

Data Validation Package

December 2012
Groundwater and Surface Water
Sampling at the
Riverton, Wyoming, Processing Site

February 2013



U.S. DEPARTMENT OF
ENERGY

Legacy
Management

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Sampling Event Summary

Site: Riverton, Wyoming, Processing Site

Sampling Period: December 3–5, 2012

The 2009 *Long-Term Management Plan for the Riverton, Wyoming, Processing Site* requires semiannual monitoring to evaluate groundwater conditions and assess the progress of natural flushing of the uppermost aquifer. This event comprised sampling 18 monitoring wells, 9 surface water locations, and 8 domestic wells at the Riverton, Wyoming, Processing Site.

Water levels were measured at all sampled monitoring wells and 14 additional monitoring wells that were not sampled. Sampling and analyses were conducted as specified in the *Sampling and Analysis Plan for the U. S. Department of Energy Office of Legacy Management Sites* (LMS/PLN/S04351, continually updated).

Concentrations of molybdenum and uranium in samples collected from semi-confined aquifer monitoring wells were below their respective U.S. Environmental Protection Agency (EPA) (Title 40 *Code of Federal Regulations* [CFR] Part 192) groundwater standard.

The EPA groundwater standards for molybdenum and uranium were exceeded in samples collected from surficial aquifer monitoring wells listed in Table 1. Time-concentration graphs are included in the Data Presentation section.

Table 1. Riverton Wells with Samples that Exceeded EPA Groundwater Standards in December 2012

Analyte	Standard ^a	Location	Concentration in mg/L
Molybdenum	0.1	0707	0.85
		0716	0.12
		0722R	0.11
		0789	0.66
Uranium	0.044	0707	0.85
		0716	0.23
		0718	0.15
		0722R	0.45
		0788	0.05
		0789	2.0
		0826	0.05

^a Standards are listed in 40 CFR 192.02 Table 1 to Subpart A.

mg/L = milligrams per liter

Groundwater samples were analyzed for selenium during this event in response to a recommendation made in the *Evaluation of Groundwater Constituents and Seasonal Variation at the Riverton, Wyoming, Processing Site*. Selenium concentrations were one to three orders of magnitude below the EPA groundwater standard (40 CFR 192) of 0.01 milligrams per liter (mg/L).

Results from domestic wells (Table 2) did not indicate any impacts from the Riverton site. Concentrations of molybdenum in samples collected from domestic wells were two orders of magnitude below the EPA groundwater standard, and uranium concentrations in samples collected from domestic wells were one to three orders of magnitude below the drinking water standard.

Table 2. Concentrations of Molybdenum and Uranium in Samples from Domestic Wells

Analyte	Standard ^a	Location	Concentration in mg/L
Molybdenum	0.1	0405	0.004
		0422	0.002
		0430	0.002
		0436	0.003
		0460	0.003
		0828	0.003
		0841	0.004
		0842	0.003
Uranium	0.03	0405	ND
		0422	0.0018
		0430	ND
		0436	0.00006
		0460	0.00006
		0828	0.00008
		0841	0.0011
		0842	0.0004

^a Standards are listed in 40 CFR 192.02 Table 1 to Subpart A (molybdenum) and EPA's National Primary Drinking Water Regulations (uranium).

mg/L = milligrams per liter

ND = not detected

Surface water uranium results were compared to statistical benchmark values derived using historical data from the Little Wind River location 0794, which is located upstream of the site and represents background conditions. As shown in Table 3, the benchmark value was exceeded only in the oxbow lake (0747), which was formed by a shift in the river path in 1994. Hydraulic and water quality data indicate that the oxbow lake is fed by the discharge of contaminated groundwater; therefore, elevated concentrations are expected. At the time of this sampling event, water was not flowing from the river into the lake. The other locations had uranium concentrations below the benchmark value, which indicates minimal site-related impact on the water quality of the Little Wind River and of the other surface water features. Time-concentration graphs of molybdenum and uranium results at all surface water locations are included in the Data Presentation section.

Table 3. Comparison of Surface Water Concentrations (December 2012) to Benchmark

Location		Uranium Concentration (mg/L)
Benchmark		0.010
0794	Little Wind River, Benchmark Location	0.0058
0796	Little Wind River	0.0057
0811	Little Wind River	0.0061
0812	Little Wind River	0.0068
0747	Oxbow Lake	0.17
0810	Constructed Wetlands	0.0075
0822	West Side Irrigation Ditch	0.0075
0823	Gravel Pit Pond	0.0062
0749	Sulfuric acid plant ditch	0.0075

mg/L = milligrams per liter

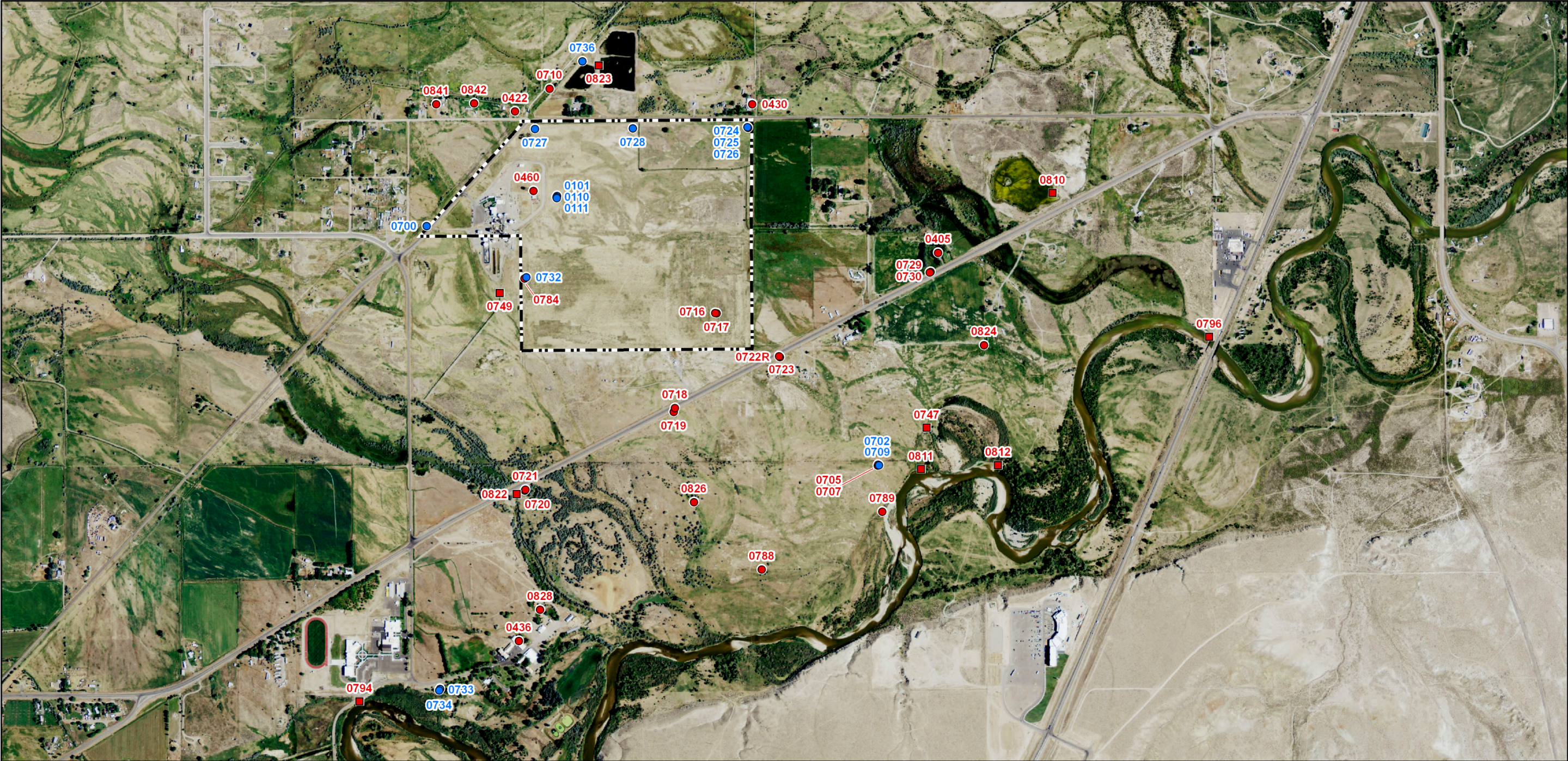
The sample collected at the ditch that discharges from the Chemtrade sulfuric acid plant (0749) continues to have elevated concentrations of sulfate (1,900 mg/L). The elevated sulfate concentration in the sulfuric acid plant effluent has affected the sulfate concentration downstream in the west side irrigation ditch (1,100 mg/L at location 0822).

Water samples from location 0822 (west side irrigation ditch) were analyzed for radium-226 and radium-228 in response to potentially elevated concentrations of these constituents in the sediments within the ditch. The radium-226 and radium-228 concentrations were slightly above the respective Decision Level Concentrations (DLC) with a combined 226+228 concentration of 0.9 pCi/L. Historically, the combined radium concentration at this location has been low, averaging 1.1 pCi/L, indicating no impact to water quality in the ditch.


 Sam Campbell
 Site Lead, S.M. Stoller Corporation

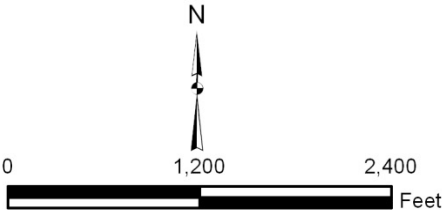
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LEGEND

- WELL TO BE SAMPLED
- WATER LEVEL ONLY
- SURFACE LOCATION TO BE SAMPLED
- - - SITE BOUNDARY



U.S. DEPARTMENT OF ENERGY GRAND JUNCTION, COLORADO	Work Performed by S.M. Stoller Corporation Under DOE Contract No. DE-AM01-07LM00090	
	Planned Sampling Map Riverton, WY, Processing Site December 2012	
DATE PREPARED: February 27, 2013	FILENAME: S0949400	

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Planned Sampling Map for Riverton, Wyoming, Processing Site

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Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	<u>Riverton, Wyoming</u>	Date(s) of Water Sampling	<u>December 3–5, 2012</u>
Date(s) of Verification	<u>January 31, 2013</u>	Name of Verifier	<u>Stephen Donovan</u>

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures? List other documents, SOPs, instructions.	<u>Yes</u>	<u>Work Order letter dated November 9, 2012.</u>
2. Were the sampling locations specified in the planning documents sampled?	<u>Yes</u>	
3. Was a pre-trip calibration conducted as specified in the above-named documents?	<u>Yes</u>	<u>Pre-trip calibration was performed on November 30, 2012.</u>
4. Was an operational check of the field equipment conducted daily? Did the operational checks meet criteria?	<u>Yes</u> <u>Yes</u>	
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	<u>Yes</u>	
6. Was the category of the well documented?	<u>Yes</u>	
7. Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged prior to sampling? Did the water level stabilize prior to sampling? Did pH, specific conductance, and turbidity measurements stabilize prior to sampling? Was the flow rate less than 500 mL/min? If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	<u>Yes</u> <u>Yes</u> <u>Yes</u> <u>Yes</u> <u>NA</u>	

Water Sampling Field Activities Verification Checklist (continued)

	Response (Yes, No, NA)	Comments
8. Were the following conditions met when purging a Category II well:		
Was the flow rate less than 500 mL/min?	Yes	
Was one pump/tubing volume removed prior to sampling?	Yes	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	Duplicate samples were collected from locations 0430 and 0747.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with nondedicated equipment?	Yes	
11. Were trip blanks prepared and included with each shipment of VOC samples?	NA	
12. Were QC samples assigned a fictitious site identification number?	Yes	
Was the true identity of the samples recorded on the Quality Assurance Sample Log or in the Field Data Collection System (FDCS) report?	Yes	
13. Were samples collected in the containers specified?	Yes	
14. Were samples filtered and preserved as specified?	Yes	
15. Were the number and types of samples collected as specified?	Yes	
16. Were chain of custody records completed and was sample custody maintained?	Yes	
17. Are field data sheets signed and dated by both team members (hardcopies) or are dates present for the "Date Signed" fields (FDCS)?	Yes	
18. Was all other pertinent information documented on the field data sheets?	Yes	
19. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
20. Were water levels measured at the locations specified in the planning documents?	Yes	

Laboratory Performance Assessment

General Information

Report Number (RIN): 12114982
Sample Event: December 3–5, 2012
Site(s): Riverton, Wyoming
Laboratory: ALS Laboratory Group, Fort Collins, Colorado
Work Order No.: 1212119
Analysis: Metals, Wet Chemistry, and Radiochemistry
Validator: Steve Donovan
Review Date: January 29, 2013

This validation was performed according to the *Environmental Procedures Catalog*, (LMS/PRO/S04325, continually updated) “Standard Practice for Validation of Laboratory Data.” The procedure was applied at Level 3, Data Validation. 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 4.

Table 4. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Metals: Mn	LMM-01	SW-846 3005A	SW-846 6010B
Metals: Mo, U	LMM-02	SW-846 3005A	SW-846 6020A
Radium-226	GPC-A-018	PA SOP712R14	PA SOP724R10
Radium-228	GPC-A-020	PA SOP746R8	PA SOP724R10
Sulfate	MIS-A-044	EPA 300.0	EPA 300.0

Data Qualifier Summary

Analytical results were qualified as listed in Table 5. Refer to the sections below for an explanation of the data qualifiers applied.

Table 5. Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
1212119-1	0405	Manganese	U	Less than 5 times the calibration blank
1212119-2	0422	Manganese	U	Less than 5 times the calibration blank
1212119-3	0430	Manganese	J	Field duplicate precision
1212119-4	0436	Manganese	U	Less than 5 times the calibration blank
1212119-5	0460	Manganese	U	Less than 5 times the calibration blank
1212119-13	0720	Manganese	U	Less than 5 times the calibration blank
1212119-14	0721	Manganese	U	Less than 5 times the calibration blank
1212119-29	0822	Radium-226	J	Less than the determination limit
1206236-29	0822	Radium-228	J	Less than the determination limit
1212119-31	0824	Manganese	U	Less than 5 times the calibration blank
1212119-33	0828	Manganese	U	Less than 5 times the calibration blank
1212119-6	0430 Duplicate	Manganese	J	Field duplicate precision

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received 38 water samples on December 11, 2012, accompanied by a Chain of Custody (COC) form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The sample submittal documents had no errors or omissions with the following exception. Radium-226 and radium-228 were listed on the COC form as requested analytes for the equipment blank collected. However these analyses were not required for the equipment blank and aliquots not submitted.

Preservation and Holding Times

The sample shipment was received cool and intact with the temperature inside the iced cooler at 1.0 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All analyses were performed within the required 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), 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.

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 SW-846 6010, Manganese

Calibrations for manganese were performed on December 14, 2012, 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 calibration 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 and all results were within the acceptance range.

Method SW-846 6020, Molybdenum, Uranium

Calibrations for molybdenum and uranium were performed on December 17, 2012, 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 calibration 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 and all results were within the acceptance range. Mass calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure. Internal standard recoveries associated with requested analytes were stable and within acceptable ranges.

Method SW-846 9056, Sulfate

The calibration for sulfate was performed using five calibration standards on November 9, 2012. The calibration curve correlation coefficient value was greater than 0.995 and the absolute value of the intercept was less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency with all calibration checks meeting the acceptance criteria.

Radium-226

Instrument calibration was performed July, 2012. Daily instrument checks met the acceptance criteria. The chemical recoveries met the acceptance criteria of 40 to 110 percent for all samples.

Radium-228

Instrument calibration was performed October 2012. Daily instrument checks met the 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.

Metals and Wet Chemistry

All method blank and calibration blank results associated with the samples were below the PQLs for all analytes. All method, initial calibration, and continuing calibration blank results associated with the samples were below the PQLs for all analytes. In cases where a blank concentration exceeds the MDL, the associated sample results are qualified with a “U” flag (not detected) when the sample result is greater than the MDL but less than 5 times the blank concentration.

Radiochemistry

The 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) samples are used to measure method performance in the sample matrix. Spike samples were analyzed for manganese, sulfate, and uranium. The MS/MSD analyses resulted in acceptable recovery and precision for all analytes. Two of the sulfate MS recoveries were greater than the laboratory recovery limits, but less than the validation limit of 125 percent, not requiring qualification.

Laboratory Replicate Analysis

Laboratory replicate sample results demonstrate acceptable laboratory precision. The relative percent difference values for the non-radiochemical sample replicates and matrix spike replicates were less than 20 percent for results that are greater than 5 times the PQL, indicating acceptable precision. The radiochemical relative error ratio (calculated using the one-sigma total propagated uncertainty) for the laboratory control sample replicates was less than three, indicating acceptable precision.

Laboratory Control Sample

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

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. The serial dilution results met the acceptance criteria.

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers. The analytical report included the MDL (MDC for radiochemistry) and PQL for all analytes and all required supporting documentation.

Chromatography Peak Integration

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

Electronic Data Deliverable (EDD) File

The EDD file was received on January 2, 2013. The Sample Management System EDD validation module was used to verify that the EDD files were complete and in compliance with requirements. The module compares the contents of the files 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: 12114982 Lab Code: PAR Validator: Stephen Donovan Validation Date: 01/29/2013
Project: Riverton Analysis Type: ☒ Metals ☒ General Chem ☒ Rad ☐ Organics
of Samples: 38 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
- ☒ Detection Limits
- ☒ Field/Trip Blanks
- ☒ Field Duplicates

All analyses were completed within the applicable holding times.

The reported detection limits are equal to or below contract requirements.

There was 1 trip/equipment blank evaluated.

There were 2 duplicates evaluated.

SAMPLE MANAGEMENT SYSTEM

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Metals Data Validation Worksheet

RIN: 12114982

Lab Code: PAR

Date Due: 01/08/2013

Matrix: Water

Site Code: RVT01

Date Completed: 01/08/2013

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								
Manganese	ICP/ES	12/14/2012	0.0000	1.0000	OK	OK	OK	104.0	99.0	102.0	2.0	99.0	6.0	109.0
Manganese	ICP/ES	12/14/2012					OK	104.0	94.0	96.0	1.0	102.0		115.0
Molybdenum	ICP/MS	12/17/2012	0.0000	1.0000	OK	OK	OK	94.0	94.0	94.0	1.0			113.0
Molybdenum	ICP/MS	12/17/2012					OK	94.0	97.0	99.0	1.0			95.0
Uranium	ICP/MS	12/17/2012	0.0000	1.0000	OK	OK	OK	106.0	104.0	103.0	2.0		1.0	105.0
Uranium	ICP/MS	12/17/2012					OK	105.0	104.0	106.0	1.0			106.0

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 12114982

Lab Code: PAR

Date Due: 01/08/2013

Matrix: Water

Site Code: RVT01

Date Completed: 01/08/2013

Analyte	Date Analyzed	CALIBRATION				Method	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	CCV	CCB						
SULFATE	12/12/2012	0.000	0.9983	OK	OK	OK	100.00	112.0	110.0	0	
SULFATE	12/12/2012					OK	98.00	117.0	105.0	2.00	
SULFATE	12/12/2012							112.0			
SULFATE	12/13/2012							117.0			

SAMPLE MANAGEMENT SYSTEM

Radiochemistry Data Validation Worksheet

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RIN: 12114982 **Lab Code:** PAR **Date Due:** 01/08/2013
Matrix: Water **Site Code:** RVT01 **Date Completed:** 01/08/2013

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate
0822	Radium-226	12/28/2012			92.7			
Blank_Spike	Radium-226	12/28/2012			94.1	98.60		
Blank_Spike_Du	Radium-226	12/28/2012			95.4	98.40		0.10
Blank	Radium-226	12/28/2012	0.0200	U	96.5			
0822	Radium-228	12/28/2012			95.4			
Blank_Spike	Radium-228	12/28/2012			94.3	120.00		
Blank_Spike_Du	Radium-228	12/28/2012			93.0	123.00		0.10
Blank	Radium-228	12/28/2012	0.4560	U	97.6			

Sampling Quality Control Assessment

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

Sampling Protocol

Surface water locations were sampled using a peristaltic pump and tubing reel or by container immersion. Monitoring wells were sampled using a peristaltic pump and dedicated tubing. Domestic wells (0405, 0422, 0430, 0436, 0460, 0828, 0841, and 0842) were classified as Category IV and sampled by filling bottles at the discharge point.

Sample results for all monitoring wells met the Category I or II 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. Wells 0705, 0719, and 0730 were classified as Category II. And were further qualified with a “Q” flag, indicating the data are qualitative because of the sampling technique.

Equipment Blank

Equipment blanks are prepared and analyzed to document contamination attributable the sample collection process. One equipment blank was submitted with these samples. There were no analytes detected in this blank.

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. Duplicate samples were collected from locations 0430 and 0747. For non-radiochemical measurements, the relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results less than five times the PQL, the range should be no greater than the PQL. The manganese duplicate results from location 0430 did not meet the applicable criteria. The associated sample and duplicate manganese results are qualified with a “J” flag as estimated values.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

Page 1 of 1

RIN: 12114982 Lab Code: PAR Project: Riverton Validation Date: 01/29/2013

Duplicate: 2175

Sample: 0430

Analyte	Sample				Duplicate				RPD	RER	Units
	Result	Flag	Error	Dilution	Result	Flag	Error	Dilution			
Manganese	8.3			1	6.1			1	30.56		UG/L
Molybdenum	2.3			10	2.2			10	4.44		UG/L
SULFATE	190			5	180			5	5.41		MG/L
Uranium	0.029	U		10	0.06	B		10			UG/L

Duplicate: 2353

Sample: 0747

Analyte	Sample				Duplicate				RPD	RER	Units
	Result	Flag	Error	Dilution	Result	Flag	Error	Dilution			
Manganese	460			1	470			1	2.15		UG/L
Molybdenum	13			10	13			10	0		UG/L
SULFATE	520			20	540	N		20	3.77		MG/L
Uranium	170			10	170			10	0		UG/L

Certification

All laboratory analytical quality control criteria were met except as qualified in this report. The data qualifiers listed on the 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 Donovan 2-25-2013
Stephen Donovan

Data Validation Lead:

Stephen Donovan 2-25-2013
Stephen Donovan

Attachment 1

Assessment of Anomalous Data

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Potential Outliers Report

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Potential Outliers Report

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

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

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

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

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

Data Validation Outliers Report - No Field Parameters

Comparison: All Historical Data

Laboratory: ALS Laboratory Group

RIN: 12114982

Report Date: 01/31/2013

Site Code	Location Code	Sample ID	Sample Date	Analyte	Current	Qualifiers		Historical Maximum			Historical Minimum			Number of Data Points		Statistical Outlier
					Result	Lab	Data	Result	Lab	Data	Result	Lab	Data	N	N Below Detect	
RVT01	0405	N001	12/03/2012	Manganese	0.00061	B	U	0.01	U	G	0.0021	B		28	11	No
RVT01	0718	N001	12/05/2012	Uranium	0.15		F	0.549			0.16		F	29	0	No
RVT01	0729	N001	12/04/2012	Sulfate	63		F	248			71.3		F	22	0	No
RVT01	0730	N001	12/04/2012	Manganese	0.039		FQ	0.18		FQ	0.04			21	0	No
RVT01	0730	N001	12/04/2012	Sulfate	140		FQ	400			150		FQ	20	0	No
RVT01	0784	N001	12/04/2012	Molybdenum	0.0076		F	0.034		F	0.0099		F	14	0	No
RVT01	0810	N001	12/04/2012	Sulfate	550			480			240			18	0	No
RVT01	0822	N001	12/04/2012	Molybdenum	0.0097			0.00746			0.003			16	0	No
RVT01	0823	N001	12/04/2012	Sulfate	1200			1100			230			16	0	No

STATISTICAL TESTS:

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

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

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

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

Attachment 2

Data Presentation

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Groundwater Quality Data

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Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0405 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/03/2012	N001	-	38			#		
Dissolved Oxygen	mg/L	12/03/2012	N001	-	0.61			#		
Manganese	mg/L	12/03/2012	N001	-	0.00061	B	U	#	0.00011	
Molybdenum	mg/L	12/03/2012	N001	-	0.0044			#	0.00032	
Oxidation Reduction Potential	mV	12/03/2012	N001	-	84.8			#		
pH	s.u.	12/03/2012	N001	-	9.35			#		
Specific Conductance	umhos/cm	12/03/2012	N001	-	969			#		
Sulfate	mg/L	12/03/2012	N001	-	380			#	5	
Temperature	C	12/03/2012	N001	-	8.73			#		
Turbidity	NTU	12/03/2012	N001	-	1.1			#		
Uranium	mg/L	12/03/2012	N001	-	0.000029	U		#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0422 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/03/2012	N001	-	150			#		
Dissolved Oxygen	mg/L	12/03/2012	N001	-	2.17			#		
Manganese	mg/L	12/03/2012	N001	-	0.00061	B	U	#	0.00011	
Molybdenum	mg/L	12/03/2012	N001	-	0.0019			#	0.00032	
Oxidation Reduction Potential	mV	12/03/2012	N001	-	122			#		
pH	s.u.	12/03/2012	N001	-	7.85			#		
Specific Conductance	umhos /cm	12/03/2012	N001	-	435			#		
Sulfate	mg/L	12/03/2012	N001	-	64			#	1	
Temperature	C	12/03/2012	N001	-	13.7			#		
Turbidity	NTU	12/03/2012	N001	-	3.2			#		
Uranium	mg/L	12/03/2012	N001	-	0.0018			#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0430 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/03/2012	N001	-	196			#		
Dissolved Oxygen	mg/L	12/03/2012	N001	-	0.6			#		
Manganese	mg/L	12/03/2012	N001	-	0.0083		J	#	0.00011	
Manganese	mg/L	12/03/2012	N002	-	0.0061			#	0.00011	
Molybdenum	mg/L	12/03/2012	N001	-	0.0023			#	0.00032	
Molybdenum	mg/L	12/03/2012	N002	-	0.0022			#	0.00032	
Oxidation Reduction Potential	mV	12/03/2012	N001	-	88.7			#		
pH	s.u.	12/03/2012	N001	-	8.72			#		
Specific Conductance	umhos /cm	12/03/2012	N001	-	734			#		
Sulfate	mg/L	12/03/2012	N001	-	190			#	2.5	
Sulfate	mg/L	12/03/2012	N002	-	180			#	2.5	
Temperature	C	12/03/2012	N001	-	7.76			#		
Turbidity	NTU	12/03/2012	N001	-	1.86			#		
Uranium	mg/L	12/03/2012	N001	-	0.000029	U		#	0.000029	
Uranium	mg/L	12/03/2012	N002	-	0.00006	B		#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0436 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/03/2012	N001	-	163			#		
Dissolved Oxygen	mg/L	12/03/2012	N001	-	6.21			#		
Manganese	mg/L	12/03/2012	N001	-	0.00054	B	U	#	0.00011	
Molybdenum	mg/L	12/03/2012	N001	-	0.0028			#	0.00032	
Oxidation Reduction Potential	mV	12/03/2012	N001	-	198.6			#		
pH	s.u.	12/03/2012	N001	-	8.42			#		
Specific Conductance	umhos /cm	12/03/2012	N001	-	796			#		
Sulfate	mg/L	12/03/2012	N001	-	200			#	2.5	
Temperature	C	12/03/2012	N001	-	10.82			#		
Turbidity	NTU	12/03/2012	N001	-	0.63			#		
Uranium	mg/L	12/03/2012	N001	-	0.00006	B		#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0460 WELL Koch Sulfuric Acid Plant

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/03/2012	N001	-	65			#		
Dissolved Oxygen	mg/L	12/03/2012	N001	-	2.5			#		
Manganese	mg/L	12/03/2012	N001	-	0.0011	B	U	#	0.00011	
Molybdenum	mg/L	12/03/2012	N001	-	0.0026			#	0.00032	
Oxidation Reduction Potential	mV	12/03/2012	N001	-	132.2			#		
pH	s.u.	12/03/2012	N001	-	8.9			#		
Specific Conductance	umhos /cm	12/03/2012	N001	-	725			#		
Sulfate	mg/L	12/03/2012	N001	-	170			#	2.5	
Temperature	C	12/03/2012	N001	-	17.93			#		
Turbidity	NTU	12/03/2012	N001	-	0.8			#		
Uranium	mg/L	12/03/2012	N001	-	0.00006	B		#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0705 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/05/2012	N001	37.3	-	61.8	80		FQ	#		
Dissolved Oxygen	mg/L	12/05/2012	N001	37.3	-	61.8	2.53		FQ	#		
Manganese	mg/L	12/05/2012	N001	37.3	-	61.8	0.011		FQJ	#	0.00011	
Molybdenum	mg/L	12/05/2012	N001	37.3	-	61.8	0.0028		FQ	#	0.00032	
Oxidation Reduction Potential	mV	12/05/2012	N001	37.3	-	61.8	66.4		FQ	#		
pH	s.u.	12/05/2012	N001	37.3	-	61.8	8.24		FQ	#		
Specific Conductance	umhos/cm	12/05/2012	N001	37.3	-	61.8	1215		FQ	#		
Sulfate	mg/L	12/05/2012	N001	37.3	-	61.8	450		FQ	#	5	
Temperature	C	12/05/2012	N001	37.3	-	61.8	9.06		FQ	#		
Turbidity	NTU	12/05/2012	N001	37.3	-	61.8	8.4		FQ	#		
Uranium	mg/L	12/05/2012	N001	37.3	-	61.8	0.00032		FQ	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0707 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/05/2012	N001	9.1 - 23.3	364		F	#		
Dissolved Oxygen	mg/L	12/05/2012	N001	9.1 - 23.3	0.81		F	#		
Manganese	mg/L	12/05/2012	N001	9.1 - 23.3	1.1		F	#	0.00011	
Molybdenum	mg/L	12/05/2012	N001	9.1 - 23.3	0.85		F	#	0.0016	
Oxidation Reduction Potential	mV	12/05/2012	N001	9.1 - 23.3	95.9		F	#		
pH	s.u.	12/05/2012	N001	9.1 - 23.3	7.01		F	#		
Specific Conductance	umhos/cm	12/05/2012	N001	9.1 - 23.3	5032		F	#		
Sulfate	mg/L	12/05/2012	N001	9.1 - 23.3	3000		F	#	25	
Temperature	C	12/05/2012	N001	9.1 - 23.3	9.65		F	#		
Turbidity	NTU	12/05/2012	N001	9.1 - 23.3	3.42		F	#		
Uranium	mg/L	12/05/2012	N001	9.1 - 23.3	0.85		F	#	0.00015	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0710 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/05/2012	N001	9.8 - 26.8	167		F	#		
Dissolved Oxygen	mg/L	12/05/2012	N001	9.8 - 26.8	0.28		F	#		
Manganese	mg/L	12/05/2012	N001	9.8 - 26.8	0.012		F	#	0.00011	
Molybdenum	mg/L	12/05/2012	N001	9.8 - 26.8	0.0018		F	#	0.00032	
Oxidation Reduction Potential	mV	12/05/2012	N001	9.8 - 26.8	139.2		F	#		
pH	s.u.	12/05/2012	N001	9.8 - 26.8	7.58		F	#		
Specific Conductance	umhos/cm	12/05/2012	N001	9.8 - 26.8	473		F	#		
Sulfate	mg/L	12/05/2012	N001	9.8 - 26.8	74		F	#	1	
Temperature	C	12/05/2012	N001	9.8 - 26.8	11.58		F	#		
Turbidity	NTU	12/05/2012	N001	9.8 - 26.8	1.45		F	#		
Uranium	mg/L	12/05/2012	N001	9.8 - 26.8	0.0022		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0716 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	9.78 - 14.78	281		F	#		
Dissolved Oxygen	mg/L	12/04/2012	N001	9.78 - 14.78	0.45		F	#		
Manganese	mg/L	12/04/2012	N001	9.78 - 14.78	0.16		F	#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	9.78 - 14.78	0.12		F	#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	9.78 - 14.78	63.4		F	#		
pH	s.u.	12/04/2012	N001	9.78 - 14.78	7.19		F	#		
Specific Conductance	umhos /cm	12/04/2012	N001	9.78 - 14.78	1278		F	#		
Sulfate	mg/L	12/04/2012	N001	9.78 - 14.78	400		F	#	5	
Temperature	C	12/04/2012	N001	9.78 - 14.78	10.51		F	#		
Turbidity	NTU	12/04/2012	N001	9.78 - 14.78	0.88		F	#		
Uranium	mg/L	12/04/2012	N001	9.78 - 14.78	0.23		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0717 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)			Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	45.1	-	55.1	108		F	#		
Dissolved Oxygen	mg/L	12/04/2012	N001	45.1	-	55.1	0.52		F	#		
Manganese	mg/L	12/04/2012	N001	45.1	-	55.1	0.18		F	#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	45.1	-	55.1	0.0075		F	#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	45.1	-	55.1	-90.5		F	#		
pH	s.u.	12/04/2012	N001	45.1	-	55.1	7.78		F	#		
Specific Conductance	umhos /cm	12/04/2012	N001	45.1	-	55.1	1865		F	#		
Sulfate	mg/L	12/04/2012	N001	45.1	-	55.1	760		F	#	10	
Temperature	C	12/04/2012	N001	45.1	-	55.1	9.57		F	#		
Turbidity	NTU	12/04/2012	N001	45.1	-	55.1	1.17		F	#		
Uranium	mg/L	12/04/2012	N001	45.1	-	55.1	0.00004	B	F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0718 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/05/2012	N001	18.24 - 23.24	348		F	#		
Dissolved Oxygen	mg/L	12/05/2012	N001	18.24 - 23.24	2		F	#		
Manganese	mg/L	12/05/2012	N001	18.24 - 23.24	0.5		F	#	0.00011	
Molybdenum	mg/L	12/05/2012	N001	18.24 - 23.24	0.1		F	#	0.00032	
Oxidation Reduction Potential	mV	12/05/2012	N001	18.24 - 23.24	113.7		F	#		
pH	s.u.	12/05/2012	N001	18.24 - 23.24	7.14		F	#		
Specific Conductance	umhos /cm	12/05/2012	N001	18.24 - 23.24	4734		F	#		
Sulfate	mg/L	12/05/2012	N001	18.24 - 23.24	2600		F	#	25	
Temperature	C	12/05/2012	N001	18.24 - 23.24	13.07		F	#		
Turbidity	NTU	12/05/2012	N001	18.24 - 23.24	2.94		F	#		
Uranium	mg/L	12/05/2012	N001	18.24 - 23.24	0.15		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0719 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/05/2012	N001	38.47 - 48.47	106		FQ	#		
Dissolved Oxygen	mg/L	12/05/2012	N001	38.47 - 48.47	0.92		FQ	#		
Manganese	mg/L	12/05/2012	N001	38.47 - 48.47	0.086		FQ	#	0.00011	
Molybdenum	mg/L	12/05/2012	N001	38.47 - 48.47	0.011		FQ	#	0.00032	
Oxidation Reduction Potential	mV	12/05/2012	N001	38.47 - 48.47	-130.3		FQ	#		
pH	s.u.	12/05/2012	N001	38.47 - 48.47	7.8		FQ	#		
Specific Conductance	umhos/cm	12/05/2012	N001	38.47 - 48.47	1223		FQ	#		
Sulfate	mg/L	12/05/2012	N001	38.47 - 48.47	480		FQ	#	5	
Temperature	C	12/05/2012	N001	38.47 - 48.47	11.79		FQ	#		
Turbidity	NTU	12/05/2012	N001	38.47 - 48.47	5.01		FQ	#		
Uranium	mg/L	12/05/2012	N001	38.47 - 48.47	0.00035		FQ	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0720 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	7.94 - 12.94	196		F	#		
Dissolved Oxygen	mg/L	12/04/2012	N001	7.94 - 12.94	1.36		F	#		
Manganese	mg/L	12/04/2012	N001	7.94 - 12.94	0.0019	B	UF	#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	7.94 - 12.94	0.0014		F	#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	7.94 - 12.94	25.2		F	#		
pH	s.u.	12/04/2012	N001	7.94 - 12.94	7.37		F	#		
Specific Conductance	umhos/cm	12/04/2012	N001	7.94 - 12.94	589		F	#		
Sulfate	mg/L	12/04/2012	N001	7.94 - 12.94	100		F	#	2.5	
Temperature	C	12/04/2012	N001	7.94 - 12.94	9.31		F	#		
Turbidity	NTU	12/04/2012	N001	7.94 - 12.94	2.27		F	#		
Uranium	mg/L	12/04/2012	N001	7.94 - 12.94	0.0042		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0721 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	44.43 - 54.43	96		F	#		
Dissolved Oxygen	mg/L	12/04/2012	N001	44.43 - 54.43	0.46		F	#		
Manganese	mg/L	12/04/2012	N001	44.43 - 54.43	0.0027	B	UF	#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	44.43 - 54.43	0.0024		F	#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	44.43 - 54.43	-63.5		F	#		
pH	s.u.	12/04/2012	N001	44.43 - 54.43	8.85		F	#		
Specific Conductance	umhos /cm	12/04/2012	N001	44.43 - 54.43	865		F	#		
Sulfate	mg/L	12/04/2012	N001	44.43 - 54.43	280		F	#	2.5	
Temperature	C	12/04/2012	N001	44.43 - 54.43	9.55		F	#		
Turbidity	NTU	12/04/2012	N001	44.43 - 54.43	0.8		F	#		
Uranium	mg/L	12/04/2012	N001	44.43 - 54.43	0.00012		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0722R WELL Replacement well for destroyed well 0722.

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	11.1 - 16.1	248		F	#		
Dissolved Oxygen	mg/L	12/04/2012	N001	11.1 - 16.1	0.82		F	#		
Manganese	mg/L	12/04/2012	N001	11.1 - 16.1	0.0074		F	#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	11.1 - 16.1	0.11		F	#	0.0016	
Oxidation Reduction Potential	mV	12/04/2012	N001	11.1 - 16.1	140.7		F	#		
pH	s.u.	12/04/2012	N001	11.1 - 16.1	7.08		F	#		
Specific Conductance	umhos /cm	12/04/2012	N001	11.1 - 16.1	1486		F	#		
Sulfate	mg/L	12/04/2012	N001	11.1 - 16.1	640		F	#	10	
Temperature	C	12/04/2012	N001	11.1 - 16.1	11.99		F	#		
Turbidity	NTU	12/04/2012	N001	11.1 - 16.1	0.84		F	#		
Uranium	mg/L	12/04/2012	N001	11.1 - 16.1	0.45		F	#	0.00015	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0723 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	45.99 - 55.99	335		F	#		
Dissolved Oxygen	mg/L	12/04/2012	N001	45.99 - 55.99	0.55		F	#		
Manganese	mg/L	12/04/2012	N001	45.99 - 55.99	0.44		F	#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	45.99 - 55.99	0.00032	U	F	#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	45.99 - 55.99	-49		F	#		
pH	s.u.	12/04/2012	N001	45.99 - 55.99	7.14		F	#		
Specific Conductance	umhos /cm	12/04/2012	N001	45.99 - 55.99	3631		F	#		
Sulfate	mg/L	12/04/2012	N001	45.99 - 55.99	1700		F	#	25	
Temperature	C	12/04/2012	N001	45.99 - 55.99	10.73		F	#		
Turbidity	NTU	12/04/2012	N001	45.99 - 55.99	1.15		F	#		
Uranium	mg/L	12/04/2012	N001	45.99 - 55.99	0.00003	B	F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0729 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	14.71 - 19.71	340		F	#		
Dissolved Oxygen	mg/L	12/04/2012	N001	14.71 - 19.71	0.36		F	#		
Manganese	mg/L	12/04/2012	N001	14.71 - 19.71	0.019		F	#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	14.71 - 19.71	0.0032		F	#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	14.71 - 19.71	32.7		F	#		
pH	s.u.	12/04/2012	N001	14.71 - 19.71	7.2		F	#		
Specific Conductance	umhos/cm	12/04/2012	N001	14.71 - 19.71	664		F	#		
Sulfate	mg/L	12/04/2012	N001	14.71 - 19.71	63		F	#	2.5	
Temperature	C	12/04/2012	N001	14.71 - 19.71	11.57		F	#		
Turbidity	NTU	12/04/2012	N001	14.71 - 19.71	9.23		F	#		
Uranium	mg/L	12/04/2012	N001	14.71 - 19.71	0.0047		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0730 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	38.62 - 48.62	347		FQ	#		
Dissolved Oxygen	mg/L	12/04/2012	N001	38.62 - 48.62	1.16		FQ	#		
Manganese	mg/L	12/04/2012	N001	38.62 - 48.62	0.039		FQ	#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	38.62 - 48.62	0.0039		FQ	#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	38.62 - 48.62	-15.4		FQ	#		
pH	s.u.	12/04/2012	N001	38.62 - 48.62	7.48		FQ	#		
Specific Conductance	umhos/cm	12/04/2012	N001	38.62 - 48.62	867		FQ	#		
Sulfate	mg/L	12/04/2012	N001	38.62 - 48.62	140		FQ	#	2.5	
Temperature	C	12/04/2012	N001	38.62 - 48.62	11.21		FQ	#		
Turbidity	NTU	12/04/2012	N001	38.62 - 48.62	1.99		FQ	#		
Uranium	mg/L	12/04/2012	N001	38.62 - 48.62	0.0061		FQ	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0784 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	1.65 - 6.65	154		F	#		
Dissolved Oxygen	mg/L	12/04/2012	N001	1.65 - 6.65	0.5		F	#		
Manganese	mg/L	12/04/2012	N001	1.65 - 6.65	0.84		F	#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	1.65 - 6.65	0.0076		F	#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	1.65 - 6.65	8.7		F	#		
pH	s.u.	12/04/2012	N001	1.65 - 6.65	7.74		F	#		
Specific Conductance	umhos/cm	12/04/2012	N001	1.65 - 6.65	4059		F	#		
Sulfate	mg/L	12/04/2012	N001	1.65 - 6.65	2500		F	#	25	
Temperature	C	12/04/2012	N001	1.65 - 6.65	10.79		F	#		
Turbidity	NTU	12/04/2012	N001	1.65 - 6.65	2.38		F	#		
Uranium	mg/L	12/04/2012	N001	1.65 - 6.65	0.004		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0788 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/05/2012	N001	1.41 - 13.41	356		F	#		
Dissolved Oxygen	mg/L	12/05/2012	N001	1.41 - 13.41	0.62		F	#		
Manganese	mg/L	12/05/2012	N001	1.41 - 13.41	0.2		F	#	0.00011	
Molybdenum	mg/L	12/05/2012	N001	1.41 - 13.41	0.022		F	#	0.00032	
Oxidation Reduction Potential	mV	12/05/2012	N001	1.41 - 13.41	70.5		F	#		
pH	s.u.	12/05/2012	N001	1.41 - 13.41	7.21		F	#		
Specific Conductance	umhos/cm	12/05/2012	N001	1.41 - 13.41	3263		F	#		
Sulfate	mg/L	12/05/2012	N001	1.41 - 13.41	1500		F	#	25	
Temperature	C	12/05/2012	N001	1.41 - 13.41	10.41		F	#		
Turbidity	NTU	12/05/2012	N001	1.41 - 13.41	6.29		F	#		
Uranium	mg/L	12/05/2012	N001	1.41 - 13.41	0.048		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0789 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/05/2012	N001	6.2 - 18.2	493		F	#		
Dissolved Oxygen	mg/L	12/05/2012	N001	6.2 - 18.2	1.37		F	#		
Manganese	mg/L	12/05/2012	N001	6.2 - 18.2	0.75		F	#	0.00011	
Molybdenum	mg/L	12/05/2012	N001	6.2 - 18.2	0.66		F	#	0.0016	
Oxidation Reduction Potential	mV	12/05/2012	N001	6.2 - 18.2	21.6		F	#		
pH	s.u.	12/05/2012	N001	6.2 - 18.2	7.11		F	#		
Specific Conductance	umhos/cm	12/05/2012	N001	6.2 - 18.2	8911		F	#		
Sulfate	mg/L	12/05/2012	N001	6.2 - 18.2	5300		F	#	50	
Temperature	C	12/05/2012	N001	6.2 - 18.2	10.1		F	#		
Turbidity	NTU	12/05/2012	N001	6.2 - 18.2	1.76		F	#		
Uranium	mg/L	12/05/2012	N001	6.2 - 18.2	2		F	#	0.00015	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0824 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	9.5 - 14.5	246		F	#		
Dissolved Oxygen	mg/L	12/04/2012	N001	9.5 - 14.5	0.36		F	#		
Manganese	mg/L	12/04/2012	N001	9.5 - 14.5	0.0032	B	UF	#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	9.5 - 14.5	0.0028		F	#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	9.5 - 14.5	-61.4		F	#		
pH	s.u.	12/04/2012	N001	9.5 - 14.5	7.16		F	#		
Specific Conductance	umhos/cm	12/04/2012	N001	9.5 - 14.5	1014		F	#		
Sulfate	mg/L	12/04/2012	N001	9.5 - 14.5	220		F	#	5	
Temperature	C	12/04/2012	N001	9.5 - 14.5	10		F	#		
Turbidity	NTU	12/04/2012	N001	9.5 - 14.5	2.06		F	#		
Uranium	mg/L	12/04/2012	N001	9.5 - 14.5	0.014		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0826 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)			Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/05/2012	N001	6.6	-	11.6	352		F	#		
Dissolved Oxygen	mg/L	12/05/2012	N001	6.6	-	11.6	0.5		F	#		
Manganese	mg/L	12/05/2012	N001	6.6	-	11.6	2.9		F	#	0.00011	
Molybdenum	mg/L	12/05/2012	N001	6.6	-	11.6	0.021		F	#	0.00032	
Oxidation Reduction Potential	mV	12/05/2012	N001	6.6	-	11.6	18.6		F	#		
pH	s.u.	12/05/2012	N001	6.6	-	11.6	7.1		F	#		
Specific Conductance	umhos /cm	12/05/2012	N001	6.6	-	11.6	3673		F	#		
Sulfate	mg/L	12/05/2012	N001	6.6	-	11.6	2000		F	#	25	
Temperature	C	12/05/2012	N001	6.6	-	11.6	9.22		F	#		
Turbidity	NTU	12/05/2012	N001	6.6	-	11.6	4.45		F	#		
Uranium	mg/L	12/05/2012	N001	6.6	-	11.6	0.048		F	#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0828 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/03/2012	N001	-	154			#		
Dissolved Oxygen	mg/L	12/03/2012	N001	-	2			#		
Manganese	mg/L	12/03/2012	N001	-	0.001	B	U	#	0.00011	
Molybdenum	mg/L	12/03/2012	N001	-	0.003			#	0.00032	
Oxidation Reduction Potential	mV	12/03/2012	N001	-	149.7			#		
pH	s.u.	12/03/2012	N001	-	8.7			#		
Specific Conductance	umhos /cm	12/03/2012	N001	-	850			#		
Sulfate	mg/L	12/03/2012	N001	-	230			#	2.5	
Temperature	C	12/03/2012	N001	-	9.65			#		
Turbidity	NTU	12/03/2012	N001	-	0.5			#		
Uranium	mg/L	12/03/2012	N001	-	0.00008	B		#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0841 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/03/2012	N001	-	198			#		
Dissolved Oxygen	mg/L	12/03/2012	N001	-	0.95			#		
Manganese	mg/L	12/03/2012	N001	-	0.11			#	0.00011	
Molybdenum	mg/L	12/03/2012	N001	-	0.004			#	0.00032	
Oxidation Reduction Potential	mV	12/03/2012	N001	-	92.7			#		
pH	s.u.	12/03/2012	N001	-	7.83			#		
Specific Conductance	umhos /cm	12/03/2012	N001	-	831			#		
Sulfate	mg/L	12/03/2012	N001	-	240			#	2.5	
Temperature	C	12/03/2012	N001	-	12.1			#		
Turbidity	NTU	12/03/2012	N001	-	0.31			#		
Uranium	mg/L	12/03/2012	N001	-	0.0011			#	0.000029	

Groundwater Quality Data by Location (USEE100) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0842 WELL

Parameter	Units	Sample		Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID			Lab	Data	QA		
Alkalinity, Total (as CaCO ₃)	mg/L	12/03/2012	N001	-	164			#		
Dissolved Oxygen	mg/L	12/03/2012	N001	-	2.08			#		
Manganese	mg/L	12/03/2012	N001	-	0.06			#	0.00011	
Molybdenum	mg/L	12/03/2012	N001	-	0.0025			#	0.00032	
Oxidation Reduction Potential	mV	12/03/2012	N001	-	124.9			#		
pH	s.u.	12/03/2012	N001	-	7.94			#		
Specific Conductance	umhos /cm	12/03/2012	N001	-	675			#		
Sulfate	mg/L	12/03/2012	N001	-	170			#	2.5	
Temperature	C	12/03/2012	N001	-	10.77			#		
Turbidity	NTU	12/03/2012	N001	-	1.27			#		
Uranium	mg/L	12/03/2012	N001	-	0.00038			#	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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Surface Water Quality Data

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Surface Water Quality Data by Location (USEE102) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0747 SURFACE LOCATION 8/26/97 State plane east changed from 594497.14 to an estimation close to river

Parameter	Units	Sample Date	ID	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/05/2012	N001	339			#		
Dissolved Oxygen	mg/L	12/05/2012	N001	11.43			#		
Manganese	mg/L	12/05/2012	0001	0.46			#	0.00011	
Manganese	mg/L	12/05/2012	0002	0.47			#	0.00011	
Molybdenum	mg/L	12/05/2012	0001	0.013			#	0.00032	
Molybdenum	mg/L	12/05/2012	0002	0.013			#	0.00032	
Oxidation Reduction Potential	mV	12/05/2012	N001	84.4			#		
pH	s.u.	12/05/2012	N001	7.62			#		
Specific Conductance	umhos/cm	12/05/2012	N001	1498			#		
Sulfate	mg/L	12/05/2012	0001	520			#	10	
Sulfate	mg/L	12/05/2012	0002	540	N		#	10	
Temperature	C	12/05/2012	N001	6.42			#		
Turbidity	NTU	12/05/2012	N001	14.9			#		
Uranium	mg/L	12/05/2012	0001	0.17			#	0.000029	
Uranium	mg/L	12/05/2012	0002	0.17			#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0749 SURFACE LOCATION 8/26/97 State plane east changed from 589532.71 to an estimation close to river

Parameter	Units	Sample Date	ID	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	138			#		
Dissolved Oxygen	mg/L	12/04/2012	N001	6.1			#		
Manganese	mg/L	12/04/2012	0001	0.084			#	0.00011	
Molybdenum	mg/L	12/04/2012	0001	0.019			#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	67.9			#		
pH	s.u.	12/04/2012	N001	8.12			#		
Specific Conductance	umhos/cm	12/04/2012	N001	3332			#		
Sulfate	mg/L	12/04/2012	0001	1900	N		#	25	
Temperature	C	12/04/2012	N001	15.42			#		
Turbidity	NTU	12/04/2012	N001	16.7			#		
Uranium	mg/L	12/04/2012	0001	0.0021			#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0794 SURFACE LOCATION 8/26/97 State plane north changed from 844178.27 to an estimation close to river

Parameter	Units	Sample Date	ID	Result	Qualifiers Lab Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	88		#		
Dissolved Oxygen	mg/L	12/04/2012	N001	12.74		#		
Manganese	mg/L	12/04/2012	N001	0.037		#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	0.0016		#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	52.7		#		
pH	s.u.	12/04/2012	N001	8.43		#		
Specific Conductance	umhos/cm	12/04/2012	N001	794		#		
Sulfate	mg/L	12/04/2012	N001	250		#	2.5	
Temperature	C	12/04/2012	N001	1.79		#		
Turbidity	NTU	12/04/2012	N001	5.97		#		
Uranium	mg/L	12/04/2012	N001	0.0058		#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0796 SURFACE LOCATION Was possibly historically sampled ~900 ft E from current location

Parameter	Units	Sample Date	ID	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/05/2012	N001	189			#		
Dissolved Oxygen	mg/L	12/05/2012	N001	12.8			#		
Manganese	mg/L	12/05/2012	N001	0.038			#	0.00011	
Molybdenum	mg/L	12/05/2012	N001	0.0014			#	0.00032	
Oxidation Reduction Potential	mV	12/05/2012	N001	15			#		
pH	s.u.	12/05/2012	N001	8.37			#		
Specific Conductance	umhos/cm	12/05/2012	N001	833			#		
Sulfate	mg/L	12/05/2012	N001	250			#	2.5	
Temperature	C	12/05/2012	N001	1.37			#		
Turbidity	NTU	12/05/2012	N001	6.6			#		
Uranium	mg/L	12/05/2012	N001	0.0057			#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0810 SURFACE LOCATION Gravel Pit Pond

Parameter	Units	Sample Date	ID	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	536			#		
Dissolved Oxygen	mg/L	12/04/2012	N001	11.14			#		
Manganese	mg/L	12/04/2012	N001	0.3			#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	0.002			#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	243.6			#		
pH	s.u.	12/04/2012	N001	8.15			#		
Specific Conductance	umhos/cm	12/04/2012	N001	1915			#		
Sulfate	mg/L	12/04/2012	N001	550			#	10	
Temperature	C	12/04/2012	N001	-.5			#		
Turbidity	NTU	12/04/2012	N001	3.68			#		
Uranium	mg/L	12/04/2012	N001	0.0075			#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0811 SURFACE LOCATION

Parameter	Units	Sample Date	ID	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/05/2012	N001	198			#		
Dissolved Oxygen	mg/L	12/05/2012	N001	13.78			#		
Manganese	mg/L	12/05/2012	N001	0.038			#	0.00011	
Molybdenum	mg/L	12/05/2012	N001	0.0016			#	0.00032	
Oxidation Reduction Potential	mV	12/05/2012	N001	57.8			#		
pH	s.u.	12/05/2012	N001	8.4			#		
Specific Conductance	umhos/cm	12/05/2012	N001	828			#		
Sulfate	mg/L	12/05/2012	N001	250			#	2.5	
Temperature	C	12/05/2012	N001	2.47			#		
Turbidity	NTU	12/05/2012	N001	6.69			#		
Uranium	mg/L	12/05/2012	N001	0.0061			#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0812 SURFACE LOCATION

Parameter	Units	Sample Date	ID	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/05/2012	N001	190			#		
Dissolved Oxygen	mg/L	12/05/2012	N001	13.68			#		
Manganese	mg/L	12/05/2012	N001	0.045			#	0.00011	
Molybdenum	mg/L	12/05/2012	N001	0.0017			#	0.00032	
Oxidation Reduction Potential	mV	12/05/2012	N001	141.1			#		
pH	s.u.	12/05/2012	N001	8.39			#		
Specific Conductance	umhos/cm	12/05/2012	N001	820			#		
Sulfate	mg/L	12/05/2012	N001	260			#	2.5	
Temperature	C	12/05/2012	N001	0.92			#		
Turbidity	NTU	12/05/2012	N001	6			#		
Uranium	mg/L	12/05/2012	N001	0.0068			#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0822 SURFACE LOCATION west-side irrigation ditch

Parameter	Units	Sample Date	ID	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	203			#		
Dissolved Oxygen	mg/L	12/04/2012	N001	11.87			#		
Manganese	mg/L	12/04/2012	N001	0.065			#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	0.0097			#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	37.4			#		
pH	s.u.	12/04/2012	N001	8.13			#		
Radium-226	pCi/L	12/04/2012	N001	0.437		J	#	0.18	0.23
Radium-228	pCi/L	12/04/2012	N001	0.455		J	#	0.41	0.281
Specific Conductance	umhos/cm	12/04/2012	N001	2115			#		
Sulfate	mg/L	12/04/2012	N001	1100			#	10	
Temperature	C	12/04/2012	N001	4.93			#		
Turbidity	NTU	12/04/2012	N001	4.61			#		
Uranium	mg/L	12/04/2012	N001	0.0075			#	0.000029	

Surface Water Quality Data by Location (USEE102) FOR SITE RVT01, Riverton Processing Site

REPORT DATE: 01/31/2013

Location: 0823 SURFACE LOCATION

Parameter	Units	Sample Date	Sample ID	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Alkalinity, Total (as CaCO ₃)	mg/L	12/04/2012	N001	41			#		
Dissolved Oxygen	mg/L	12/04/2012	N001	11.69			#		
Manganese	mg/L	12/04/2012	N001	0.028			#	0.00011	
Molybdenum	mg/L	12/04/2012	N001	0.0015			#	0.00032	
Oxidation Reduction Potential	mV	12/04/2012	N001	107.5			#		
pH	s.u.	12/04/2012	N001	8.11			#		
Specific Conductance	umhos/cm	12/04/2012	N001	2939			#		
Sulfate	mg/L	12/04/2012	N001	1200			#	25	
Temperature	C	12/04/2012	N001	2.55			#		
Turbidity	NTU	12/04/2012	N001	1.83			#		
Uranium	mg/L	12/04/2012	N001	0.0062			#	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.

Equipment Blank Data

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BLANKS REPORT

LAB: PARAGON/ALS LABORATORY GROUP (Fort Collins, CO)

RIN: 12114982

Report Date: 01/31/2013

Parameter	Site Code	Location ID	Sample Date	Sample ID	Units	Result	Qualifiers Lab Data	Detection Limit	Uncertainty	Sample Type
Manganese	RVT01	0999	12/05/2012	N001	mg/L	0.00011	U	0.00011		E
Molybdenum	RVT01	0999	12/05/2012	N001	mg/L	0.00032	U	0.00032		E
Sulfate	RVT01	0999	12/05/2012	N001	mg/L	0.5	U	0.5		E
Uranium	RVT01	0999	12/05/2012	N001	mg/L	0.000029	U	0.000029		E

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.

SAMPLE TYPES:

- E Equipment Blank.

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Static Water Level Data

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STATIC WATER LEVELS (USEE700) FOR SITE RVT01, Riverton Processing Site
REPORT DATE: 02/06/2013

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)
0101	O	4946.58	12/04/2012	10:27:00	10.7	4935.88
0110	O	4950.19	12/04/2012	10:25:00	14.2	4935.99
0111	O	4946.87	12/04/2012	10:26:00	10.87	4936
0700	U	4951.38	12/05/2012	12:38:00	6.12	4945.26
0702	D	4931	12/05/2012	12:37:00	6.6	4924.4
0705	D	4930.8	12/05/2012	12:36:00	6.74	4924.06
0705	D	4930.8	12/05/2012	13:40:09	6.74	4924.06
0707	D	4931	12/05/2012	12:35:00	5.75	4925.25
0707	D	4931	12/05/2012	13:30:28	5.75	4925.25
0709	D	4930.7	12/05/2012	12:36:00	5.45	4925.25
0710	U	4947.9	12/05/2012	09:30:32	6.8	4941.1
0710	U	4947.9	12/05/2012	12:32:00	6.8	4941.1
0716	O	4939.12	12/04/2012	10:30:00	9.14	4929.98
0716	O	4939.12	12/04/2012	16:05:06	9.14	4929.98
0717	O	4938.8	12/04/2012	16:30:35	8.82	4929.98
0718	D	4937.6	12/05/2012	10:45:02	8.25	4929.35
0719	D	4937.55	12/05/2012	11:00:00	7.89	4929.66
0720	C	4940.46	12/04/2012	11:35:25	5.37	4935.09
0721	C	4940.47	12/04/2012	11:55:22	8.02	4932.45
0722R		4937.06	12/04/2012	09:05:09	9.41	4927.65
0723	D	4936.01	12/04/2012	09:20:18	8.15	4927.86
0724	U	4941.36	12/04/2012	10:29:00	8.66	4932.7
0725	U	4941.66	12/04/2012	10:29:00	8.98	4932.68
0726	U	4942	12/04/2012	10:30:00	8.17	4933.83
0727	U	4951.69	12/04/2012	10:27:00	11.23	4940.46
0728	U	4946.01	12/04/2012	10:28:00	9.82	4936.19
0729	D	4932.75	12/04/2012	11:00:19	6.92	4925.83
0730	D	4933.08	12/04/2012	11:10:07	7.64	4925.44

STATIC WATER LEVELS (USEE700) FOR SITE RVT01, Riverton Processing Site
REPORT DATE: 02/06/2013

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)
0732	U	4945.07	12/04/2012	10:23:00	8.23	4936.84
0733	U	4946.76	12/04/2012	10:25:00	8.24	4938.52
0734	U	4946.08	12/04/2012	10:24:00	9.32	4936.76
0736	U	4946	12/04/2012	10:24:00	7.9	4938.1
0784	U	4945.45	12/04/2012	14:40:23	6.72	4938.73
0788	C	4935.09	12/05/2012	14:50:02	9.27	4925.82
0789	D	4933.66	12/05/2012	12:37:00	9.31	4924.35
0789	D	4933.66	12/05/2012	14:05:10	9.31	4924.35
0824		4928.27	12/04/2012	10:30:27	5.99	4922.28
0826		4936.98	12/05/2012	15:15:35	7.76	4929.22

FLOW CODES: B BACKGROUND
 N UNKNOWN

C CROSS GRADIENT
 O ON SITE

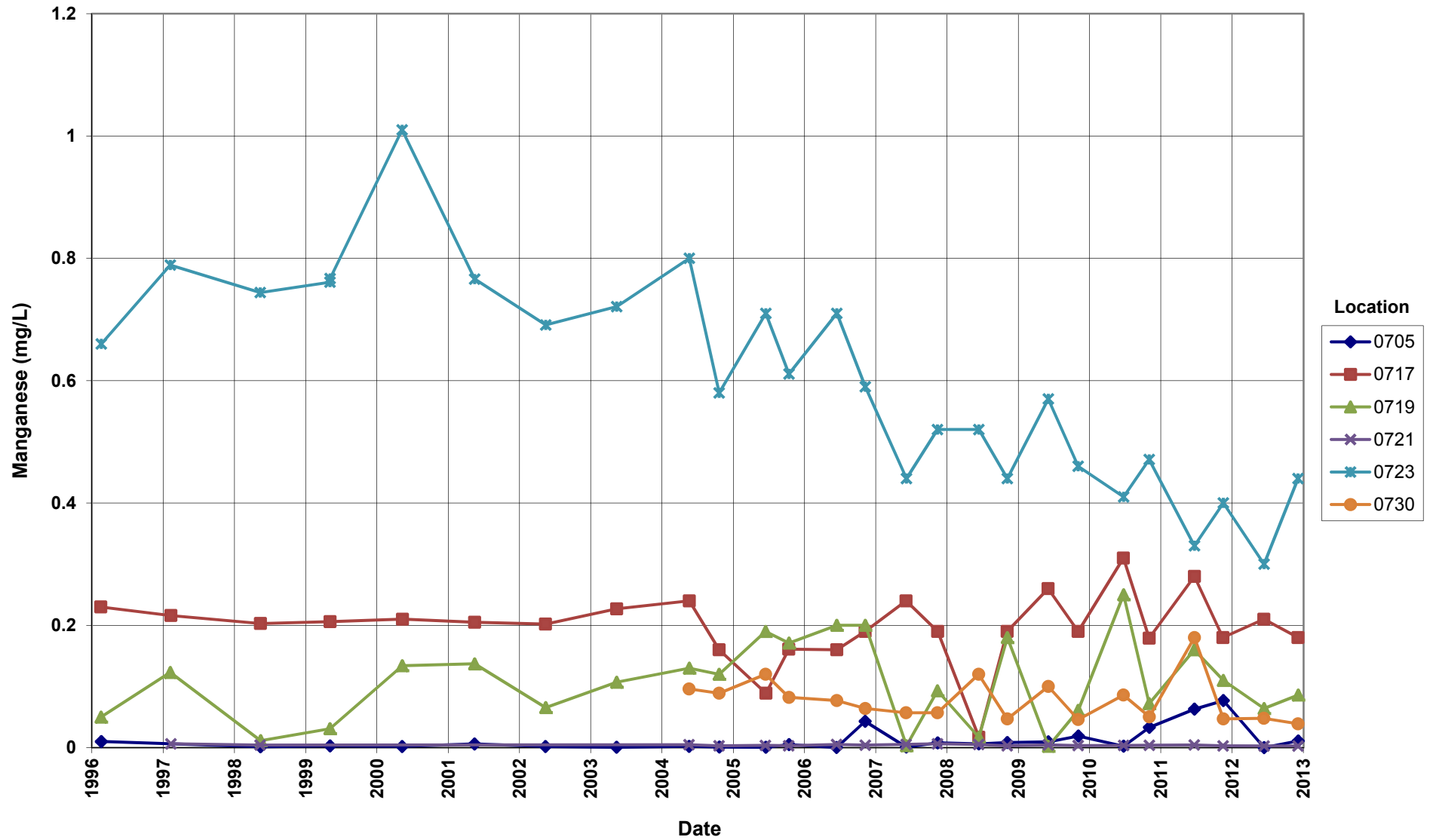
D DOWN GRADIENT
 U UPGRADIENT

F OFF SITE

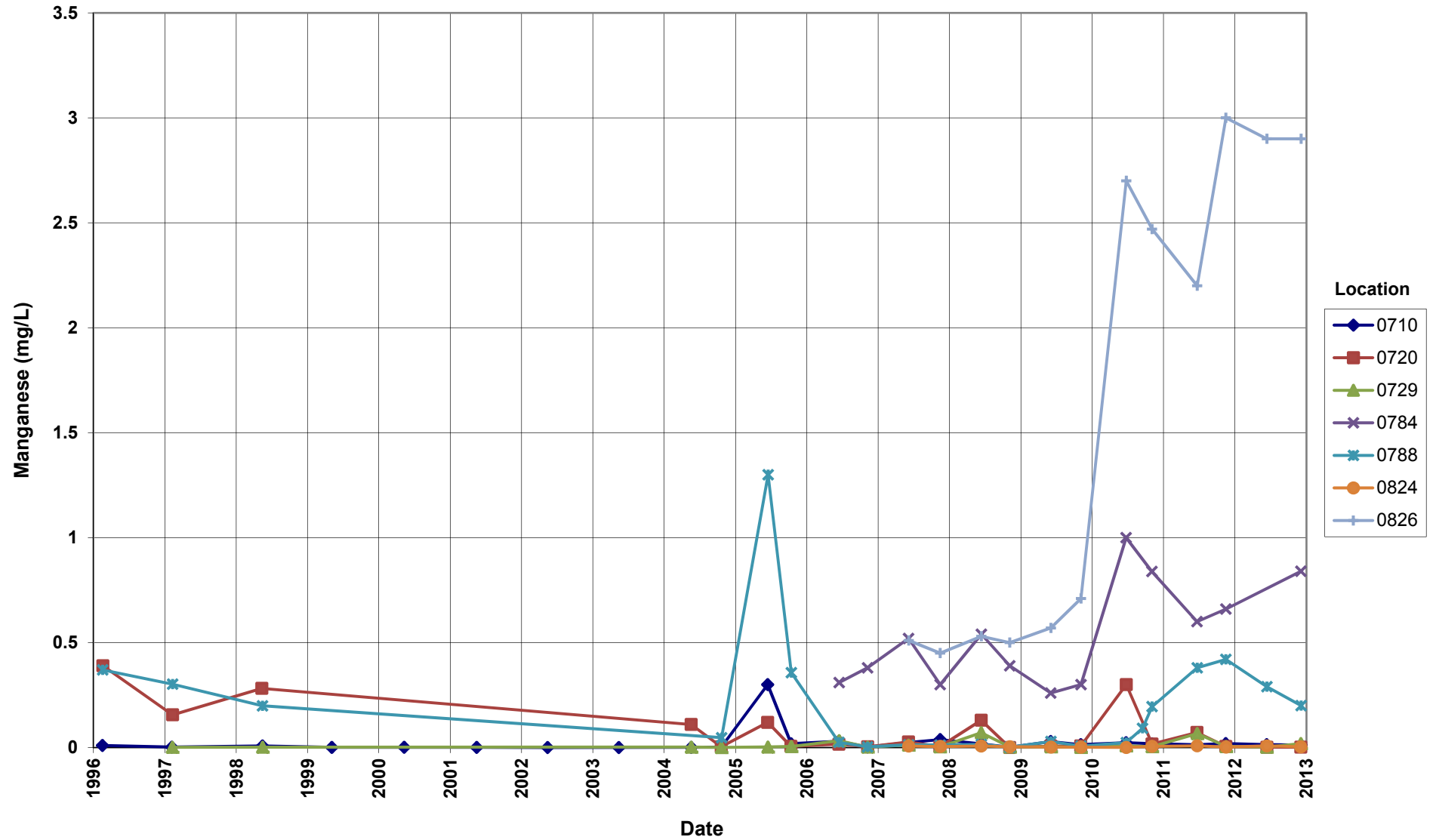
Time-Concentration Graphs

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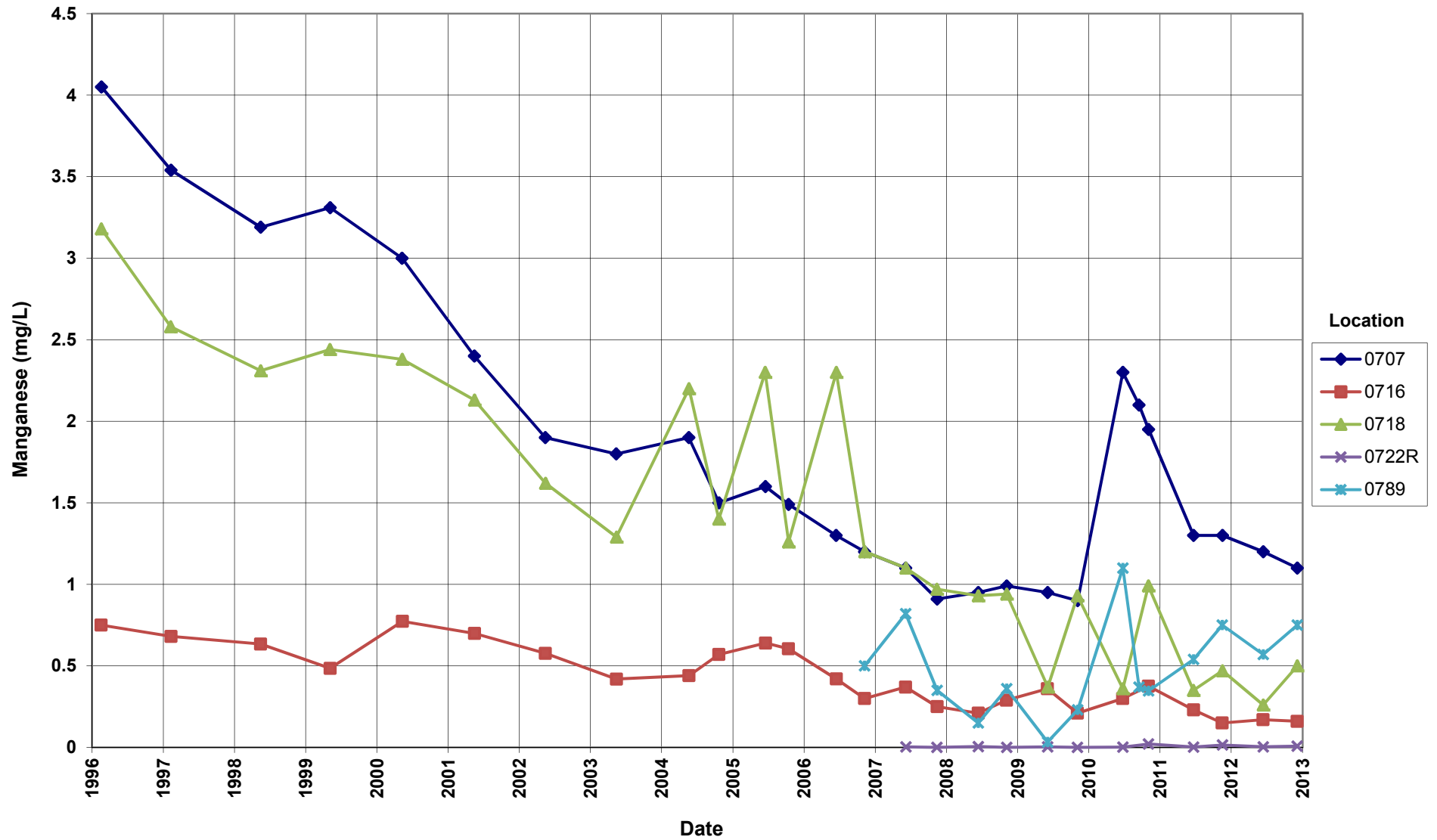
Riverton Processing Site
Manganese Concentration
Semi-Confined Aquifer Locations



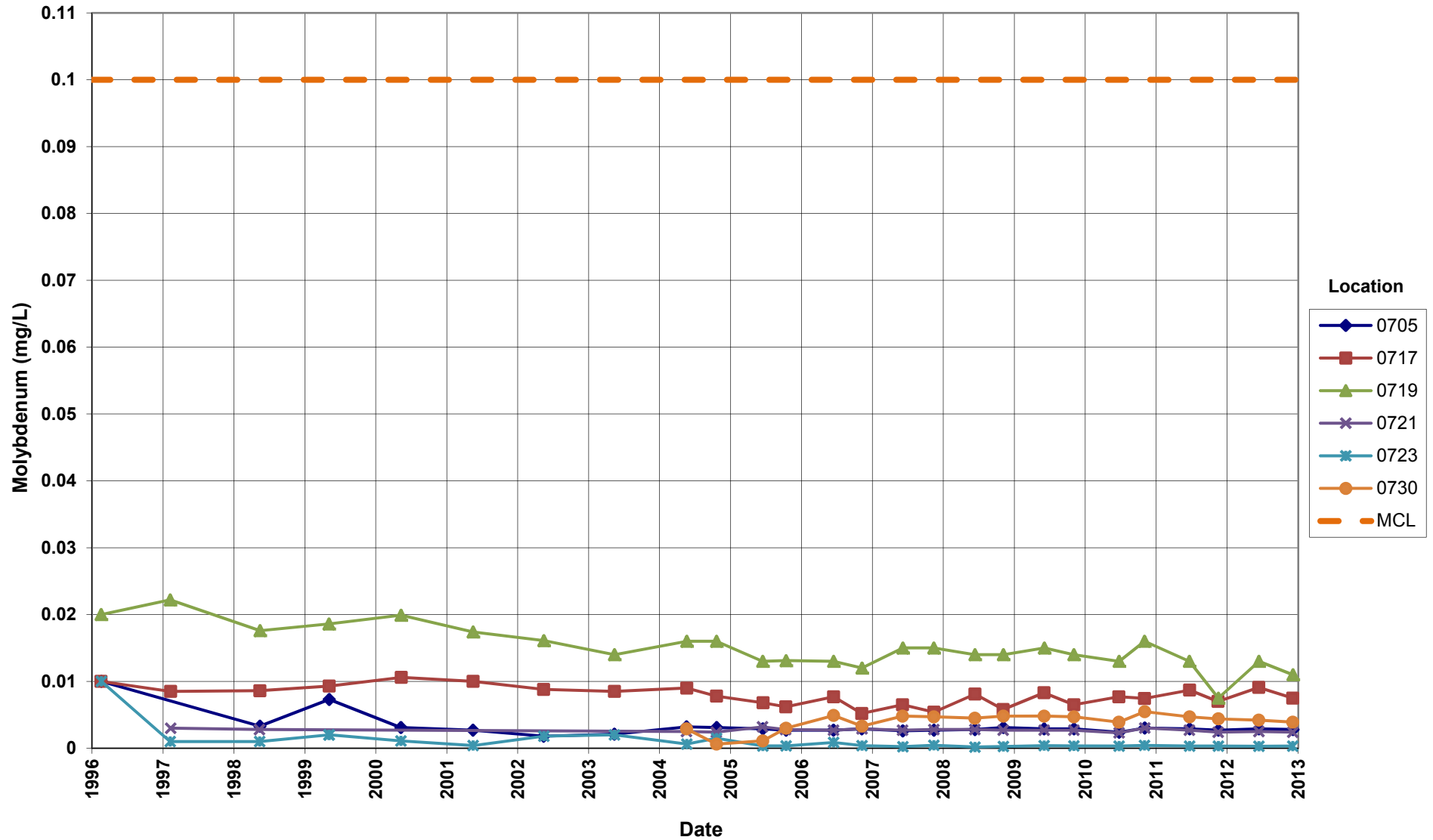
Riverton Processing Site
Manganese Concentration
Surficial Aquifer Locations



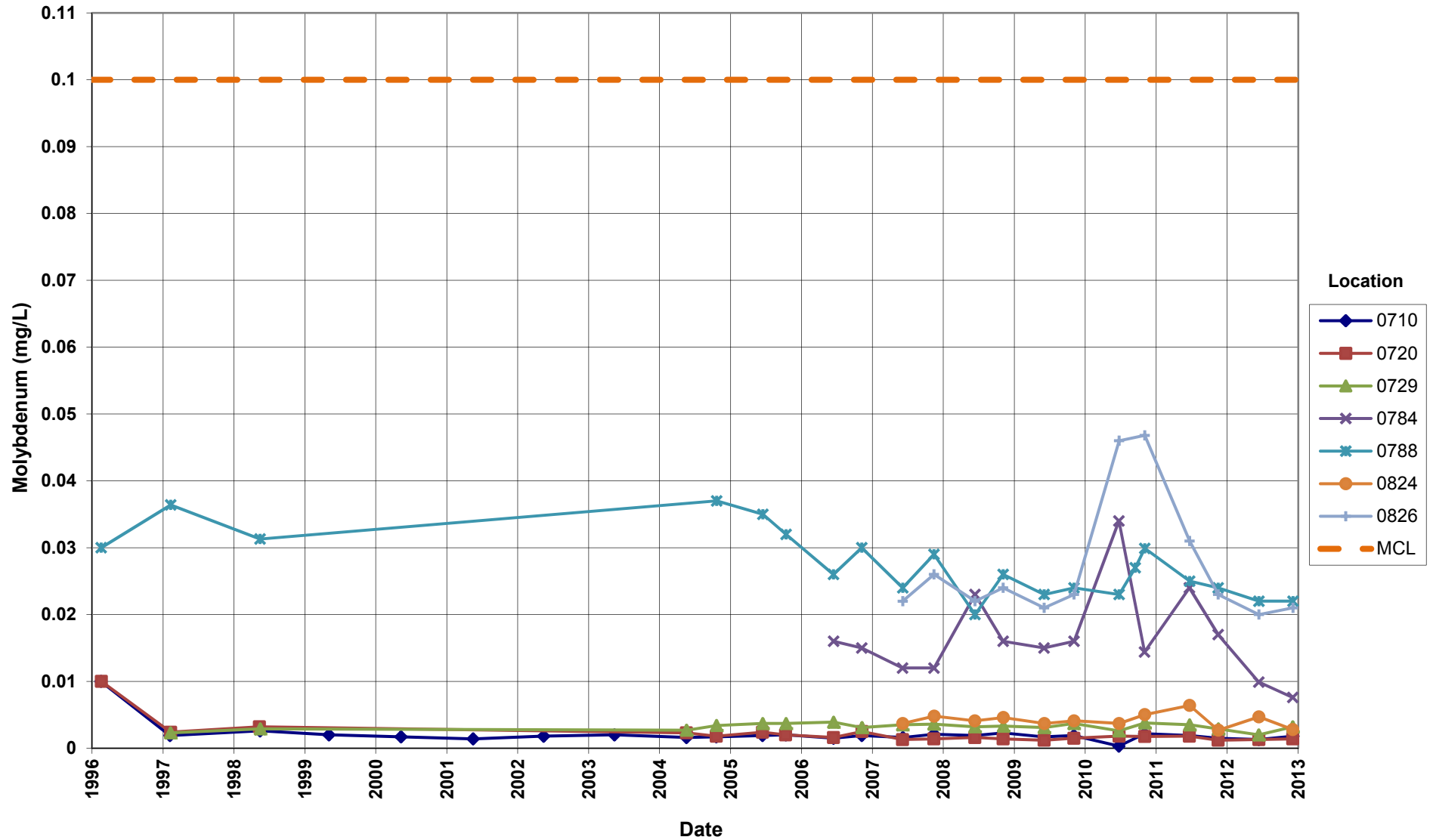
Riverton Processing Site
Manganese Concentration
Surficial Aquifer Locations



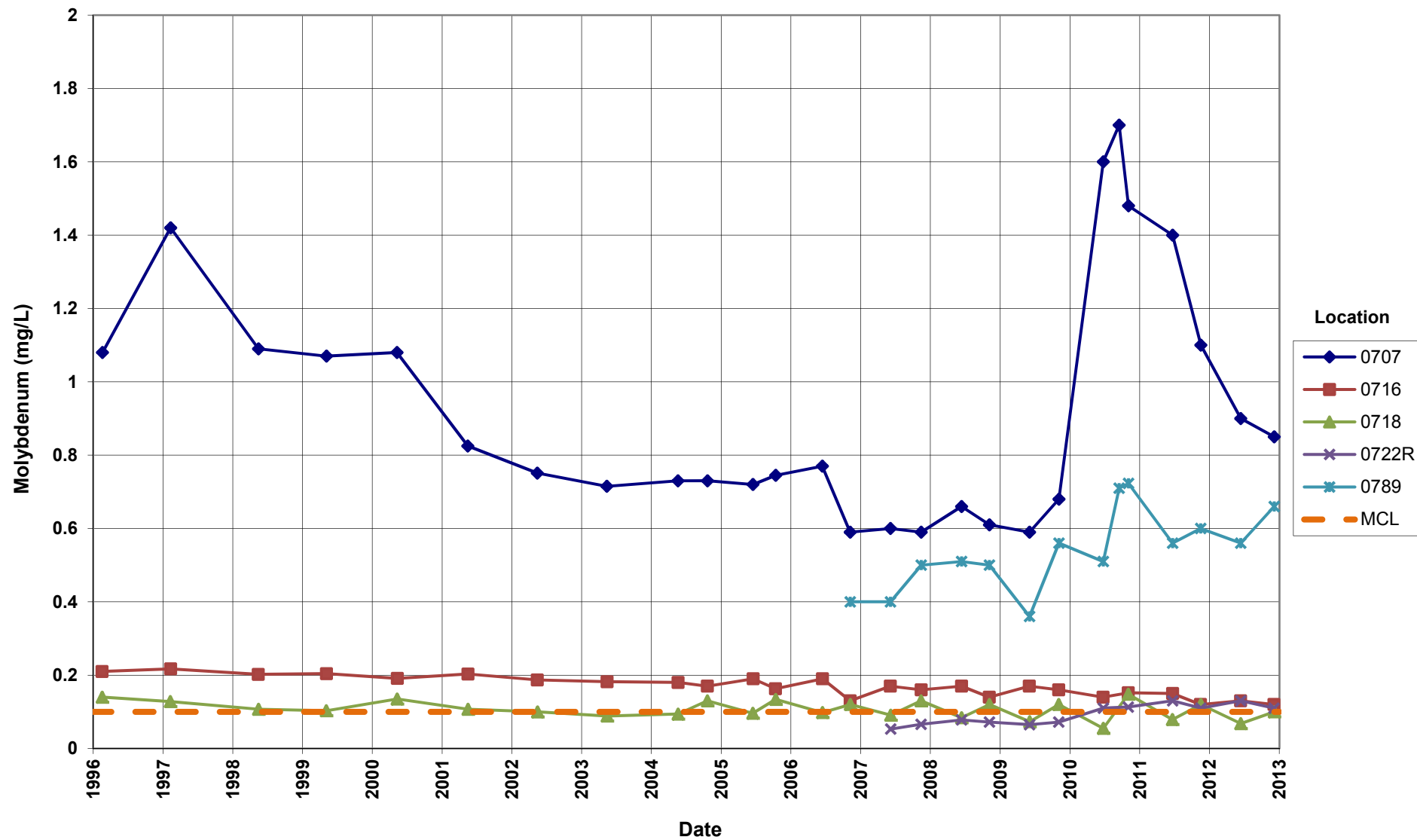
Riverton Processing Site
Molybdenum Concentration
Semi-confined Aquifer Locations
Maximum Concentration Limit (MCL) = 0.1 mg/L



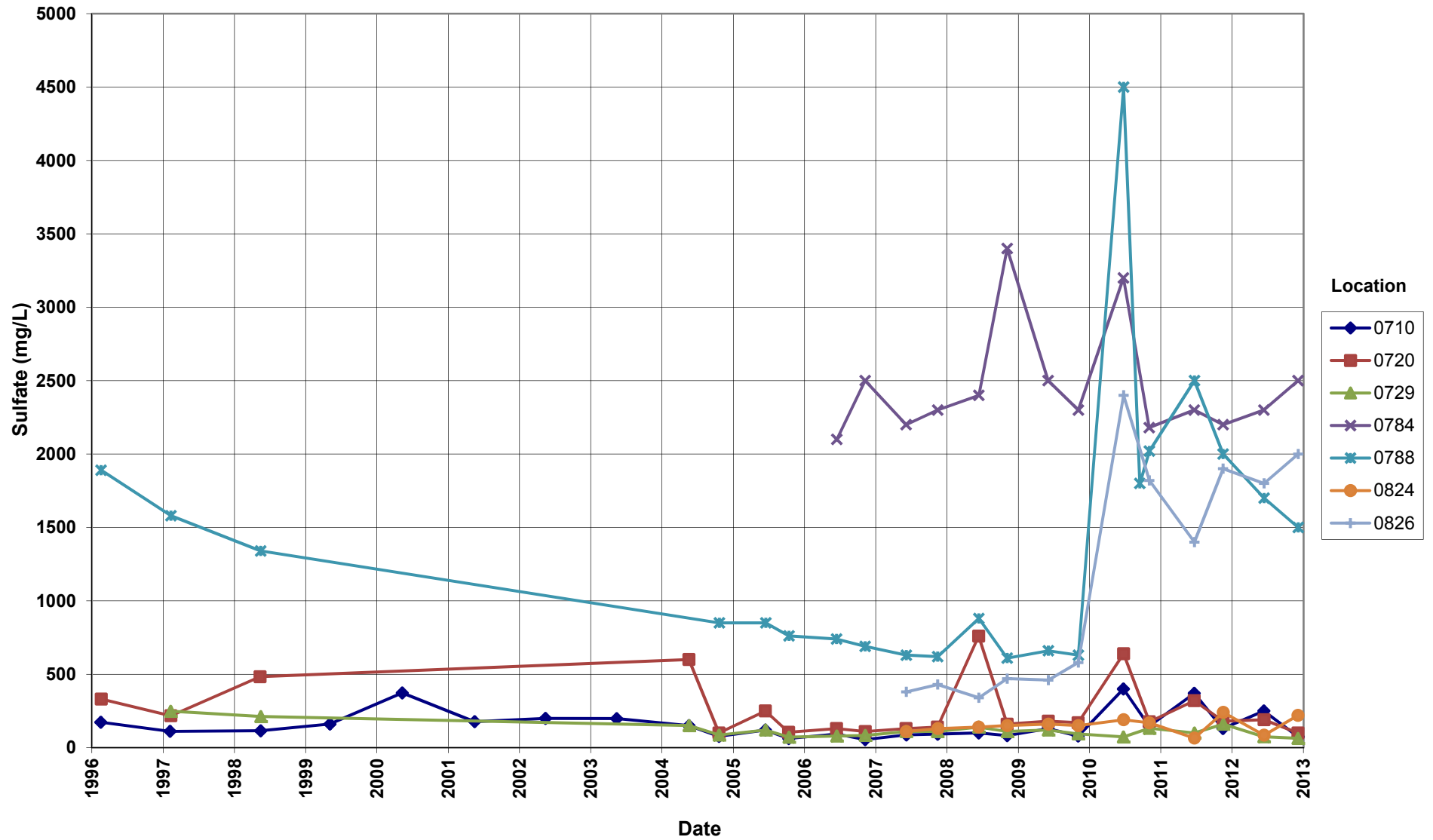
Riverton Processing Site
Molybdenum Concentration
Surficial Aquifer Locations
Maximum Concentration Limit (MCL) = 0.1 mg/L



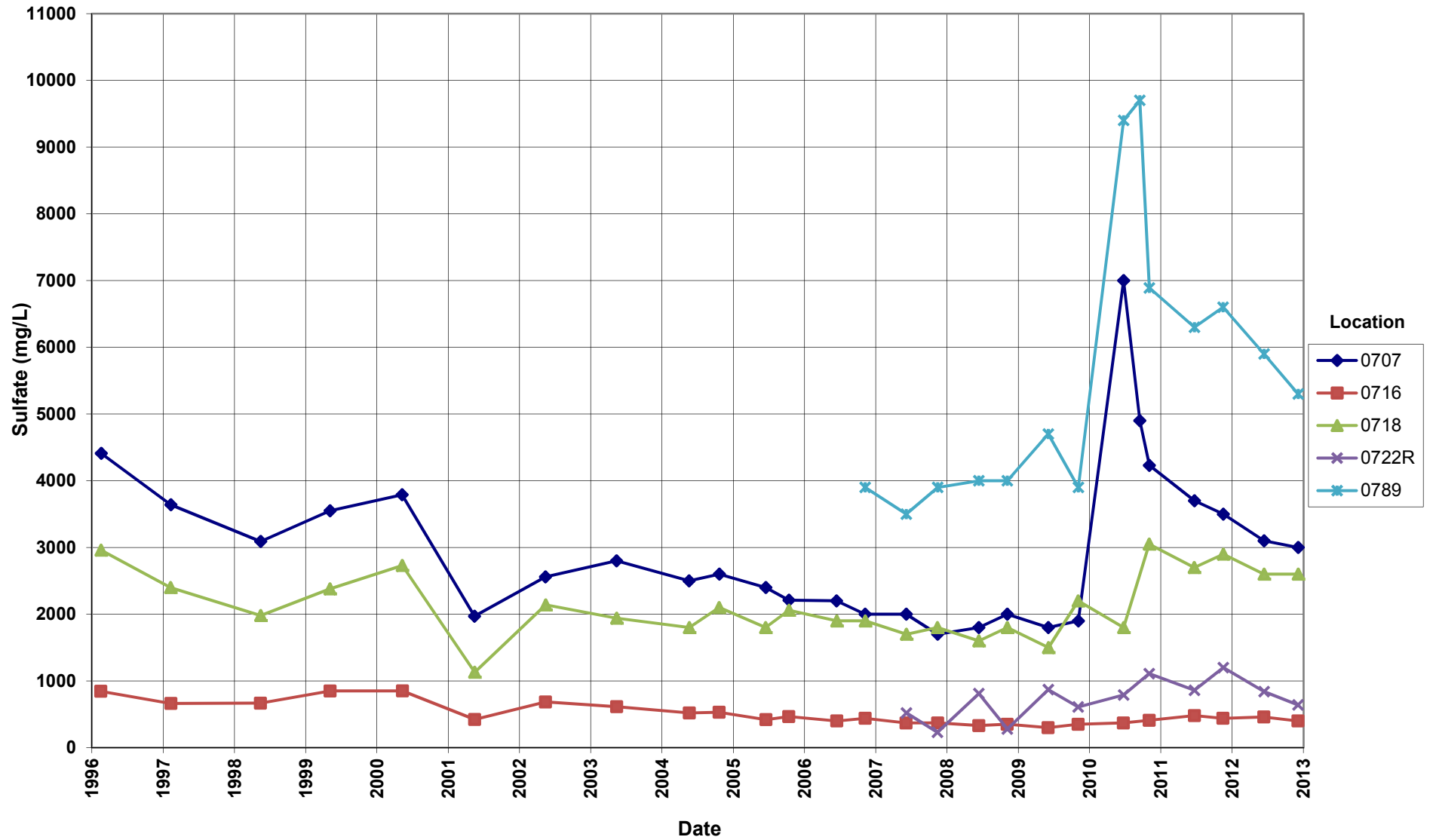
Riverton Processing Site
Molybdenum Concentration
Surficial Aquifer Locations
Maximum Concentration Limit (MCL) = 0.1 mg/L



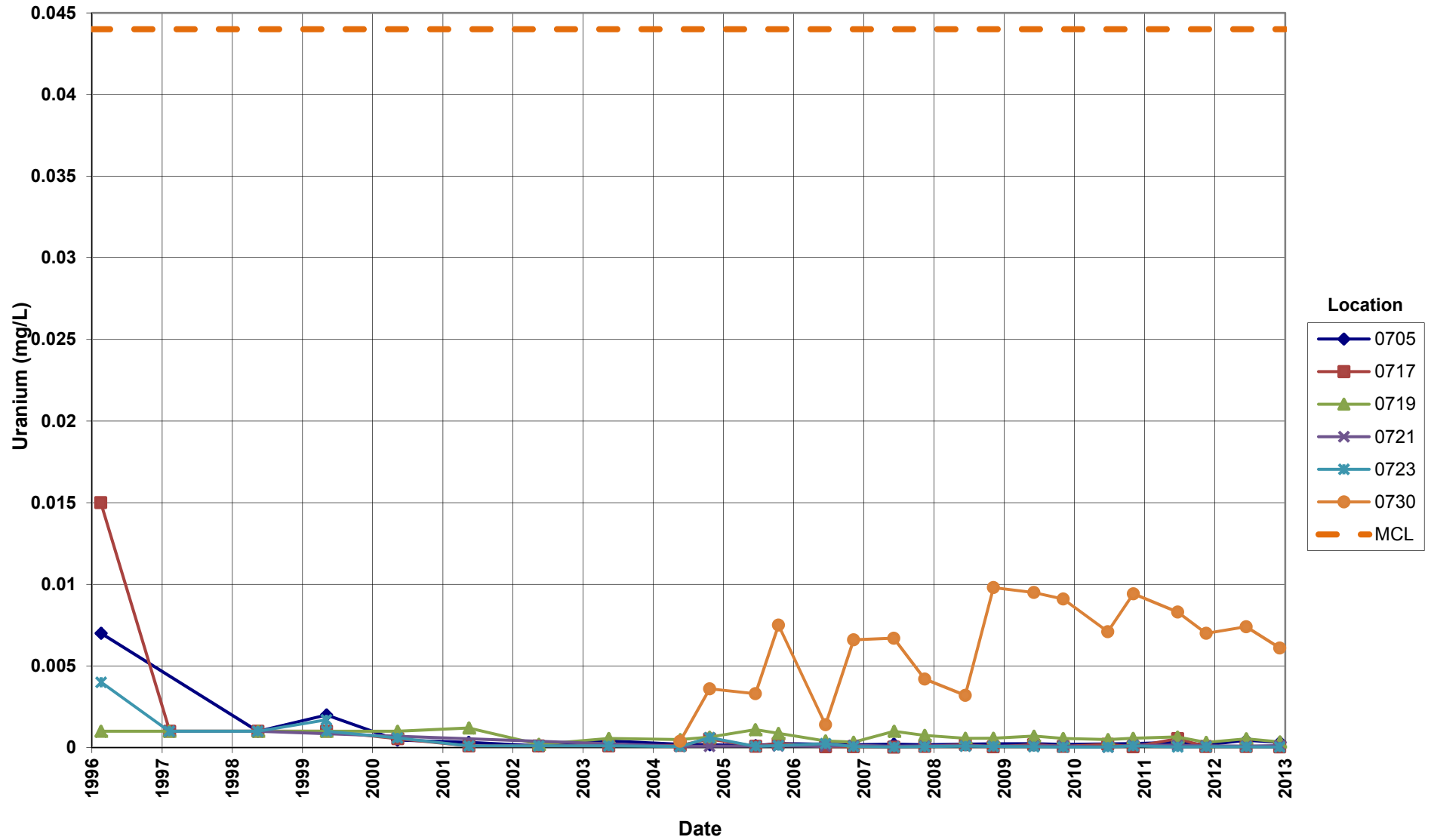
Riverton Processing Site
Sulfate Concentration
Surficial Aquifer Locations



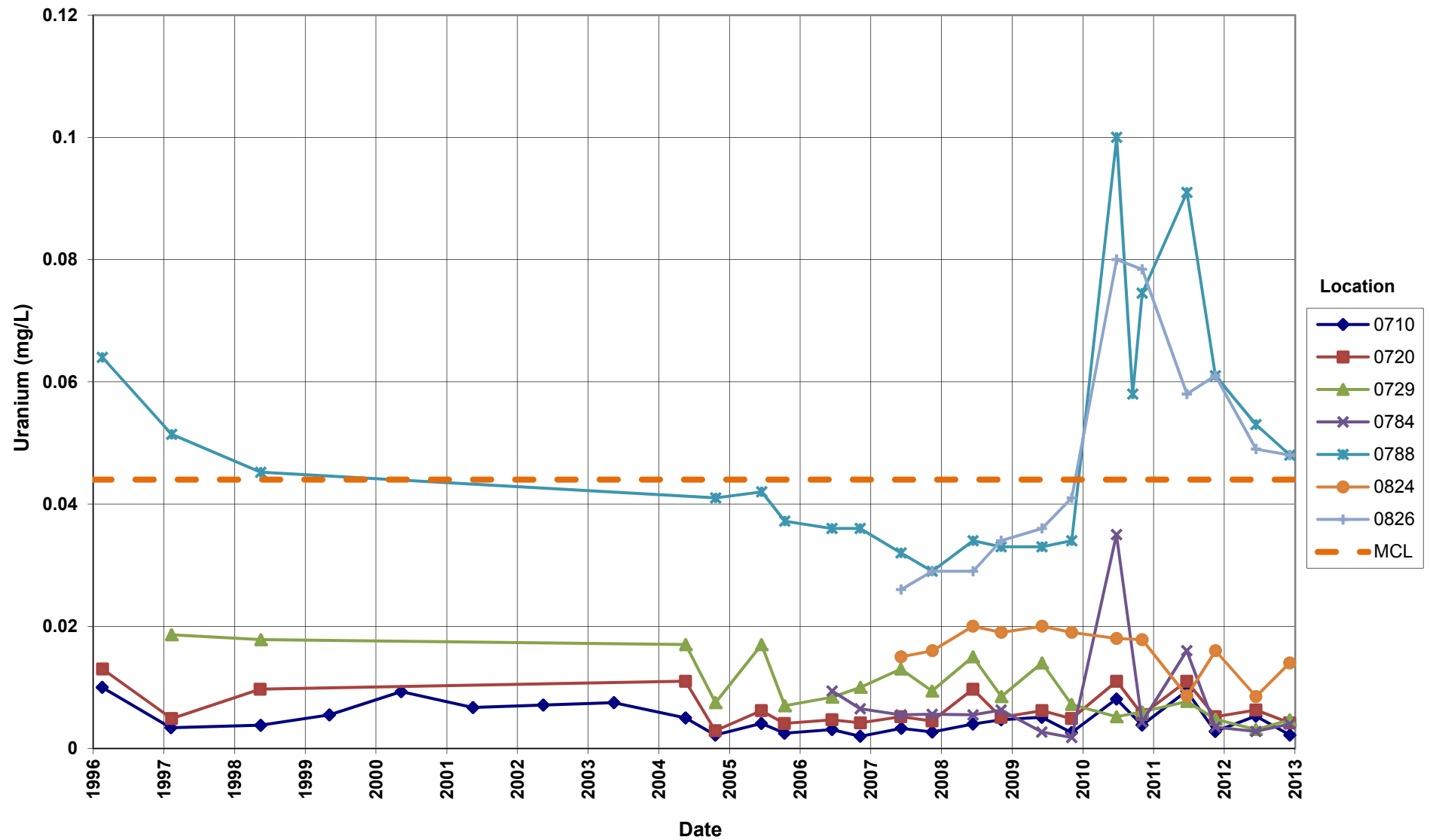
Riverton Processing Site
Sulfate Concentration
Surficial Aquifer Locations



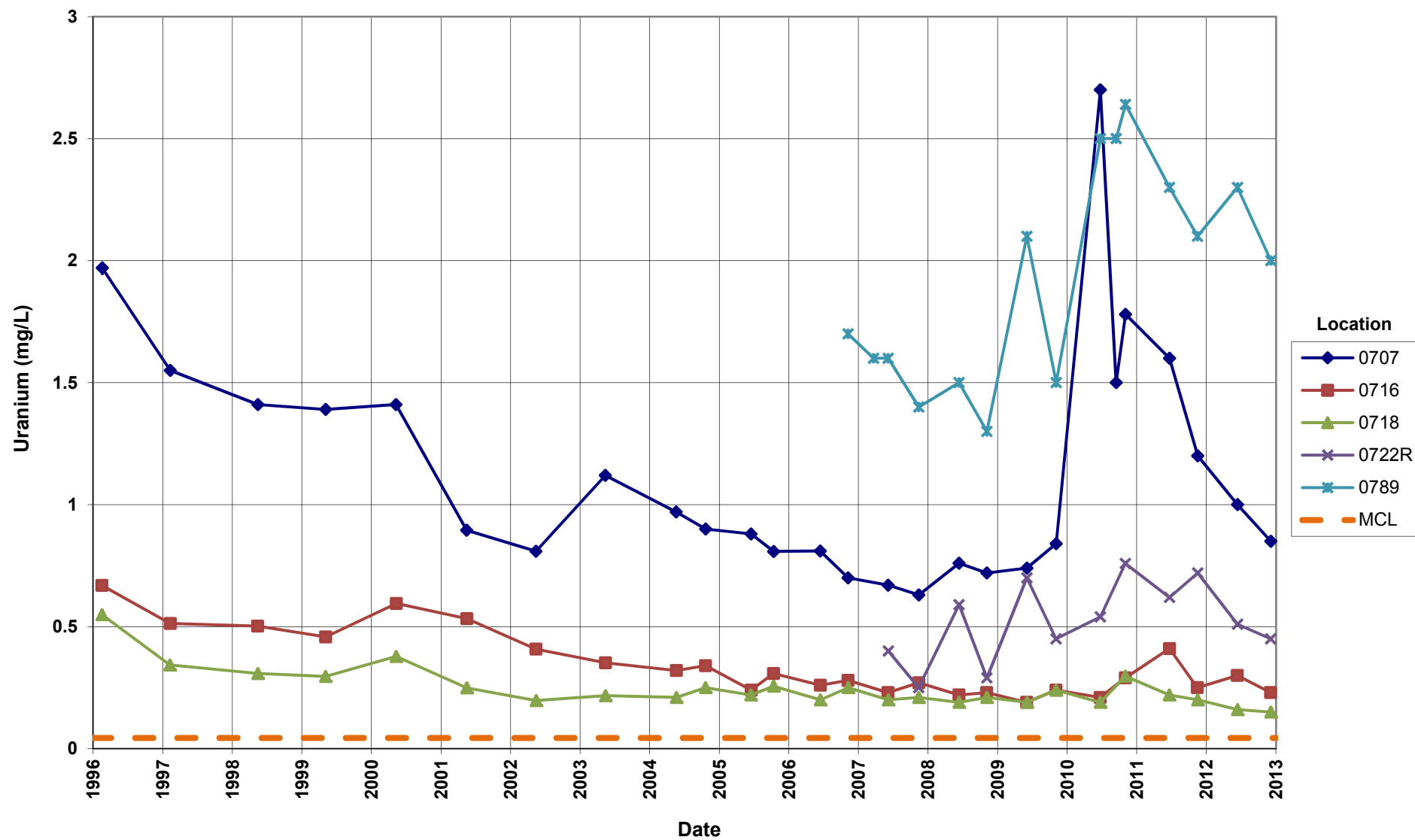
Riverton Processing Site
Uranium Concentration
Semi-Confined Aquifer Locations
Maximum Concentration Limit (MCL) = 0.044 mg/L



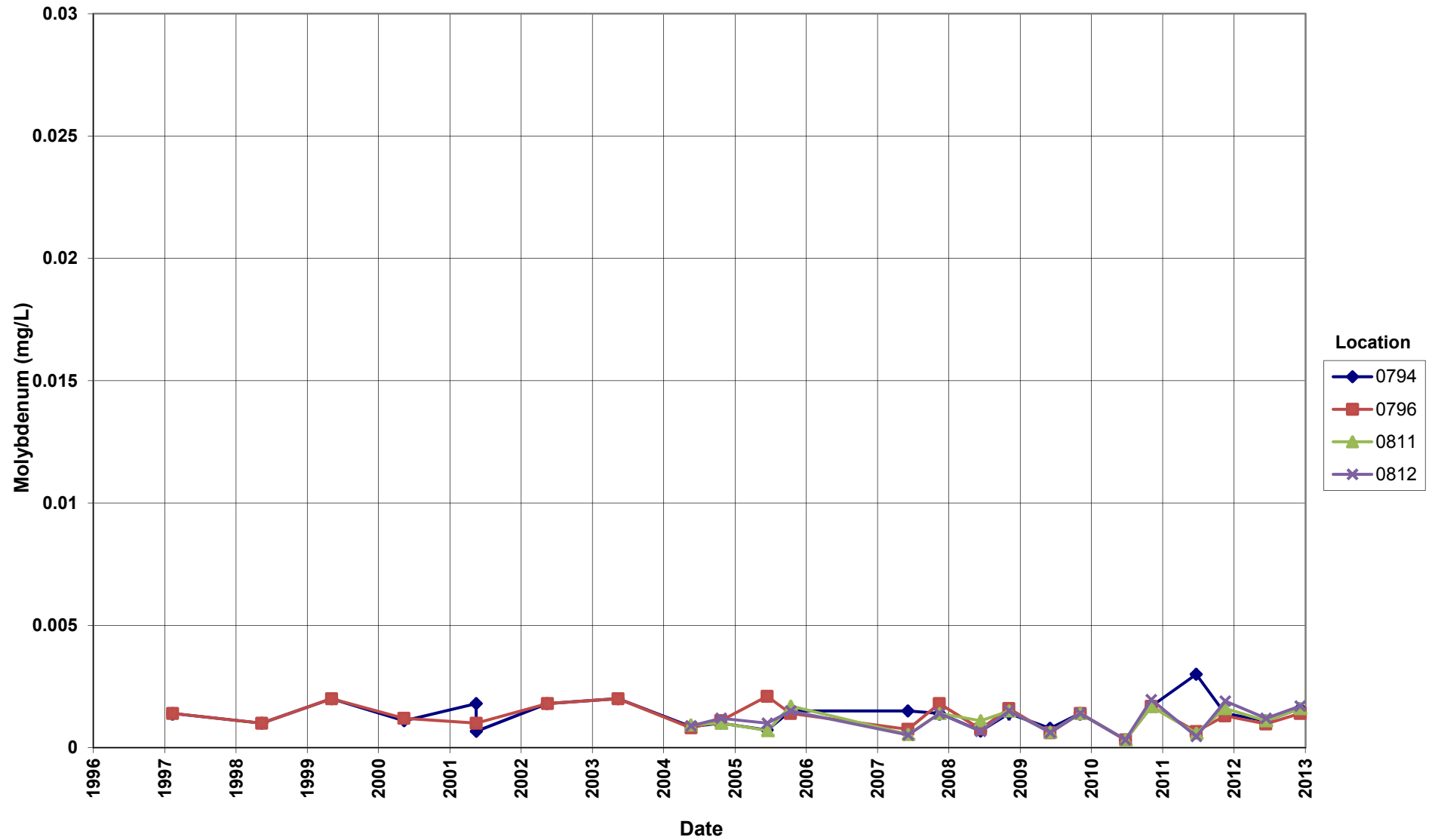
Riverton Processing Site
Uranium Concentration
Surficial Aquifer Locations
Maximum Concentration Limit (MCL) = 0.044 mg/L



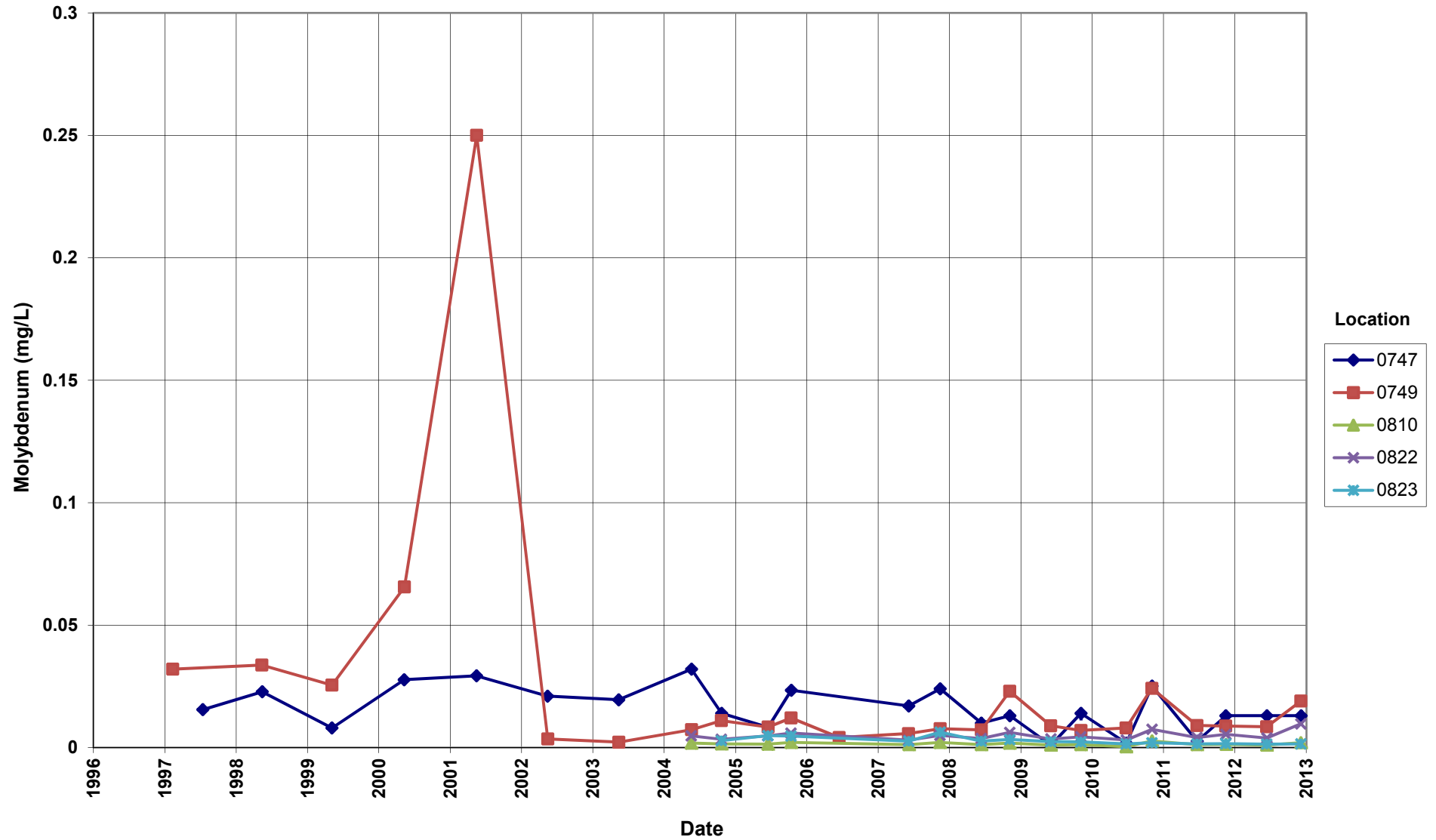
Riverton Processing Site
Uranium Concentration
Surficial Aquifer Locations
Maximum Concentration Limit (MCL) = 0.044 mg/L



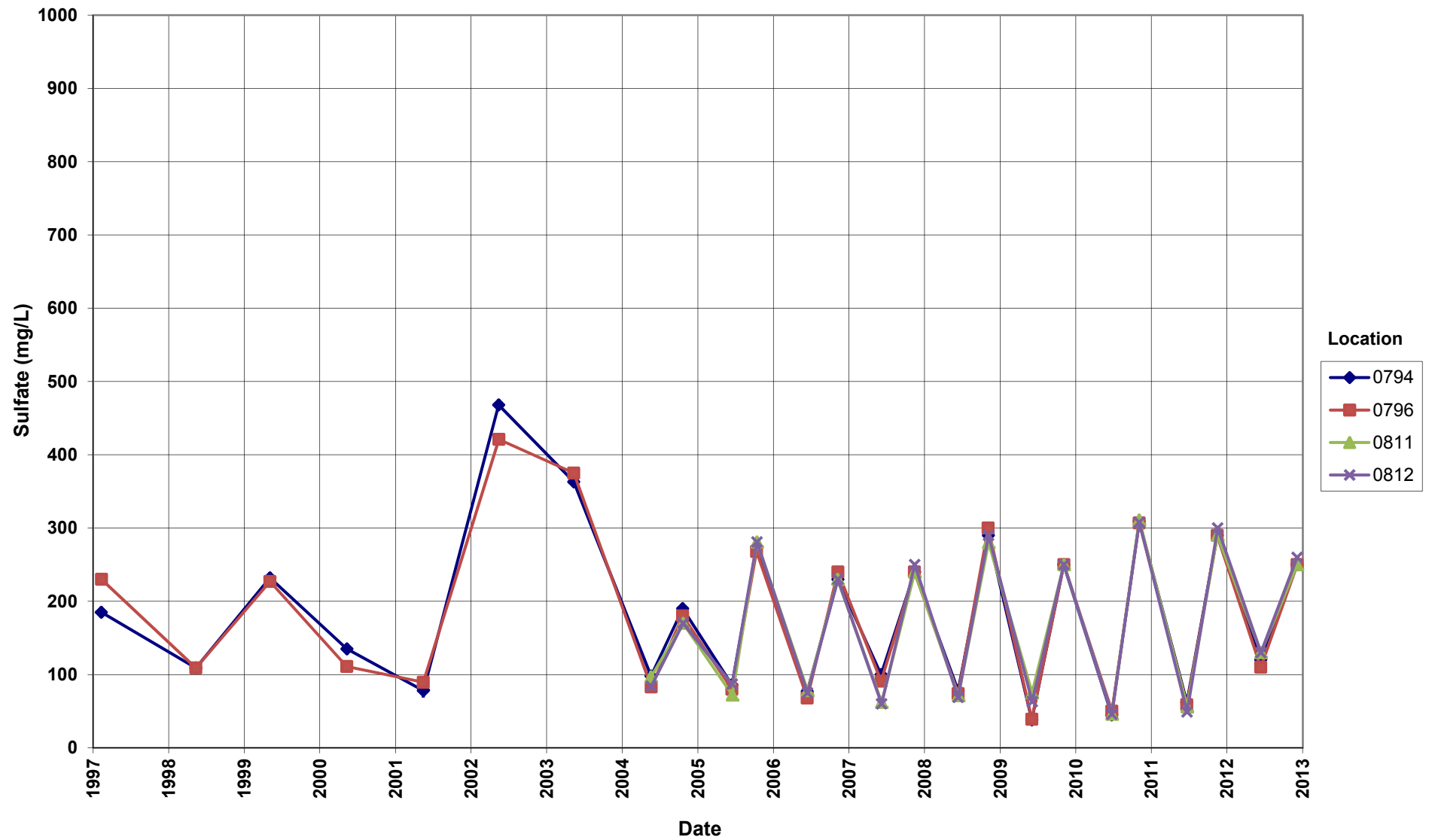
Riverton Processing Site
Molybdenum Concentration
Little Wind River Surface Water Locations



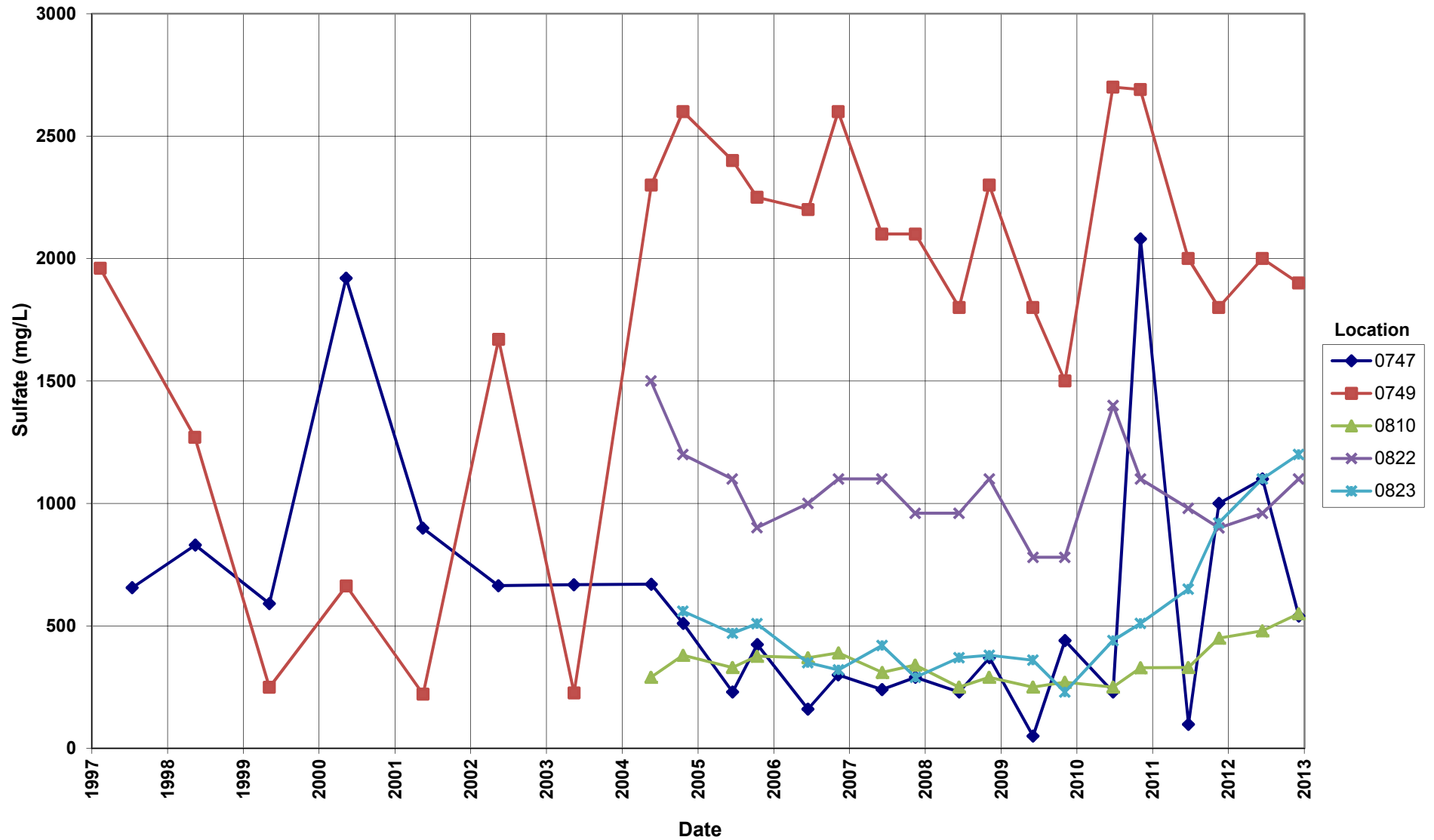
Riverton Processing Site
Molybdenum Concentration
Oxbow Lake, Wetlands, Ditch & Pond Surface Water Locations



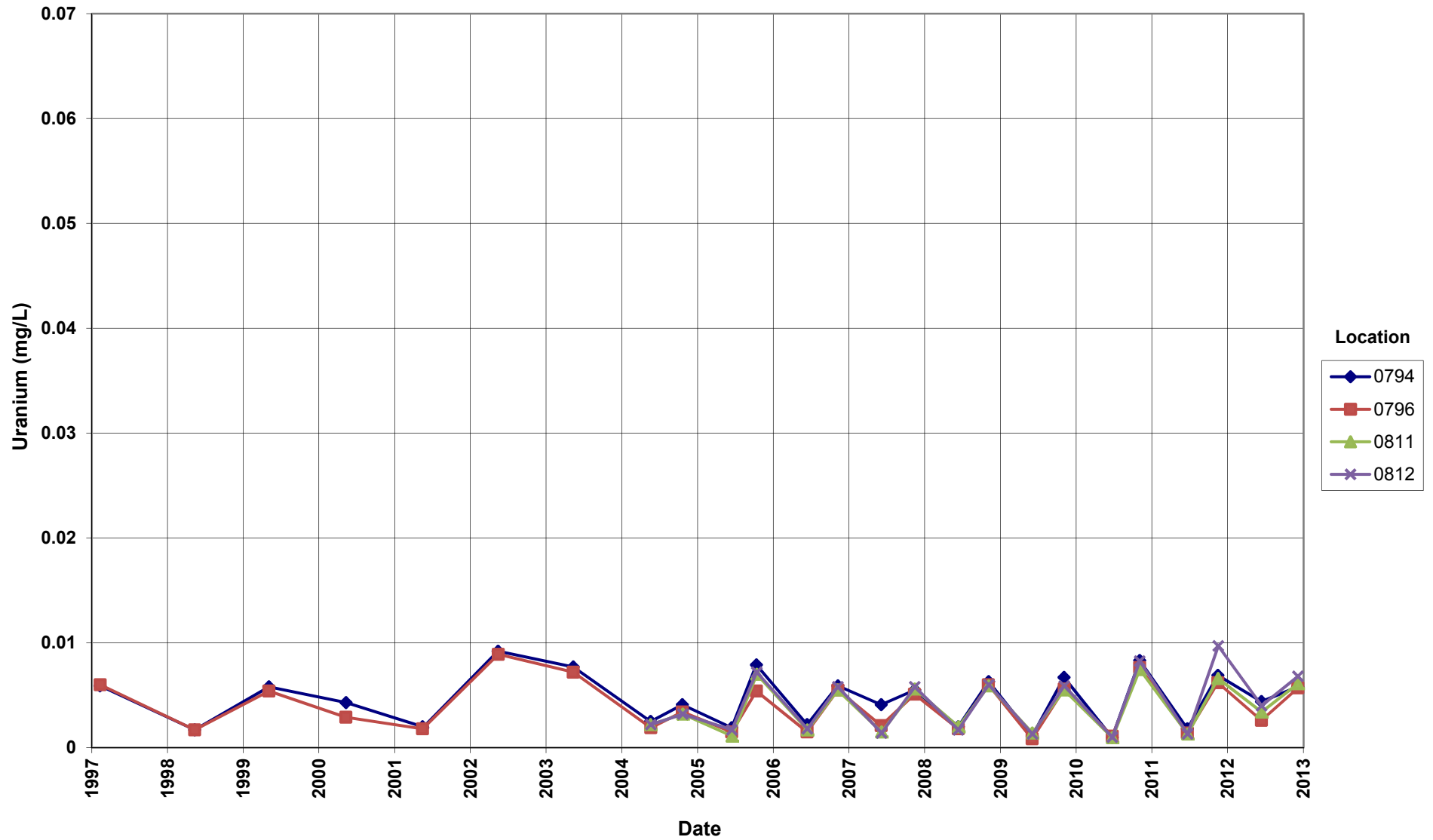
Riverton Processing Site
Sulfate Concentration
Little Wind River Surface Water Locations



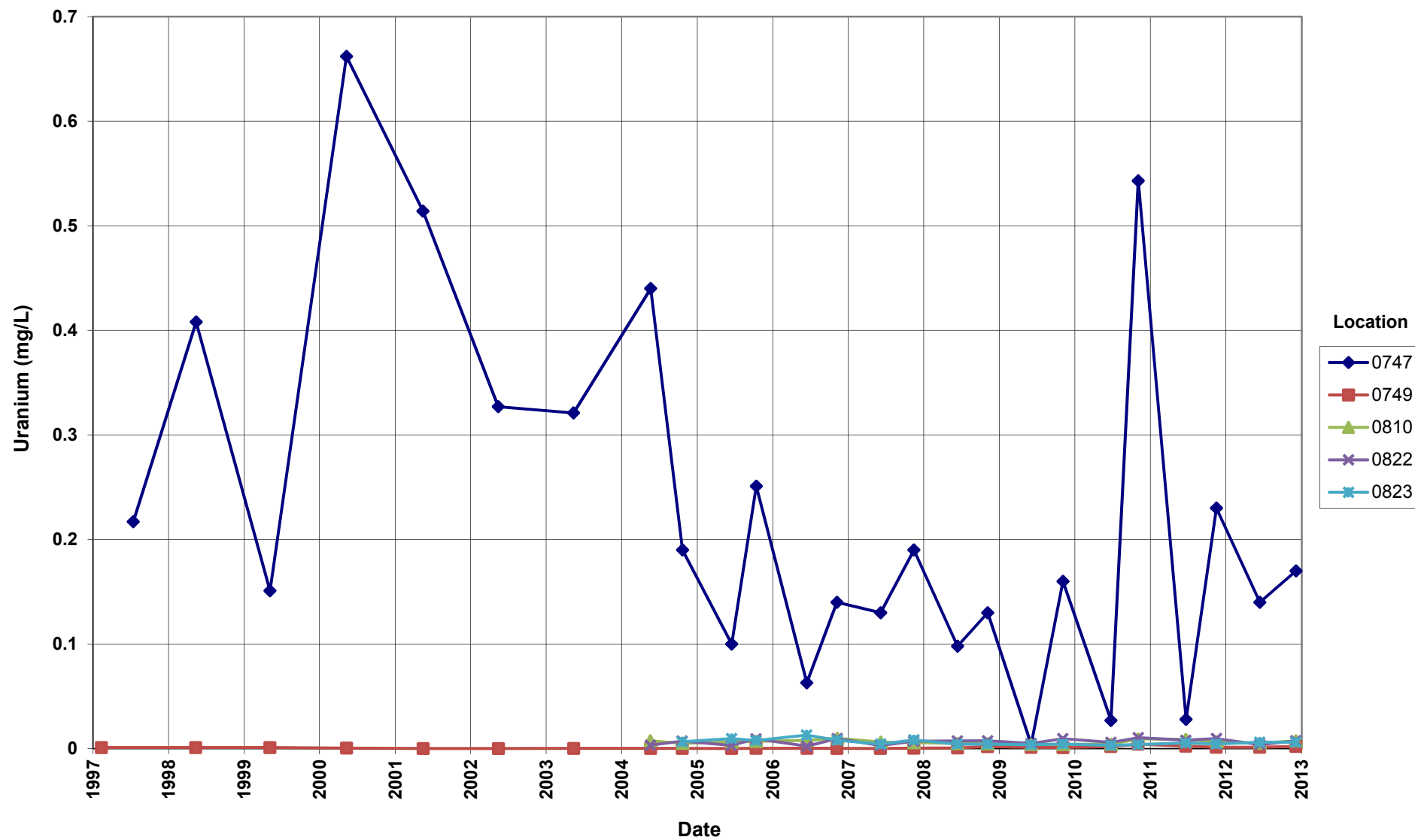
Riverton Processing Site
Sulfate Concentration
Oxbow Lake, Wetlands, Ditch & Pond Surface Water Locations



Riverton Processing Site
Uranium Concentration
Little Wind River Surface Water Locations



Riverton Processing Site
Uranium Concentration
Oxbow Lake, Wetlands, Ditch & Pond Surface Water Locations



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Attachment 3
Sampling and Analysis Work Order

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established 1959

Task Order LM00-501
Control Number 13-0114

November 9, 2012

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

SUBJECT: Contract No. DE-AM01-07LM00060, S.M. Stoller Corporation (Stoller)
December 2012 Environmental Sampling at the Riverton, Wyoming,
Processing Site

REFERENCE: Task Order LM-501-02-117-402, Riverton, Wyoming, Processing Site

Dear Dr. Gil:

The purpose of this letter is to inform you of the upcoming sampling event at Riverton, Wyoming. Enclosed are the map and tables specifying sample locations and analytes for monitoring at the Riverton processing site. Water quality data will be collected from monitoring wells, domestic wells, and surface locations at this site as part of the routine environmental sampling currently scheduled to begin the week of December 3, 2012.

The following lists show the monitoring wells (with zone of completion), surface locations, and domestic wells scheduled to be sampled during this event.

Monitoring Wells*

705 Se	716 Sf	719 Se	722R Sf	730 Se	788 Sf	824 Sf
707 Sf	717 Se	720 Sf	723 Se	784 Sf	789 Sf	826 Sf
710 Sf	718 Sf	721 Se	729 Sf			

*NOTE: Se = Semi-confined sandstone; Sf = surficial

Surface Locations

747	794	810	811	812	822	823
749	796					

Domestic Wells

405	430	436	460	828	841	842
422						

Dr. April Gil
Control Number 13-0114
Page 2

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

Please contact me at (970) 248-6654 if you have any questions.

Sincerely,



Sam Campbell
Site Lead

SC/lcg/lb

Enclosures (3)

cc: (electronic)

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

Sampling Frequencies for Locations at Riverton, Wyoming

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
101					X	WL only
110					X	WL only
111					X	WL only
700					X	WL only
702					X	Data logger
705	X					
707	X					Data logger
709					X	WL only; Data logger
710	X					
716	X					
717	X					
718	X					
719	X					
720	X					
721	X					
722R	X					
723	X					
724					X	WL only
725					X	WL only
726					X	WL only
727					X	WL only
728					X	WL only
729	X					
730	X					
732					X	WL only
733					X	WL only
734					X	WL only
736					X	WL only
784	X					
788	X					
789	X					Data logger
824	X					
826	X					
Surface Locations						
747	X					
749	X					
794	X					
796	X					
810	X					Gravel pit
811	X					Little Wind River
812	X					Little Wind River
822	X					
823	X					

Sampling Frequencies for Locations at Riverton, Wyoming

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Domestic Wells						
405	X					921 Rendezvous Road
422	X					10 Whitetail Drive
430	X					204 Goes in Lodge Road
436	X					33 St Stephens Road
460	X					140 Goes in Lodge Road
828	X					33 St Stephens Road
841	X					22 Whitetail Dr
842	X					14 Whitetail Dr

Quarterly sampling conducted in December, March, June, and August

Constituent Sampling Breakdown

Site	Riverton				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	138	36			
<i>Field Measurements</i>					
Alkalinity	X	X			
Dissolved Oxygen	X	X			
Redox Potential	X	X			
Residual Chlorine					
pH	X	X			
Specific Conductance	X	X			
Turbidity	X	X			
Temperature	X	X			
<i>Laboratory Measurements</i>					
Aluminum					
Ammonia as N (NH ₃ -N)					
Calcium					
Chloride					
Chromium					
Gross Alpha					
Gross Beta					
Iron					
Lead					
Magnesium					
Manganese	X	X	0.005	SW-846 6010	LMM-01
Molybdenum	X	X	0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO ₃ +NO ₂)-N					
Potassium					
Radium-226		0822 only	1 pCi/L	Gas Proportional Counter	GPC-A-018
Radium-228		0822 only	1 pCi/L	Gas Proportional Counter	GPC-A-020
Selenium					
Silica					
Sodium					
Strontium					
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids					
Total Organic Carbon					
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	4	6			

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

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Attachment 4

Trip Report

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Memorandum

DATE: December 21, 2012

TO: Sam Campbell

FROM: David Atkinson

SUBJECT: Trip Report

Site: Riverton processing site.

Dates of Sampling Event: 12/3/2012 – 12/6/2012.

Team Members: David Atkinson, Dan Sellers.

Number of Locations Sampled: 18 monitoring well locations, 9 surface locations, and 8 domestic locations were sampled. In addition 3 quality control samples were collected, including 2 duplicate samples and 1 equipment blank.

Locations Not Sampled/Reason: None.

Location Specific Information: Dataloggers were downloaded at the following 5 locations: 0101, 0101, 0707, 0710, 0716, and 0789.

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

QC Sample Type	Ticket Number	False ID	Sample Date/Time	True ID
Duplicate	KMW 756	2175	12-03-12/1200	0430
Duplicate	KMW 763	2353	12-05-12/1100	0747
RINST/EQBLANK	KMW 764	2433	12-05-12/1700	N/A

RIN Number Assigned: All samples were assigned to RIN 12114982.

Sample Shipment: Samples were shipped overnight via FedEx to ALS Laboratory Group in Fort Collins, CO from Grand Junction, CO on December 10, 2012.

Water Level Measurements: Water levels at all monitoring wells were measured prior to sampling. Water levels were also measured at the following locations: 0101, 0110, 0111, 0700, 0702, 0709, 0724, 0725, 0726, 0727, 0732, 0733, 0734, and 0736.

Well Inspection Summary: N/A

Field Variance: None.

Equipment: All equipment functioned properly.

Site Issues: The oxbow was dry- no water flowing in or out, all warning signs surrounding the oxbow were up and legible (though fading).

Corrective Action Required/Taken: Gate at entry to the well cluster (i.e. RVT01 0705 and 0709) needs to be replaced.

cc: (electronic)
Bill Dam, DOE
Sam Campbell, Stoller
Steve Donovan, Stoller
EDD Delivery