LMS/PKB/S01113

Data Validation Package

November 2013
Groundwater Sampling at the Parkersburg, West Virginia, Disposal Site

February 2014

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Contents

Sampling Event Summary 1
Parkersburg, West Virginia, Disposal Site Sample Location Map 5
Data Assessment Summary.....7
Water Sampling Field Activities Verification Checklist 9
Laboratory Performance Assessment 11
Sampling Quality Control Assessment 26
Certification 28

Attachment 1—Assessment of Anomalous Data

Potential Outliers Report

Attachment 2—Data Presentation

Groundwater Quality Data
Static Water Level Data
Hydrograph
Time-Concentration Graphs

Attachment 3—Sampling and Analysis Work Order

Attachment 4—Trip Report

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Sampling Event Summary

Site: Parkersburg, West Virginia, Disposal Site

Sampling Period: November 21, 2013

Groundwater samples were collected from monitoring wells MW-5 and MW-6 at the Parkersburg, West Virginia, Disposal Site as required in the *Long-Term Surveillance Plan for the Parkersburg, West Virginia, Disposal Site* (LTSP).

Sampling and analyses were conducted as specified *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated). One duplicate sample was collected from location MW-6.

The LTSP prescribes that groundwater quality data for major cations and anions, metals, radionuclides, and thiocyanate be compared to water quality data reported in 1994 and 1995 to determine if changes in groundwater quality have occurred. The data comparison is presented in Tables 1 and 2.

Table 1. Monitoring Well MW-5 Water Quality

Analyte	Units	1994	1995	2013	EPA [a]	WVa [b]
Metals						
Antimony	µg/L	3.1	U	U	6	
Barium	µg/L	90.4	86.6	92	2000	2000
Beryllium	µg/L	U	U	U	4	4
Cadmium	µg/L	U	U	U	5	5
Chromium	µg/L	U	U	U	100	100
Lead	µg/L	U	U	0.3	15 [c]	15
Mercury	µg/L	U	U	U	2	2
Nickel	µg/L	U	U	U		
Selenium	µg/L	U	U	U	50	50
Thallium	µg/L	U	U	U	2	2
Uranium	µg/L	U	U	0.4		
Zirconium	µg/L	1.1	U	U		
Cations / Anions						
Calcium	mg/L	110	107	160		
Magnesium	mg/L	16.2	15.4	21.0		
Potassium	mg/L	4.3	3.6	3.3		
Sodium	mg/L	10.6	7.7	11.0		
Chloride	mg/L	25.9	23.0	79		
Sulfate	mg/L	53.3	54.1	64		
Nitrate + nitrite as N	µg/L	3.9	3.3	7.3	10	10
Thiocyanate	µg/L	U	U	U		

Table 1 (continued). Monitoring Well MW-5 Water Quality

Analyte	Units	1994	1995	2013	EPA [a]	WVa [b]
Radiochemical Parameters						
Radium-226 + 228	pCi/L	0.15	0.15	U	5	5
Gross Alpha	pCi/L	U	U	U	15	15
Gross Beta	pCi/L	U	U	1.8	4 [d]	4 [d]

[a] U.S. Environmental Protection Agency (EPA) federal Safe Drinking Water Act standard
[b] State of West Virginia groundwater standards
[c] Action limit
[d] mrem
µg/L = micrograms per liter, mg/L = milligrams per liter, pCi/L = picocuries per liter
U = Result was below detection limit

Table 2. Monitoring Well MW-6 Water Quality

Analyte	Units	1994	1995	2013	EPA [a]	WVa [b]
Metals						
Antimony	µg/L	1.1	1.0	0.4	6	
Barium	µg/L	89.3	88.9	160	2000	2000
Beryllium	µg/L	U	U	U	4	4
Cadmium	µg/L	U	U	U	5	5
Chromium	µg/L	U	U	U	100	100
Lead	µg/L	U	U	0.2	15 [c]	15
Mercury	µg/L	U	U	U	2	2
Nickel	µg/L	U	U	U		
Selenium	µg/L	U	U	U	50	50
Thallium	µg/L	U	U	U	2	2
Uranium	µg/L	U	U	0.6		
Zirconium	µg/L	1.5	U	U		
Cations / Anions						
Calcium	mg/L	133	122	190		
Magnesium	mg/L	14.8	13.2	24		
Potassium	mg/L	2.3	1.8	3.3		
Sodium	mg/L	13.9	12.9	32		
Chloride	mg/L	31.6	26	120		
Sulfate	mg/L	101	81	91		
Nitrate + nitrite as N	µg/L	10	9.7	14	10	10
Thiocyanate	µg/L	U	U	U		
Radiochemical Parameters						
Radium-226 + 228	pCi/L	0.25	0.1	U	5	5
Gross Alpha	pCi/L	U	U	U	15	15
Gross Beta	pCi/L	U	U	3.4	4 [d]	4 [d]

[a] U.S. Environmental Protection Agency (EPA) federal Safe Drinking Water Act standard
[b] State of West Virginia groundwater standards
[c] Action limit
[d] mrem
µg/L = micrograms per liter, mg/L = milligrams per liter, pCi/L = picocuries per liter
U = Result was below detection limit

Water levels were measured at each sampled well and four additional wells. As shown in the attached hydrograph, the water levels are approximately two feet higher than those measured in 2008.

Time-concentration graphs are included in this report for those parameters measured that were detected at concentrations above the method detection limit (MDL). Review of those data indicate increasing concentrations of most major cations and anions, with the nitrate + nitrite as N exceeding the state and federal standards.

Michele L. Miller
2014.02.05 17:04:53 -05'00'

Michele Miller
Site Lead, S.M. Stoller Corporation

Date

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LEGEND

- WELL TO BE SAMPLED
- SITE BOUNDARY

N

0 150 300 Feet

U.S. DEPARTMENT OF ENERGY GRAND JUNCTION, COLORADO	Work Performed by S.M. Stoller Corporation Under DOE Contract No. DE-AM01-07LM00060
Planned Sampling Map Parkersburg, WV, Disposal Site October 2013	
DATE PREPARED: September 11, 2013	FILENAME: S1069000

M:\LTS\111\0001\16\000\S10690\S1069000-11x17.mxd smithw 09/11/2013 1:12:20 PM

Parkersburg, West Virginia, Disposal Site Sample Location Map

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Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	Parkersburg, West Virginia Disposal Site	**Date(s) of Water Sampling**	November 21, 2013
Date(s) of Verification	January 27, 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 September 25, 2013.
2. Were the sampling locations specified in the planning documents sampled?	Yes	
3. Were calibrations conducted as specified in the above-named documents?	NA	Calibration data were not available for review.
4. Was an operational check of the field equipment conducted daily?	NA	Operational check data were not available for review.
Did the operational checks meet criteria?	NA	
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	Both 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 from well MW-6.
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

Report Number (RIN): 13095640
Sample Event: November 21, 2013
Site(s): Parkersburg, West Virginia
Laboratory: ALS Laboratory Group, Fort Collins, Colorado
Work Order No.: 1311458
Analysis: Metals, Inorganics, and Radiochemistry
Validator: Stephen Donivan
Review Date: January 24, 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 3.

Table 3. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Alkalinity	WCH-A-002	EPA 310.1	EPA 310.1
Chloride	MIS-A-045	SW-846 9056	SW-846 9056
Gross Alpha/Beta	GPC-A-001	EPA 900.0	EPA 900.0
Metals: Ba, Be, Ca, Cr, Hg, K, Mg, Na, Ni, Zr	LMM-01	SW-846 3005A, 7470A	SW-846 6010B, 7470A
Metals: Cd, Pb, Sb, Se, Tl, U	LMM-02	SW-846 3005A	SW-846 6020
Nitrate	WCH-A-021	EPA 353.2	EPA 3536.2
Nitrite	WCH-A-022	SW-846 9056	SW-846 9056
Radium-226	GPC-A-001	SOP 712R14	SOP 724R10
Radium-228	GPC-A-001	SOP 746R8	SOP 724R10
Sulfate	MIS-A-045	SW-846 9056	SW-846 9056

Data Qualifier Summary

The analytical results were qualified as listed in Table 4.

Table 4. Data Qualifier Summary

Sample Number	Location	Analyte	Flag	Reason
1311458-1	MW-6 Duplicate	Gross Beta	J	Less than the determination limit
1311458-1	MW-6 Duplicate	Nitrate+Nitrite as N	J	Matrix spike recoveries
1311458-1	MW-6 Duplicate	Selenium	U	Less than 5 times the method blank
1311458-2	MW-5	Gross Beta	J	Less than the determination limit
1311458-2	MW-5	Mercury	U	Less than 5 times the method blank
1311458-2	MW-5	Thallium	U	Less than 5 times the method blank

Table 4. (continued). Data Qualifier Summary

Sample Number	Location	Analyte	Flag	Reason
1311458-3	MW-6	Gross Beta	J	Less than the determination limit
1311458-3	MW-6	Mercury	U	Less than 5 times the method blank
1311458-3	MW-6	Nitrate+Nitrite as N	J	Matrix spike recoveries
1311458-3	MW-6	Radium-226	U	Less than the decision level
1311458-3	MW-6	Selenium	U	Less than 5 times the method blank

Sample Shipping/Receiving

ALS Laboratory Group, Fort Collins, Colorado, received three water samples on November 22, 2013, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed on the form and that signatures and dates were present indicating sample relinquishment and receipt. The sample submittal had no errors or omissions. Copies of the air waybill labels were included with the sample receiving documentation.

Preservation and Holding Times

The sample shipment was received intact with the temperatures inside the iced coolers between 3.0 °C and 4.8 °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 metal, organic, and wet chemical analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99 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.

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

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

selenium (6 µg/L) and boron (15 µg/L) were slightly above the MDLs specified in the applicable line item codes (5 µg/L and 10 µg/L, respectively). These detection limits are acceptable.

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 353.2, Nitrate + Nitrite as N
Calibrations were performed using six calibration standards on November 25, 2013. 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 calibration check results within the acceptance range.

Method SW-846 6010B
Calibrations for method 6010B metals were performed on December 9, 2013. The initial calibrations were performed using three calibration standards resulting in calibration curves with correlation coefficient values greater than 0.995. The absolute values of the curve intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency with all check results meeting the acceptance criteria. A reporting limit verification check was made at the required frequency to verify the linearity of the calibration curve near the practical quantitation limit. The check results were within the acceptance range.

Method SW-846 6020
Calibrations for method 6020 metals were performed December 5, 2013. The initial calibrations were performed using six calibration standards resulting in calibration curves with correlation coefficient values greater than 0.995. The absolute values of the curve intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency with all verification results within the acceptance range. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curves near the practical quantitation limit. Check results were within the acceptance range. The mass calibration and resolution was checked at the beginning of each analytical run in accordance with the procedure. Internal standard recoveries were stable and within acceptance ranges.

Method SW-846 7470A
Calibration for mercury was performed on December 2, 2013. The initial calibration was performed using six calibration standards resulting in a calibration curve correlation coefficient value greater than 0.995. The absolute value of the curve intercept was less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency with all calibration check results meeting the acceptance criteria. A reporting limit verification

check was made at the required frequency to verify the linearity of the calibration curve near the practical quantitation limit. The check results were within the acceptance range.

Method SW-846 9056
Initial calibrations were performed for chloride, nitrite, and sulfate using five calibration standards on November 11, 2013. The resulting calibration curves had correlation coefficient values greater than 0.995 and intercepts less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency with all verification results within the acceptance range.

Radiochemical Analysis

Gross Alpha/Beta
Plateau calibrations were performed on June 4, 2013. Alpha and beta attenuation calibrations were performed on June 11, 2013, covering a range of 0 to 156 milligrams (mg). All standards were counted to a minimum of 10,000 counts. All calibration and background checks met the acceptance criteria. The residual mass was less than 100 mg for all samples.

Radium-226
Plateau voltage determinations and detector efficiency calibrations were performed in July and August 2013. Daily instrument checks were performed on December 4, 2013, with acceptable results. The chemical recoveries met the acceptance criteria of 40 to 110 percent for all samples.

Radium-228
Plateau voltage determinations and detector efficiency calibrations were performed in May 2013. All calibration and background checks performed on December 10, 2013, met acceptance criteria. The chemical recoveries met the acceptance criteria of 40 to 110 percent for all samples.

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 initial and continuing calibration blank results were below the practical quantitation limits. In cases where blank concentration exceeds the instrument detection limit, 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. The gross alpha, gross beta, radium-226, and radium-228 method blank results were below the DLC.

Inductively Coupled Plasma (ICP) Interference Check Sample (ICS) Analysis

ICP interference check samples ICSA and ICSAB 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) pairs were analyzed for all analytes as a measure of method performance in the sample matrix. Matrix spike data are not evaluated when

the concentration of the unspiked sample is greater than 4 times the spike concentration. The MS/MSD recoveries met the acceptance criteria for all analytes evaluated with the following exception. The nitrate + nitrite as N MS/MSD recoveries exceeded the acceptance range. The associated sample nitrate + nitrite as N result is qualified with a "J" flag as an estimated value. The nitrite and sulfate MS/MSD recoveries were outside the laboratory acceptance range but within the validation range of 75 to 125 percent, not requiring qualification.

Laboratory Replicate Analysis

The relative percent difference values for the laboratory replicate sample and matrix spike duplicate sample results for all non-radiochemical analytes were less than twenty percent and the relative error ratio for gross alpha and gross beta was less than 3.0, indicating acceptable laboratory precision.

Laboratory Control Samples

Laboratory control samples (LCS) were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. The LCS results were acceptable for all analysis categories.

Metals Serial Dilution

Serial dilutions were performed during the metals analysis to monitor physical or chemical interferences that may exist in the sample matrix. Serial dilutions were prepared and analyzed for all metals. The acceptance criteria were met for all analytes.

Detection Limits/Dilutions

Samples were diluted in a consistent and acceptable manner when required. The required detection limits were met for all analytes with the following exception. The total alkalinity reported detection limits were greater than the required detection limit. All total alkalinity results were greater than the detection limit.

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 chloride, nitrite, and sulfate 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 the total cations when expressed in milliequivalents per liter (meq/L). Table 5 shows the total anion and cation results 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 5. Cation/Anion Balance

Site Code	Location	Cations (meq/L)	Anions (meq/L)	Charge Balance (%)
PKB01	MW-5	10.27	9.68	2.96
PKB01	MW-6	12.93	12.48	1.77

The charge balance value for all locations was less than 10 percent indicating acceptable data quality.

Electronic Data Deliverable (EDD) File

The EDD file arrived on December 13, 2013. 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: 13095640 **Lab Code:** PAR **Validator:** Stephen Donivan **Validation Date:** 01/24/2014

Project: Parkersburg 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: 13095640 **Lab Code:** PAR **Date Due:** 12/20/2013

Matrix: Water **Site Code:** PKB01 **Date Completed:** 12/16/2013

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								
Antimony	ICP/MS	12/05/2013	0.0000	1.0000	OK	OK	OK	101.0	80.0	83.0	4.0	105.0		120.0
Barium	ICP/ES	12/09/2013	0.0000	1.0000	OK	OK	OK	103.0	99.0	99.0	0.0	97.0	0.0	107.0
Beryllium	ICP/ES	12/09/2013	0.0000	1.0000	OK	OK	OK	101.0	97.0	97.0	0.0	97.0		125.0
Cadmium	ICP/MS	12/05/2013	0.0000	1.0000	OK	OK	OK	103.0	84.0	83.0	1.0	95.0		110.0
Calcium	ICP/ES	12/09/2013	0.0000	1.0000	OK	OK	OK	98.0	94.0	89.0	1.0	108.0	7.0	108.0
Chromium	ICP/ES	12/09/2013	0.0000	1.0000	OK	OK	OK	102.0	97.0	98.0	1.0	94.0		113.0
Lead	ICP/MS	12/05/2013	0.0000	1.0000	OK	OK	OK	107.0	87.0	89.0	3.0	105.0		116.0
Magnesium	ICP/ES	12/09/2013	0.0000	1.0000	OK	OK	OK	97.0	94.0	94.0	0.0	109.0	1.0	108.0
Mercury	CVAA	12/02/2013	0.0000	1.0000	OK	OK	OK	91.0	95.0	93.0	2.0	98.0		98.0
Nickel	ICP/ES	12/09/2013	0.0000	1.0000	OK	OK	OK	107.0	102.0	102.0	1.0	95.0		107.0
Potassium	ICP/ES	12/09/2013	0.0000	1.0000	OK	OK	OK	97.0	108.0	109.0	0.0			87.0
Selenium	ICP/MS	12/05/2013	0.0000	1.0000	OK	OK	OK	100.0	88.0	85.0	3.0	98.0		71.0
Sodium	ICP/ES	12/09/2013	0.0000	1.0000	OK	OK	OK	94.0	108.0	105.0	1.0		8.0	82.0
Thallium	ICP/MS	12/05/2013	0.0000	1.0000	OK	OK	OK	104.0	81.0	90.0	10.0	101.0		100.0
Uranium	ICP/MS	12/05/2013	0.0000	1.0000	OK	OK	OK	101.0	84.0	88.0	4.0	102.0		130.0
Zirconium	ICP/ES	12/09/2013	0.0000	1.0000	OK	OK	OK	106.0	101.0	101.0	0.0	100.0		114.0

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 13095640 **Lab Code:** PAR **Date Due:** 12/20/2013

Matrix: Water **Site Code:** PKB01 **Date Completed:** 12/16/2013

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate
Blank	GROSS ALPHA	11/27/2013	-0.4600	U				
MW-5	GROSS ALPHA	11/27/2013					107.0	
Blank_Spike	GROSS ALPHA	11/27/2013				111.00		
MW-6	GROSS ALPHA	12/02/2013						2.06
Blank_Spike	GROSS BETA	11/27/2013				102.00		
MW-5	GROSS BETA	11/27/2013					107.0	
Blank	GROSS BETA	11/27/2013	0.2260	U				
MW-6	GROSS BETA	12/02/2013						0.70
2678	Radium-226	12/04/2013			98.4			
MW-5	Radium-226	12/04/2013			99.5			
MW-6	Radium-226	12/04/2013			94.1			
Blank_Spike	Radium-226	12/04/2013			91.1	106.00		
Blank_Spike_Du	Radium-226	12/04/2013			101.0	96.10		0.60
Blank	Radium-226	12/04/2013	-0.0200	U	102.0			
2678	Radium-228	12/10/2013			94.4			
MW-5	Radium-228	12/10/2013			92.6			
MW-6	Radium-228	12/10/2013			95.5			
Blank_Spike	Radium-228	12/10/2013			97.8	93.30		
Blank_Spike_Du	Radium-228	12/10/2013			94.9	104.00		
Blank	Radium-228	12/10/2013	-0.0600	U	96.3			

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 13095640 **Lab Code:** PAR **Date Due:** 12/20/2013

Matrix: Water **Site Code:** PKB01 **Date Completed:** 12/16/2013

Analyte	Date Analyzed	CALIBRATION				Method Blank	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	CCV	CCB						
ALKALINITY, Total as CaCO3	11/25/2013					OK	101.00			0	
CHLORIDE	11/22/2013	0.000	1.0000	OK	OK	OK	103.00				
Nitrate+Nitrite as N	11/25/2013	0.000	1.0000	OK	OK	OK	94.00	129.0	128.0	0	
Nitrite	11/22/2013	0.000	1.0000	OK	OK	OK	99.00				
Nitrite	11/23/2013							81.0	82.0	1.00	
SULFATE	11/22/2013	0.000	1.0000	OK	OK	OK	102.00				
SULFATE	11/23/2013							84.0	82.0	0	

General Information

Report Number (RIN):	13115753
Sample Event:	November 21, 2013
Site(s):	Parkersburg, West Virginia
Laboratory:	TestAmerica, Denver, Colorado
Work Order No.:	280-49617-1
Analysis:	Wet Chemistry
Validator:	Stephen Donivan
Review Date:	January 27, 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 2, Data Verification. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 6.

Table 6. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Thiocyanate	MIS-A-045	SM 4500 CN M	SM 4500 CN M

Data Qualifier Summary

None of the analytical results required qualification.

Sample Shipping/Receiving

TestAmerica in Denver, Colorado, received three water samples on November 22, 2013, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions.

The thiocyanate by method SM 4500 CN M was subcontracted to the TestAmerica Chicago Laboratory at 2417 Bond Street, University Park, IL 60484.

Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced cooler at 5.6 °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 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 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.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate samples (MS/MSD) were analyzed for thiocyanate as a measure of method performance in the sample matrix. The recoveries met the acceptance criteria.

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 Sample

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

Completeness

Results were reported in the correct units using contract-required laboratory qualifiers.

Electronic Data Deliverable (EDD) File

The EDD file arrived on December 19, 2013. 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: 13115753 **Lab Code:** CHI **Validator:** Stephen Donivan **Validation Date:** 01/27/2014

Project: Parkersburg 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	The reported detection limits are equal to or below contract requirements.
☐ Field/Trip Blanks	
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 13115753 **Lab Code:** STD **Date Due:** 12/20/2013

Matrix: Water **Site Code:** PKB01 **Date Completed:** 12/19/2013

Analyte	Date Analyzed	CALIBRATION				Method Blank	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	CCV	CCB						
Thiocyanate	11/27/2014			OK	OK	OK	103.00	83.0	75.0	12.00	

Sampling Quality Control Assessment

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

Sampling Protocol

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

Equipment Blank Assessment

The samples were collected using dedicated equipment 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 (RPD) for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results less than 5 times the PQL, the range should be no greater than the PQL. A duplicate sample was collected from location MW-6. The duplicate results met these criteria demonstrating acceptable overall precision.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 13095640 **Lab Code:** PAR **Project:** Parkersburg Disposal Site **Validation Date:** 01/24/2014

Duplicate: 2678 **Sample:** MW-6

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
ALKALINITY, Total as CaCO3	310			1	310			1	0		MG/L
Antimony	0.44			10	0.12	U		10			UG/L
Barium	160			1	160			1	0		UG/L
Beryllium	0.18	U		1	0.18	U		1			UG/L
Cadmium	0.12	U		10	0.12	U		10			UG/L
Calcium	190000			1	190000			1	0		UG/L
CHLORIDE	120			10	120			10	0		MG/L
Chromium	0.51	U		1	0.58	B		1			UG/L
GROSS ALPHA	1.45	U	1.25	1	-0.604	U	1.19	1		2.3	pCi/L
GROSS BETA	3.37		1.39	1	2.62		1.3	1		0.8	pCi/L
Lead	0.24	B		10	0.17	B		10			UG/L
Magnesium	24000			1	24000			1	0		UG/L
Mercury	0.0062	B		1	0.0029	U		1			UG/L
Nickel	0.93	U		1	0.93	U		1			UG/L
Nitrate+Nitrite as N	14			10	12	N		10	15.38		MG/L
Nitrite	0.1	U		1	0.1	UN		1			MG/L
Potassium	3300			1	3300			1	0		UG/L
Radium-226	0.284		0.196	1	0.156	U	0.17	1		1.0	pCi/L
Radium-228	0.168	U	0.28	1	-0.0403	U	0.247	1		1.1	pCi/L
Selenium	0.11			1	0.11			1			UG/L
Sodium	32000			1	32000			1	0		UG/L
SULFATE	91			1	91			1	0		MG/L
Thallium	0.016	U		10	0.016	U		10			UG/L
Uranium	0.64			10	0.61			10	4.80		UG/L
Zirconium	0.5	U		1	0.5	U		1			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: Stephen E. Donivan 2014.01.31 07:22:02 -07'00'

Data Validation Lead: Stephen Donivan — Date: Stephen E. Donivan 2014.01.31 07:22:18 -07'00'

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 PKB01, Parkersburg Disposal Site
REPORT DATE: 01/27/2014
Location: MW-5 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	11/21/2013	N001	-	280		F	#	20	
Antimony	mg/L	11/21/2013	N001	-	0.00012	U	F	#	0.00012	
Barium	mg/L	11/21/2013	N001	-	0.092		F	#	0.00019	
Beryllium	mg/L	11/21/2013	N001	-	0.00018	U	F	#	0.00018	
Cadmium	mg/L	11/21/2013	N001	-	0.00012	U	F	#	0.00012	
Calcium	mg/L	11/21/2013	N001	-	160		F	#	0.012	
Chloride	mg/L	11/21/2013	N001	-	79		F	#	2	
Chromium	mg/L	11/21/2013	N001	-	0.00051	U	F	#	0.00051	
Gross Alpha	pCi/L	11/21/2013	N001	-	1.6	U	F	#	1.6	0.932
Gross Beta	pCi/L	11/21/2013	N001	-	2.79		FJ	#	1.8	1.22
Lead	mg/L	11/21/2013	N001	-	0.00026	B	F	#	0.000068	
Magnesium	mg/L	11/21/2013	N001	-	21		F	#	0.013	
Mercury	mg/L	11/21/2013	N001	-	0.0000071	B	UF	#	0.0000029	
Nickel	mg/L	11/21/2013	N001	-	0.00093	U	F	#	0.00093	
Nitrate + Nitrite as Nitrogen	mg/L	11/21/2013	N001	-	7.3		F	#	0.1	
Nitrite	mg/L	11/21/2013	N001	-	0.1	U	F	#	0.1	
Oxidation Reduction Potential	mV	11/21/2013	N001	-	158.3		F	#		
pH	s.u.	11/21/2013	N001	-	7.21		F	#		

Groundwater Quality Data by Location (USEE100) FOR SITE PKB01, Parkersburg Disposal Site
REPORT DATE: 01/27/2014
Location: MW-5 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Potassium	mg/L	11/21/2013	N001	-	3.3		F	#	0.11	
Radium-226	pCi/L	11/21/2013	N001	-	0.21	U	F	#	0.21	0.155
Radium-228	pCi/L	11/21/2013	N001	-	0.39	U	F	#	0.39	0.25
Selenium	mg/L	11/21/2013	N001	-	0.000032	U	F	#	0.000032	
Sodium	mg/L	11/21/2013	N001	-	11		F	#	0.0066	
Specific Conductance	umhos /cm	11/21/2013	N001	-	963		F	#		
Sulfate	mg/L	11/21/2013	N001	-	64		F	#	0.5	
Temperature	C	11/21/2013	N001	-	12.29		F	#		
Thallium	mg/L	11/21/2013	N001	-	0.00003	B	UF	#	0.000016	
Thiocyanate	mg/L	11/21/2013	N002	-	0.16	U	F	#	0.16	
Turbidity	NTU	11/21/2013	N001	-	0.93		F	#		
Uranium	mg/L	11/21/2013	N001	-	0.00038		F	#	0.000029	
Zirconium	mg/L	11/21/2013	N001	-	0.0005	U	F	#	0.0005	

Groundwater Quality Data by Location (USEE100) FOR SITE PKB01, Parkersburg Disposal Site
REPORT DATE: 01/27/2014
Location: MW-6 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	11/21/2013	N001	-	310		F	#	20	
Alkalinity, Total (as $CaCO_3$)	mg/L	11/21/2013	N002	-	310		F	#	20	
Antimony	mg/L	11/21/2013	N001	-	0.00044		F	#	0.00012	
Antimony	mg/L	11/21/2013	N002	-	0.00012	U	F	#	0.00012	
Barium	mg/L	11/21/2013	N001	-	0.16		F	#	0.00019	
Barium	mg/L	11/21/2013	N002	-	0.16		F	#	0.00019	
Beryllium	mg/L	11/21/2013	N001	-	0.00018	U	F	#	0.00018	
Beryllium	mg/L	11/21/2013	N002	-	0.00018	U	F	#	0.00018	
Cadmium	mg/L	11/21/2013	N001	-	0.00012	U	F	#	0.00012	
Cadmium	mg/L	11/21/2013	N002	-	0.00012	U	F	#	0.00012	
Calcium	mg/L	11/21/2013	N001	-	190		F	#	0.012	
Calcium	mg/L	11/21/2013	N002	-	190		F	#	0.012	
Chloride	mg/L	11/21/2013	N001	-	120		F	#	2	
Chloride	mg/L	11/21/2013	N002	-	120		F	#	2	
Chromium	mg/L	11/21/2013	N001	-	0.00051	U	F	#	0.00051	
Chromium	mg/L	11/21/2013	N002	-	0.00058	B	F	#	0.00051	
Gross Alpha	pCi/L	11/21/2013	N001	-	2	U	F	#	2	1.25
Gross Alpha	pCi/L	11/21/2013	N002	-	2.1	U	F	#	2.1	1.19

Groundwater Quality Data by Location (USEE100) FOR SITE PKB01, Parkersburg Disposal Site
REPORT DATE: 01/27/2014
Location: MW-6 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Gross Beta	pCi/L	11/21/2013	N001	-	3.37		FJ	#	2	1.39
Gross Beta	pCi/L	11/21/2013	N002	-	2.62		FJ	#	2	1.3
Lead	mg/L	11/21/2013	N001	-	0.00024	B	F	#	0.000068	
Lead	mg/L	11/21/2013	N002	-	0.00017	B	F	#	0.000068	
Magnesium	mg/L	11/21/2013	N001	-	24		F	#	0.013	
Magnesium	mg/L	11/21/2013	N002	-	24		F	#	0.013	
Mercury	mg/L	11/21/2013	N001	-	0.0000062	B	UF	#	0.0000029	
Mercury	mg/L	11/21/2013	N002	-	0.0000029	U	F	#	0.0000029	
Nickel	mg/L	11/21/2013	N001	-	0.00093	U	F	#	0.00093	
Nickel	mg/L	11/21/2013	N002	-	0.00093	U	F	#	0.00093	
Nitrate + Nitrite as Nitrogen	mg/L	11/21/2013	N001	-	14		FJ	#	0.1	
Nitrate + Nitrite as Nitrogen	mg/L	11/21/2013	N002	-	12	N	FJ	#	0.1	
Nitrite	mg/L	11/21/2013	N001	-	0.1	U	F	#	0.1	
Nitrite	mg/L	11/21/2013	N002	-	0.1	UN	F	#	0.1	
Oxidation Reduction Potential	mV	11/21/2013	N001	-	176.9		F	#		
pH	s.u.	11/21/2013	N001	-	7.1		F	#		
Potassium	mg/L	11/21/2013	N001	-	3.3		F	#	0.11	
Potassium	mg/L	11/21/2013	N002	-	3.3		F	#	0.11	

Groundwater Quality Data by Location (USEE100) FOR SITE PKB01, Parkersburg Disposal Site
REPORT DATE: 01/27/2014
Location: MW-6 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Radium-226	pCi/L	11/21/2013	N001	-	0.284		UF	#	0.2	0.196
Radium-226	pCi/L	11/21/2013	N002	-	0.25	U	F	#	0.25	0.17
Radium-228	pCi/L	11/21/2013	N001	-	0.46	U	F	#	0.46	0.28
Radium-228	pCi/L	11/21/2013	N002	-	0.43	U	F	#	0.43	0.247
Selenium	mg/L	11/21/2013	N001	-	0.00011		UF	#	0.000032	
Selenium	mg/L	11/21/2013	N002	-	0.00011		UF	#	0.000032	
Sodium	mg/L	11/21/2013	N001	-	32		F	#	0.0066	
Sodium	mg/L	11/21/2013	N002	-	32		F	#	0.0066	
Specific Conductance	umhos /cm	11/21/2013	N001	-	1222		F	#		
Sulfate	mg/L	11/21/2013	N001	-	91		F	#	0.5	
Sulfate	mg/L	11/21/2013	N002	-	91		F	#	0.5	
Temperature	C	11/21/2013	N001	-	11.3		F	#		
Thallium	mg/L	11/21/2013	N001	-	0.000016	U	F	#	0.000016	
Thallium	mg/L	11/21/2013	N002	-	0.000016	U	F	#	0.000016	
Thiocyanate	mg/L	11/21/2013	N003	-	0.16	U	F	#	0.16	
Thiocyanate	mg/L	11/21/2013	N004	-	0.16	U	F	#	0.16	
Turbidity	NTU	11/21/2013	N001	-	0.89		F	#		
Uranium	mg/L	11/21/2013	N001	-	0.00064		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE PKB01, Parkersburg Disposal Site
REPORT DATE: 01/27/2014
Location: MW-6 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Uranium	mg/L	11/21/2013	N002	-	0.00061		F	#	0.000029	
Zirconium	mg/L	11/21/2013	N001	-	0.0005	U	F	#	0.0005	
Zirconium	mg/L	11/21/2013	N002	-	0.0005	U	F	#	0.0005	

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

QA QUALIFIER:
- # Validated according to quality assurance guidelines.

Static Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE PKB01, Parkersburg Disposal Site
REPORT DATE: 01/27/2014

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Measurement Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)
MW-1	N	638.65	11/21/2013		60.8	577.85
MW-2	N	633.44	11/21/2013		55.32	578.12
MW-3	N	638.19	11/21/2013		60.43	577.76
MW-4	N	639.58	11/21/2013		61.13	578.45
MW-5	N	638.65	11/21/2013	09:23:18	60.83	577.82
MW-6	N	638.05	11/21/2013	08:01:28	60.22	577.83

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

Hydrograph

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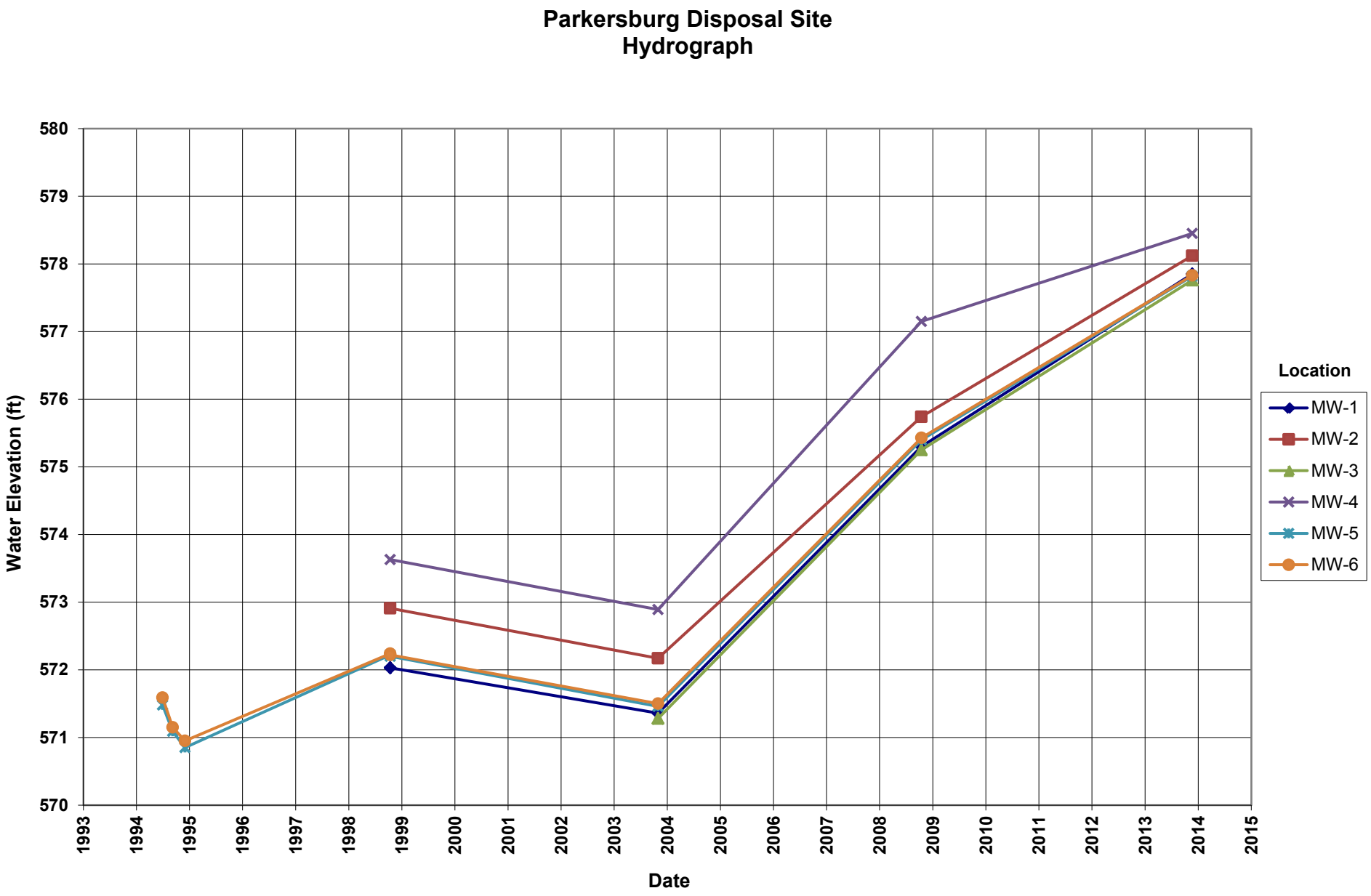
Parkersburg Disposal Site
Hydrograph
Water Elevation (ft)
580
579
578
577
576
575
574
573
572
571
570
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6

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Time-Concentration Graphs

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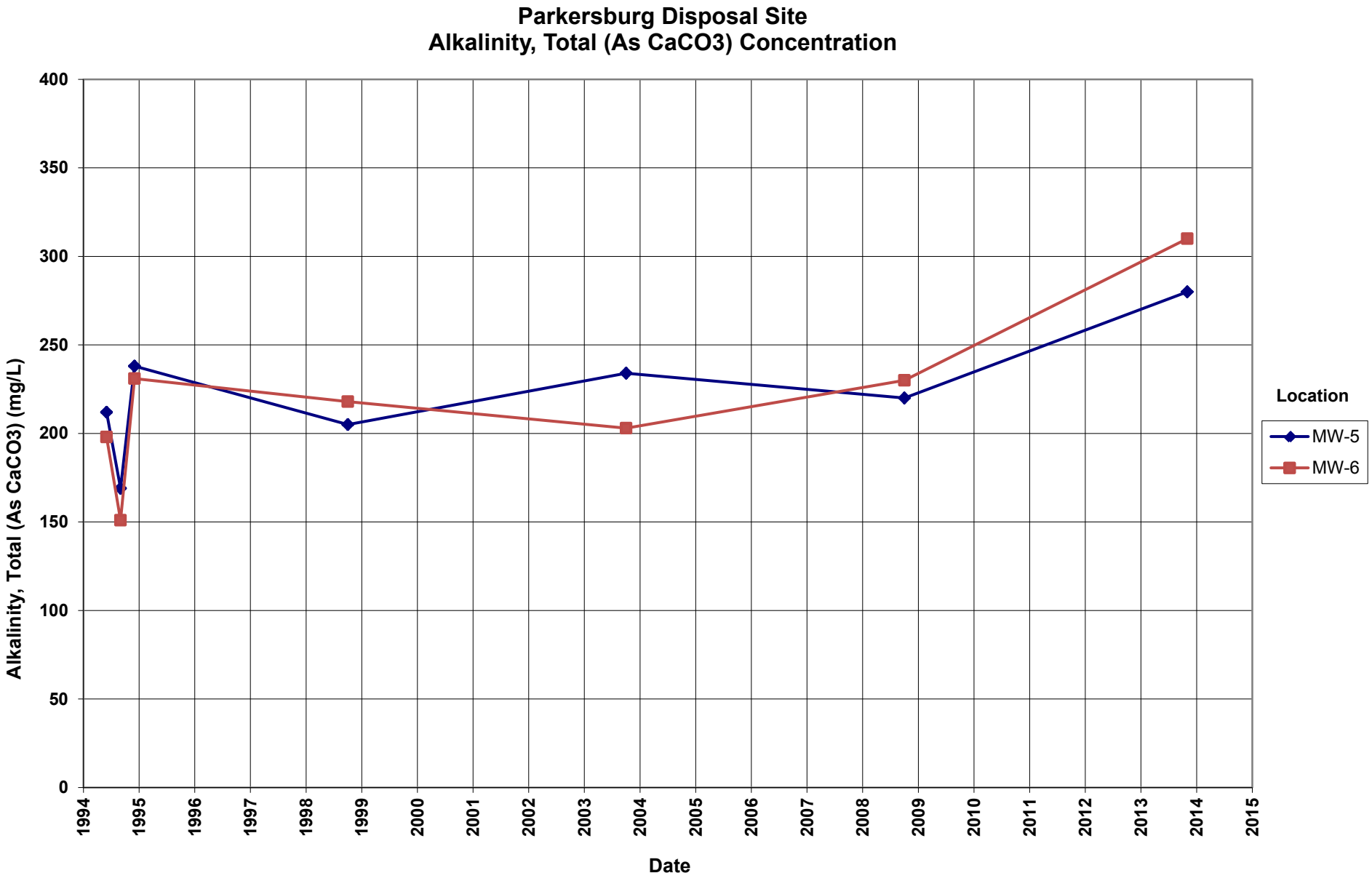
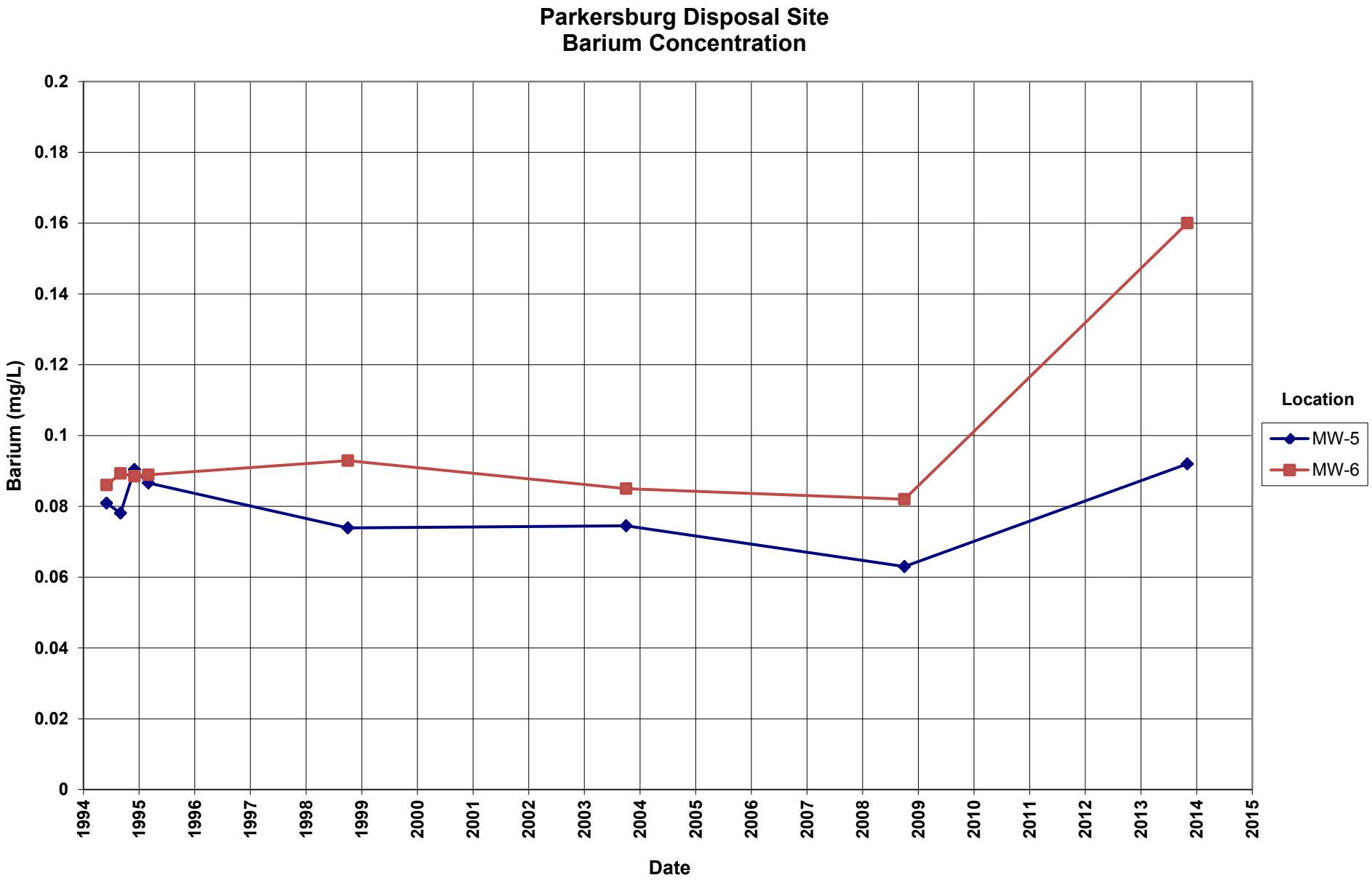
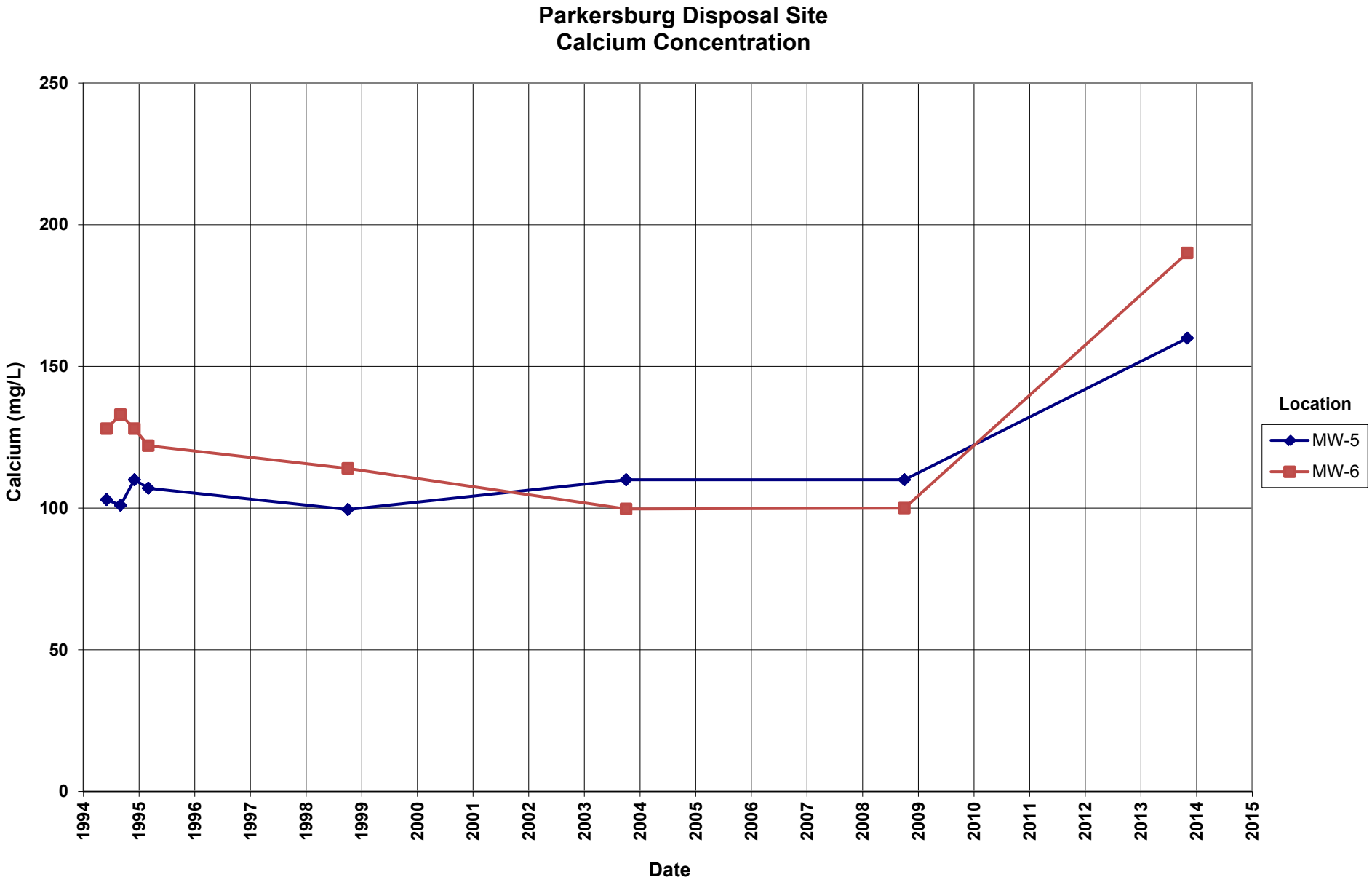
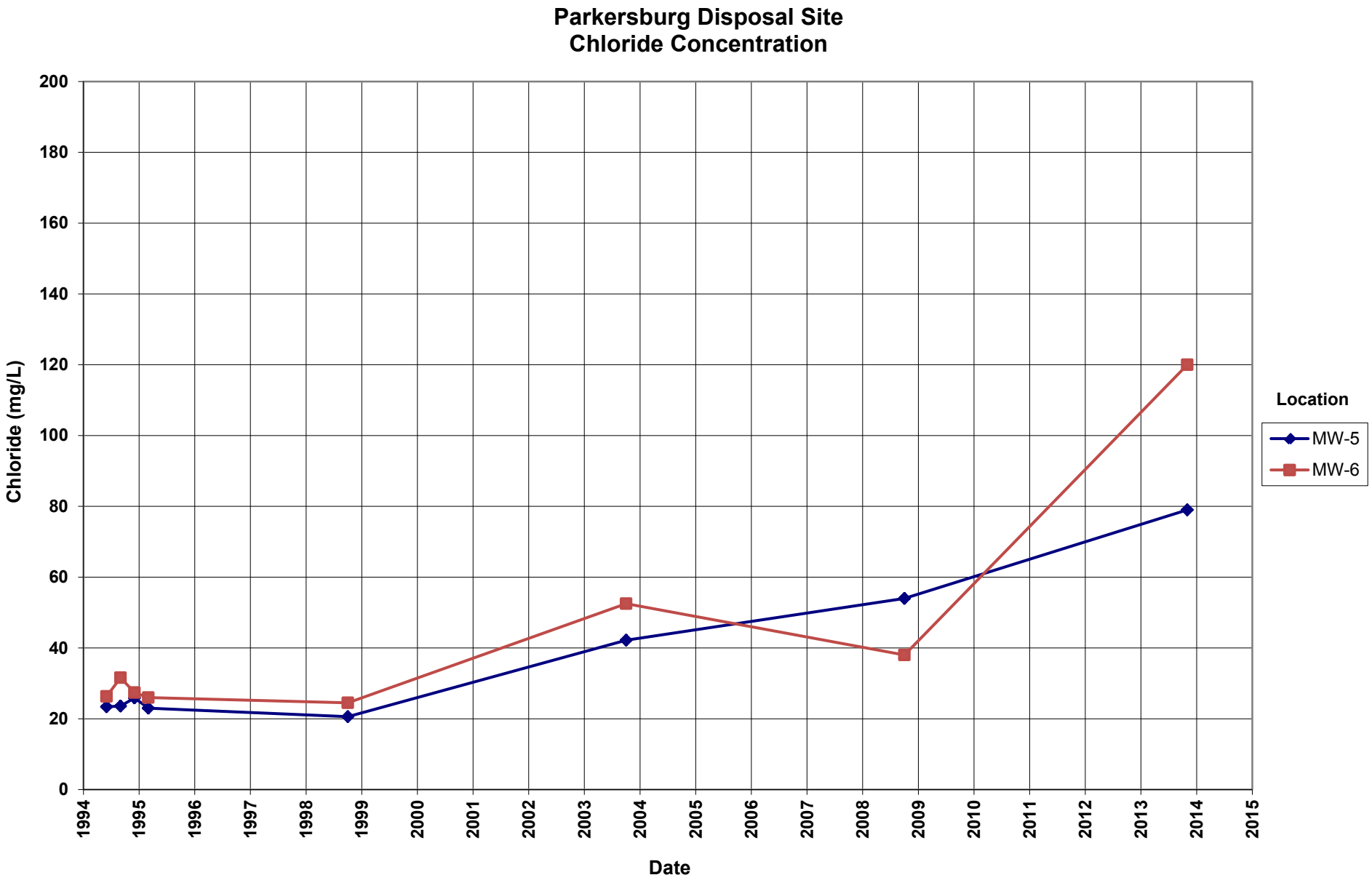
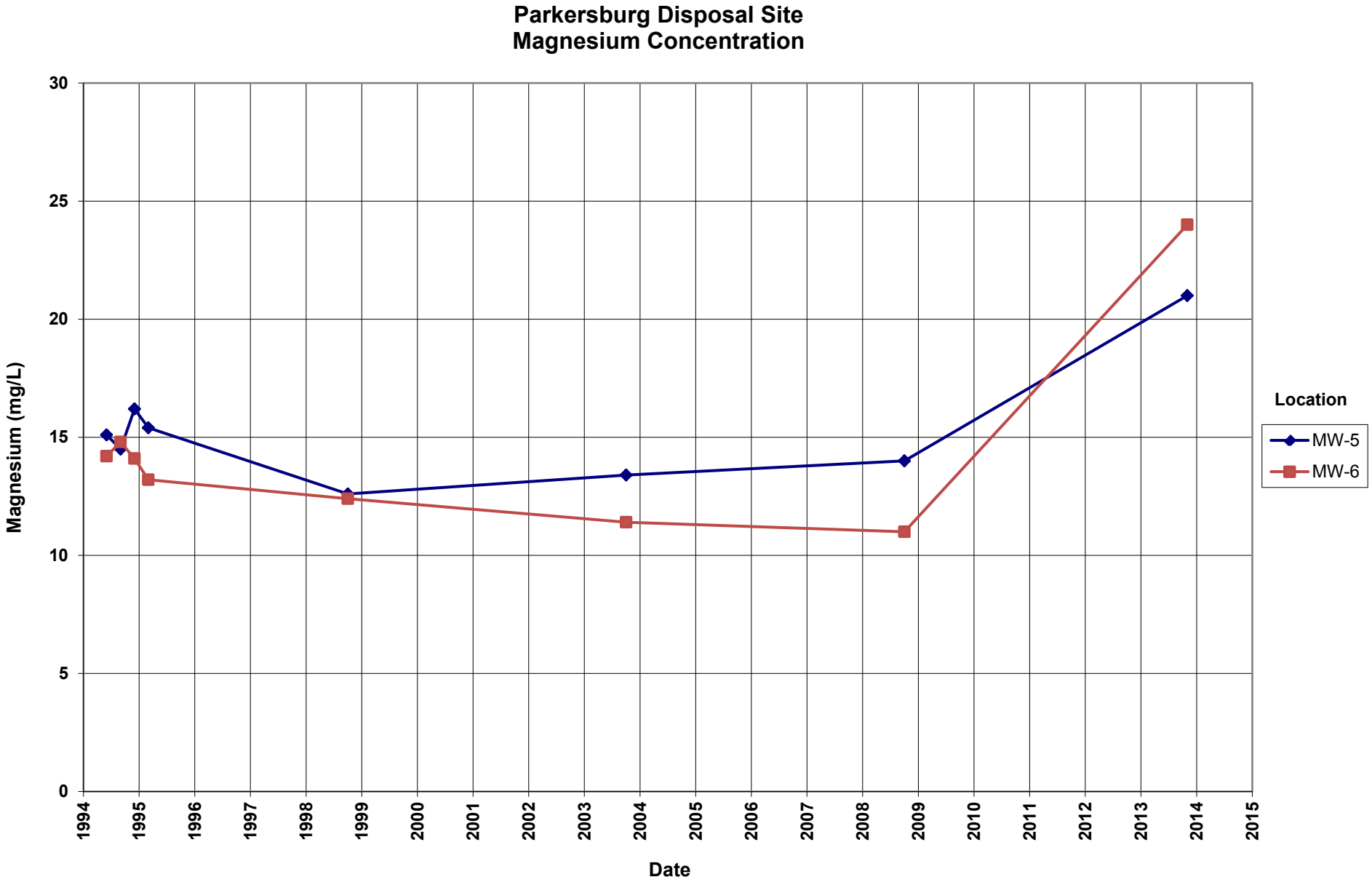
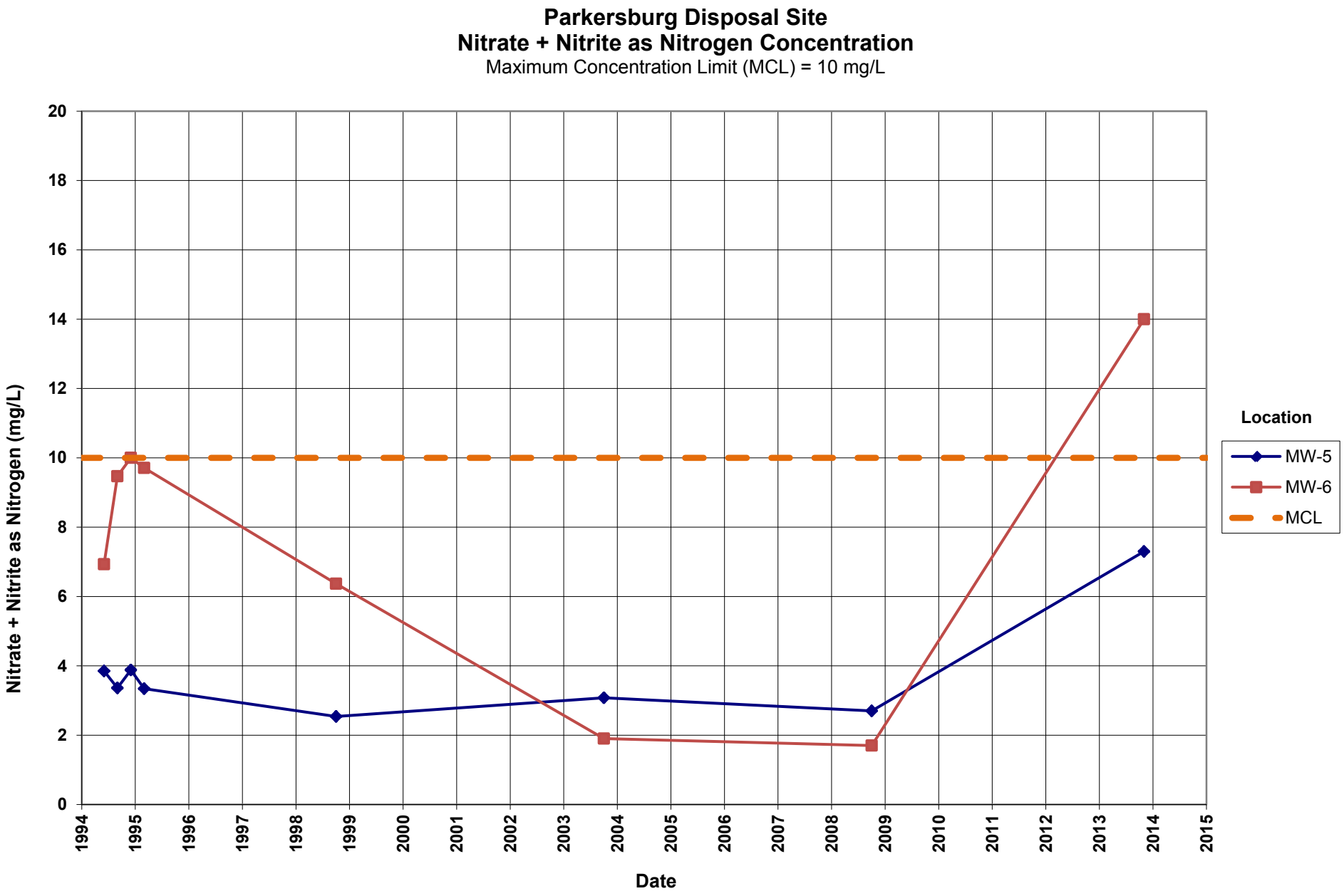

Parkersburg Disposal Site
Alkalinity, Total (As CaCO3) Concentration
Alkalinity, Total (As CaCO3) (mg/L)
400
350
300
250
200
150
100
50
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
MW-5
MW-6

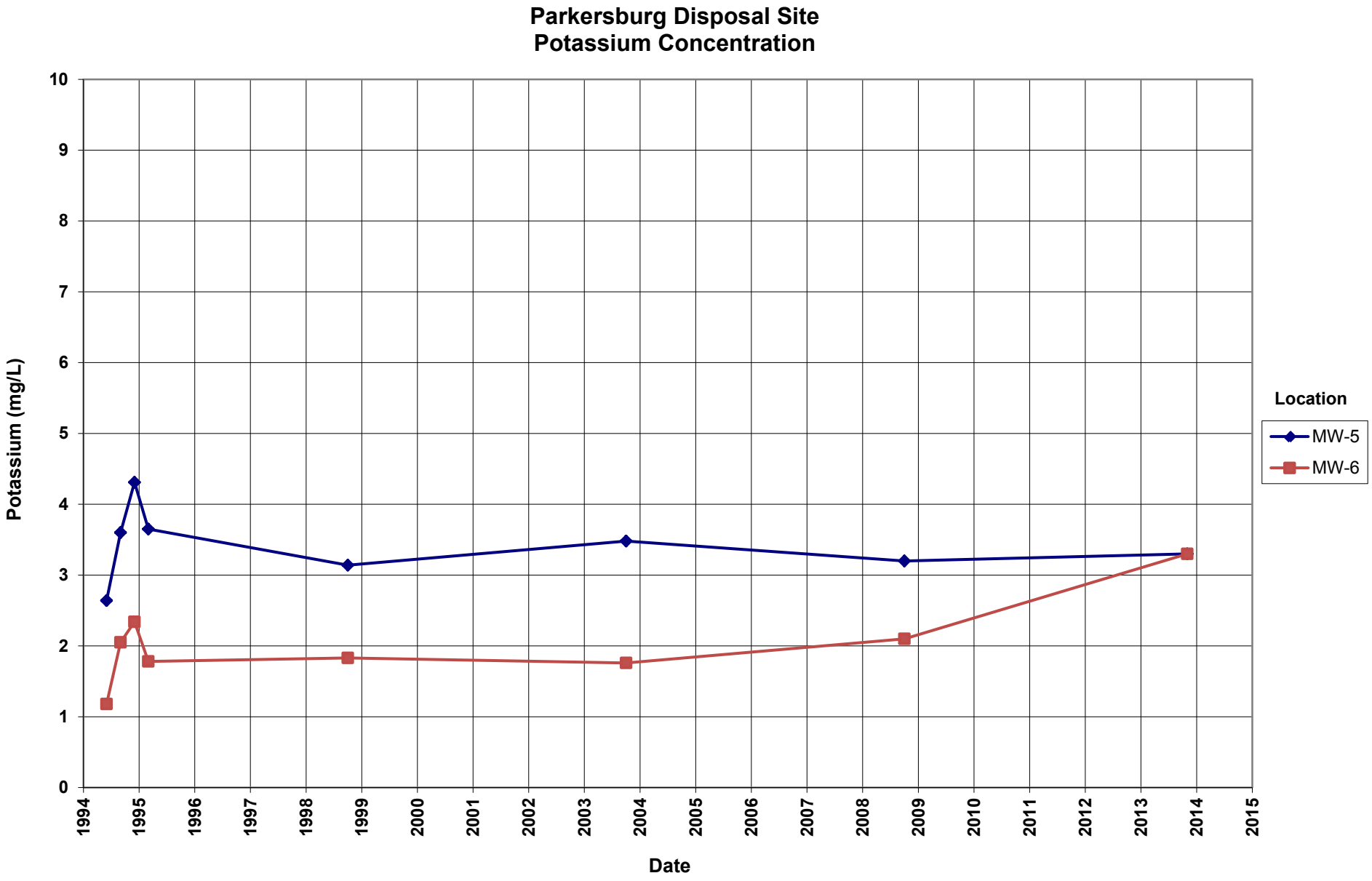

Parkersburg Disposal Site
Barium Concentration
Barium (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
MW-5
MW-6

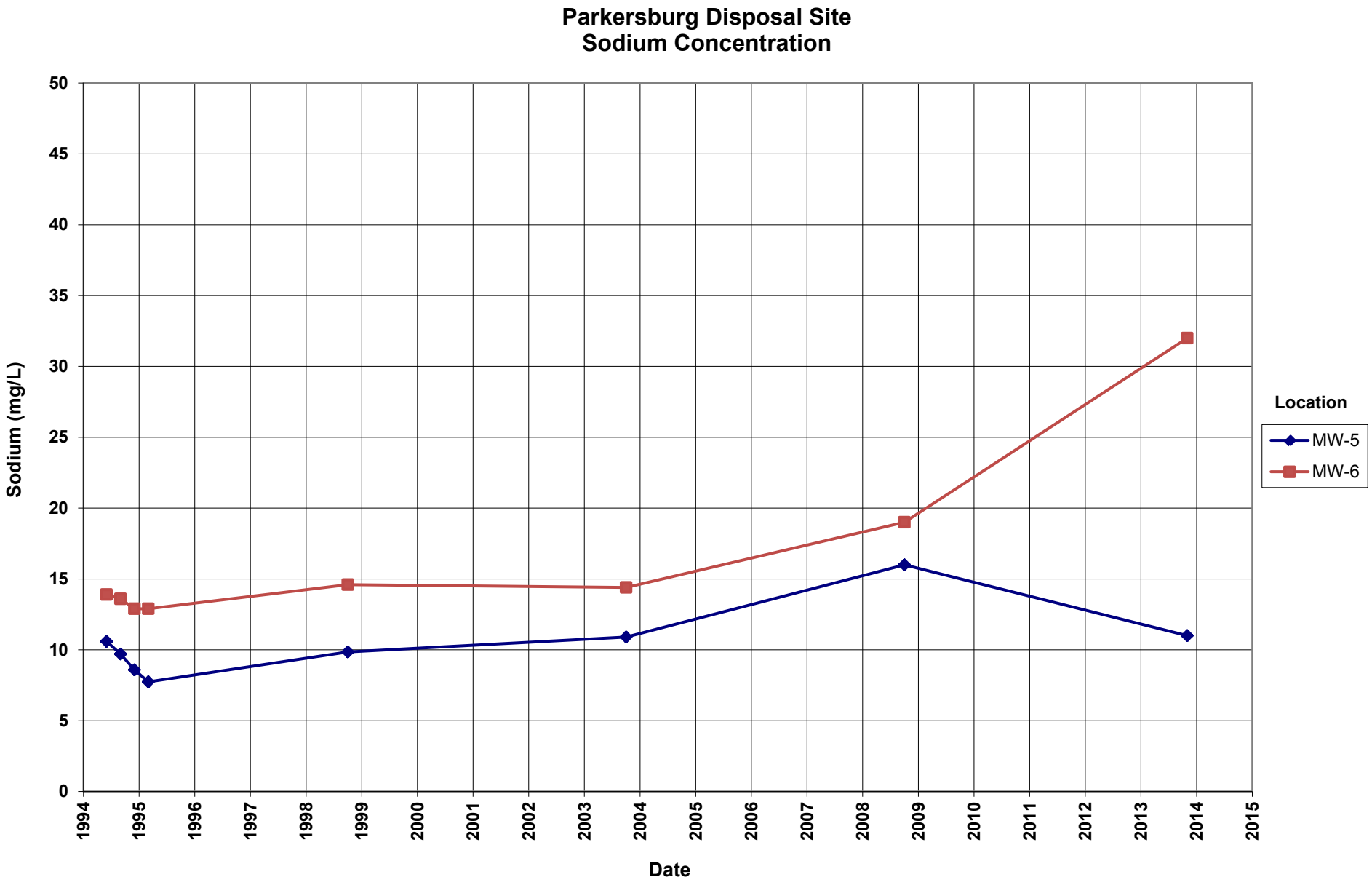

Parkersburg Disposal Site
Calcium Concentration
Calcium (mg/L)
250
200
150
100
50
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
MW-5
MW-6

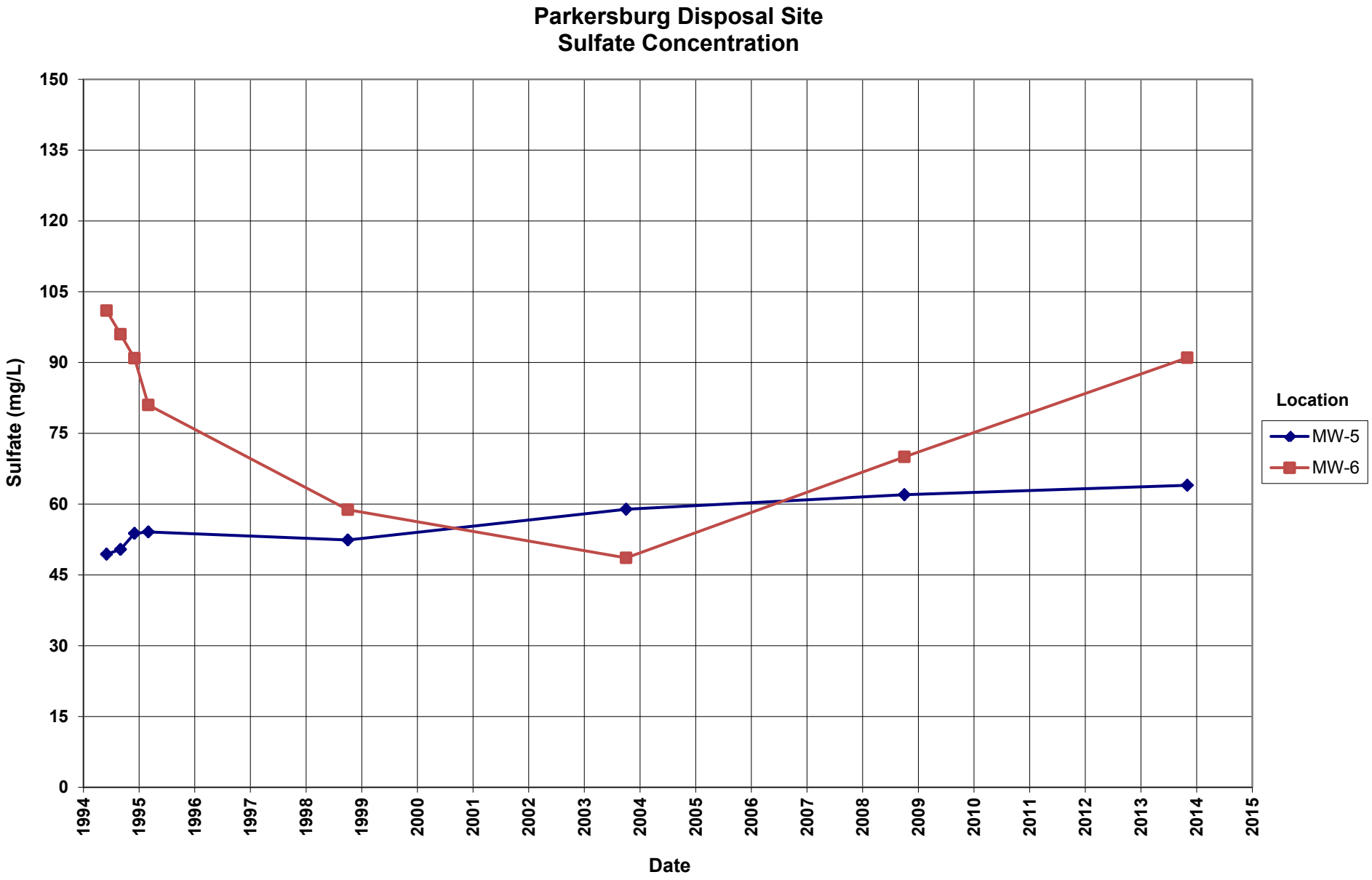

Parkersburg Disposal Site
Chloride Concentration
Chloride (mg/L)
200
180
160
140
120
100
80
60
40
20
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
MW-5
MW-6

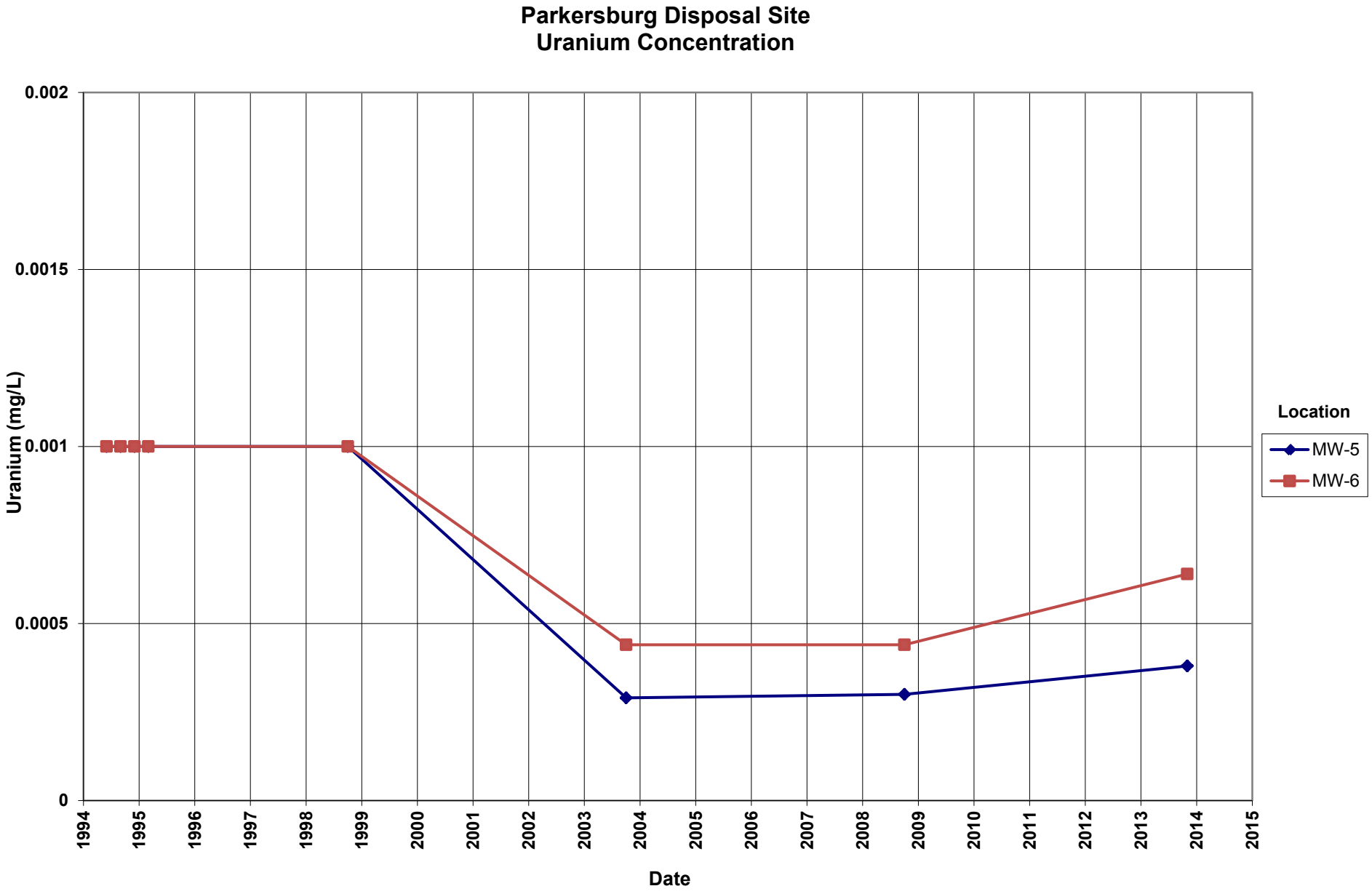

Parkersburg Disposal Site
Magnesium Concentration
Magnesium (mg/L)
30
25
20
15
10
5
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
MW-5
MW-6


Parkersburg Disposal Site
Nitrate + Nitrite as Nitrogen Concentration
Maximum Concentration Limit (MCL) = 10 mg/L
Nitrate + Nitrite as Nitrogen (mg/L)
0
2
4
6
8
10
12
14
16
18
20
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
MW-5
MW-6
MCL


Parkersburg Disposal Site
Potassium Concentration
Potassium (mg/L)
10
9
8
7
6
5
4
3
2
1
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
MW-5
MW-6


Parkersburg Disposal Site
Sodium Concentration
Sodium (mg/L)
50
45
40
35
30
25
20
15
10
5
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
MW-5
MW-6


Parkersburg Disposal Site
Sulfate Concentration
Sulfate (mg/L)
150
135
120
105
90
75
60
45
30
15
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
MW-5
MW-6


Parkersburg Disposal Site
Uranium Concentration
Uranium (mg/L)
0.002
0.0015
0.001
0.0005
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Date
Location
MW-5
MW-6

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Attachment 3
Sampling and Analysis Work Order

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Stoller

established 1959

Task Order LM-501
Control Number 13-0840

September 25, 2013

U.S. Department of Energy
Office of Legacy Management
ATTN: Clifford Carpenter
Site Manager
99 Research Park Road
Morgantown, WV 26505

SUBJECT: Contract No. DE-AM01-07LM00060, S.M. Stoller Corporation (Stoller) October 2013 Environmental Sampling at the Parkersburg, West Virginia, Disposal Site

REFERENCE: Task Order LM00-501-07-609-402, Parkersburg, West Virginia, Disposal Site

Dear Mr. Carpenter:

The purpose of this letter is to inform you of the upcoming sampling event at Parkersburg, West Virginia. Enclosed are the map and tables specifying sample locations and analytes for monitoring at the Parkersburg site. Water quality data will be collected from monitoring wells at this site as part of the routine environmental sampling currently scheduled to begin the week of October 14, 2013.

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

Monitoring Wells*
MW-5 Al MW-6 Al

*NOTE: Al = alluvium

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 (412) 818-7015 if you have any questions.

Sincerely,

Michele Miller
Project Manager

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

MM/lcg/lb

Enclosures (3)

cc: (electronic)
Christina Pennal, DOE
Steve Donivan, Stoller
Bev Gallagher, Stoller
Lauren Goodknight, Stoller
Michelle Miller, Stoller
EDD Delivery
rc-grand.junction
File: PKB 410.02

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

Sampling Frequencies for Locations at Parkersburg, West Virginia

Location ID	Quarterly	Semiannually	Annually	Every 5 years	Not Sampled	Notes
Monitoring Wells						
MW-1					X	Water levels
MW-2					X	Water levels
MW-3					X	Water levels
MW-4					X	Water levels
MW-5				X		Next sampling 10/13
MW-6				X		Next sampling 10/13

Sampling conducted in October

Based on LTSP dated September 1995

Constituent Sampling Breakdown

Site	Parkersburg				
Analyte	**Ground Water**	**Surface Water**	**Required Detection Limit (mg/L)**	**Analytical Method**	**Line Item Code**
Approx. No. Samples/yr	2	0			
Field Measurements					
Alkalinity					
Dissolved Oxygen					
Redox Potential	X				
pH	X				
Specific Conductance	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Alkalinity, total as CaCO3	X		10	SM2320 B	WCH-A-002
Antimony	X		0.003	SW-846 6020	LMM-02
Barium	X		0.02	SW-846 6010	LMM-01
Beryllium	X		0.0008	SW-846 6010	LMM-01
Cadmium	X		0.001	SW-846 6020	LMM-02
Calcium	X		5	SW-846 6010	LMM-01
Chloride	X		0.5	SW-846 9056	MIS-A-039
Chromium	X		0.002	SW-846 6010	LMM-01
Gross Alpha	X		2 pCi/L	EPA 900.0	GPC-A-001
Gross Beta	X		4 pCi/L	EPA 900.0	GPC-A-001
Lead	X		0.002	SW-846 6020	LMM-02
Magnesium	X		5	SW-846 6010	LMM-01
Mercury	X		0.0001	SW-846 7470	LMM-01
Nickel	X		0.02	SW-846 6010	LMM-01
Nitrate + Nitrite as N (NO3+NO2)-N	X		0.05	EPA 353.1	WCH-A-022
Nitrite	X		0.5	EPA 354.1	WCH-A-021
Potassium	X		1	SW-846 6010	LMM-01
Radium-226	X		1 pCi/L	Gas Proportional Counter	GPC-A-018
Radium-228	X		1 pCi/L	Gas Proportional Counter	GPC-A-020
Selenium	X		0.0001	SW-846 6020	LMM-02
Sodium	X		1	SW-846 6010	LMM-01
Sulfate	X		0.5	SW-846 9056	MIS-A-044
Thallium	X		0.004	SW-846 6020	LMM-02
Thiocyanate	X		0.1	EPA 300.0	MIS-A-045
Uranium	X		0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc			0.02	SW-846 6010	LMM-01
Zirconium	X		0.001	SW-846 6010	LMM-02
Total No. of Analytes	25	0			

NOTES:

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

Hafnium was removed from the analyte list in 2008. The 1994 sampling plan lists hafnium as a process related analyte. The zirconium ores processed at the site contained approximately 2-3% hafnium. Zirconium is expected to be a better indicator of contamination originating from the disposal cell because of its higher concentration in the ores processed.

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Attachment 4
Trip Report

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Stoller

established 1959

Memorandum

DATE: January 6, 2014

TO: Michele Miller
Ken Broberg

FROM: Mike Stott

SUBJECT: Trip Report for Parkersburg, West Virginia, Five Year Sampling, 2013

Date of Sampling Event: November 21, 2013

Team Members: Mike Stott, Roy Mowen, Bill Gutzwiller

Number of Locations Sampled: Two monitoring wells were sampled; a duplicate sample was collected from well MW-6. Sample turbidity measurements were less than 10 Nephelometric Units and, therefore, samples did not require filtering.

Equipment: Samples were collected from monitoring wells MW-5 and MW-6 using the dedicated bladder pumps installed in the two wells.

Location Specific Information: The following table includes the established well type and ticket numbers identified for each sampled well location.

Ticket Number	Location	Sample Date	Well Type
LKX 080	MW-5	11/21/13	CAT I
LKX 081	MW-6	11/21/13	CAT I
LMS 444	MW-5	11/21/13	CAT I
LMS 445	MW-6	11/21/13	CAT I

Water Level Measurements: Water levels were measured in all six monitoring wells onsite. Water level data are provided in the table above and represent depth to water measurements measured from top of well.

Well Number	Water Level	Date
MW-1	60.80	11/21/2013
MW-2	55.32	11/21/2013
MW-3	60.42	11/21/2013
MW-4	61.13	11/21/2013
MW-5	60.83	11/21/2013
MW-6	60.22	11/21/2013

Sample Shipment: Samples were shipped overnight by FedEx to ALS Laboratory Group, Fort Collins, CO, on November 21 2013 (RIN 13095640) and TestAmerica Denver, Arvada, CO (RIN 13115753)

Field Variance: None

Quality Control Sample Cross Reference: Following is the false identification assigned to the quality control sample:

False ID	True ID	Sample Type	Ticket Number
2678	MW-6	Duplicate	LKX 082
2555	MW-6	Duplicate	LMS 446

Requisition Numbers Assigned: Samples were assigned to requisition identification number (RIN) 13095640 and (RIN) 13115753.

Well Maintenance: Recommendations for monitoring well MW-1, MW-2, MW-3, and MW-4 include replacing the large, rusty protective casings with conventional, painted protective casings; removing and disposing of the electrical pumps, fuse boxes, and cables within the wells; and raising the annular seals above the ground surface with bentonite topped with sand. Concrete well pads and proper labeling of the wells are also recommended to be completed at the time of these identified well repairs.

Institutional Controls: The gate was appropriately closed and locked following completion of the sampling event.