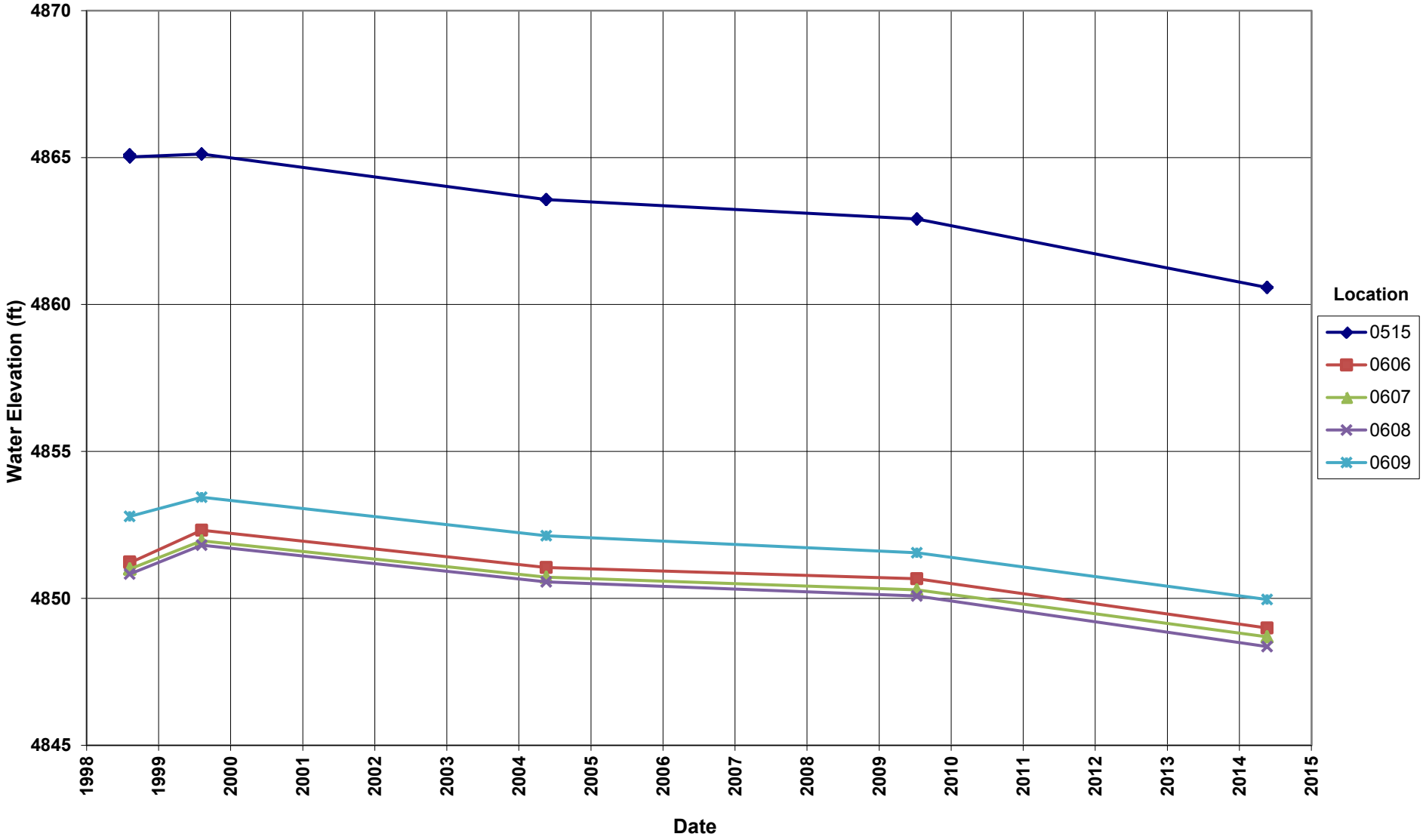
Lakeview Disposal Site
Hydrograph



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Time-Concentration Graphs

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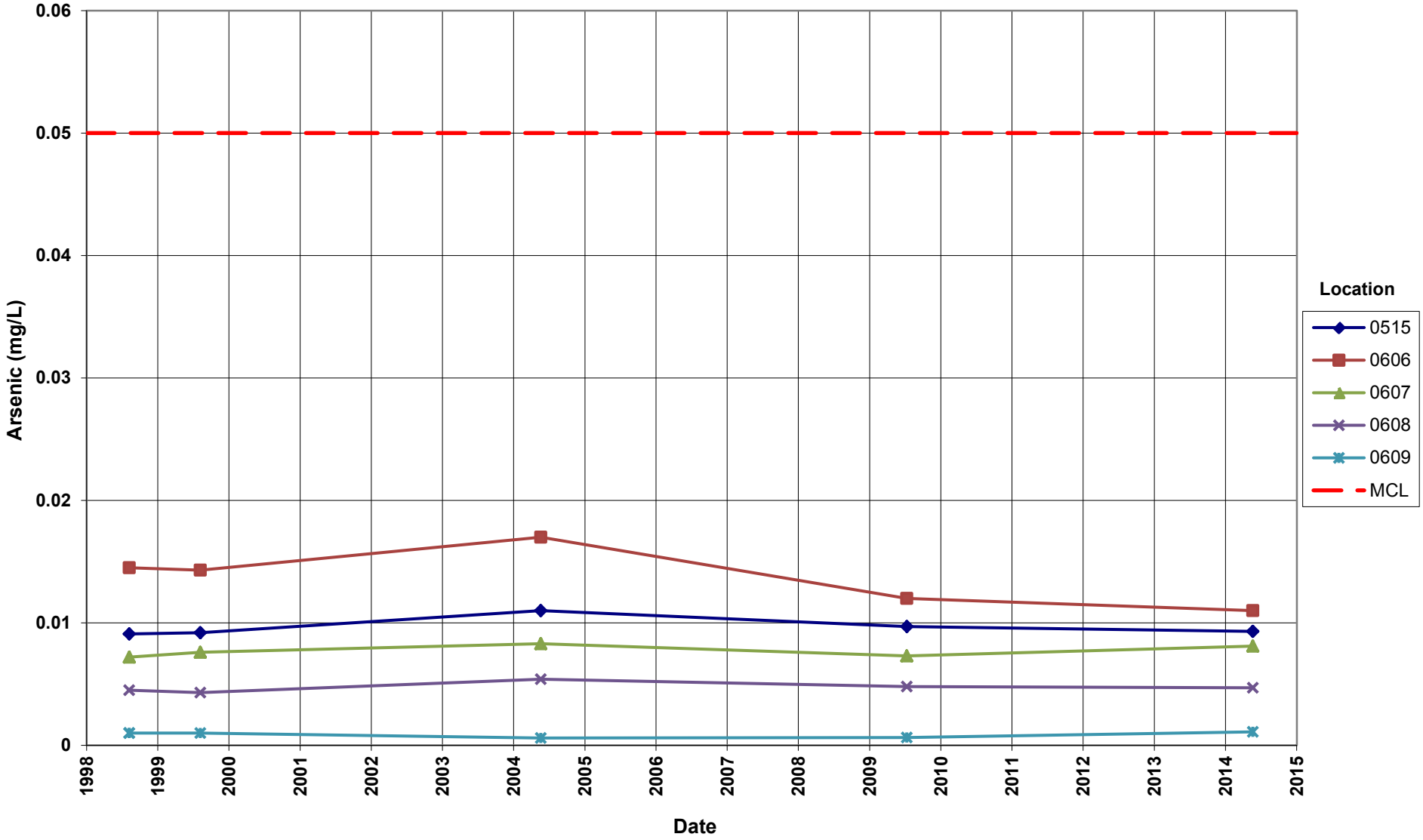
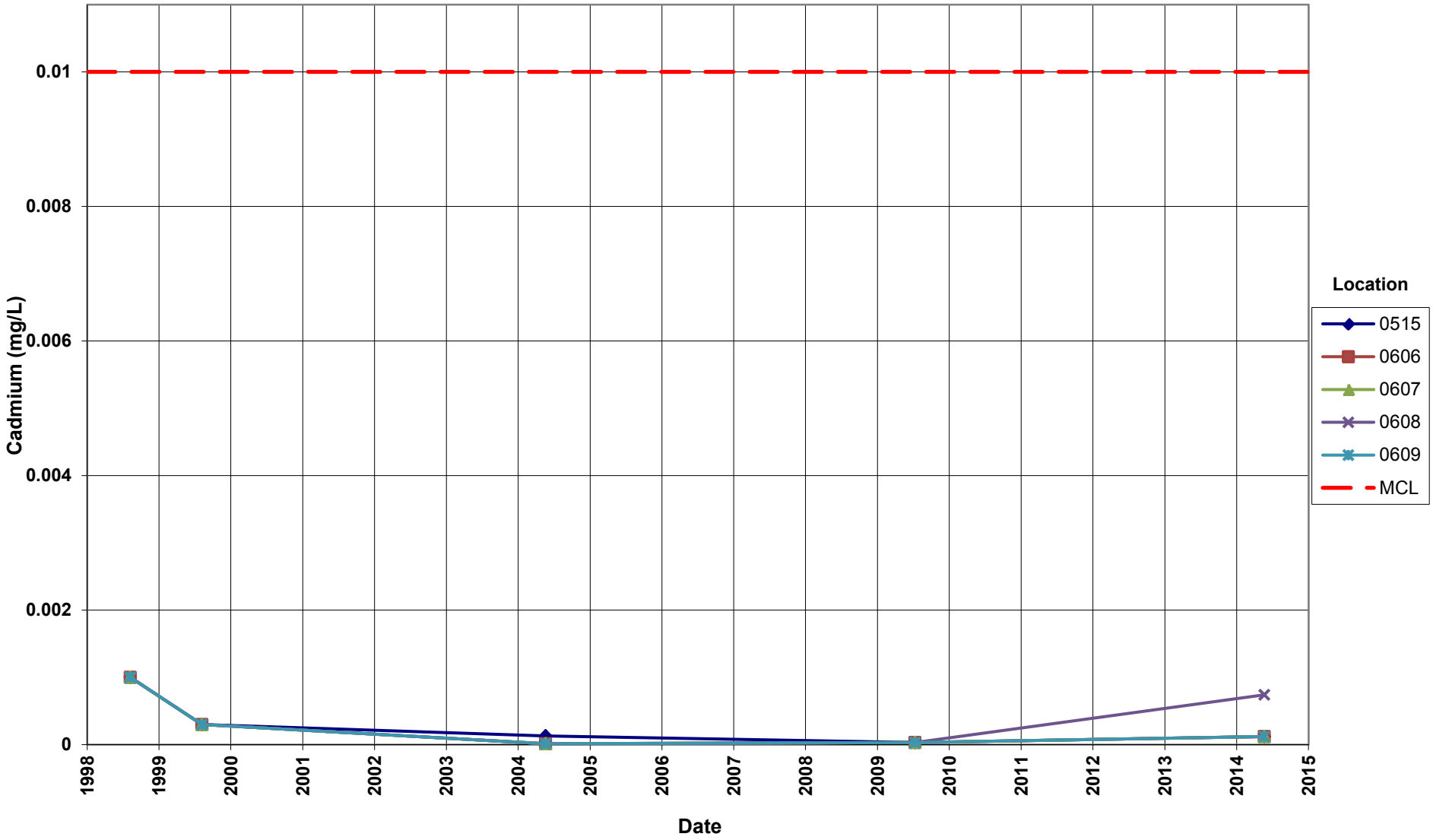
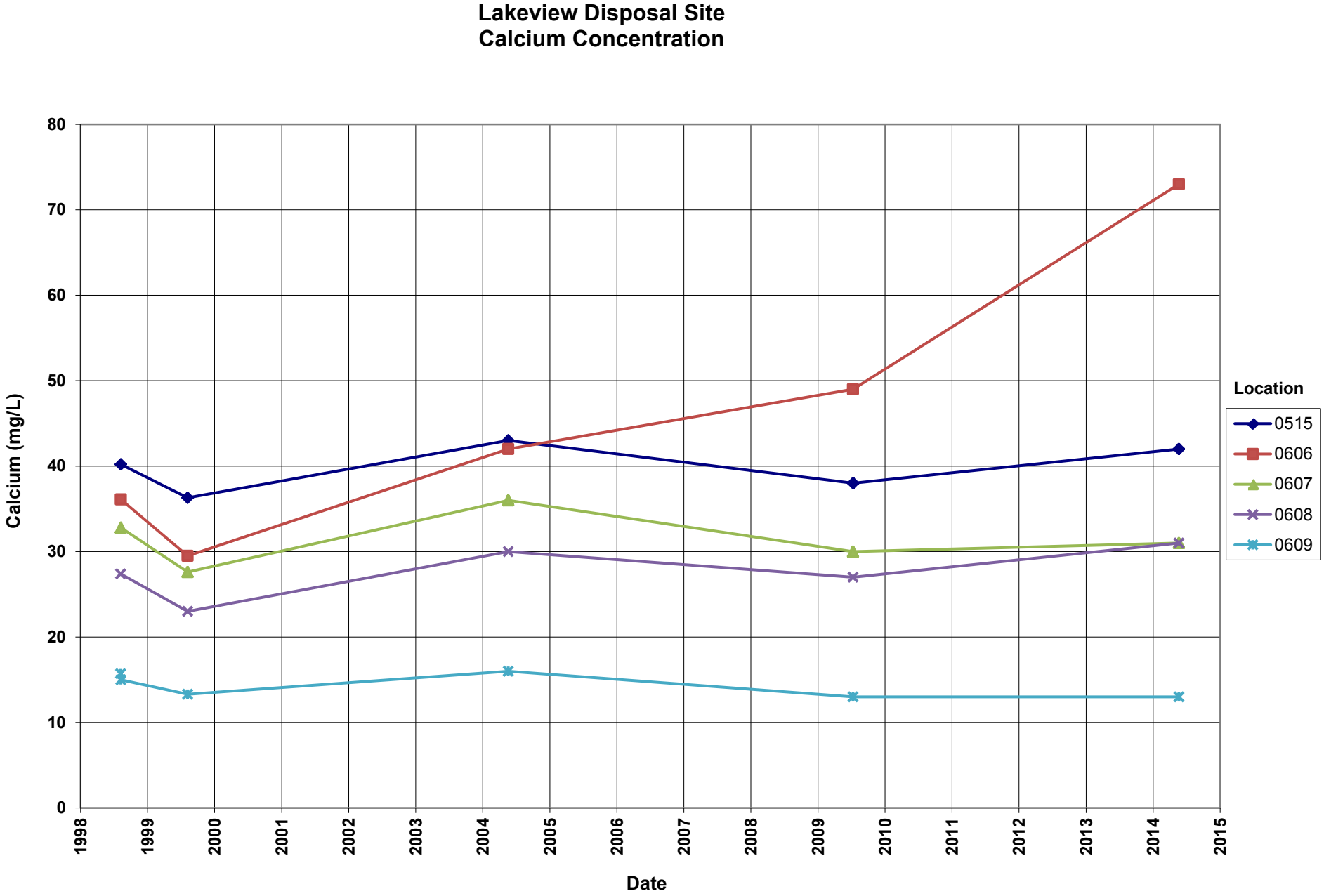
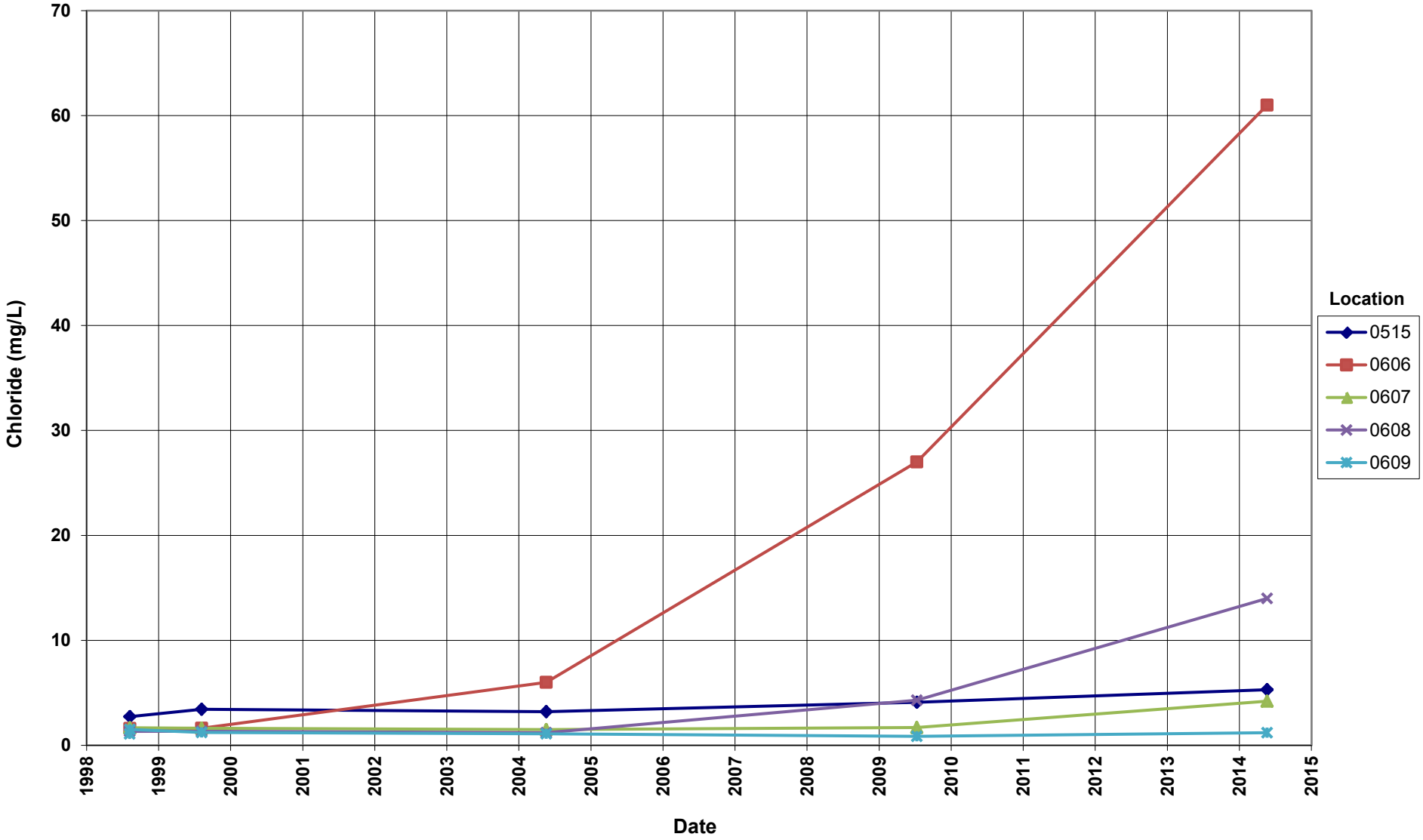
Lakeview Disposal Site
Arsenic Concentration
40 CFR 192.02 Maximum Contaminant Level (MCL) = 0.05 mg/L



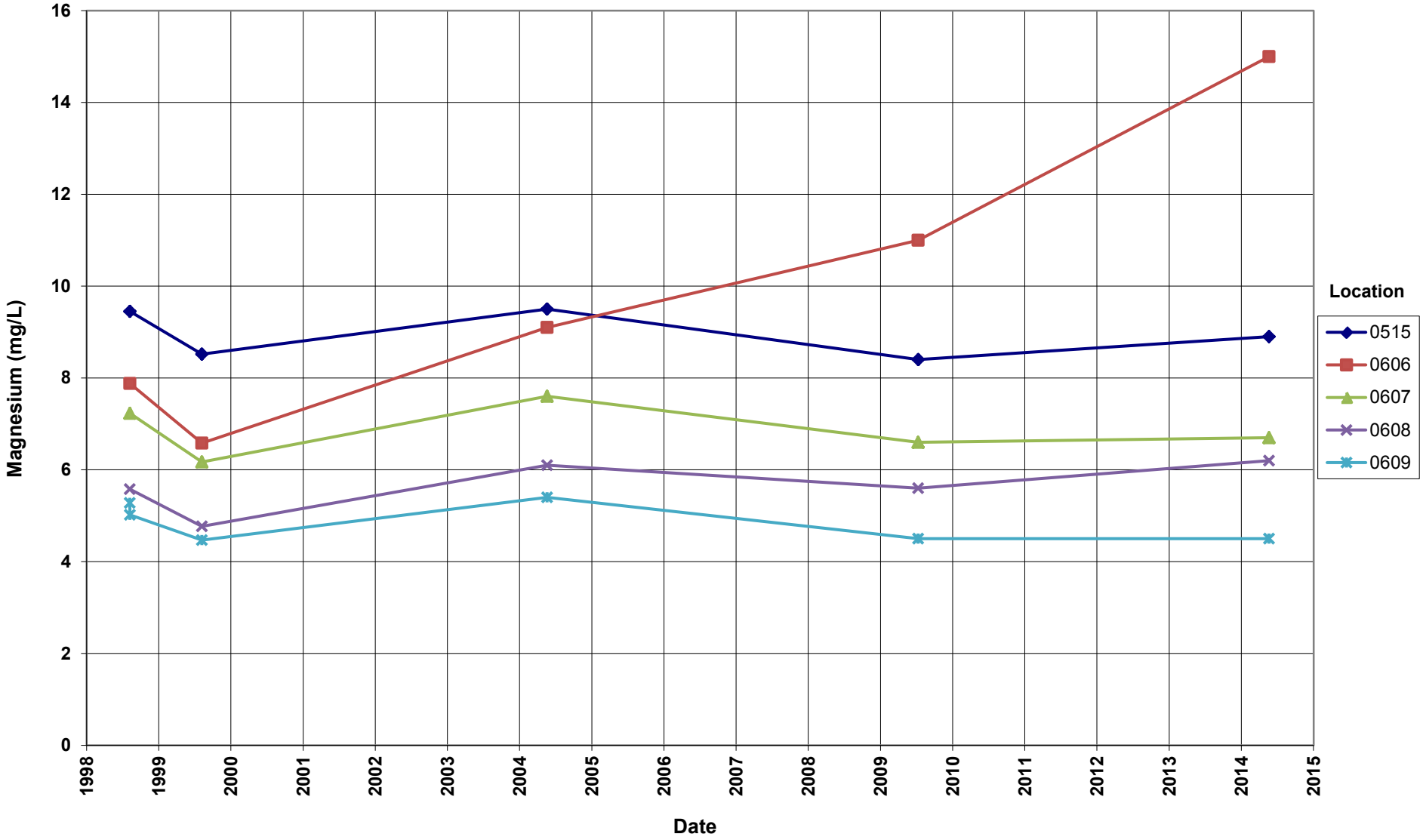
Lakeview Disposal Site
Cadmium Concentration
40 CFR 192.02 Maximum Contaminant Level (MCL) = 0.01 mg/L



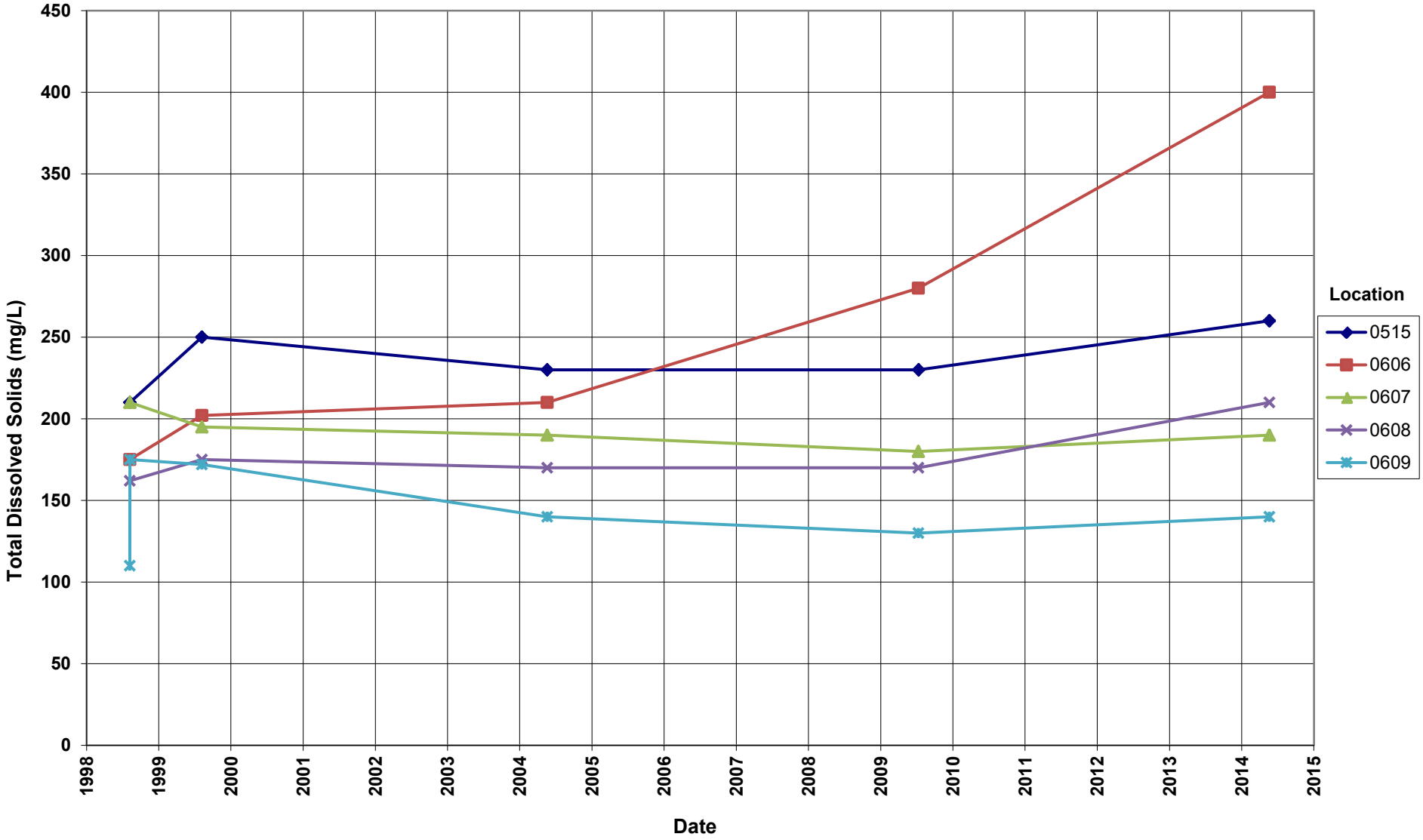

Lakeview Disposal Site
Calcium Concentration
Calcium (mg/L)
80
70
60
50
40
30
20
10
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
0515
0606
0607
0608
0609


Lakeview Disposal Site
Chloride Concentration
Chloride (mg/L)
70
60
50
40
30
20
10
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
0515
0606
0607
0608
0609

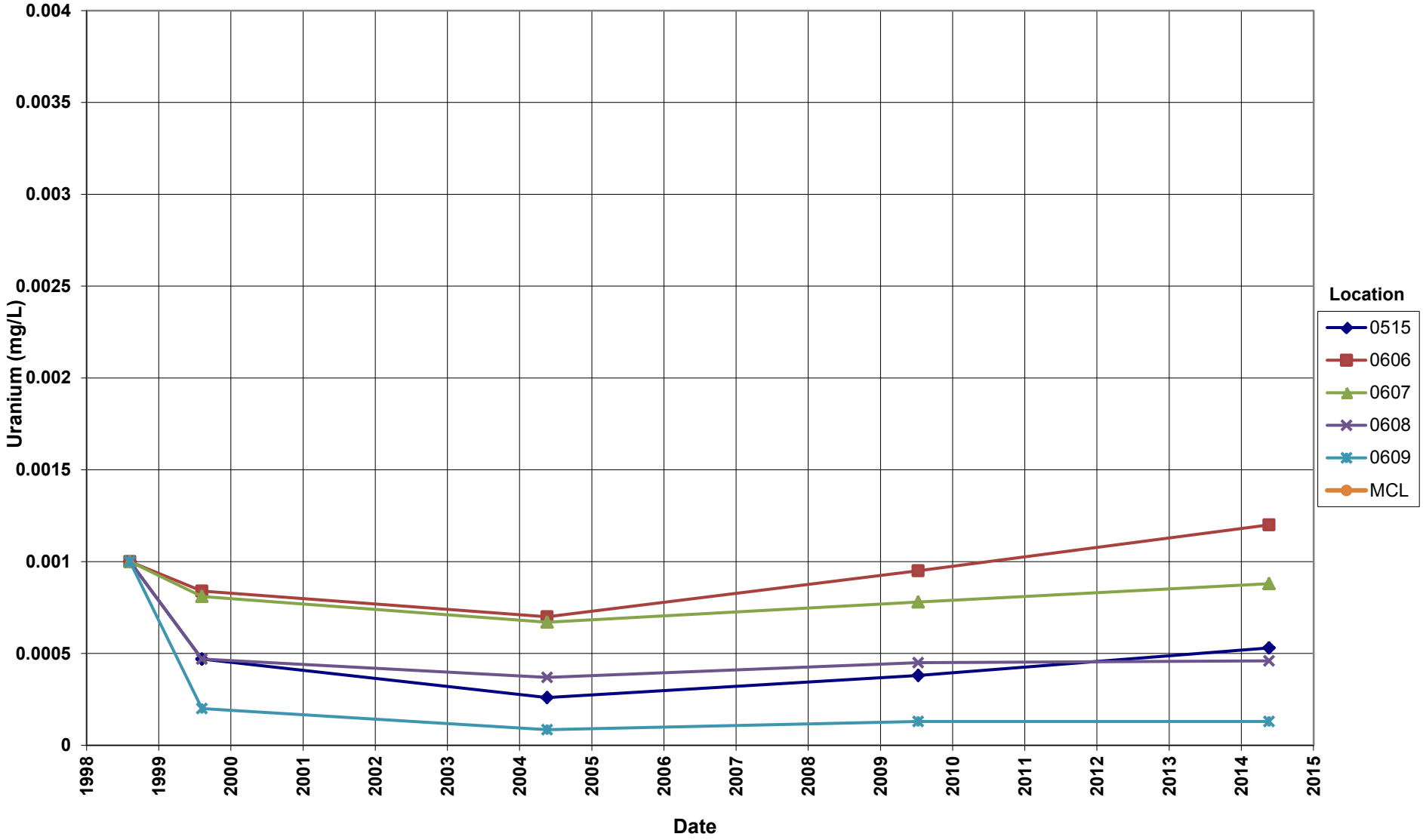
Lakeview Disposal Site
Magnesium Concentration



Lakeview Disposal Site
Total Dissolved Solids Concentration



Lakeview Disposal Site
Uranium Concentration
40 CFR 192.02 Maximum Contaminant Level (MCL) = 0.044 mg/L



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Attachment 3
Sampling and Analysis Work Order

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Stoller

May 12, 2014

Task Order LM00-501
Control Number 14-0513

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

SUBJECT: Contract No. DE-AM01-07LM00060, The S.M. Stoller Corporation, a wholly owned subsidiary of Huntington Ingalls Industries (Stoller)
May 2014 Environmental Sampling at the Lakeview, Oregon, Disposal and Processing Sites

REFERENCE: Task Order LM00-501-02-109, Lakeview, Oregon, Disposal and Processing Sites

Dear Ms. Dayvault:

The purpose of this letter is to inform you of the upcoming sampling event at Lakeview, Oregon. Enclosed are the map and tables specifying sample locations and analytes for groundwater monitoring at the Lakeview disposal and processing sites. Water quality data will be collected at the disposal and processing site as part of the routine environmental sampling currently scheduled to occur between May 19 and May 23, 2014. The processing site sampling is consistent with Appendix A of the *Groundwater Compliance Action Plan for the Lakeview, Oregon, Processing Site,* June 2010, which adds sampling of monitoring well 518 and the inclusion of a sulfur isotope analysis at all sampled processing site wells to the routine sampling.

The following lists show the monitoring wells (with zone of completion) and domestic well that are scheduled to be sampled during this event.

MONITORING WELLS

Processing Site

503 Sp 505 Sp 509 Sp 540 Al 518 Sp

Disposal Site

515 Sp 603 Al 604 Al 605 Al 606 Cl 607 Al 608 Al 609 Cl
602 Al

*NOTE: Al = alluvium; Cl = Lean Clays, Sandy Clays, or Gravelly Clays; Sp = Sand or Gravelly Sand, Poorly Graded

Domestic Well
543

All samples will be collected as directed in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*. Additionally, all monitoring wells will be developed during this sampling event prior to commencing sampling.

Private property pre-access notifications will be completed before the beginning of fieldwork.

Please contact me at (970) 248-6579 if you have any questions.

Sincerely,

Ann M. Houska

Ann Houska
Site Lead

AH/lcg/lb

Enclosures (4)

cc: (electronic)
Christina Pennal, DOE
Steve Donivan, Stoller
Bev Gallagher, Stoller
Lauren Goodknight, Stoller
Ann Houska, Stoller
EDD Delivery
rc-grand.junction
File: LKV 410.02(A)

Sampling Frequencies for Locations at Lakeview, Oregon

Location ID	Quarterly	Semiannually	Annually	Biennially	Every 5 years	Notes
Monitoring Wells						
LKV01 - Processing Site						
503				Even year		Next sampling in 5/2014
505				Even year		Next sampling in 5/2014
509				Even year		Next sampling in 5/2014
518				Even year		Next sampling in 5/2014
540				Even year		Next sampling in 5/2014
LKV02 - Disposal Site						
515					X	Every 5 years; next in 5/2014
602					X	Every 5 years; next in 5/2014
603					X	Every 5 years; next in 5/2014
604					X	Every 5 years; next in 5/2014
605					X	Every 5 years; next in 5/2014
606					X	Every 5 years; next in 5/2014
607					X	Every 5 years; next in 5/2014
608					X	Every 5 years; next in 5/2014
609					X	Every 5 years; next in 5/2014
Private Wells						
LKV01 - Processing Site						
543				Even year		Next sampling in 5/2014

Sampling conducted in May.

Constituent Sampling Breakdown

Site	Lakeview				
Analyte	**Groundwater**		**Required Detection Limit (mg/L)**	**Analytical Method**	**Line Item Code**
Approx. No. Samples/yr	9 every 5 yrs.; 6 every 2 yrs.				
Field Measurements					
Alkalinity	X				
Dissolved Oxygen					
Redox Potential	X				
pH	X				
Specific Conductance	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements	***Disposal***	***Processing***			
Aluminum					
Ammonia as N (NH3-N)					
Arsenic	X		0.0001	SW-846 6020	LMM-02
Cadmium	X		0.001	SW-846 6020	LMM-02
Calcium	X		5	SW-846 6010	LMM-01
Chloride	X		0.5	SW-846 9056	WCH-A-039
Gross Alpha					
Gross Beta					
Iron	X		0.05	SW-846 6020	LMM-02
Lead					
Magnesium	X		5	SW-846 6010	LMM-01
Manganese	X	X	0.005	SW-846 6010	LMM-01
Molybdenum					
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO_3+NO_2)-N					
Potassium	X		1	SW-846 6010	LMM-01
Radium-226					
Radium-228					
Selenium					
Silica	X		0.1	SW-846 6010	LMM-01
Sodium	X		1	SW-846 6010	LMM-01
Strontium					
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Sulfide					
Sulfur-34 (from Sulfate SO_4)		X	n/a	Mass Spectrometry	LMW-09
Total Dissolved Solids	X		10	SM2540 C	WCH-A-033
Total Organic Carbon					
Uranium	X		0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	13	3			

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

Attachment 4
Trip Report

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Stoller

Memorandum

DATE: June 16, 2014

TO: Ann Houska

FROM: David Atkinson

SUBJECT: Sampling trip report

Site: Lakeview, OR, Processing and Disposal Sites.

Dates of Sampling Event: 5/20/2014 – 5/21/2014

Team Members: David Atkinson, Alison Kuhlman.

Number of Locations Sampled: Samples were collected from 5 monitoring well locations at the processing site, and 5 monitoring well locations at the disposal site. In addition, 1 duplicate sample was collected at the processing site, and 1 duplicate sample at the disposal site.

Locations Not Sampled/Reason: Locations 0602, 0603, 0604, and 0605 at the disposal site were dry and could not be sampled. Private well location 0543 at the processing site was not sampled per the direction of the site lead.

Location Specific Information: At processing site location 0518, the casing was slanted and drop tubing had to be installed (to approximately 3 ft. above the bottom of the well) prior to sampling. Turbidity less than 10 NTUs could not be reached at two of the processing site wells (see Field Variance section), the samplers recommend well redevelopment be conducted on the processing site wells prior to the next round of sampling.

Quality Control Sample Cross Reference: The following table summarizes the QC samples taken during the sampling event.

Sample Date/Time	Sample Type	False ID	True ID	Ticket #
5-21-14/1200	Duplicate	2628	0540	MGR 433
5-21-14/1200	Duplicate	2604	0540	MGR 454
5-21-14/1900	Duplicate	2793	0608	MGR 419

RIN Number Assigned: All disposal site samples were assigned to RIN 14056157. Sulfur isotope samples collected at the processing site and duplicate sample 2604 were assigned to RIN 14056158. All other processing site samples were assigned to RIN 14056157.

Sample Shipment: Samples assigned to RIN 14056157 were shipped to ALS Laboratory Group in Fort Collins, CO, and samples assigned to RIN 14056158 were shipped to Reston Stable Isotope Lab in Reston, VA. All samples were shipped priority overnight via FedEx from Pendleton, OR, on May 22, 2014.

Water Level Measurements: Water levels were measured at all wells prior to the start of sampling.

Well Inspection Summary: All wells were in good condition except for processing site location 0509. The ground has eroded away from the concrete pad, and the protective casing is now loose and could cause damage to the inner casing if livestock were to push hard against the outer casing.

Field Variance: Turbidity less than 10 NTUs could not be reached at processing site wells 0503, and 0540. After turbidity had stabilized above 10 NTUs, the samplers collected samples through 0.45 micron filters.

Equipment: All equipment functioned properly.

Institutional Controls:

Fences, Gates, Locks: No issues identified.
Trespassing/Site Disturbances: None observed.

Site Issues:

Disposal Cell/Drainage Structure Integrity: Disposal cell appeared to be in good condition.
Vegetation/Noxious Weed Concerns: None.
Maintenance Requirements: None
Access Issues: None

Corrective Action Required: Replace concrete pad around processing site well 0509, redevelop processing site wells.

cc: (electronic)
Jalena Dayvault, DOE
Steve Donivan, Stoller
Ann Houska, Stoller
EDD Delivery