

## **Data Validation Package for the Old and New Rifle, Colorado, Processing Sites, June 2016**

The U.S. Department of Energy (DOE) has prepared a Data Validation Package containing the groundwater and surface water monitoring data generated from the June 2016 sampling event at the Old and New Rifle, Colorado, Processing Sites. This package includes worksheets and reports that document the sampling activities and validation procedures conducted. **At your request, you are receiving a hard copy of the report.**

The report is also available for your review on the Internet at the DOE Office of Legacy Management (LM) website – <http://energy.gov/lm>. From the LM website home page, select the LM SITES MAP. Then select Rifle Sites from the LM SITES list in the right column. The report will be available on the Old and New Rifle Processing Sites pages under Site Documents and Links.



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# Data Validation Package

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WM-DDDL62

**June 2016**  
**Groundwater and Surface Water**  
**Sampling at the**  
**Old and New Rifle, Colorado,**  
**Processing Sites**

**September 2016**



U.S. DEPARTMENT OF  
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### **Attachment 1—Sampling and Analysis Work Order**

### **Attachment 2—Trip Report**

### **Attachment 3—Data Presentation**

New Rifle Groundwater Quality Data  
New Rifle Surface Water Quality Data  
Old Rifle Groundwater Quality Data  
Old Rifle Surface Water Quality Data  
Equipment Blank Data  
Static Water Level Data  
New Rifle Groundwater Time-Concentration Graphs  
Old Rifle Groundwater Time-Concentration Graphs

### **Attachment 4—Assessment of Anomalous Data**

Potential Outliers Report



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# Sampling Event Summary

**Site:** Old and New Rifle, Colorado, Processing Sites

**Sampling Period:** June 14–17 and July 7, 2016

Water samples were collected from 36 locations at New Rifle and Old Rifle, Colorado, Disposal/Processing Sites. Planned monitoring locations are shown in Attachment 1, Sampling and Analysis Work Order. Duplicate samples were collected from New Rifle locations 0216 and 0855, and Old Rifle location 0655. One equipment blank was collected after decontamination of non-dedicated equipment used to collect one surface water sample. See Attachment 2, Trip Report for additional details. Sampling and analyses were conducted as specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated, <http://energy.gov/lm/downloads/sampling-and-analysis-plan-us-department-energy-office-legacy-management-sites>).

## New Rifle Site

Samples were collected at the New Rifle site from 16 monitoring wells and 7 surface locations in compliance with the December 2008 *Groundwater Compliance Action Plan [GCAP] for the New Rifle, Colorado, Processing Site* (LMS/RFN/S01920). Monitoring well 0216 could not be sampled in June because it was surrounded by standing water due to the high river stage from spring runoff, it was later sampled in July. Monitoring well 0635 and surface location 0322 could not be sampled because access through the elk fence along Interstate 70 has not been completed at this time.

Analytes measured at the New Rifle site included contaminants of concern (COCs) (arsenic, molybdenum, nitrate + nitrite as nitrogen, selenium, uranium, and vanadium) ammonia as nitrogen, major cations, and major anions. Field measurements of total alkalinity, oxidation-reduction potential, pH, specific conductance, turbidity, and temperature were made at each location, and the water level was measured at each sampled well. A proposed alternate concentration limit (ACL) for vanadium of 50 milligrams per liter (mg/L), specific to the point-of-compliance (POC) wells (RFN-0217, -0659, -0664, and -0669) is included in the New Rifle Groundwater Compliance Action Plan (GCAP). Vanadium concentrations in the POC wells were below the proposed ACL as shown in the time-concentration graphs in Attachment 3, Data Presentation.

The surface water locations were sampled to monitor the impact of groundwater discharge. COC concentrations at Colorado River surface water locations RFN-0324 and RFN-0326, downgradient of the site, remained low and were consistent with historical results, indicating no impact to the river due to groundwater discharge. In many cases, elevated COC concentrations at the New Rifle site pond locations were observed. As noted in the GCAP, this indicates impacts from groundwater discharge to the ponds.

## Old Rifle Site

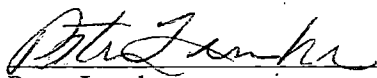
Samples were collected at the Old Rifle site from eight monitoring wells and five surface locations in compliance with the December 2001 *Ground Water Compliance Action Plan for the Old Rifle, Colorado, UMTRA Project Site* (GJO-2000-177-TAR).

Analytes measured at the Old Rifle site included COCs (selenium, uranium, and vanadium), major cations, and major anions. Field measurements of total alkalinity, oxidation-reduction potential, pH, specific conductance, turbidity, and temperature were made at each location, and the water level was measured at each sampled well.

The monitoring strategy described in the GCAP is designed to determine progress of the natural flushing process in meeting compliance standards for site COCs. Standards for selenium and vanadium are the proposed ACLs of 0.05 mg/L and 1.0 mg/L, respectively. For uranium the cleanup goal is the UMTRA standard of 0.044 mg/L or background, whichever is higher. As shown in the time concentration graphs, the uranium concentration exceeds the cleanup goal at groundwater monitoring locations RFO-0304, -0305, -0310, -0655, and -0656.

The surface water locations were sampled to monitor the impact of groundwater discharge at Colorado River surface water locations adjacent to (RFO-0396) and downgradient of the site (RFO-0741). COC concentrations remain low and consistent with historical concentrations, which indicate no impact from groundwater discharge to the river.

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



Peter Lemke

Navarro Research and Engineering, Inc.

17 October 2016

Date

## **Data Assessment Summary**

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## Water Sampling Field Activities Verification Checklist

<b>Project</b>	<u>Rifle, Colorado</u>	<b>Date(s) of Water Sampling</b>	<u>June 14–17 and July 7, 2016</u>
<b>Date(s) of Verification</b>	<u>August 24, 2016</u>	<b>Name of Verifier</b>	<u>Stephen Donovan</u>

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures?  List any Program Directives or other documents, SOPs, instructions.	Yes	<u>Work Order letter dated May 4, 2016.</u>
2. Were the sampling locations specified in the planning documents sampled?	No	<u>Locations 0635 and 0322 were not sampled due to access issues.</u>
3. Were field equipment calibrations conducted as specified in the above-named documents?	Yes	<u>Calibrations were performed on June 13 and July 7, 2016.</u>
4. Was an operational check of the field equipment conducted daily?  Did the operational checks meet criteria?	Yes	
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	Yes	
6. Were wells categorized correctly?	Yes	
7. Were the following conditions met when purging a Category I well:  Was one pump/tubing volume purged prior to sampling?	Yes	
Did the water level stabilize prior to sampling?	Yes	
Did pH, specific conductance, and turbidity measurements meet criteria prior to sampling?	Yes	
Was the flow rate less than 500 mL/min?	Yes	

### Water Sampling Field Activities Verification Checklist (continued)

	Response (Yes, No, NA)	Comments
8. Were the following conditions met when purging a Category II well:		
Was the flow rate less than 500 mL/min?	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 at locations 0216, 0855, and 0655.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	Yes	One equipment blank was collected.
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

Task ID: RFN01.1-16060001  
Sample Event: June 14–17, 2016  
Site(s): New Rifle Processing Site, Colorado  
Laboratory: ALS Laboratory Group, Fort Collins, Colorado  
Work Order No.: 1606412  
Analysis: Metals and Wet Chemistry  
Validator: Stephen Donovan  
Review Date: August 17, 2016

This validation was performed according to “Standard Practice for Validation of Environmental Data” found in Appendix A of the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated, <http://energy.gov/lm/downloads/sampling-and-analysis-plan-us-department-energy-office-legacy-management-sites>). The procedure was applied at Level 3, Data Validation.

This validation includes the evaluation of data quality indicators (DQIs) associated with the data. DQIs are the quantitative and qualitative descriptors that are used to interpret the degree of acceptability or utility of data. Indicators of data quality include the analysis of laboratory control samples to assess accuracy; duplicates and replicates to assess precision; and interference check samples to assess bias (see attached Data Validation Worksheets). The DQIs comparability, completeness, and sensitivity are also evaluated in the sections to follow.

All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Ammonia as N	WCH-A-005	EPA 350.1	EPA 350.1
Arsenic, Molybdenum, Selenium, Uranium, Vanadium	LMM-02	SW-846 3005A	SW-846 6020
Calcium, Magnesium, Potassium, Sodium	LMM-01	SW-846 3005A	SW-846 6010
Chloride, Sulfate	MIS-A-045	SW-846 9056	SW-846 9056
Nitrate + Nitrite as N	WCH-A-022	EPA 353.2	EPA 353.2



## Data Qualifier Summary

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

*Table 2. Data Qualifier Summary*

Sample Number	Location	Analyte(s)	Flag	Reason
1606412-13	0453	Chloride	J	Exceeded holding time
1606412-13	0453	Sulfate	J	Exceeded holding time
1606412-14	0575	Chloride	J	Exceeded holding time
1606412-14	0575	Sulfate	J	Exceeded holding time
1606412-15	0590	Chloride	J	Exceeded holding time
1606412-15	0590	Sulfate	J	Exceeded holding time
1606412-19	0664	Chloride	J	Exceeded holding time
1606412-19	0664	Sulfate	J	Exceeded holding time
1606412-21	0670	Chloride	J	Exceeded holding time
1606412-21	0670	Sulfate	J	Exceeded holding time
1606412-22	0855	Sulfate	J	Field duplicate precision
1606412-23	0855 Duplicate	Chloride	J	Exceeded holding time
1606412-23	0855 Duplicate	Sulfate	J	Exceeded holding time

## Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received 24 water samples on June 22, 2016, accompanied a Chain of Custody form. The Chain of Custody form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The receiving documentation included copies of the air bills. The Chain of Custody form was complete with no errors or omissions.

## Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced coolers at 1.3 °C and 2.4 °C, which complies with requirements. All samples were analyzed within the applicable holding times, with the exception of six locations for chloride and sulfate analysis. These samples were initially analyzed within holding time but were reanalyzed out of holding time to resolve laboratory errors. Chloride and sulfate results for these samples are qualified with a "J" flag as estimated values. All samples were received in the correct container types and had been preserved correctly for the requested analyses.

## Detection and Quantitation Limits

The method detection limit (MDL) was reported for all analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and

reported with 99 percent confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL. The reported MDLs for all analytes demonstrate compliance with contractual requirements.

#### Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial calibration verification (ICV) demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification (CCV) demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument calibrations and calibration verifications were performed correctly in accordance with the cited methods.

##### *Method EPA 350.1 Ammonia as N*

Calibrations were performed using six calibration standards on July 8, 2016. 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

##### *Method EPA 353.2 Nitrate + Nitrite as N*

Calibrations were performed using seven calibration standards on July 1, 2016. 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

##### *Method SW-846 6010 Ca, Mg, K, Na*

Calibrations were performed on June 25, 2016, using three 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL and all results were within the acceptance range.

##### *Method SW-846 6020 As, Mo, Se, U, V*

Calibrations were performed on June 25–30, 2016, 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL and all results were within the acceptance range. 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 Chloride, Sulfate*

Calibrations were performed using six calibration standards on July 14, 2016. 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

### Method and Calibration Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. Calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis. All method-blank and calibration-blank results associated with the samples were below the PQL for all analytes. In cases where the blank concentration exceeds the MDL, associated sample results that are greater than the MDL but less than 5 times the blank concentration are qualified with a "U" flag as not detected.

### Inductively Coupled Plasma Interference Check Sample Analysis

Interference check samples are analyzed to verify the instrumental interelement and background correction factors and assess any bias due to interelement interferences. Interference check samples were analyzed at the required frequency with all results meeting the acceptance criteria.

### Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike concentration. The spike results met the recovery and precision criteria for all analytes evaluated.

### Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. All replicate results met these criteria, demonstrating acceptable precision.

### Laboratory Control Sample

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

### Metals Serial Dilution

Serial dilutions were prepared and analyzed for the metals analyses to monitor chemical or physical interferences in the sample matrix. Serial dilution data are evaluated when the

concentration of the undiluted sample is greater than 50 times the MDL. All evaluated serial dilution data were acceptable.

#### Completeness

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

#### Electronic Data Deliverable (EDD) File

The EDD file arrived on July 31, 2016. The EDD was examined to verify that the file was complete and in compliance with requirements. The contents of the file were compared 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.

#### Anion/Cation Balance

Environmental water should be electrically neutral. Expressed in milliequivalents per liter (meq/L), the sum of the anions should equal the sum of the cations. The anion/cation balance is calculated as the difference between the anions and cations, divided by the sum of the anions and cations. The anion/cation balance can be used to identify potential errors in the analytical results. Typically, a charge balance of less than 10 percent is considered acceptable. When a charge balance is greater than 10 percent, the associated data are closely examined for error. If no errors are found, the results are considered to be acceptable. Table 3 shows the total anion and cation results from this event and the charge balance.

Table 3. Comparison of Major Anions and Cations

Location	Cations (meq/L)	Anions (meq/L)	Charge Balance (%)
0169	26.45	28.96	4.53
0170	35.20	43.87	10.96
0172	130.61	158.30	9.59
0195	12.85	13.57	2.70
0201	49.27	50.75	1.48
0215	17.15	18.02	2.49
0217	43.06	46.50	3.84
0320	47.30	54.55	7.12
0323	70.99	82.05	7.22
0324	2.82	2.78	0.69
0326	2.74	3.16	7.22
0452	40.48	45.09	5.39
0453	35.60	45.13	11.80
0575	93.27	121.84	13.28
0590	63.82	79.43	10.90
0620	79.79	91.89	7.05
0658	30.99	38.90	11.32
0659	41.75	49.97	8.97
0664	24.00	29.13	9.65
0669	31.22	38.66	10.65
0670	21.69	25.90	8.85
0855	25.55	21.75	8.03

The charge balance exceeded 10 percent at six locations. With the exception of the previously discussed analytical difficulties with the chloride and sulfate analysis, there were no errors noted during the review of these data.

# General Data Validation Report

Page 1 of 1

Task Code: RFN01.1-  
16060001

Lab Code: PAR Validator: Stephen Donovan

Validation Date: 08-17-2016

Project: Rifle, New, Processing Site

# Samples: 23

Analysis Type: ☒ General Chemistry ☒ Metals ☐ Organics ☐ Radiochemistry

## Chain of Custody

## Sample

Present: OK Signed: OK Dated: OK

Integrity: OK Preservation OK Temperature: OK

## Check

## Summary

<b>Holding Times:</b>	There were 13 analyses performed outside the applicable holding times.
<b>Detection Limits:</b>	The reported detection limits are equal to or below the contract required limits.
<b>Field Blanks:</b>	There was 1 field blank associated with this task.
<b>Field Duplicates:</b>	There was 1 duplicate evaluated.

## Metals Data Validation Worksheet

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**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16060001

**Lab Code:** PAR

23-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Arsenic	SW-846 6020	06-25-2016	LCS	105.00		80	120		20				
Arsenic	SW-846 6020	06-25-2016	LCS	107.00		80	120		20				
Arsenic	SW-846 6020	06-25-2016	MB							96		111	MB < MDL
Arsenic	SW-846 6020	06-25-2016	MB							97			MB < MDL
Arsenic	SW-846 6020	06-25-2016	MS	102.00		75	125		20				
Arsenic	SW-846 6020	06-25-2016	MS	107.00		75	125		20				
Arsenic	SW-846 6020	06-25-2016	MSD		103.00	75	125	1	20				
Arsenic	SW-846 6020	06-25-2016	MSD		106.00	75	125	0	20				
Arsenic	SW-846 6020	06-25-2016	R						20				
Arsenic	SW-846 6020	06-25-2016	R						20				
Calcium	SW-846 6010	06-25-2016	LCS	101.00		80	120		20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

## Metals Data Validation Worksheet

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23-Aug-2016

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16060001

**Lab Code:** PAR

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Calcium	SW-846 6010	06-25-2016	LCS	101.00		80	120		20				
Calcium	SW-846 6010	06-25-2016	MB							102	2	103	MB < MDL
Calcium	SW-846 6010	06-25-2016	MB							97	1		MB < MDL
Calcium	SW-846 6010	06-25-2016	MS	100.00		80	120		20				
Calcium	SW-846 6010	06-25-2016	MS	102.00		80	120		20				
Calcium	SW-846 6010	06-25-2016	MSD		98.00	80	120	1	20				
Calcium	SW-846 6010	06-25-2016	MSD		99.00	80	120	2	20				
Calcium	SW-846 6010	06-25-2016	R					3	20				
Calcium	SW-846 6010	06-25-2016	R					0	20				
Magnesium	SW-846 6010	06-25-2016	LCS	101.00		80	120		20				
Magnesium	SW-846 6010	06-25-2016	LCS	102.00		80	120		20				
Magnesium	SW-846 6010	06-25-2016	MB							100	1	106	MB < MDL

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference



# Metals Data Validation Worksheet

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**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16060001

**Lab Code:** PAR

23-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Magnesium	SW-846 6010	06-25-2016	MB							97			MB < MDL
Magnesium	SW-846 6010	06-25-2016	MS	102.00		80	120		20				
Magnesium	SW-846 6010	06-25-2016	MS	98.00		80	120		20				
Magnesium	SW-846 6010	06-25-2016	MSD		98.00	80	120	0	20				
Magnesium	SW-846 6010	06-25-2016	MSD		101.00	80	120	1	20				
Magnesium	SW-846 6010	06-25-2016	R					1	20				
Magnesium	SW-846 6010	06-25-2016	R					2	20				
Molybdenum	SW-846 6020	06-25-2016	LCS	106.00		80	120		20				
Molybdenum	SW-846 6020	06-25-2016	LCS	106.00		80	120		20				
Molybdenum	SW-846 6020	06-25-2016	MB							102		118	MB < MDL
Molybdenum	SW-846 6020	06-25-2016	MB							102			MB < MDL
Molybdenum	SW-846 6020	06-25-2016	MS	105.00		75	125		20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP Interference check RPD: Relative Percent Difference

## Metals Data Validation Worksheet

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**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16060001

**Lab Code:** PAR

23-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Molybdenum	SW-846 6020	06-25-2016	MS	104.00		75	125		20				
Molybdenum	SW-846 6020	06-25-2016	MSD		105.00	75	125	1	20				
Molybdenum	SW-846 6020	06-25-2016	MSD		104.00	75	125	1	20				
Molybdenum	SW-846 6020	06-25-2016	R					13	20				
Molybdenum	SW-846 6020	06-25-2016	R						20				
Potassium	SW-846 6010	06-25-2016	LCS	103.00		80	120		20				
Potassium	SW-846 6010	06-25-2016	LCS	104.00		80	120		20				
Potassium	SW-846 6010	06-25-2016	MB								3	102	MB < MDL
Potassium	SW-846 6010	06-25-2016	MB										MB < MDL
Potassium	SW-846 6010	06-25-2016	MS	108.00		80	120		20				
Potassium	SW-846 6010	06-25-2016	MS	103.00		80	120		20				
Potassium	SW-846 6010	06-25-2016	MSD		107.00	80	120	3	20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

## Metals Data Validation Worksheet

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**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16060001

**Lab Code:** PAR

23-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Potassium	SW-846 6010	06-25-2016	MSD		108.00	80	120	1	20				
Potassium	SW-846 6010	06-25-2016	R						20				
Potassium	SW-846 6010	06-25-2016	R					1	20				
Selenium	SW-846 6020	06-25-2016	LCS	106.00		80	120		20				
Selenium	SW-846 6020	06-25-2016	LCS	106.00		80	120		20				
Selenium	SW-846 6020	06-25-2016	MB							96		117	MB < MDL
Selenium	SW-846 6020	06-25-2016	MB							97			MB < MDL
Selenium	SW-846 6020	06-25-2016	MS	100.00		75	125		20				
Selenium	SW-846 6020	06-25-2016	MS	107.00		75	125		20				
Selenium	SW-846 6020	06-25-2016	MSD		104.00	75	125	3	20				
Selenium	SW-846 6020	06-25-2016	MSD		105.00	75	125	4	20				
Selenium	SW-846 6020	06-25-2016	R						20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

## Metals Data Validation Worksheet

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**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16060001

**Lab Code:** PAR

23-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Selenium	SW-846 6020	06-25-2016	R						20				
Sodium	SW-846 6010	06-25-2016	LCS	103.00		80	120		20				
Sodium	SW-846 6010	06-25-2016	LCS	104.00		80	120		20				
Sodium	SW-846 6010	06-25-2016	MB								0	105	MB < MDL
Sodium	SW-846 6010	06-25-2016	MB								2		MB < MDL
Sodium	SW-846 6010	06-25-2016	MS	97.00		80	120		20				
Sodium	SW-846 6010	06-25-2016	MS	109.00		80	120		20				
Sodium	SW-846 6010	06-25-2016	MSD		102.00	80	120	1	20				
Sodium	SW-846 6010	06-25-2016	MSD		108.00	80	120	1	20				
Sodium	SW-846 6010	06-25-2016	R					4	20				
Sodium	SW-846 6010	06-25-2016	R					1	20				
Uranium	SW-846 6020	06-25-2016	LCS	105.00		80	120		20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

## Metals Data Validation Worksheet

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23-Aug-2016

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16060001

**Lab Code:** PAR

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Uranium	SW-846 6020	06-25-2016	LCS	105.00		80	120		20				
Uranium	SW-846 6020	06-25-2016	MB							95	4	100	MB < MDL
Uranium	SW-846 6020	06-25-2016	MB							97	0		MB < MDL
Uranium	SW-846 6020	06-25-2016	MS	110.00		75	125		20				
Uranium	SW-846 6020	06-25-2016	MS	107.00		75	125		20				
Uranium	SW-846 6020	06-25-2016	MSD		109.00	75	125	1	20				
Uranium	SW-846 6020	06-25-2016	MSD		105.00	75	125	4	20				
Uranium	SW-846 6020	06-25-2016	R					3	20				
Uranium	SW-846 6020	06-25-2016	R					11	20				
Vanadium	SW-846 6020	06-25-2016	LCS	104.00		80	120		20				
Vanadium	SW-846 6020	06-25-2016	LCS	105.00		80	120		20				
Vanadium	SW-846 6020	06-25-2016	MB							96		111	MB < MDL

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

## Metals Data Validation Worksheet

Page 8 of 8

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16060001

**Lab Code:** PAR

23-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Vanadium	SW-846 6020	06-25-2016	MB							101			
Vanadium	SW-846 6020	06-25-2016	MS	103.00		75	125		20				
Vanadium	SW-846 6020	06-25-2016	MS	103.00		75	125		20				
Vanadium	SW-846 6020	06-25-2016	MSD		103.00	75	125	0	20				
Vanadium	SW-846 6020	06-25-2016	MSD		103.00	75	125	1	20				
Vanadium	SW-846 6020	06-25-2016	R						20				
Vanadium	SW-846 6020	06-25-2016	R						20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

# Wet Chemistry Data Validation Worksheet

Page 1 of 2

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16060001

**Lab Code:** PAR

23-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	Comments
Ammonia Total as N	EPA 350.1	07-08-2016	LCS	102.00		90	110		20	
Ammonia Total as N	EPA 350.1	07-08-2016	MB							MB < MDL
Ammonia Total as N	EPA 350.1	07-08-2016	MS	94.00		75	125		20	
Ammonia Total as N	EPA 350.1	07-08-2016	MSD		93.00	75	125	0	20	
Ammonia Total as N	EPA 350.1	07-11-2016	LCS	101.00		90	110		20	
Ammonia Total as N	EPA 350.1	07-11-2016	MB							MB < MDL
Chloride	SW-846 9056	06-29-2016	LCS	109.00		90	110		15	
Chloride	SW-846 9056	06-29-2016	MB							MB < MDL
Chloride	SW-846 9056	06-30-2016	LCS	107.00		90	110		15	
Chloride	SW-846 9056	06-30-2016	LCSD	103.00	103.00	90	110	4	15	
Chloride	SW-846 9056	06-30-2016	MB							MB < MDL
Chloride	SW-846 9056	07-12-2016	MS	102.00		85	115		15	
Chloride	SW-846 9056	07-12-2016	MSD		102.00	85	115	0	15	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	LCS	106.00		90	110		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	LCS	105.00		90	110		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	LCSD	103.00	103.00	90	110	2	20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	LCSD	103.00	103.00	90	110	2	20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	MB							MB < MDL
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	MB							MB < MDL
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	MS	83.00		75	125		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	MS	83.00		75	125		20	

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** RPD: Relative Percent Difference

# Wet Chemistry Data Validation Worksheet

Page 2 of 2

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16060001

**Lab Code:** PAR

23-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	Comments
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	MSD		79.00	75	125	3	20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	MSD		81.00	75	125	2	20	
Sulfate	SW-846 9056	06-29-2016	LCS	108.00		90	110		15	
Sulfate	SW-846 9056	06-29-2016	MB							MB < MDL
Sulfate	SW-846 9056	06-30-2016	LCS	108.00		90	110		15	
Sulfate	SW-846 9056	06-30-2016	LCSD	104.00	104.00	90	110	4	15	
Sulfate	SW-846 9056	06-30-2016	MB							MB < MDL
Sulfate	SW-846 9056	07-12-2016	MS	89.00		85	115		15	
Sulfate	SW-846 9056	07-12-2016	MSD		91.00	85	115	1	15	

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** RPD: Relative Percent Difference



## General Information

Task ID: RFO01.1-16060001  
Sample Event: June 15–16, 2016  
Site(s): New Rifle Processing Site, Colorado  
Laboratory: ALS Laboratory Group, Fort Collins, Colorado  
Work Order No.: 1606418  
Analysis: Metals and Wet Chemistry  
Validator: Stephen Donovan  
Review Date: August 23, 2016

This validation was performed according to “Standard Practice for Validation of Environmental Data” found in Appendix A of the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated, <http://energy.gov/lm/downloads/sampling-and-analysis-plan-us-department-energy-office-legacy-management-sites>). The procedure was applied at Level 3, Data Validation.

This validation includes the evaluation of data quality indicators (DQIs) associated with the data. DQIs are the quantitative and qualitative descriptors that are used to interpret the degree of acceptability or utility of data. Indicators of data quality include the analysis of laboratory control samples to assess accuracy; duplicates and replicates to assess precision; and interference check samples to assess bias (see attached Data Validation Worksheets). The DQIs comparability, completeness, and sensitivity are also evaluated in the sections to follow.

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
Selenium, Uranium, Vanadium	LMM-02	SW-846 3005A	SW-846 6020
Calcium, Magnesium, Potassium, Sodium	LMM-01	SW-846 3005A	SW-846 6010
Chloride, Sulfate	MIS-A-045	SW-846 9056	SW-846 9056
Nitrate + Nitrite as N	WCH-A-022	EPA 353.2	EPA 353.2

## 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
1606418-2	0294	Chloride	J	Exceeded holding time
1606418-2	0294	Sulfate	J	Exceeded holding time
1606418-8	0396	Chloride	J	Exceeded holding time
1606418-8	0396	Sulfate	J	Exceeded holding time
1606418-9	0398	Chloride	J	Exceeded holding time
1606418-9	0398	Sulfate	J	Exceeded holding time
1606418-11	0656	Chloride	J	Exceeded holding time
1606418-11	0656	Sulfate	J	Exceeded holding time
1606418-12	0658	Chloride	J	Exceeded holding time
1606418-12	0658	Sulfate	J	Exceeded holding time
1606418-13	0741	Chloride	J	Exceeded holding time
1606418-13	0741	Sulfate	J	Exceeded holding time

#### Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received 14 water samples on June 22, 2016, accompanied a Chain of Custody form. The Chain of Custody form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The receiving documentation included copies of the air bills. The Chain of Custody form was complete with no errors or omissions.

#### Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced cooler at 2.4 °C, which complies with requirements. All samples were analyzed within the applicable holding times, with the exception of six locations for chloride and sulfate analysis. These samples were initially analyzed within holding time but were reanalyzed out of holding time to resolve laboratory errors. Chloride and sulfate results for these samples are qualified with a “J” flag as estimated values. All samples were received in the correct container types and had been preserved correctly for the requested analyses.

#### Detection and Quantitation Limits

The method detection limit (MDL) was reported for all analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL. The reported MDLs for all analytes demonstrate compliance with contractual requirements.

## Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial calibration verification (ICV) demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification (CCV) demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument calibrations and calibration verifications were performed correctly in accordance with the cited methods.

### *Method EPA 350.1 Ammonia as N*

Calibrations were performed using six calibration standards on July 22, 2016. 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

### *Method EPA 353.2 Nitrite + Nitrate as N*

Calibrations were performed using seven calibration standards on July 1, 2016. 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

### *Method SW-846 6010 Ca, Mg, K, Na*

Calibrations were performed on June 25, 2016, using three 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL and all results were within the acceptance range.

### *Method SW-846 6020 As, Mo, Se, U, V*

Calibrations were performed on June 25, 2016, 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL and all results were within the acceptance range. 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 Chloride, Sulfate*

Calibrations were performed using six calibration standards on July 7, 2016. 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

### Method and Calibration Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. Calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis. All method-blank and calibration-blank results associated with the samples were below the PQL for all analytes. In cases where the blank concentration exceeds the MDL, associated sample results that are greater than the MDL but less than 5 times the blank concentration are qualified with a "U" flag as not detected.

### Inductively Coupled Plasma Interference Check Sample Analysis

Interference check samples are analyzed to verify the instrumental interelement and background correction factors and assess any bias due to interelement interferences. Interference check samples were analyzed at the required frequency with all results meeting the acceptance criteria.

### Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike concentration. The spike results met the recovery and precision criteria for all analytes evaluated with the exception of chloride. The associated sample chloride results are qualified with a "J" flag as estimated values.

### 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. All replicate results met these criteria, demonstrating acceptable precision.

### Laboratory Control Sample

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

### Metals Serial Dilution

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

## Completeness

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

## Electronic Data Deliverable (EDD) File

The EDD file arrived on July 27, 2016. The EDD was examined to verify that the file was complete and in compliance with requirements. The contents of the file were compared 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.

## Anion/Cation Balance

Environmental water should be electrically neutral. Expressed in milliequivalents per liter (meq/L), the sum of the anions should equal the sum of the cations. The anion/cation balance is calculated as the difference between the anions and cations, divided by the sum of the anions and cations. The anion/cation balance can be used to identify potential errors in the analytical results. Typically, a charge balance of less than 10 percent is considered acceptable. When a charge balance is greater than 10 percent, the associated data are closely examined for error. If no errors are found, the results are considered to be acceptable. Table 6 shows the total anion and cation results from this event and the charge balance.

*Table 6. Comparison of Major Anions and Cations*

Location	Cations (meq/L)	Anions (meq/L)	Charge Balance (%)
0292A	28.61	35.55	10.81
0294	2.71	2.88	2.98
0304	22.32	29.63	14.06
0305	27.96	34.51	10.48
0309	27.29	32.22	8.29
0310	32.02	40.05	11.14
0395	12.05	14.23	8.26
0396	2.71	3.29	9.61
0398	15.58	18.60	8.84
0655	30.01	37.09	10.55
0656	30.91	40.08	12.91
0658	21.62	25.46	8.14
0741	2.71	3.60	14.05

The charge balance exceeded 10 percent at seven locations. With the exception of the previously discussed analytical difficulties with the chloride and sulfate analysis, there were no errors noted during the review of these data.

# General Data Validation Report

Page 1 of 1

Task Code: RFO01.1-  
16060001

Lab Code: PAR Validator: Stephen Donovan

Validation Date: 08-23-2016

Project: Rifle, Old, Processing Site

# Samples: 14

Analysis Type: ☒ General Chemistry ☒ Metals ☐ Organics ☐ Radiochemistry

## Chain of Custody

Present: OK Signed: OK Dated: OK

## Sample

Integrity: OK Preservation OK Temperature: OK

## Check

## Summary

<b>Holding Times:</b>	There were 12 analyses performed outside the applicable holding times.
<b>Detection Limits:</b>	The reported detection limits are equal to or below the contract required limits.
<b>Field Duplicates:</b>	There was 1 duplicate evaluated.

## Metals Data Validation Worksheet

Page 1 of 3

**Project:** Rifle, Old, Processing Site

**Task Code:** RFO01.1-16060001

**Lab Code:** PAR

24-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Calcium	SW-846 6010	06-25-2016	LCS	101.00		80	120		20				
Calcium	SW-846 6010	06-25-2016	MB							102	0	100	MB < MDL
Calcium	SW-846 6010	06-25-2016	MS	92.00		80	120		20				
Calcium	SW-846 6010	06-25-2016	MSD		90.00	80	120	1	20				
Calcium	SW-846 6010	06-25-2016	R					1	20				
Magnesium	SW-846 6010	06-25-2016	LCS	101.00		80	120		20				
Magnesium	SW-846 6010	06-25-2016	MB							100	1	98	MB < MDL
Magnesium	SW-846 6010	06-25-2016	MS	96.00		80	120		20				
Magnesium	SW-846 6010	06-25-2016	MSD		95.00	80	120	0	20				
Magnesium	SW-846 6010	06-25-2016	R					1	20				
Potassium	SW-846 6010	06-25-2016	LCS	103.00		80	120		20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

## Metals Data Validation Worksheet

Page 2 of 3

24-Aug-2016

**Project:** Rifle, Old, Processing Site

**Task Code:** RFO01.1-16060001

**Lab Code:** PAR

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Potassium	SW-846 6010	06-25-2016	MB									102	MB < MDL
Potassium	SW-846 6010	06-25-2016	MS	105.00		80	120		20				
Potassium	SW-846 6010	06-25-2016	MSD		103.00	80	120	2	20				
Potassium	SW-846 6010	06-25-2016	R						20				
Selenium	SW-846 6020	06-25-2016	LCS	106.00		80	120		20				
Selenium	SW-846 6020	06-25-2016	MB							96		114	MB < MDL
Selenium	SW-846 6020	06-25-2016	MS	102.00		75	125		20				
Selenium	SW-846 6020	06-25-2016	MSD		100.00	75	125	2	20				
Selenium	SW-846 6020	06-25-2016	R						20				
Sodium	SW-846 6010	06-25-2016	LCS	103.00		80	120		20				
Sodium	SW-846 6010	06-25-2016	MB								2	100	MB < MDL
Sodium	SW-846 6010	06-25-2016	MS	102.00		80	120		20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference



## Metals Data Validation Worksheet

Page 3 of 3

**Project:** Rifle, Old, Processing Site

**Task Code:** RFO01.1-16060001

**Lab Code:** PAR

24-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Sodium	SW-846 6010	06-25-2016	MSD		96.00	80	120	2	20				
Sodium	SW-846 6010	06-25-2016	R					0	20				
Uranium	SW-846 6020	06-25-2016	LCS	105.00		80	120		20				
Uranium	SW-846 6020	06-25-2016	MB							95	0	100	MB < MDL
Uranium	SW-846 6020	06-25-2016	MS	113.00		75	125		20				
Uranium	SW-846 6020	06-25-2016	MSD		108.00	75	125	1	20				
Uranium	SW-846 6020	06-25-2016	R					1	20				
Vanadium	SW-846 6020	06-25-2016	LCS	105.00		80	120		20				
Vanadium	SW-846 6020	06-25-2016	MB							96		111	MB < MDL
Vanadium	SW-846 6020	06-25-2016	MS	105.00		75	125		20				
Vanadium	SW-846 6020	06-25-2016	MSD		103.00	75	125	2	20				
Vanadium	SW-846 6020	06-25-2016	R						20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

# Wet Chemistry Data Validation Worksheet

Page 1 of 1

**Project:** Rifle, Old, Processing Site

**Task Code:** RFO01.1-16060001

**Lab Code:** PAR

24-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	Comments
Chloride	SW-846 9056	07-14-2016	LCS	102.00		90	110		15	
Chloride	SW-846 9056	07-14-2016	LCSD	99.00	99.00	90	110	2	15	
Chloride	SW-846 9056	07-14-2016	MB							MB < MDL
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	LCS	105.00		90	110		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	LCSD	103.00	103.00	90	110	2	20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	MB							MB < MDL
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	MS	83.00		75	125		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-01-2016	MSD		82.00	75	125	2	20	
Sulfate	SW-846 9056	07-14-2016	LCS	107.00		90	110		15	
Sulfate	SW-846 9056	07-14-2016	LCSD	103.00	103.00	90	110	4	15	
Sulfate	SW-846 9056	07-14-2016	MB							MB < MDL

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** RPD: Relative Percent Difference

## General Information

Task ID: RFN01.1-16070002  
Sample Event: July 7, 2016  
Site(s): New Rifle Processing Site, Colorado  
Laboratory: ALS Laboratory Group, Fort Collins, Colorado  
Work Order No.: 1607224  
Analysis: Metals and Wet Chemistry  
Validator: Stephen Donovan  
Review Date: August 23, 2016

This validation was performed according to "Standard Practice for Validation of Environmental Data" found in Appendix A of the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated, <http://energy.gov/lm/downloads/sampling-and-analysis-plan-us-department-energy-office-legacy-management-sites>). The procedure was applied at Level 3, Data Validation.

This validation includes the evaluation of data quality indicators (DQIs) associated with the data. DQIs are the quantitative and qualitative descriptors that are used to interpret the degree of acceptability or utility of data. Indicators of data quality include the analysis of laboratory control samples to assess accuracy; duplicates and replicates to assess precision; and interference check samples to assess bias (see attached Data Validation Worksheets). The DQIs comparability, completeness, and sensitivity are also evaluated in the sections to follow.

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 7.

*Table 7. Analytes and Methods*

Analyte	Line Item Code	Prep Method	Analytical Method
Ammonia as N	WCH-A-005	EPA 350.1	EPA 350.1
Arsenic, Molybdenum, Selenium, Uranium, Vanadium	LMM-02	SW-846 3005A	SW-846 6020
Calcium, Magnesium, Potassium, Sodium	LMM-01	SW-846 3005A	SW-846 6010
Chloride, Sulfate	MIS-A-045	SW-846 9056	SW-846 9056
Nitrate + Nitrite as N	WCH-A-022	EPA 353.2	EPA 353.2

## Data Qualifier Summary

Analytical results were qualified as listed in Table 8. Refer to the sections below for an explanation of the data qualifiers applied.

Table 8. Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
1607224-1	0216	Chloride	J	Matrix spike recovery
1607224-2	0216 Duplicate	Chloride	J	Matrix spike recovery

### Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received 2 water samples on July 14, 2016, accompanied a Chain of Custody form. The Chain of Custody form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The receiving documentation included copies of the air bills. The Chain of Custody form was complete with no errors or omissions.

### Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced cooler at 2.8 °C, which complies with requirements. All samples were analyzed within the applicable holding times. All samples were received in the correct container types and had been preserved correctly for the requested analyses.

### Detection and Quantitation Limits

The method detection limit (MDL) was reported for all analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL. The reported MDLs for all analytes demonstrate compliance with contractual requirements.

### Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial calibration verification (ICV) demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing calibration verification (CCV) demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument calibrations and calibration verifications were performed correctly in accordance with the cited methods.

### *Method EPA 350.1 Ammonia as N*

Calibrations were performed using six calibration standards on July 22, 2016. 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

*Method EPA 353.2 Nitrite + Nitrate as N*

Calibrations were performed using seven calibration standards on July 19, 2016. 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

*Method SW-846 6010 Ca, Mg, K, Na*

Calibrations were performed on July 20, 2016, using three 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL and all results were within the acceptance range.

*Method SW-846 6020 As, Mo, Se, U, V*

Calibrations were performed on July 20, 2016, 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL and all results were within the acceptance range. 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 Chloride, Sulfate*

Calibrations were performed using six calibration standards on July 7, 2016. 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

Method and Calibration Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. Calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis. All method-blank and calibration-blank results associated with the samples were below the PQL for all analytes. In cases where the blank concentration exceeds the MDL, associated sample results that are greater than the MDL but less than 5 times the blank concentration are qualified with a "U" flag as not detected.

Inductively Coupled Plasma Interference Check Sample Analysis

Interference check samples are analyzed to verify the instrumental interelement and background correction factors and assess any bias due to interelement interferences. Interference check samples were analyzed at the required frequency with all results meeting the acceptance criteria.

### Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis is used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike concentration. The spike results met the recovery and precision criteria for all analytes evaluated with the exception of chloride. The associated sample chloride results are qualified with a "J" flag as estimated values.

### 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. All replicate results met these criteria, demonstrating acceptable precision.

### Laboratory Control Sample

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

### Metals Serial Dilution

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

### Completeness

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

### Electronic Data Deliverable (EDD) File

The EDD file arrived on July 28, 2016. The EDD was examined to verify that the file was complete and in compliance with requirements. The contents of the file were compared 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.

### Anion/Cation Balance

Environmental water should be electrically neutral. Expressed in milliequivalents per liter (meq/L), the sum of the anions should equal the sum of the cations. The anion/cation balance is calculated as the difference between the anions and cations, divided by the sum of the anions and cations. The anion/cation balance can be used to identify potential errors in the analytical results. Typically, a charge balance of less than 10 percent is considered acceptable. When a charge balance is greater than 10 percent, the associated data are closely examined for error. If no errors are found, the results are considered to be acceptable. Table 9 shows the total anion and cation results from this event and the charge balance.

*Table 9. Comparison of Major Anions and Cations*

<b>Location</b>	<b>Cations (meq/L)</b>	<b>Anions (meq/L)</b>	<b>Charge Balance (%)</b>
0216	19.21	16.77	6.78
0216 Duplicate	19.20	16.77	6.76

The charge balance was less than 10 percent for both samples.

# General Data Validation Report

Page 1 of 1

Task Code: RFN01.1-  
16070002

Lab Code: PAR Validator: Stephen Donovan

Validation Date: 08-23-2016

Project: Rifle, New, Processing Site

# Samples: 2

Analysis Type: ☐ General Chemistry ☐ Metals ☐ Organics ☐ Radiochemistry

## Chain of Custody

Present: OK Signed: OK Dated: OK

## Sample

Integrity: OK Preservation OK Temperature: OK

## Check

## Summary

<b>Holding Times:</b>	All analyses were completed within the applicable holding times.
<b>Detection Limits:</b>	The reported detection limits are equal to or below the contract required limits.
<b>Field Duplicates:</b>	There was 1 duplicate evaluated.



## Metals Data Validation Worksheet

Page 1 of 4

23-Aug-2016

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16070002

**Lab Code:** PAR

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Arsenic	SW-846 6020	07-20-2016	LCS	105.00		80	120		20				
Arsenic	SW-846 6020	07-20-2016	MB							100	1	107	MB < MDL
Arsenic	SW-846 6020	07-20-2016	MS	102.00		75	125		20				
Arsenic	SW-846 6020	07-20-2016	MSD		106.00	75	125	3	20				
Arsenic	SW-846 6020	07-20-2016	R					2	20				
Calcium	SW-846 6010	07-20-2016	LCS	101.00		80	120		20				
Calcium	SW-846 6010	07-20-2016	MB							102	2	106	
Calcium	SW-846 6010	07-20-2016	MS	86.00		80	120		20				
Calcium	SW-846 6010	07-20-2016	MSD		86.00	80	120	0	20				
Calcium	SW-846 6010	07-20-2016	R					0	20				
Magnesium	SW-846 6010	07-20-2016	LCS	101.00		80	120		20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

# Metals Data Validation Worksheet

Page 2 of 4

23-Aug-2016

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16070002

**Lab Code:** PAR

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Magnesium	SW-846 6010	07-20-2016	MB							100	1	106	
Magnesium	SW-846 6010	07-20-2016	MS	95.00		80	120		20				
Magnesium	SW-846 6010	07-20-2016	MSD		96.00	80	120	1	20				
Magnesium	SW-846 6010	07-20-2016	R					0	20				
Molybdenum	SW-846 6020	07-20-2016	LCS	97.00		80	120		20				
Molybdenum	SW-846 6020	07-20-2016	MB							106	3	105	MB < MDL
Molybdenum	SW-846 6020	07-20-2016	MS	100.00		75	125		20				
Molybdenum	SW-846 6020	07-20-2016	MSD		103.00	75	125	2	20				
Molybdenum	SW-846 6020	07-20-2016	R					0	20				
Potassium	SW-846 6010	07-20-2016	LCS	101.00		80	120		20				
Potassium	SW-846 6010	07-20-2016	MB								5	98	MB < MDL
Potassium	SW-846 6010	07-20-2016	MS	103.00		80	120		20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

## Metals Data Validation Worksheet

Page 3 of 4

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16070002

**Lab Code:** PAR

23-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Potassium	SW-846 6010	07-20-2016	MSD		103.00	80	120	0	20				
Potassium	SW-846 6010	07-20-2016	R					2	20				
Selenium	SW-846 6020	07-20-2016	LCS	109.00		80	120		20				
Selenium	SW-846 6020	07-20-2016	MB							100		104	MB < MDL
Selenium	SW-846 6020	07-20-2016	MS	107.00		75	125		20				
Selenium	SW-846 6020	07-20-2016	MSD		107.00	75	125	1	20				
Selenium	SW-846 6020	07-20-2016	R					2	20				
Sodium	SW-846 6010	07-20-2016	LCS	100.00		80	120		20				
Sodium	SW-846 6010	07-20-2016	MB								3	99	MB < MDL
Sodium	SW-846 6010	07-20-2016	MS	89.00		80	120		20				
Sodium	SW-846 6010	07-20-2016	MSD		85.00	80	120	1	20				
Sodium	SW-846 6010	07-20-2016	R					1	20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

## Metals Data Validation Worksheet

Page 4 of 4

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16070002

**Lab Code:** PAR

23-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Uranium	SW-846 6020	07-20-2016	LCS	99.00		80	120		20				
Uranium	SW-846 6020	07-20-2016	MB							100	1	80	MB < MDL
Uranium	SW-846 6020	07-20-2016	MS	105.00		75	125		20				
Uranium	SW-846 6020	07-20-2016	MSD		123.00	75	125	4	20				
Uranium	SW-846 6020	07-20-2016	R					1	20				
Vanadium	SW-846 6020	07-20-2016	LCS	102.00		80	120		20				
Vanadium	SW-846 6020	07-20-2016	MB							100	2	102	MB < MDL
Vanadium	SW-846 6020	07-20-2016	MS	102.00		75	125		20				
Vanadium	SW-846 6020	07-20-2016	MSD		106.00	75	125	1	20				
Vanadium	SW-846 6020	07-20-2016	R					1	20				

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference



# Wet Chemistry Data Validation Worksheet

Page 1 of 1

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16070002

**Lab Code:** PAR

23-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	Comments
Ammonia Total as N	EPA 350.1	07-22-2016	LCS	103.00		90	110		20	
Ammonia Total as N	EPA 350.1	07-22-2016	MB							MB < MDL
Ammonia Total as N	EPA 350.1	07-22-2016	MS	113.00		75	125		20	
Ammonia Total as N	EPA 350.1	07-22-2016	MSD		77.00	75	125	4	20	
Chloride	SW-846 9056	07-19-2016	LCS	102.00		90	110		15	
Chloride	SW-846 9056	07-19-2016	LCSD	99.00	99.00	90	110	3	15	
Chloride	SW-846 9056	07-19-2016	MB							MB < MDL
Chloride	SW-846 9056	07-20-2016	MS	76.00		85	115		15	
Chloride	SW-846 9056	07-20-2016	MSD		74.00	85	115	1	15	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-19-2016	LCS	97.00		90	110		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-19-2016	LCSD	97.00	97.00	90	110	0	20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-19-2016	MB							MB < MDL
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-19-2016	MS	78.00		75	125		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	07-19-2016	MSD		77.00	75	125	1	20	
Sulfate	SW-846 9056	07-19-2016	LCS	107.00		90	110		15	
Sulfate	SW-846 9056	07-19-2016	LCSD	103.00	103.00	90	110	3	15	
Sulfate	SW-846 9056	07-19-2016	MB							MB < MDL
Sulfate	SW-846 9056	07-20-2016	MS	98.00		85	115		15	
Sulfate	SW-846 9056	07-20-2016	MSD		96.00	85	115	1	15	

**QC Types:** LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

**QC Checks:** RPD: Relative Percent Difference

## **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, indicating the wells were purged and sampled using the low-flow method. At all monitoring well locations, purging and sampling met the Category I criteria with the following exceptions: wells 0217 and 0669 were classified as Category II because they produced water at a rate less than the minimum low-flow purging rate. The sample results for these wells were qualified with a "Q" flag (qualitative), indicating the samples were not collected under the optimal conditions of the Category I stability criteria.

### Equipment Blank Assessment

Equipment blanks are prepared and analyzed to document contamination attributable to the sample collection process. An equipment blank (field ID 2804) was collected after decontamination of the non-dedicated tubing reel used to collect surface water samples. Calcium, magnesium, potassium, and sodium were detected in the equipment blank. All associated sample results were greater than 5 times the equipment blank and no further qualification is 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. Duplicate samples were collected from locations RFN01-0216, RFN01-0855, and RFO01-0655. The relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. With the exception of sulfate, the duplicate results met the criteria, demonstrating acceptable overall precision. The sulfate sample and duplicate results are qualified with a "J" flag as estimated values.

## Validation Report: Field Duplicates

Page 1 of 1  
 17-Aug-2016

**Project:** Rifle, New, Processing Site  
**Task Code:** RFN01.1-16060001  
**Lab Code:** PAR

Analyte	Duplicate: RFN01.1-16060001-026				Sample: RFN01.1-16060001-025 0855				RPD	RER	Units
	Result	Qualifiers	Uncert.	Dilution	Result	Qualifiers	Uncert.	Dilution			
Ammonia Total as N	25			25	25			25	0		mg/L
Arsenic	0.19			10	0.19			10	0		mg/L
Calcium	210			1	220			1	4.7		mg/L
Chloride	250			25	220			25	12.8		mg/L
Magnesium	40			1	41			1	2.5		mg/L
Molybdenum	0.43			10	0.43			10	0		mg/L
Nitrate + Nitrite as Nitrogen	7.6			50	8.2			50	7.6		mg/L
Potassium	11			1	11			1	0		mg/L
Selenium	0.74			10	0.73			10	1.4		mg/L
Sodium	210			1	210			1	0		mg/L
Sulfate	910			25	740			25	20.6		mg/L
Uranium	0.034			10	0.036			10	5.7		mg/L
Vanadium	11			100	11			100	0		mg/L

**QC Checks:** RPD: Relative Percent Difference RER: Relative Error Ratio

## Validation Report: Field Duplicates

Page 1 of 1  
23-Aug-2016

**Project:** Rifle, New, Processing Site      **Task Code:** RFN01.1-16070002      **Lab Code:** PAR

Analyte	Duplicate: RFN01.1-16070002-027				Sample: RFN01.1-16070002-007 0216				RPD	RER	Units
	Result	Qualifiers	Uncert.	Dilution	Result	Qualifiers	Uncert.	Dilution			
Ammonia Total as N	8.5			25	8.5			5	0		mg/L
Arsenic	0.024			10	0.024			10	0		mg/L
Calcium	160			1	160			1	0		mg/L
Chloride	240			20	240			20	0		mg/L
Magnesium	33			1	33			1	0		mg/L
Molybdenum	0.052			10	0.049			10	5.9		mg/L
Nitrate + Nitrite as Nitrogen	0.01	U		1	0.24			1			mg/L
Potassium	9.3			1	9.5			1	2.1		mg/L
Selenium	0.0095			10	0.01			10	5.1		mg/L
Sodium	190			1	190			1	0		mg/L
Sulfate	480			20	480			20	0		mg/L
Uranium	0.039			10	0.037			10	5.3		mg/L
Vanadium	0.5			10	0.52			10	3.9		mg/L

**QC Checks:** RPD: Relative Percent Difference      RER: Relative Error Ratio



## Validation Report: Field Duplicates

Page 1 of 1  
23-Aug-2016

**Project:** Rifle, Old, Processing Site      **Task Code:** RFO01.1-16060001      **Lab Code:** PAR

Duplicate: RFO01.1-16060001-014					Sample: RFO01.1-16060001-010 0655						
Analyte	Result	Qualifiers	Uncert	Dilution	Result	Qualifiers	Uncert	Dilution	RPD	RER	Units
Calcium	200			1	200			1	0		mg/L
Chloride	230			40	230			40	0		mg/L
Magnesium	130			1	130			1	0		mg/L
Nitrate + Nitrite as Nitrogen	1.1			1	1.2			1	8.7		mg/L
Potassium	7.8			1	7.7			1	1.3		mg/L
Selenium	0.059			10	0.057			10	3.4		mg/L
Sodium	220			1	210			1	4.7		mg/L
Sulfate	1100			40	1000			40	9.5		mg/L
Uranium	0.13			10	0.13			10	0		mg/L
Vanadium	0.31			10	0.3			10	3.3		mg/L

**QC Checks:** RPD: Relative Percent Difference      RER: Relative Error Ratio

### Certification

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

9-27-2016  
Date

Data Validation Lead:

Stephen Donovan  
Stephen Donovan

9-27-2016  
Date

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## **Attachment 1**

# **Sampling and Analysis Work Order**

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May 4, 2016

Task Assignment 103  
Control Number 16-0548

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

SUBJECT: Contract No. DE-LM0000421, Navarro Research & Engineering, Inc. (Navarro)  
Task Assignment 103 LTS&M-UMTRCA TI & TII Sites, D&D Sites, Other  
Sites, and Other  
June 2016 Environmental Sampling at the Rifle, Colorado, New and Old  
Processing Sites

REFERENCE: Task Assignment 103, 1-103-1-02-116, Rifle, Colorado, New and Old  
Processing Sites

Dear Mr. Bush:

The purpose of this letter is to inform you of the upcoming sampling event at Rifle, Colorado. Enclosed are the map and tables specifying sample locations and analytes for monitoring at the Rifle New and Old sites. Water quality data will be collected from these sites as part of the environmental sampling currently scheduled to begin the week of June 13, 2016.

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

**MONITORING WELLS\*****New Rifle**

169 AI	195 AI	216 AI	620 AI	658 AI	664 AI	670 AI
170 AI	201 AI	217 AI	635 AI	659 AI	669 AI	855 AI
172 AI	215 AI	590 AI				

**Old Rifle**

292A AI	305 AI	309 AI	310 AI	655 AI	656 AI	658 AI
304 AI						

\*NOTE: AI = Alluvium

**Task Code Assigned:** All New Rifle samples were assigned to Task Code RFN01.1-16060001 and all Old Rifle samples were assigned to Task Code RFO01.1-16060001. Field data sheets can be found in \\crow\sms\RFN01.1-16060001\FieldData and \\crow\sms\RFO01.1-16060001\FieldData in the FieldData folder(s).

**Sample Shipment:** Samples were shipped from Grand Junction, Colorado, to ALS Laboratory Group via FedEx priority overnight on Tuesday, June 21, 2016.

**Water Level Measurements:** Water levels were measured in wells prior to sampling them.

**Well Inspection Summary:** No issues were identified.

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

**Field Variance:** None.

**Equipment:** Wells were sampled with a peristaltic pump and dedicated tubing except for New Rifle well 0170 which was sampled with a dedicated bladder pump. Surface water locations were sampled using a peristaltic pump and surface reel, or with container immersion. All equipment functioned properly.

**Stakeholder/Regulatory/DOE:** Nothing to note.

**Institutional Controls:**

**Fences, Gates, and Locks:** N/A

**Signs:** No issues were observed.

**Trespassing/Site Disturbances:** None observed

**Disposal Cell/Drainage Structure Integrity:** N/A

**Vegetation/Noxious Weed Concerns:** None observed.

**Maintenance Requirements:** None.

**Safety Issues:** None.

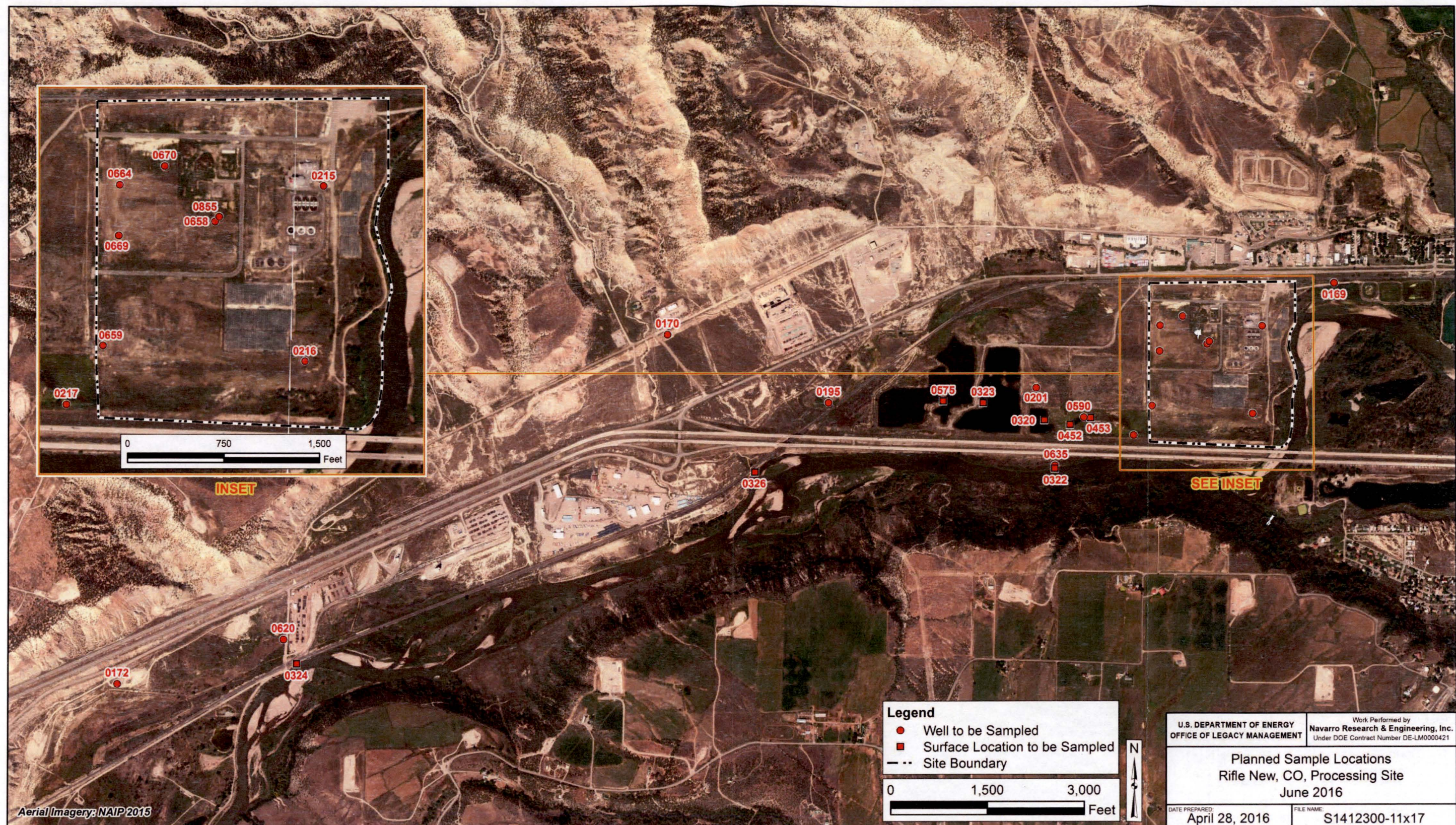
**Access Issues:** Standing water due to the high river stage prevented sampling New Rifle monitoring well 0216. Also New Rifle monitoring well 0635 and surface location 0322 could not be sampled because access through the elk fence along Interstate 70 has not been completed at this time.

**General Information:** Nothing to note.

**Immediate Actions Taken:** None.

**Future Actions Required or Suggested:** None.





New Rifle, Colorado, Processing Site Planned Sample Locations Map





Old Rifle, Colorado, Processing Site Planned Sample Locations Map



**Sampling Frequencies for Locations at  
Rifle, Colorado**

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
<b>Monitoring Wells</b>						
<b>New Rifle</b>						
169		X				Background well
170		X				Far downgradient
172		X				Far downgradient
195		X				Downgradient
201		X				Data logger; downgradient
215		X				Onsite
216		X				Onsite
217		X				Downgradient
590		X				Data logger; downgradient
620		X				Far downgradient
635		X				Downgradient
658		X				Onsite
659		X				Onsite
664		X				Onsite
669		X				Onsite
670		X				Onsite
855		X				Onsite
<b>Old Rifle</b>						
292A		X				Background well
304		X				Onsite
305		X				Onsite
309		X				Onsite
310		X				Data logger; onsite
655		X				Data logger; onsite
656		X				Onsite
658		X				Background well
<b>Surface Locations</b>						
<b>New Rifle</b>						
320		X				Wetland Pond
322		X				Colorado River
323		X				Gravel pit pond
324		X				Colorado River downgradient
326		X				Colorado River
452		X				Wetland Pond
453		X				Wetland Pond
575		X				Gravel pit pond
<b>Old Rifle</b>						
294		X				River, upstream
395		X				Seep, upgradient
396		X				River
398		X				Ditch, onsite
741		X				River
<b>Disposal Cell</b>						
<b>RFL08-Disposal Cell Effluent</b>						
MW03			X			July

Semi-annual sampling conducted in June and November; annual sampling conducted for Rifle Disposal Cell in July

### Constituent Sampling Breakdown

Site	Rifle					Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Analyte	Groundwater		Surface Water					
Approx. No. Samples/yr	51		24					
Field Measurements								
Alkalinity	X		X					
Dissolved Oxygen								
Redox Potential	X		X					
pH	X		X					
Specific Conductance	X		X					
Turbidity	X							
Temperature	X		X					
Laboratory Measurements	*RFO	*RFN	RFO	RFN	RFL			
Aluminum								
Ammonia as N (NH3-N)		X		X		0.1	EPA 350.1	WCH-A-005
Arsenic		X		X		0.0001	SW-846 6020	LMM-02
Calcium	X	X	X	X		5	SW-846 6010	LMM-01
Chloride	X	X	X	X		0.5	SW-846 9056	MIS-A_039
Chromium								
Gross Alpha								
Gross Beta								
Iron								
Lead								
Magnesium	X	X	X	X		5	SW-846 6010	LMM-01
Manganese								
Molybdenum		X		X		0.003	SW-846 6020	LMM-02
Nickel								
Nickel-63								
Nitrate + Nitrite as N (NO3+NO2)-N	X	X	X	X		0.05	EPA 353.1	WCH-A-022
Potassium	X	X	X	X		1	SW-846 6010	LMM-01
Radium-226								
Radium-228								
Selenium	X	X	X	X		0.0001	SW-846 6020	LMM-02
Silica								
Sodium	X	X	X	X		1	SW-846 6010	LMM-01
Strontium								
Sulfate	X	X	X	X		0.5	SW-846 9056	MIS-A-044
Sulfide								
Total Dissolved Solids								
Total Organic Carbon								
Uranium	X	X	X	X	X	0.0001	SW-846 6020	LMM-02
Vanadium	X	X	X	X	X	0.0003	SW-846 6020	LMM-02
Zinc								
Total No. of Analytes	10	13	10	13	2			

\*RFN = New Rifle; \*RFO = Old Rifle

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

## **Attachment 2**

### **Trip Report**

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memo



To: Scott Smith, Navarro  
From: David Atkinson, Navarro  
CC: Richard Bush, DOE  
Steve Donivan, Navarro  
EDD Delivery  
Date: 6/30/2016  
Re: Sampling Trip Report

**Site:** Rifle, Colorado, New and Old Processing Sites

**Dates of Sampling Event:** June 14–17, 2016

**Team Members:** David Atkinson, Eric Szabelski, and Jennifer Graham all from Navarro.

**Number of Locations Sampled:** Samples were collected from 35 of the 38 locations identified on the sampling notification letter as follows:

	Locations That Were Sampled	Planned Locations
Monitoring wells	New: 15 Old: 8	New: 17 Old: 8
Surface water locations	New: 7 Old: 5	New: 8 Old: 5

**Locations Not Sampled/Reason:** New Rifle monitoring well 0216 could not be sampled because it was surrounded by standing water due to the high river stage from spring runoff. Also New Rifle monitoring well 0635 and surface location 0322 could not be sampled because access through the elk fence along Interstate 70 has not been completed at this time.

**Location Specific Information:** Old Rifle surface locations 0396 and 0741 were sampled with access across the Union Pacific Railroad (UPR) under the supervision of a UPR-provided flagger as per the Navarro-UPR purchase order. New Rifle locations 0324 and 0620 were sampled with access through the C-TAP utility yard gate provided by WPX Energy. Contact info for WPX Energy has been updated. Well RFO-0304 did not make turbidity.

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

Site ID	False ID	Sample ID	Sample Type	True ID	Associated Matrix	Associated Samples
RFN01	2803	RFN01.1-16060001-026	Duplicate	0855	Groundwater	
RFN01	2804	RFN01.1-16060001-027	Equipment Blank		Surface Water	0323, 0324, 0326, 0575
RFO01	2551	RFO01.1-16060001-014	Duplicate	0655	Groundwater	

**Task Code Assigned:** All New Rifle samples were assigned to Task Code RFN01.1-16060001 and all Old Rifle samples were assigned to Task Code RFO01.1-16060001. Field data sheets can be found in \\crow\sms\RFN01.1-16060001\FieldData and \\crow\sms\RFO01.1-16060001\FieldData in the FieldData folder(s).

**Sample Shipment:** Samples were shipped from Grand Junction, Colorado, to ALS Laboratory Group via FedEx priority overnight on Tuesday, June 21, 2016.

**Water Level Measurements:** Water levels were measured in wells prior to sampling them.

**Well Inspection Summary:** No issues were identified.

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

**Field Variance:** None.

**Equipment:** Wells were sampled with a peristaltic pump and dedicated tubing except for New Rifle well 0170 which was sampled with a dedicated bladder pump. Surface water locations were sampled using a peristaltic pump and surface reel, or with container immersion. All equipment functioned properly.

**Stakeholder/Regulatory/DOE:** Nothing to note.

**Institutional Controls:**

**Fences, Gates, and Locks:** N/A

**Signs:** No issues were observed.

**Trespassing/Site Disturbances:** None observed

**Disposal Cell/Drainage Structure Integrity:** N/A

**Vegetation/Noxious Weed Concerns:** None observed.

**Maintenance Requirements:** None.

**Safety Issues:** None.

**Access Issues:** Standing water due to the high river stage prevented sampling New Rifle monitoring well 0216. Also New Rifle monitoring well 0635 and surface location 0322 could not be sampled because access through the elk fence along Interstate 70 has not been completed at this time.

**General Information:** Nothing to note.

**Immediate Actions Taken:** None.

**Future Actions Required or Suggested:** None.

**Attachment 3**  
**Data Presentation**



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**New Rifle**  
**Groundwater Quality Data**

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# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0169

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/14/2016	F	N	0.03		0.03	U	F	Y
Arsenic	mg/L	06/14/2016	F	T	0.0007		0.00012	J	F	Y
Calcium	mg/L	06/14/2016	F	T	180		0.024		F	Y
Chloride	mg/L	06/14/2016	F	N	93		1.5		F	Y
Magnesium	mg/L	06/14/2016	F	T	110		0.03		F	Y
Molybdenum	mg/L	06/14/2016	F	T	0.0034		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/14/2016	F	N	0.26		0.003		F	Y
ORP	mV	06/14/2016	F	N	198.6				F	Y
pH	SU	06/14/2016	F	N	7.10				F	Y
Potassium	mg/L	06/14/2016	F	T	5.6		0.052		F	Y
SC	uS/cm	06/14/2016	F	N	1954				F	Y
Selenium	mg/L	06/14/2016	F	T	0.0072		0.00066		F	Y
Sodium	mg/L	06/14/2016	F	T	190		0.047		F	Y
Sulfate	mg/L	06/14/2016	F	N	880		7.5		F	Y
Temp	deg C	06/14/2016	F	N	13.65				F	Y
Total ALK	mg/L	06/14/2016	F	N	400				F	Y
Turb	NTU	06/14/2016	F	N	1.72				F	Y
Uranium	mg/L	06/14/2016	F	T	0.024		0.000012		F	Y
Vanadium	mg/L	06/14/2016	F	T	0.00075		0.00058	J	F	Y

# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0170

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/16/2016	F	N	0.83		0.03		F	Y
Arsenic	mg/L	06/16/2016	F	T	0.00033		0.00012	J	F	Y
Calcium	mg/L	06/16/2016	F	T	170		0.024		F	Y
Chloride	mg/L	06/16/2016	F	N	220		2.4		F	Y
Magnesium	mg/L	06/16/2016	F	T	100		0.03		F	Y
Molybdenum	mg/L	06/16/2016	F	T	0.0029		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/16/2016	F	N	11		0.15		F	Y
ORP	mV	06/16/2016	F	N	19.9				F	Y
pH	SU	06/16/2016	F	N	7.11				F	Y
Potassium	mg/L	06/16/2016	F	T	6.3		0.052		F	Y
SC	uS/cm	06/16/2016	F	N	2952				F	Y
Selenium	mg/L	06/16/2016	F	T	0.022		0.00066		F	Y
Sodium	mg/L	06/16/2016	F	T	420		0.047		F	Y
Sulfate	mg/L	06/16/2016	F	N	1300		12		F	Y
Temp	deg C	06/16/2016	F	N	17.01				F	Y
Total ALK	mg/L	06/16/2016	F	N	520				F	Y
Turb	NTU	06/16/2016	F	N	4.73				F	Y
Uranium	mg/L	06/16/2016	F	T	0.062		0.000012		F	Y
Vanadium	mg/L	06/16/2016	F	T	0.00082		0.00058	J	F	Y

# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0172

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/16/2016	F	N	0.03		0.03	U	F	Y
Arsenic	mg/L	06/16/2016	F	T	0.018		0.00012		F	Y
Calcium	mg/L	06/16/2016	F	T	390		0.12		F	Y
Chloride	mg/L	06/16/2016	F	N	1200		7.5		F	Y
Magnesium	mg/L	06/16/2016	F	T	290		0.15		F	Y
Molybdenum	mg/L	06/16/2016	F	T	0.016		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/16/2016	F	N	0.003		0.003	U	F	Y
ORP	mV	06/16/2016	F	N	-94.6				F	Y
pH	SU	06/16/2016	F	N	7.12				F	Y
Potassium	mg/L	06/16/2016	F	T	11		0.26		F	Y
SC	uS/cm	06/16/2016	F	N	10320				F	Y
Selenium	mg/L	06/16/2016	F	T	0.00066		0.00066	U	F	Y
Sodium	mg/L	06/16/2016	F	T	2000		0.23		F	Y
Sulfate	mg/L	06/16/2016	F	N	5300		38		F	Y
Temp	deg C	06/16/2016	F	N	16.89				F	Y
Total ALK	mg/L	06/16/2016	F	N	702				F	Y
Turb	NTU	06/16/2016	F	N	8.33				F	Y
Uranium	mg/L	06/16/2016	F	T	0.038		0.000012		F	Y
Vanadium	mg/L	06/16/2016	F	T	0.00058		0.00058	U	F	Y

# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0195

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/15/2016	F	N	0.03		0.03	U	F	Y
Arsenic	mg/L	06/15/2016	F	T	0.0013		0.00012		F	Y
Calcium	mg/L	06/15/2016	F	T	90		0.024		F	Y
Chloride	mg/L	06/15/2016	F	N	21		0.75		F	Y
Magnesium	mg/L	06/15/2016	F	T	41		0.03		F	Y
Molybdenum	mg/L	06/15/2016	F	T	0.015		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	0.003		0.003	U	F	Y
ORP	mV	06/15/2016	F	N	15.9				F	Y
pH	SU	06/15/2016	F	N	7.19				F	Y
Potassium	mg/L	06/15/2016	F	T	7.7		0.052		F	Y
SC	uS/cm	06/15/2016	F	N	1056				F	Y
Selenium	mg/L	06/15/2016	F	T	0.00066		0.00066	U	F	Y
Sodium	mg/L	06/15/2016	F	T	110		0.047		F	Y
Sulfate	mg/L	06/15/2016	F	N	210		3.8		F	Y
Temp	deg C	06/15/2016	F	N	20.01				F	Y
Total ALK	mg/L	06/15/2016	F	N	430				F	Y
Turb	NTU	06/15/2016	F	N	8.55				F	Y
Uranium	mg/L	06/15/2016	F	T	0.018		0.000012		F	Y
Vanadium	mg/L	06/15/2016	F	T	0.00096		0.00058	J	F	Y

# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0201

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/15/2016	F	N	62		0.75		F	Y
Arsenic	mg/L	06/15/2016	F	T	0.00056		0.00012	J	F	Y
Calcium	mg/L	06/15/2016	F	T	560		0.12		F	Y
Chloride	mg/L	06/15/2016	F	N	200		3		F	Y
Magnesium	mg/L	06/15/2016	F	T	49		0.15		F	Y
Molybdenum	mg/L	06/15/2016	F	T	1.6		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	20		0.15		F	Y
ORP	mV	06/15/2016	F	N	161.2				F	Y
pH	SU	06/15/2016	F	N	6.89				F	Y
Potassium	mg/L	06/15/2016	F	T	10		0.26		F	Y
SC	uS/cm	06/15/2016	F	N	3548				F	Y
Selenium	mg/L	06/15/2016	F	T	0.064		0.00066		F	Y
Sodium	mg/L	06/15/2016	F	T	290		0.23		F	Y
Sulfate	mg/L	06/15/2016	F	N	1900		15		F	Y
Temp	deg C	06/15/2016	F	N	13.74				F	Y
Total ALK	mg/L	06/15/2016	F	N	260				F	Y
Turb	NTU	06/15/2016	F	N	2.21				F	Y
Uranium	mg/L	06/15/2016	F	T	0.11		0.000012		F	Y
Vanadium	mg/L	06/15/2016	F	T	0.00058		0.00058	J	F	Y



**Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site****Location: 0215**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/14/2016	F	N	3		0.03		F	Y
Arsenic	mg/L	06/14/2016	F	T	0.00045		0.00012	J	F	Y
Calcium	mg/L	06/14/2016	F	T	100		0.024		F	Y
Chloride	mg/L	06/14/2016	F	N	190		1.2		F	Y
Magnesium	mg/L	06/14/2016	F	T	43		0.03		F	Y
Molybdenum	mg/L	06/14/2016	F	T	0.019		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/14/2016	F	N	2.4		0.075		F	Y
ORP	mV	06/14/2016	F	N	102.8				F	Y
pH	SU	06/14/2016	F	N	7.55				F	Y
Potassium	mg/L	06/14/2016	F	T	5.4		0.052		F	Y
SC	uS/cm	06/14/2016	F	N	1520				F	Y
Selenium	mg/L	06/14/2016	F	T	0.0026		0.00066		F	Y
Sodium	mg/L	06/14/2016	F	T	190		0.047		F	Y
Sulfate	mg/L	06/14/2016	F	N	410		6		F	Y
Temp	deg C	06/14/2016	F	N	13.10				F	Y
Total ALK	mg/L	06/14/2016	F	N	204				F	Y
Turb	NTU	06/14/2016	F	N	1.66				F	Y
Uranium	mg/L	06/14/2016	F	T	0.021		0.000012		F	Y
Vanadium	mg/L	06/14/2016	F	T	0.00097		0.00058	J	F	Y

# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0216

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
ALK	mg/L	07/07/2016	F	N	197				F	Y
Ammonia Total as N	mg/L	07/07/2016	F	N	8.5		0.03		F	Y
Arsenic	mg/L	07/07/2016	F	T	0.024		0.00012		F	Y
Calcium	mg/L	07/07/2016	F	T	160		0.024		F	Y
Chloride	mg/L	07/07/2016	F	N	240		1.2		FJ	Y
Magnesium	mg/L	07/07/2016	F	T	33		0.03		F	Y
Molybdenum	mg/L	07/07/2016	F	T	0.049		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	07/07/2016	F	N	0.24		0.003		F	Y
ORP	mV	07/07/2016	F	N	57.6				F	Y
pH	s.u.	07/07/2016	F	N	7.16				F	Y
Potassium	mg/L	07/07/2016	F	T	9.5		0.052		F	Y
SC	umhos/cm	07/07/2016	F	N	1986				F	Y
Selenium	mg/L	07/07/2016	F	T	0.01		0.00066		F	Y
Sodium	mg/L	07/07/2016	F	T	190		0.047		F	Y
Sulfate	mg/L	07/07/2016	F	N	480		6		F	Y
TEMP	C	07/07/2016	F	N	15.67				F	Y
TURB	NTU	07/07/2016	F	N	1.51				F	Y
Uranium	mg/L	07/07/2016	F	T	0.037		0.000012		F	Y
Vanadium	mg/L	07/07/2016	F	T	0.52		0.00058		F	Y

# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0217

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/15/2016	F	N	37		0.75		FQ	Y
Arsenic	mg/L	06/15/2016	F	T	0.00067		0.00012	J	FQ	Y
Calcium	mg/L	06/15/2016	F	T	590		0.12		FQ	Y
Chloride	mg/L	06/15/2016	F	N	210		2.4		FQ	Y
Magnesium	mg/L	06/15/2016	F	T	23		0.15		FQ	Y
Molybdenum	mg/L	06/15/2016	F	T	1.5		0.00032		FQ	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	0.003		0.003	U	FQ	Y
ORP	mV	06/15/2016	F	N	184.0				FQ	Y
pH	SU	06/15/2016	F	N	7.07				FQ	Y
Potassium	mg/L	06/15/2016	F	T	15		0.26		FQ	Y
SC	uS/cm	06/15/2016	F	N	3115				FQ	Y
Selenium	mg/L	06/15/2016	F	T	0.0051		0.00066		FQ	Y
Sodium	mg/L	06/15/2016	F	T	200		0.23		FQ	Y
Sulfate	mg/L	06/15/2016	F	N	1700		12		FQ	Y
Temp	deg C	06/15/2016	F	N	13.23				FQ	Y
Total ALK	mg/L	06/15/2016	F	N	258				FQ	Y
Turb	NTU	06/15/2016	F	N	3.37				FQ	Y
Uranium	mg/L	06/15/2016	F	T	0.15		0.000012		FQ	Y
Vanadium	mg/L	06/15/2016	F	T	2.1		0.00058		FQ	Y

# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0590

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/15/2016	F	N	150		1.5		F	Y
Arsenic	mg/L	06/15/2016	F	T	0.00078		0.00012	J	F	Y
Calcium	mg/L	06/15/2016	F	T	550		0.12		F	Y
Chloride	mg/L	06/15/2016	F	N	450		3.8		FJ	Y
Magnesium	mg/L	06/15/2016	F	T	56		0.15		F	Y
Molybdenum	mg/L	06/15/2016	F	T	1.1		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	10		0.15		F	Y
ORP	mV	06/15/2016	F	N	184.6				F	Y
pH	SU	06/15/2016	F	N	6.84				F	Y
Potassium	mg/L	06/15/2016	F	T	24		0.26		F	Y
SC	uS/cm	06/15/2016	F	N	4793				F	Y
Selenium	mg/L	06/15/2016	F	T	0.022		0.00066		F	Y
Sodium	mg/L	06/15/2016	F	T	470		0.23		F	Y
Sulfate	mg/L	06/15/2016	F	N	2900		19		FJ	Y
Temp	deg C	06/15/2016	F	N	14.46				F	Y
Total ALK	mg/L	06/15/2016	F	N	308				F	Y
Turb	NTU	06/15/2016	F	N	1.45				F	Y
Uranium	mg/L	06/15/2016	F	T	0.09		0.000012		F	Y
Vanadium	mg/L	06/15/2016	F	T	0.47		0.00058		F	Y

# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0620

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/17/2016	F	N	0.03		0.03	U	F	Y
Arsenic	mg/L	06/17/2016	F	T	0.00042		0.00012	J	F	Y
Calcium	mg/L	06/17/2016	F	T	360		0.12		F	Y
Chloride	mg/L	06/17/2016	F	N	1400		12		F	Y
Magnesium	mg/L	06/17/2016	F	T	220		0.15		F	Y
Molybdenum	mg/L	06/17/2016	F	T	0.011		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/17/2016	F	N	8.6		0.15		F	Y
ORP	mV	06/17/2016	F	N	158.5				F	Y
pH	SU	06/17/2016	F	N	7.04				F	Y
Potassium	mg/L	06/17/2016	F	T	8.4		0.26		F	Y
SC	uS/cm	06/17/2016	F	N	6554				F	Y
Selenium	mg/L	06/17/2016	F	T	0.014		0.00066		F	Y
Sodium	mg/L	06/17/2016	F	T	1000		0.23		F	Y
Sulfate	mg/L	06/17/2016	F	N	2000		60		F	Y
Temp	deg C	06/17/2016	F	N	15.23				F	Y
Total ALK	mg/L	06/17/2016	F	N	530				F	Y
Turb	NTU	06/17/2016	F	N	4.26				F	Y
Uranium	mg/L	06/17/2016	F	T	0.057		0.000012		F	Y
Vanadium	mg/L	06/17/2016	F	T	0.0018		0.00058	J	F	Y

# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0658

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/14/2016	F	N	36		0.75		F	Y
Arsenic	mg/L	06/14/2016	F	T	0.2		0.00012		F	Y
Calcium	mg/L	06/14/2016	F	T	340		0.024		F	Y
Chloride	mg/L	06/14/2016	F	N	250		2.4		F	Y
Magnesium	mg/L	06/14/2016	F	T	36		0.03		F	Y
Molybdenum	mg/L	06/14/2016	F	T	1.4		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/14/2016	F	N	5.2		0.15		F	Y
ORP	mV	06/14/2016	F	N	166.1				F	Y
pH	SU	06/14/2016	F	N	6.97				F	Y
Potassium	mg/L	06/14/2016	F	T	8.7		0.052		F	Y
SC	uS/cm	06/14/2016	F	N	2523				F	Y
Selenium	mg/L	06/14/2016	F	T	0.83		0.00066		F	Y
Sodium	mg/L	06/14/2016	F	T	190		0.047		F	Y
Sulfate	mg/L	06/14/2016	F	N	1300		12		F	Y
Temp	deg C	06/14/2016	F	N	13.32				F	Y
Total ALK	mg/L	06/14/2016	F	N	234				F	Y
Turb	NTU	06/14/2016	F	N	2.37				F	Y
Uranium	mg/L	06/14/2016	F	T	0.037		0.000012		F	Y
Vanadium	mg/L	06/14/2016	F	T	23		0.0058		F	Y

# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0659

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/14/2016	F	N	11		0.75		F	Y
Arsenic	mg/L	06/14/2016	F	T	0.088		0.00012		F	Y
Calcium	mg/L	06/14/2016	F	T	580		0.12		F	Y
Chloride	mg/L	06/14/2016	F	N	210		2.4		F	Y
Magnesium	mg/L	06/14/2016	F	T	31		0.15		F	Y
Molybdenum	mg/L	06/14/2016	F	T	1.5		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/14/2016	F	N	10		0.15		F	Y
ORP	mV	06/14/2016	F	N	12.5				F	Y
pH	SU	06/14/2016	F	N	7.01				F	Y
Potassium	mg/L	06/14/2016	F	T	13		0.26		F	Y
SC	uS/cm	06/14/2016	F	N	2973				F	Y
Selenium	mg/L	06/14/2016	F	T	0.17		0.00066		F	Y
Sodium	mg/L	06/14/2016	F	T	210		0.23		F	Y
Sulfate	mg/L	06/14/2016	F	N	1900		12		F	Y
Temp	deg C	06/14/2016	F	N	17.80				F	Y
Total ALK	mg/L	06/14/2016	F	N	215				F	Y
Turb	NTU	06/14/2016	F	N	7.12				F	Y
Uranium	mg/L	06/14/2016	F	T	0.1		0.000012		F	Y
Vanadium	mg/L	06/14/2016	F	T	5		0.00058		F	Y

# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0664

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/14/2016	F	N	28		0.75		F	Y
Arsenic	mg/L	06/14/2016	F	T	0.0045		0.00012		F	Y
Calcium	mg/L	06/14/2016	F	T	140		0.024		F	Y
Chloride	mg/L	06/14/2016	F	N	150		2.4		FJ	Y
Magnesium	mg/L	06/14/2016	F	T	74		0.03		F	Y
Molybdenum	mg/L	06/14/2016	F	T	0.24		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/14/2016	F	N	2.6		0.15		F	Y
ORP	mV	06/14/2016	F	N	163.9				F	Y
pH	SU	06/14/2016	F	N	7.10				F	Y
Potassium	mg/L	06/14/2016	F	T	8.9		0.052		F	Y
SC	uS/cm	06/14/2016	F	N	1966				F	Y
Selenium	mg/L	06/14/2016	F	T	0.19		0.00066		F	Y
Sodium	mg/L	06/14/2016	F	T	200		0.047		F	Y
Sulfate	mg/L	06/14/2016	F	N	810		12		FJ	Y
Temp	deg C	06/14/2016	F	N	14.47				F	Y
Total ALK	mg/L	06/14/2016	F	N	399				F	Y
Turb	NTU	06/14/2016	F	N	9.67				F	Y
Uranium	mg/L	06/14/2016	F	T	0.059		0.000012		F	Y
Vanadium	mg/L	06/14/2016	F	T	2.5		0.00058		F	Y



# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0669

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/14/2016	F	N	56		0.75		FQ	Y
Arsenic	mg/L	06/14/2016	F	T	0.0072		0.00012		FQ	Y
Calcium	mg/L	06/14/2016	F	T	280		0.024		FQ	Y
Chloride	mg/L	06/14/2016	F	N	160		2.4		FQ	Y
Magnesium	mg/L	06/14/2016	F	T	48		0.03		FQ	Y
Molybdenum	mg/L	06/14/2016	F	T	0.61		0.00032		FQ	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/14/2016	F	N	0.072		0.003		FQ	Y
ORP	mV	06/14/2016	F	N	136.5				FQ	Y
pH	SU	06/14/2016	F	N	7.07				FQ	Y
Potassium	mg/L	06/14/2016	F	T	6.4		0.052		FQ	Y
SC	uS/cm	06/14/2016	F	N	2424				FQ	Y
Selenium	mg/L	06/14/2016	F	T	0.03		0.00066		FQ	Y
Sodium	mg/L	06/14/2016	F	T	210		0.047		FQ	Y
Sulfate	mg/L	06/14/2016	F	N	1300		12		FQ	Y
Temp	deg C	06/14/2016	F	N	14.37				FQ	Y
Total ALK	mg/L	06/14/2016	F	N	353				FQ	Y
Turb	NTU	06/14/2016	F	N	9.64				FQ	Y
Uranium	mg/L	06/14/2016	F	T	0.08		0.000012		FQ	Y
Vanadium	mg/L	06/14/2016	F	T	2.9		0.00058		FQ	Y

# Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0670

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/14/2016	F	N	11		0.75		F	Y
Arsenic	mg/L	06/14/2016	F	T	0.0041		0.00012		F	Y
Calcium	mg/L	06/14/2016	F	T	120		0.024		F	Y
Chloride	mg/L	06/14/2016	F	N	170		1.5		FJ	Y
Magnesium	mg/L	06/14/2016	F	T	73		0.03		F	Y
Molybdenum	mg/L	06/14/2016	F	T	0.16		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/14/2016	F	N	2.8		0.15		F	Y
ORP	mV	06/14/2016	F	N	144.1				F	Y
pH	SU	06/14/2016	F	N	7.20				F	Y
Potassium	mg/L	06/14/2016	F	T	8.2		0.052		F	Y
SC	uS/cm	06/14/2016	F	N	1801				F	Y
Selenium	mg/L	06/14/2016	F	T	0.31		0.00066		F	Y
Sodium	mg/L	06/14/2016	F	T	200		0.047		F	Y
Sulfate	mg/L	06/14/2016	F	N	670		7.5		FJ	Y
Temp	deg C	06/14/2016	F	N	14.03				F	Y
Total ALK	mg/L	06/14/2016	F	N	355				F	Y
Turb	NTU	06/14/2016	F	N	4.45				F	Y
Uranium	mg/L	06/14/2016	F	T	0.082		0.000012		F	Y
Vanadium	mg/L	06/14/2016	F	T	1.8		0.00058		F	Y

**Groundwater Quality Data by Location For Site RFN01, Rifle New Processing Site****Location: 0855**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/14/2016	F	N	25		0.75		F	Y
Arsenic	mg/L	06/14/2016	F	T	0.19		0.00012		F	Y
Calcium	mg/L	06/14/2016	F	T	220		0.024		F	Y
Chloride	mg/L	06/14/2016	F	N	220		1.5		F	Y
Magnesium	mg/L	06/14/2016	F	T	41		0.03		F	Y
Molybdenum	mg/L	06/14/2016	F	T	0.43		0.00032		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/14/2016	F	N	8.2		0.15		F	Y
ORP	mV	06/14/2016	F	N	149.3				F	Y
pH	SU	06/14/2016	F	N	7.01				F	Y
Potassium	mg/L	06/14/2016	F	T	11		0.052		F	Y
SC	uS/cm	06/14/2016	F	N	2091				F	Y
Selenium	mg/L	06/14/2016	F	T	0.73		0.00066		F	Y
Sodium	mg/L	06/14/2016	F	T	210		0.047		F	Y
Sulfate	mg/L	06/14/2016	F	N	740		7.5		FJ	Y
Temp	deg C	06/14/2016	F	N	16.36				F	Y
Turb	NTU	06/14/2016	F	N	2.54				F	Y
Uranium	mg/L	06/14/2016	F	T	0.036		0.000012		F	Y
Vanadium	mg/L	06/14/2016	F	T	11		0.0058		F	Y

SAMPLE TYPE: D = Duplicate E = Equipment Blank F = Field Sample FB = Field Blank TB = Trip Blank

FRACTION: D = Dissolved N = NA T = Total

MDC / MDL: MDC = Radiochemical minimum detectable concentration MDL = Non-radiochemical minimum detection limit

LAB QUALIFIERS (details can be found in laboratory report):

- \* = One or more quality control criteria failed (e.g., laboratory control sample, surrogate spike, or calibration verification recovery).
- B = Blank contamination. The reported result is associated with a contaminated blank.
- D = Result is from the analysis of a diluted sample.
- H = Holding time was exceeded.
- J = The reported result is an estimated value (e.g., matrix interference was observed or the analyte was detected at a concentration outside the quantitation range).
- U = Analytical result is below the MDC or MDL.
- 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 = Rejected, unusable result |
| U = Parameter analyzed for, but not detected.          | X = Location is undefined.                        |                               |

QA QUALIFIER: Yes = Validated, acceptable as qualified.

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**New Rifle**

**Surface Water Quality Data**

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# **Surface Water Quality Data by Location For Site RFN01, Rifle New Processing Site**

**Location: 0320**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/15/2016	F	N	13		0.75			Y
Arsenic	mg/L	06/15/2016	F	T	0.0049		0.00012			Y
Calcium	mg/L	06/15/2016	F	T	470		0.024			Y
Chloride	mg/L	06/15/2016	F	N	380		3			Y
Magnesium	mg/L	06/15/2016	F	T	68		0.03			Y
Molybdenum	mg/L	06/15/2016	F	T	0.69		0.00032			Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	0.71		0.003			Y
ORP	mV	06/15/2016	F	N	162.8					Y
pH	SU	06/15/2016	F	N	8.22					Y
Potassium	mg/L	06/15/2016	F	T	31		0.052			Y
SC	uS/cm	06/15/2016	F	N	3671					Y
Selenium	mg/L	06/15/2016	F	T	0.0057		0.00066			Y
Sodium	mg/L	06/15/2016	F	T	380		0.047			Y
Sulfate	mg/L	06/15/2016	F	N	1900		15			Y
Temp	deg C	06/15/2016	F	N	23.49					Y
Total ALK	mg/L	06/15/2016	F	N	212					Y
Turb	NTU	06/15/2016	F	N	2.15					Y
Uranium	mg/L	06/15/2016	F	T	0.12		0.000012			Y
Vanadium	mg/L	06/15/2016	F	T	0.087		0.00058			Y



# **Surface Water Quality Data by Location For Site RFN01, Rifle New Processing Site**

**Location: 0323**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/14/2016	F	N	16		0.75			Y
Arsenic	mg/L	06/14/2016	F	T	0.00081		0.00012	J		Y
Calcium	mg/L	06/14/2016	F	T	540		0.12			Y
Chloride	mg/L	06/14/2016	F	N	440		6			Y
Magnesium	mg/L	06/14/2016	F	T	120		0.15			Y
Molybdenum	mg/L	06/14/2016	F	T	1.9		0.00032			Y
Nitrate + Nitrite as Nitrogen	mg/L	06/14/2016	F	N	12		0.15			Y
ORP	mV	06/14/2016	F	N	79.5					Y
pH	SU	06/14/2016	F	N	8.32					Y
Potassium	mg/L	06/14/2016	F	T	50		0.26			Y
SC	uS/cm	06/14/2016	F	N	5344					Y
Selenium	mg/L	06/14/2016	F	T	0.0091		0.00066			Y
Sodium	mg/L	06/14/2016	F	T	730		0.23			Y
Sulfate	mg/L	06/14/2016	F	N	3200		30			Y
Temp	deg C	06/14/2016	F	N	23.09					Y
Total ALK	mg/L	06/14/2016	F	N	139					Y
Turb	NTU	06/14/2016	F	N	1.50					Y
Uranium	mg/L	06/14/2016	F	T	0.22		0.000012			Y
Vanadium	mg/L	06/14/2016	F	T	0.003		0.00058	J		Y

# **Surface Water Quality Data by Location For Site RFN01, Rifle New Processing Site**

**Location: 0324**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/17/2016	F	N	0.03		0.03	U		Y
Arsenic	mg/L	06/17/2016	F	D	0.00037		0.00012	J		Y
Calcium	mg/L	06/17/2016	F	D	29		0.024			Y
Chloride	mg/L	06/17/2016	F	N	28		0.3			Y
Magnesium	mg/L	06/17/2016	F	D	5.6		0.03			Y
Molybdenum	mg/L	06/17/2016	F	D	0.0092		0.00032			Y
Nitrate + Nitrite as Nitrogen	mg/L	06/17/2016	F	N	0.082		0.003			Y
ORP	mV	06/17/2016	F	N	69.0					Y
pH	SU	06/17/2016	F	N	8.75					Y
Potassium	mg/L	06/17/2016	F	D	1.3		0.052			Y
SC	uS/cm	06/17/2016	F	N	285					Y
Selenium	mg/L	06/17/2016	F	D	0.00066		0.00066	U		Y
Sodium	mg/L	06/17/2016	F	D	20		0.047			Y
Sulfate	mg/L	06/17/2016	F	N	34		1.5			Y
Temp	deg C	06/17/2016	F	N	16.09					Y
Total ALK	mg/L	06/17/2016	F	N	64					Y
Turb	NTU	06/17/2016	F	N	34.9					Y
Uranium	mg/L	06/17/2016	F	D	0.0011		0.000012			Y
Vanadium	mg/L	06/17/2016	F	D	0.00058		0.00058	U		Y

# Surface Water Quality Data by Location For Site RFN01, Rifle New Processing Site

Location: 0326

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/15/2016	F	N	0.03		0.03	U		Y
Arsenic	mg/L	06/15/2016	F	D	0.00033		0.00012	J		Y
Calcium	mg/L	06/15/2016	F	D	29		0.024			Y
Chloride	mg/L	06/15/2016	F	N	26		0.3			Y
Magnesium	mg/L	06/15/2016	F	D	5.7		0.03			Y
Molybdenum	mg/L	06/15/2016	F	D	0.005		0.00032			Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	0.08		0.003			Y
ORP	mV	06/15/2016	F	N	83.9					Y
pH	SU	06/15/2016	F	N	8.07					Y
Potassium	mg/L	06/15/2016	F	D	1.2		0.052			Y
SC	uS/cm	06/15/2016	F	N	278					Y
Selenium	mg/L	06/15/2016	F	D	0.00066		0.00066	U		Y
Sodium	mg/L	06/15/2016	F	D	18		0.047			Y
Sulfate	mg/L	06/15/2016	F	N	34		1.5			Y
Temp	deg C	06/15/2016	F	N	19.19					Y
Total ALK	mg/L	06/15/2016	F	N	86					Y
Turb	NTU	06/15/2016	F	N	37.7					Y
Uranium	mg/L	06/15/2016	F	D	0.00099		0.000012			Y
Vanadium	mg/L	06/15/2016	F	D	0.00059		0.00058	J		Y

# **Surface Water Quality Data by Location For Site RFN01, Rifle New Processing Site**

**Location: 0452**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/15/2016	F	N	3.3		0.03			Y
Arsenic	mg/L	06/15/2016	F	T	0.014		0.00012			Y
Calcium	mg/L	06/15/2016	F	T	440		0.024			Y
Chloride	mg/L	06/15/2016	F	N	340		2.4			Y
Magnesium	mg/L	06/15/2016	F	T	50		0.03			Y
Molybdenum	mg/L	06/15/2016	F	T	1.4		0.00032			Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	3.3		0.15			Y
ORP	mV	06/15/2016	F	N	161.5					Y
pH	SU	06/15/2016	F	N	8.20					Y
Potassium	mg/L	06/15/2016	F	T	27		0.052			Y
SC	uS/cm	06/15/2016	F	N	3132					Y
Selenium	mg/L	06/15/2016	F	T	0.011		0.00066			Y
Sodium	mg/L	06/15/2016	F	T	310		0.047			Y
Sulfate	mg/L	06/15/2016	F	N	1500		12			Y
Temp	deg C	06/15/2016	F	N	21.86					Y
Total ALK	mg/L	06/15/2016	F	N	210					Y
Turb	NTU	06/15/2016	F	N	3.26					Y
Uranium	mg/L	06/15/2016	F	T	0.19		0.000012			Y
Vanadium	mg/L	06/15/2016	F	T	0.67		0.00058			Y

# **Surface Water Quality Data by Location For Site RFN01, Rifle New Processing Site**

**Location: 0453**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/15/2016	F	N	2.8		0.03			Y
Arsenic	mg/L	06/15/2016	F	T	0.017		0.00012			Y
Calcium	mg/L	06/15/2016	F	T	380		0.024			Y
Chloride	mg/L	06/15/2016	F	N	350		2.4		J	Y
Magnesium	mg/L	06/15/2016	F	T	44		0.03			Y
Molybdenum	mg/L	06/15/2016	F	T	1.1		0.00032			Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	3		0.15			Y
ORP	mV	06/15/2016	F	N	145.7					Y
pH	SU	06/15/2016	F	N	7.75					Y
Potassium	mg/L	06/15/2016	F	T	25		0.052			Y
SC	uS/cm	06/15/2016	F	N	2929					Y
Selenium	mg/L	06/15/2016	F	T	0.015		0.00066			Y
Sodium	mg/L	06/15/2016	F	T	280		0.047			Y
Sulfate	mg/L	06/15/2016	F	N	1400		12		J	Y
Temp	deg C	06/15/2016	F	N	20.06					Y
Total ALK	mg/L	06/15/2016	F	N	302					Y
Turb	NTU	06/15/2016	F	N	0.82					Y
Uranium	mg/L	06/15/2016	F	T	0.16		0.000012			Y
Vanadium	mg/L	06/15/2016	F	T	0.56		0.00058			Y

# **Surface Water Quality Data by Location For Site RFN01, Rifle New Processing Site**

**Location: 0575**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Ammonia Total as N	mg/L	06/14/2016	F	N	0.5		0.03			Y
Arsenic	mg/L	06/14/2016	F	T	0.00099		0.00012	J		Y
Calcium	mg/L	06/14/2016	F	T	430		0.12			Y
Chloride	mg/L	06/14/2016	F	N	700		6		J	Y
Magnesium	mg/L	06/14/2016	F	T	270		0.15			Y
Molybdenum	mg/L	06/14/2016	F	T	0.89		0.00032			Y
Nitrate + Nitrite as Nitrogen	mg/L	06/14/2016	F	N	1		0.003			Y
ORP	mV	06/14/2016	F	N	53.5					Y
pH	SU	06/14/2016	F	N	7.70					Y
Potassium	mg/L	06/14/2016	F	T	67		0.26			Y
SC	uS/cm	06/14/2016	F	N	6874					Y
Selenium	mg/L	06/14/2016	F	T	0.0012		0.00066			Y
Sodium	mg/L	06/14/2016	F	T	1100		0.23			Y
Sulfate	mg/L	06/14/2016	F	N	4800		30		J	Y
Temp	deg C	06/14/2016	F	N	23.27					Y
Total ALK	mg/L	06/14/2016	F	N	104					Y
Turb	NTU	06/14/2016	F	N	8.27					Y
Uranium	mg/L	06/14/2016	F	T	0.17		0.000012			Y
Vanadium	mg/L	06/14/2016	F	T	0.0015		0.00058	J		Y

SAMPLE TYPE: D = Duplicate E = Equipment Blank F = Field Sample FB = Field Blank TB = Trip Blank

FRACTION: D = Dissolved N = NA T = Total

MDC / MDL: MDC = Radiochemical minimum detectable concentration. MDL = Non-radiochemical minimum detection limit

LAB QUALIFIERS (details can be found in laboratory report):

- \* = One or more quality control criteria failed (e.g., laboratory control sample, surrogate spike, or calibration verification recovery).
- B = Blank contamination. The reported result is associated with a contaminated blank.
- D = Result is from the analysis of a diluted sample.
- H = Holding time was exceeded.
- J = The reported result is an estimated value (e.g., matrix interference was observed or the analyte was detected at a concentration outside the quantitation range).
- U = Analytical result is below the MDC or MDL.
- 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 = Rejected, unusable result |
| U = Parameter analyzed for, but not detected.          | X = Location is undefined.                        |                               |

QA QUALIFIER: Yes = Validated, acceptable as qualified.

**Old Rifle**

**Groundwater Quality Data**



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# Groundwater Quality Data by Location For Site RFO01, Rifle Old Processing Site

Location: 0292A

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/16/2016	F	T	180		0.024		F	Y
Chloride	mg/L	06/16/2016	F	N	150		1.5		F	Y
Magnesium	mg/L	06/16/2016	F	T	110		0.03		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/16/2016	F	N	0.003		0.003	U	F	Y
ORP	mV	06/16/2016	F	N	30.1				F	Y
pH	SU	06/16/2016	F	N	7.21				F	Y
Potassium	mg/L	06/16/2016	F	T	5.4		0.052		F	Y
SC	uS/cm	06/16/2016	F	N	2295				F	Y
Selenium	mg/L	06/16/2016	F	T	0.0021		0.00066		F	Y
Sodium	mg/L	06/16/2016	F	T	240		0.047		F	Y
Sulfate	mg/L	06/16/2016	F	N	1000		7.5		F	Y
Temp	deg C	06/16/2016	F	N	13.67				F	Y
Total ALK	mg/L	06/16/2016	F	N	524				F	Y
Turb	NTU	06/16/2016	F	N	1.77				F	Y
Uranium	mg/L	06/16/2016	F	T	0.038		0.000012		F	Y
Vanadium	mg/L	06/16/2016	F	T	0.00058		0.00058	U	F	Y

**Groundwater Quality Data by Location For Site RFO01, Rifle Old Processing Site****Location: 0304**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/16/2016	F	D	190		0.024		F	Y
Chloride	mg/L	06/16/2016	F	N	240		1.5		F	Y
Magnesium	mg/L	06/16/2016	F	D	69		0.03		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/16/2016	F	N	0.013		0.003		F	Y
ORP	mV	06/16/2016	F	N	-23.6				F	Y
pH	SU	06/16/2016	F	N	7.36				F	Y
Potassium	mg/L	06/16/2016	F	D	8		0.052		F	Y
SC	uS/cm	06/16/2016	F	N	1976				F	Y
Selenium	mg/L	06/16/2016	F	D	0.0011		0.00066		F	Y
Sodium	mg/L	06/16/2016	F	D	160		0.047		F	Y
Sulfate	mg/L	06/16/2016	F	N	790		7.5		F	Y
Temp	deg C	06/16/2016	F	N	14.61				F	Y
Total ALK	mg/L	06/16/2016	F	N	320				F	Y
Turb	NTU	06/16/2016	F	N	34.1				F	Y
Uranium	mg/L	06/16/2016	F	D	0.059		0.000012		F	Y
Vanadium	mg/L	06/16/2016	F	D	0.022		0.00058		F	Y

# Groundwater Quality Data by Location For Site RFO01, Rifle Old Processing Site

Location: 0305

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/16/2016	F	T	220		0.024		F	Y
Chloride	mg/L	06/16/2016	F	N	450		2.4		F	Y
Magnesium	mg/L	06/16/2016	F	T	93		0.03		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/16/2016	F	N	0.003		0.003	U	F	Y
ORP	mV	06/16/2016	F	N	67.7				F	Y
pH	SU	06/16/2016	F	N	7.26				F	Y
Potassium	mg/L	06/16/2016	F	T	7.7		0.052		F	Y
SC	uS/cm	06/16/2016	F	N	2392				F	Y
Selenium	mg/L	06/16/2016	F	T	0.013		0.00066		F	Y
Sodium	mg/L	06/16/2016	F	T	210		0.047		F	Y
Sulfate	mg/L	06/16/2016	F	N	690		12		F	Y
Temp	deg C	06/16/2016	F	N	14.42				F	Y
Total ALK	mg/L	06/16/2016	F	N	372				F	Y
Turb	NTU	06/16/2016	F	N	8.49				F	Y
Uranium	mg/L	06/16/2016	F	T	0.073		0.000012		F	Y
Vanadium	mg/L	06/16/2016	F	T	0.26		0.00058		F	Y

# Groundwater Quality Data by Location For Site RFO01, Rifle Old Processing Site

Location: 0309

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/16/2016	F	T	180		0.024		F	Y
Chloride	mg/L	06/16/2016	F	N	170		1.5		F	Y
Magnesium	mg/L	06/16/2016	F	T	120		0.03		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/16/2016	F	N	0.003		0.003	U	F	Y
ORP	mV	06/16/2016	F	N	-42.0				F	Y
pH	SU	06/16/2016	F	N	7.26				F	Y
Potassium	mg/L	06/16/2016	F	T	6.5		0.052		F	Y
SC	uS/cm	06/16/2016	F	N	2137				F	Y
Selenium	mg/L	06/16/2016	F	T	0.00066		0.00066	U	F	Y
Sodium	mg/L	06/16/2016	F	T	190		0.047		F	Y
Sulfate	mg/L	06/16/2016	F	N	990		7.5		F	Y
Temp	deg C	06/16/2016	F	N	16.06				F	Y
Total ALK	mg/L	06/16/2016	F	N	340				F	Y
Turb	NTU	06/16/2016	F	N	9.55				F	Y
Uranium	mg/L	06/16/2016	F	T	0.026		0.000012		F	Y
Vanadium	mg/L	06/16/2016	F	T	0.00067		0.00058	J	F	Y

# Groundwater Quality Data by Location For Site RFO01, Rifle Old Processing Site

Location: 0310

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/16/2016	F	T	230		0.024		F	Y
Chloride	mg/L	06/16/2016	F	N	260		2.4		F	Y
Magnesium	mg/L	06/16/2016	F	T	120		0.03		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/16/2016	F	N	0.003		0.003	U	F	Y
ORP	mV	06/16/2016	F	N	-54.4				F	Y
pH	SU	06/16/2016	F	N	7.24				F	Y
Potassium	mg/L	06/16/2016	F	T	9		0.052		F	Y
SC	uS/cm	06/16/2016	F	N	2503				F	Y
Selenium	mg/L	06/16/2016	F	T	0.0012		0.00066		F	Y
Sodium	mg/L	06/16/2016	F	T	240		0.047		F	Y
Sulfate	mg/L	06/16/2016	F	N	1100		12		F	Y
Temp	deg C	06/16/2016	F	N	14.10				F	Y
Total ALK	mg/L	06/16/2016	F	N	490				F	Y
Turb	NTU	06/16/2016	F	N	3.21				F	Y
Uranium	mg/L	06/16/2016	F	T	0.17		0.000012		F	Y
Vanadium	mg/L	06/16/2016	F	T	0.0087		0.00058		F	Y

**Groundwater Quality Data by Location For Site RFO01, Rifle Old Processing Site****Location: 0655**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/16/2016	F	T	200		0.024		F	Y
Chloride	mg/L	06/16/2016	F	N	230		2.4		F	Y
Magnesium	mg/L	06/16/2016	F	T	130		0.03		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/16/2016	F	N	1.2		0.003		F	Y
ORP	mV	06/16/2016	F	N	-75.8				F	Y
pH	SU	06/16/2016	F	N	7.19				F	Y
Potassium	mg/L	06/16/2016	F	T	7.7		0.052		F	Y
SC	uS/cm	06/16/2016	F	N	2363				F	Y
Selenium	mg/L	06/16/2016	F	T	0.057		0.00066		F	Y
Sodium	mg/L	06/16/2016	F	T	210		0.047		F	Y
Sulfate	mg/L	06/16/2016	F	N	1000		12		F	Y
Temp	deg C	06/16/2016	F	N	13.46				F	Y
Total ALK	mg/L	06/16/2016	F	N	484				F	Y
Turb	NTU	06/16/2016	F	N	2.17				F	Y
Uranium	mg/L	06/16/2016	F	T	0.13		0.000012		F	Y
Vanadium	mg/L	06/16/2016	F	T	0.3		0.00058		F	Y

# Groundwater Quality Data by Location For Site RFO01, Rifle Old Processing Site

Location: 0656

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/15/2016	F	T	200		0.024		F	Y
Chloride	mg/L	06/15/2016	F	N	440		2.4		FJ	Y
Magnesium	mg/L	06/15/2016	F	T	98		0.03		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	0.017		0.003		F	Y
ORP	mV	06/15/2016	F	N	115.1				F	Y
pH	SU	06/15/2016	F	N	7.18				F	Y
Potassium	mg/L	06/15/2016	F	T	10		0.052		F	Y
SC	uS/cm	06/15/2016	F	N	2657				F	Y
Selenium	mg/L	06/15/2016	F	T	0.0017		0.00066		F	Y
Sodium	mg/L	06/15/2016	F	T	290		0.047		F	Y
Sulfate	mg/L	06/15/2016	F	N	990		12		FJ	Y
Temp	deg C	06/15/2016	F	N	17.66				F	Y
Total ALK	mg/L	06/15/2016	F	N	352				F	Y
Turb	NTU	06/15/2016	F	N	5.33				F	Y
Uranium	mg/L	06/15/2016	F	T	0.25		0.000012		F	Y
Vanadium	mg/L	06/15/2016	F	T	0.025		0.00058		F	Y



**Groundwater Quality Data by Location For Site RFO01, Rifle Old Processing Site****Location: 0658**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/15/2016	F	T	190		0.024		F	Y
Chloride	mg/L	06/15/2016	F	N	38		1.2		FJ	Y
Magnesium	mg/L	06/15/2016	F	T	100		0.03		F	Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	0.021		0.003		F	Y
ORP	mV	06/15/2016	F	N	-19.4				F	Y
pH	SU	06/15/2016	F	N	7.24				F	Y
Potassium	mg/L	06/15/2016	F	T	3.4		0.052		F	Y
SC	uS/cm	06/15/2016	F	N	1580				F	Y
Selenium	mg/L	06/15/2016	F	T	0.0018		0.00066		F	Y
Sodium	mg/L	06/15/2016	F	T	88		0.047		F	Y
Sulfate	mg/L	06/15/2016	F	N	700		6		FJ	Y
Temp	deg C	06/15/2016	F	N	14.25				F	Y
Total ALK	mg/L	06/15/2016	F	N	490				F	Y
Turb	NTU	06/15/2016	F	N	7.06				F	Y
Uranium	mg/L	06/15/2016	F	T	0.013		0.000012		F	Y
Vanadium	mg/L	06/15/2016	F	T	0.00071		0.00058	J	F	Y

SAMPLE TYPE: D = Duplicate E = Equipment Blank F = Field Sample FB = Field Blank TB = Trip Blank

FRACTION: D = Dissolved N = NA T = Total

MDC / MDL MDC = Radiochemical minimum detectable concentration MDL = Non-radiochemical minimum detection limit

LAB QUALIFIERS (details can be found in laboratory report):

- \* = One or more quality control criteria failed (e.g., laboratory control sample, surrogate spike, or calibration verification recovery).
- B = Blank contamination. The reported result is associated with a contaminated blank.
- D = Result is from the analysis of a diluted sample.
- H = Holding time was exceeded.
- J = The reported result is an estimated value (e.g., matrix interference was observed or the analyte was detected at a concentration outside the quantitation range).
- U = Analytical result is below the MDC or MDL.
- 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 = Rejected, unusable result |
| U = Parameter analyzed for, but not detected.          | X = Location is undefined.                        |                               |

QA QUALIFIER: Yes = Validated, acceptable as qualified.

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**Old Rifle**

**Surface Water Quality Data**

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# **Surface Water Quality Data by Location For Site RFO01, Rifle Old Processing Site**

**Location: 0294**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/15/2016	F	D	28		0.024			Y
Chloride	mg/L	06/15/2016	F	N	29		0.3		J	Y
Magnesium	mg/L	06/15/2016	F	D	5.5		0.03			Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	0.077		0.003			Y
ORP	mV	06/15/2016	F	N	101.9					Y
pH	SU	06/15/2016	F	N	8.47					Y
Potassium	mg/L	06/15/2016	F	D	1.3		0.052			Y
SC	uS/cm	06/15/2016	F	N	283					Y
Selenium	mg/L	06/15/2016	F	D	0.00066		0.00066	U		Y
Sodium	mg/L	06/15/2016	F	D	19		0.047			Y
Sulfate	mg/L	06/15/2016	F	N	39		1.5		J	Y
Temp	deg C	06/15/2016	F	N	14.81					Y
Total ALK	mg/L	06/15/2016	F	N	62					Y
Turb	NTU	06/15/2016	F	N	27.4					Y
Uranium	mg/L	06/15/2016	F	D	0.00087		0.000012			Y
Vanadium	mg/L	06/15/2016	F	D	0.00058		0.00058	U		Y

# Surface Water Quality Data by Location For Site RFO01, Rifle Old Processing Site

Location: 0395

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/16/2016	F	T	89		0.024			Y
Chloride	mg/L	06/16/2016	F	N	29		1.2			Y
Magnesium	mg/L	06/16/2016	F	T	60		0.03			Y
Nitrate + Nitrite as Nitrogen	mg/L	06/16/2016	F	N	0.056		0.003			Y
ORP	mV	06/16/2016	F	N	204.0					Y
pH	SU	06/16/2016	F	N	7.59					Y
Potassium	mg/L	06/16/2016	F	T	2.6		0.052			Y
SC	uS/cm	06/16/2016	F	N	1045					Y
Selenium	mg/L	06/16/2016	F	T	0.0018		0.00066			Y
Sodium	mg/L	06/16/2016	F	T	60		0.047			Y
Sulfate	mg/L	06/16/2016	F	N	340		6			Y
Temp	deg C	06/16/2016	F	N	19.22					Y
Total ALK	mg/L	06/16/2016	F	N	316					Y
Turb	NTU	06/16/2016	F	N	2.77					Y
Uranium	mg/L	06/16/2016	F	T	0.023		0.000012			Y
Vanadium	mg/L	06/16/2016	F	T	0.00099		0.00058	J		Y

# **Surface Water Quality Data by Location For Site RFO01, Rifle Old Processing Site**

**Location: 0396**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/15/2016	F	D	28		0.024			Y
Chloride	mg/L	06/15/2016	F	N	30		0.3		J	Y
Magnesium	mg/L	06/15/2016	F	D	5.5		0.03			Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	0.081		0.003			Y
ORP	mV	06/15/2016	F	N	82.9					Y
pH	SU	06/15/2016	F	N	7.30					Y
Potassium	mg/L	06/15/2016	F	D	1.3		0.052			Y
SC	uS/cm	06/15/2016	F	N	262					Y
Selenium	mg/L	06/15/2016	F	D	0.00066		0.00066	U		Y
Sodium	mg/L	06/15/2016	F	D	19		0.047			Y
Sulfate	mg/L	06/15/2016	F	N	40		1.5		J	Y
Temp	deg C	06/15/2016	F	N	17.07					Y
Total ALK	mg/L	06/15/2016	F	N	80					Y
Turb	NTU	06/15/2016	F	N	16.3					Y
Uranium	mg/L	06/15/2016	F	D	0.00083		0.000012			Y
Vanadium	mg/L	06/15/2016	F	D	0.00058		0.00058	U		Y



# Surface Water Quality Data by Location For Site RFO01, Rifle Old Processing Site

Location: 0398

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/15/2016	F	T	130		0.024			Y
Chloride	mg/L	06/15/2016	F	N	170		1.2		J	Y
Magnesium	mg/L	06/15/2016	F	T	46		0.03			Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	0.29		0.003			Y
ORP	mV	06/15/2016	F	N	120.5					Y
pH	SU	06/15/2016	F	N	8.21					Y
Potassium	mg/L	06/15/2016	F	T	3.3		0.052			Y
SC	uS/cm	06/15/2016	F	N	1345					Y
Selenium	mg/L	06/15/2016	F	T	0.0032		0.00066			Y
Sodium	mg/L	06/15/2016	F	T	120		0.047			Y
Sulfate	mg/L	06/15/2016	F	N	460		6		J	Y
Temp	deg C	06/15/2016	F	N	20.89					Y
Total ALK	mg/L	06/15/2016	F	N	210					Y
Turb	NTU	06/15/2016	F	N	7.55					Y
Uranium	mg/L	06/15/2016	F	T	0.013		0.000012			Y
Vanadium	mg/L	06/15/2016	F	T	0.0037		0.00058			Y

# **Surface Water Quality Data by Location For Site RFO01, Rifle Old Processing Site**

**Location: 0741 River location near old 572 pond location**

Report Date: 08/24/2016

Parameter	Units	Sample Date	Sample Type	Fraction	Result	Uncertainty	MDC/MDL	Lab	Data	QA
Calcium	mg/L	06/15/2016	F	D	28		0.024			Y
Chloride	mg/L	06/15/2016	F	N	31		0.3		J	Y
Magnesium	mg/L	06/15/2016	F	D	5.5		0.03			Y
Nitrate + Nitrite as Nitrogen	mg/L	06/15/2016	F	N	0.081		0.003			Y
ORP	mV	06/15/2016	F	N	154.6					Y
pH	SU	06/15/2016	F	N	6.51					Y
Potassium	mg/L	06/15/2016	F	D	1.3		0.052			Y
SC	uS/cm	06/15/2016	F	N	261					Y
Selenium	mg/L	06/15/2016	F	D	0.00066		0.00066	U		Y
Sodium	mg/L	06/15/2016	F	D	19		0.047			Y
Sulfate	mg/L	06/15/2016	F	N	42		1.5		J	Y
Temp	deg C	06/15/2016	F	N	14.81					Y
Total ALK	mg/L	06/15/2016	F	N	92					Y
Turb	NTU	06/15/2016	F	N	17.1					Y
Uranium	mg/L	06/15/2016	F	D	0.0009		0.000012			Y
Vanadium	mg/L	06/15/2016	F	D	0.00058		0.00058	U		Y

SAMPLE TYPE: D = Duplicate E = Equipment Blank F = Field Sample FB = Field Blank TB = Trip Blank

FRACTION: D = Dissolved N = NA T = Total

MDC / MDL: MDC = Radiochemical minimum detectable concentration MDL = Non-radiochemical minimum detection limit

LAB QUALIFIERS (details can be found in laboratory report):

- \* = One or more quality control criteria failed (e.g., laboratory control sample, surrogate spike, or calibration verification recovery).
- B = Blank contamination. The reported result is associated with a contaminated blank.
- D = Result is from the analysis of a diluted sample.
- H = Holding time was exceeded.
- J = The reported result is an estimated value (e.g., matrix interference was observed or the analyte was detected at a concentration outside the quantitation range).
- U = Analytical result is below the MDC or MDL.
- 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 = Rejected, unusable result |
| U = Parameter analyzed for, but not detected.          | X = Location is undefined.                        |                               |

QA QUALIFIER: Yes = Validated, acceptable as qualified.

## **Equipment Blank Data**

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# Validation Report: Field Blanks

Page 1 of 4

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-16060001

**Lab Code:** PAR

17-Aug-2016

Blank Type	Sample Code	Location	Method	Analyte	Result	Lab Qualifiers
E	RFN01.1-16060001-027	2804	SW-846 6010	Calcium	0.12	J

## Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
RFN01.1-16060001-011	0323	540	5		
RFN01.1-16060001-012	0324	29	1		
RFN01.1-16060001-013	0326	29	1		
RFN01.1-16060001-016	0575	430	5		

## Validation Report: Field Blanks

Page 2 of 4

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-  
16060001

**Lab Code:** PAR

17-Aug-2016

E	RFN01.1-16060001-027	2804	SW-846 6010	Magnesium	0.037	J
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### Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
RFN01.1-16060001-011	0323	120	5		
RFN01.1-16060001-012	0324	5.6	1		
RFN01.1-16060001-013	0326	5.7	1		
RFN01.1-16060001-016	0575	270	5		

# Validation Report: Field Blanks

Page 3 of 4

Project: Rifle, New, Processing Site

Task Code: RFN01.1-  
16060001

Lab Code: PAR

17-Aug-2016

E	RFN01.1-16060001-027	2804	SW-846 6010	Potassium	0.11	J
---	----------------------	------	-------------	-----------	------	---

## Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
RFN01.1-16060001-011	0323	50	5		
RFN01.1-16060001-012	0324	1.3	1		
RFN01.1-16060001-013	0326	1.2	1		
RFN01.1-16060001-016	0575	67	5		



# Validation Report: Field Blanks

Page 4 of 4

**Project:** Rifle, New, Processing Site

**Task Code:** RFN01.1-  
16060001

**Lab Code:** PAR

17-Aug-2016

E	RFN01.1-16060001-027	2804	SW-846 6010	Sodium	0.15	J
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## Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
RFN01.1-16060001-011	0323	730	5		
RFN01.1-16060001-012	0324	20	1		
RFN01.1-16060001-013	0326	18	1		
RFN01.1-16060001-016	0575	1100	5		

## **Static Water Level Data**

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**Static Water Levels For Site RFN01, Rifle New Processing Site**

Measurement Date Between : 06/14/2016 and 07/07/2016

Report Date: 08/24/2016

Location Code	Measurement Date	Top of Casing Elevation	Water Elevation	Water Level Depth	Units
0169	06/14/2016	5275.47	5268.67	6.8	ft
0170	06/16/2016	5332.97	5238.37	94.6	ft
0172	06/16/2016	5229.45	5219.23	10.22	ft
0195	06/15/2016	5253.1	5244.05	9.05	ft
0201	06/15/2016	5261.07	5248.46	12.61	ft
0215	06/14/2016	5271.42	5264.61	6.81	ft
0216	07/07/2016	5265.41	5259.94	5.47	ft
0217	06/15/2016	5256.98	5253.68	3.3	ft
0590	06/15/2016	5256.37	5250.2	6.17	ft
0620	06/17/2016	5231.22	5222.82	8.4	ft
0658	06/14/2016	5265.91	5262.1	3.81	ft
0659	06/14/2016	5261.33	5255.48	5.85	ft
0664	06/14/2016	5270.17	5258.47	11.7	ft
0669	06/14/2016	5266.56	5258.44	8.12	ft
0670	06/14/2016	5270.94	5260.09	10.85	ft
0855	06/14/2016	5267.24	5262.29	4.95	ft

**Static Water Levels For Site RFO01, Rifle Old Processing Site**

Measurement Date Between : 06/14/2016 and 07/07/2016

Report Date: 08/24/2016

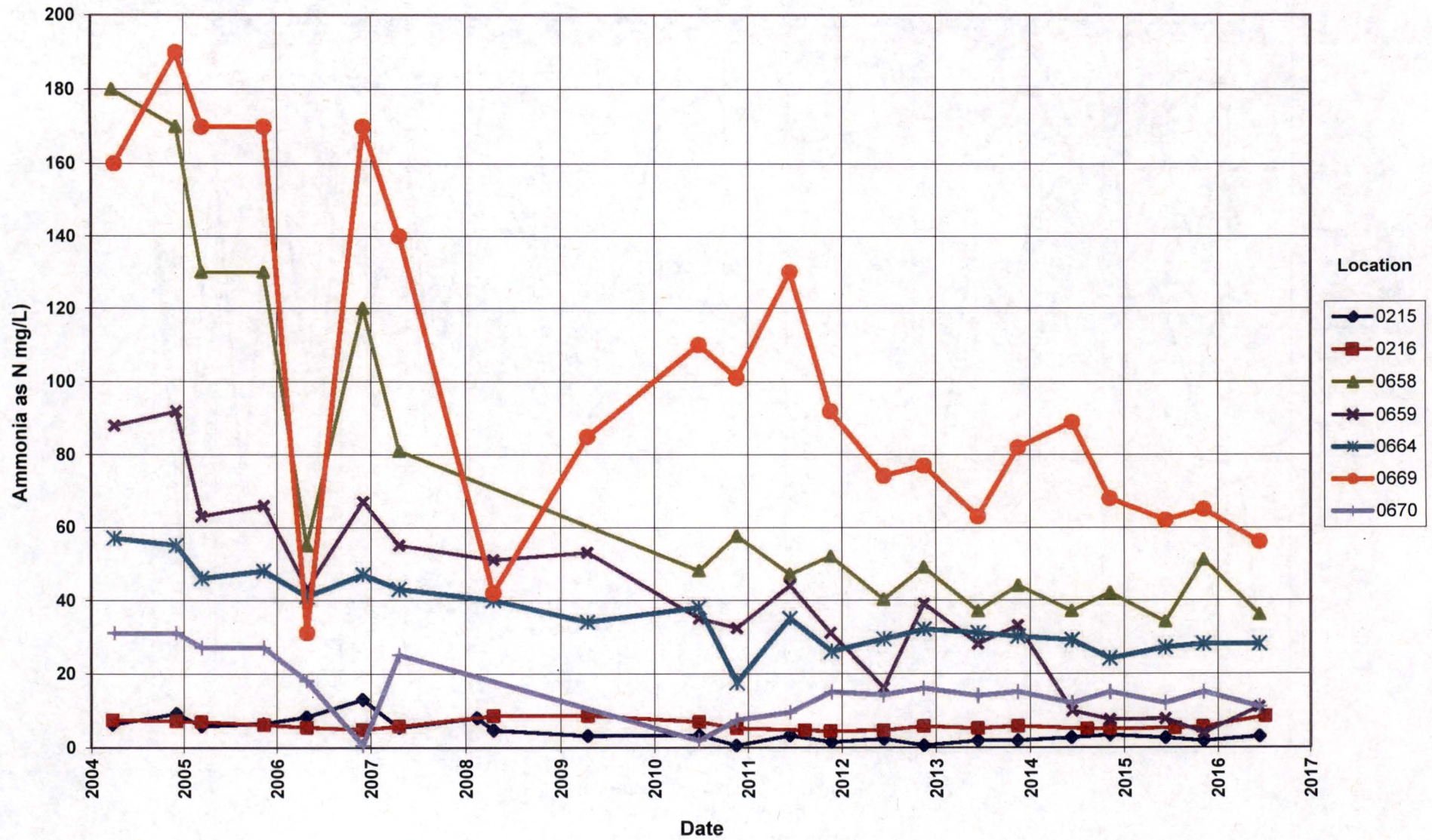
Location Code	Measurement Date	Top of Casing Elevation	Water Elevation	Water Level Depth	Units
0292A	06/16/2016	5323.08	5312.88	10.2	ft
0304	06/16/2016	5310.63	5302.68	7.95	ft
0305	06/16/2016	5312.08	5303.53	8.55	ft
0309	06/16/2016	5313.37	5301.67	11.7	ft
0310	06/16/2016	5311.64	5302.79	8.85	ft
0655	06/16/2016	5312.87	5302.92	9.95	ft
0656	06/15/2016	5313.28	5304.33	8.95	ft
0658	06/15/2016	5323.07	5315.87	7.2	ft

**New Rifle**

**Groundwater Time-Concentration Graphs**

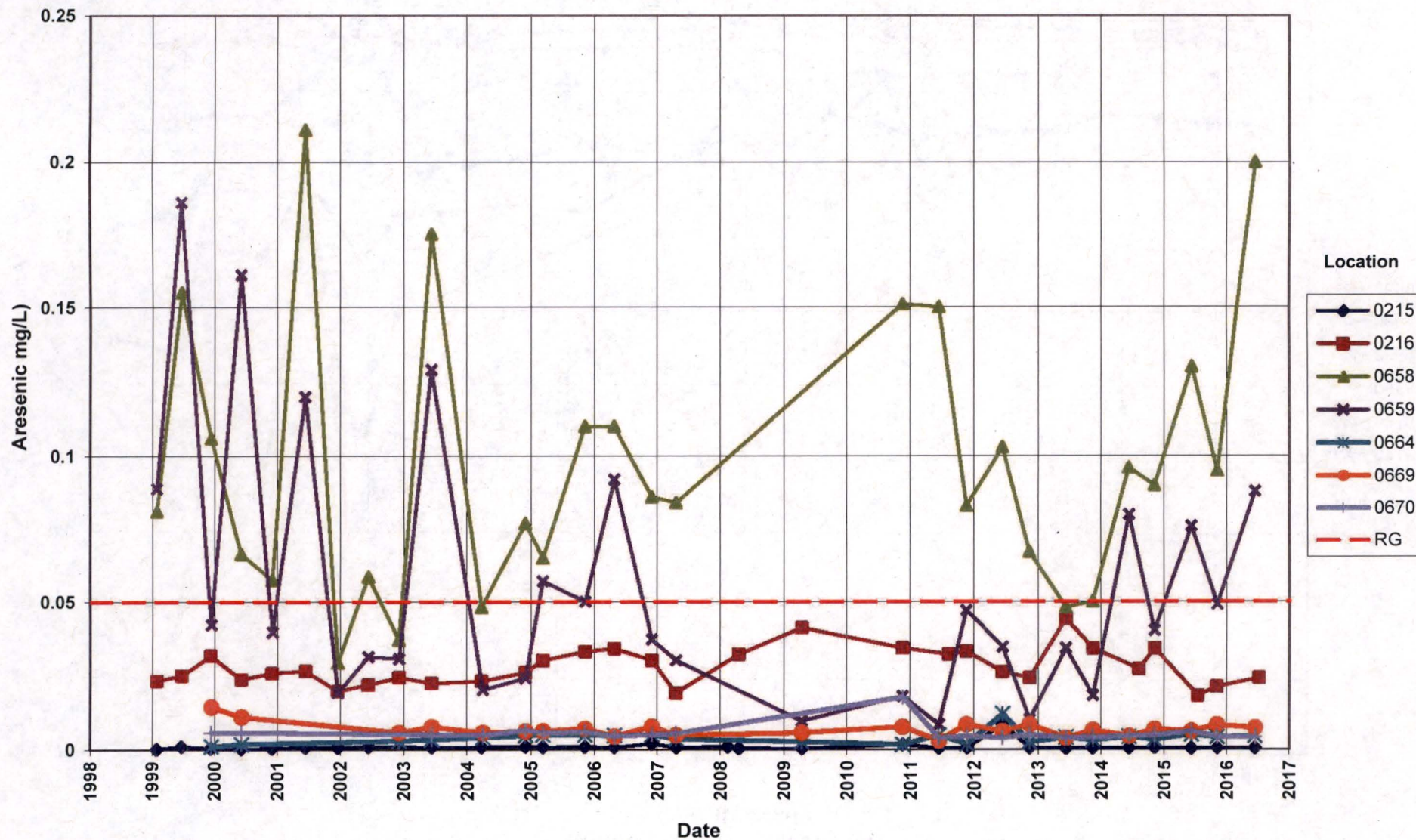
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Rifle New Processing Site  
Ammonia as N Concentration  
On-Site Wells



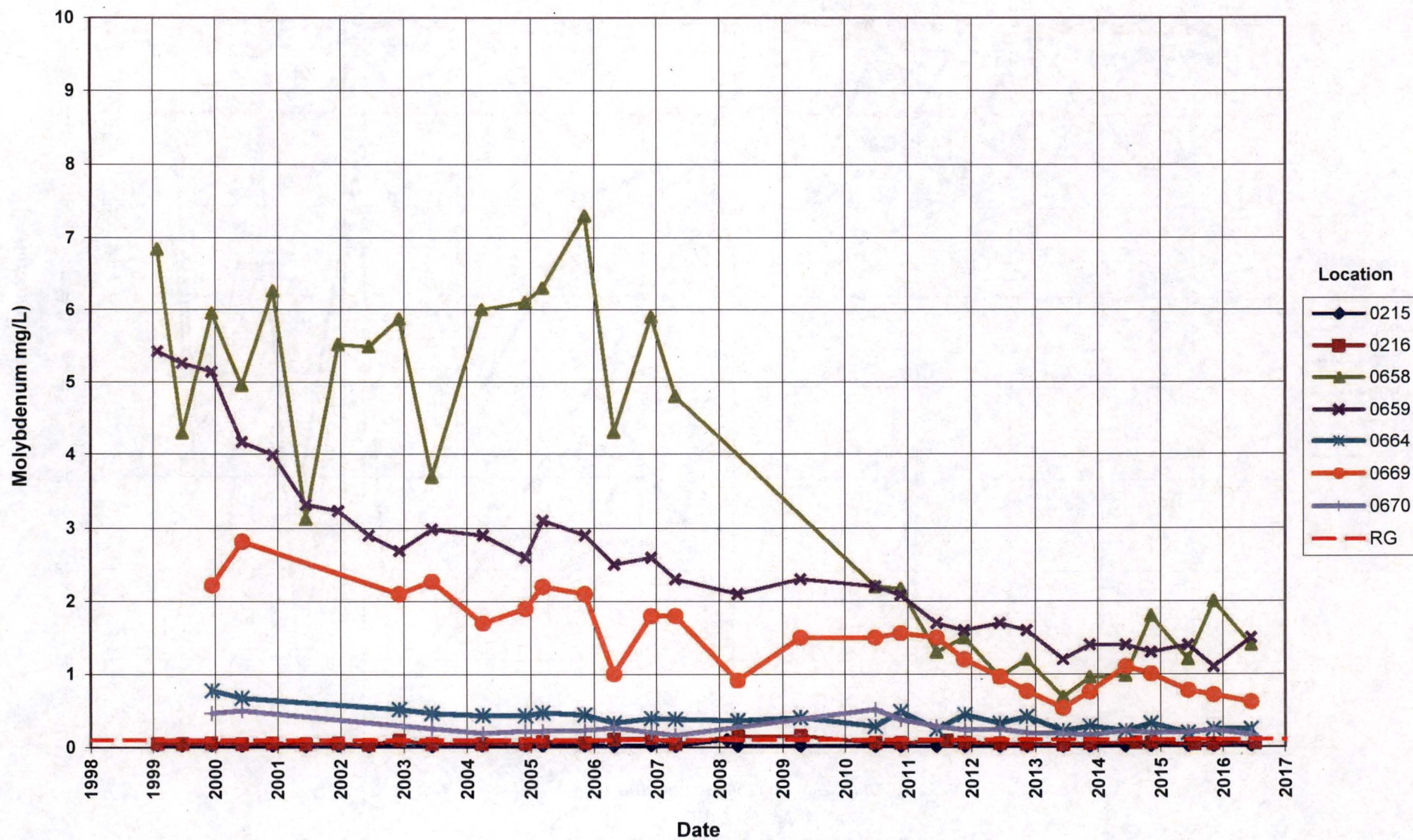


**Rifle New Processing Site  
Arsenic Concentration  
On-Site Wells**  
Remediation Goal (RG) = 0.05 mg/L



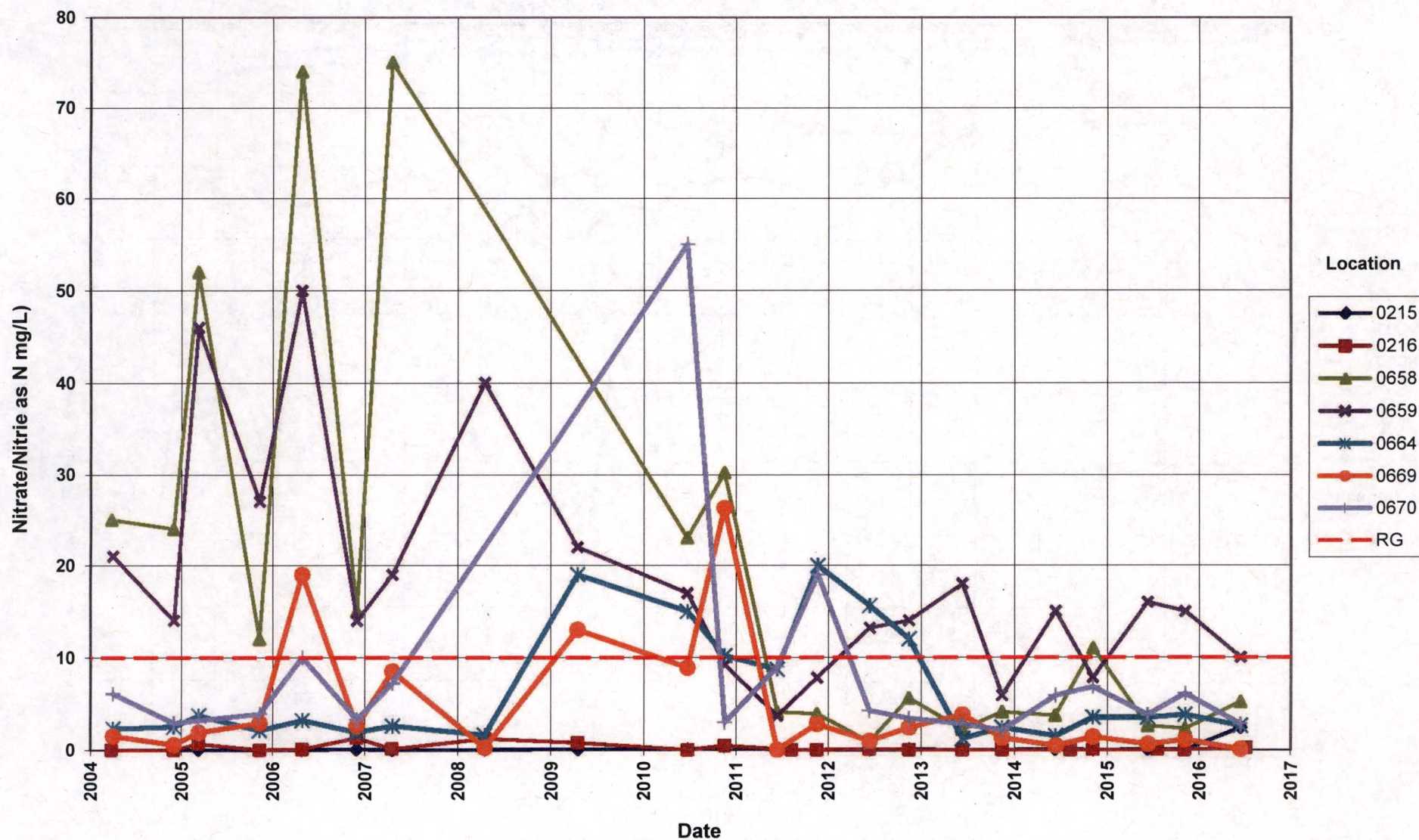


**Rifle New Processing Site  
Molybdenum Concentration  
On-Site Wells**  
Remediation Goal (RG) = 0.1 mg/L



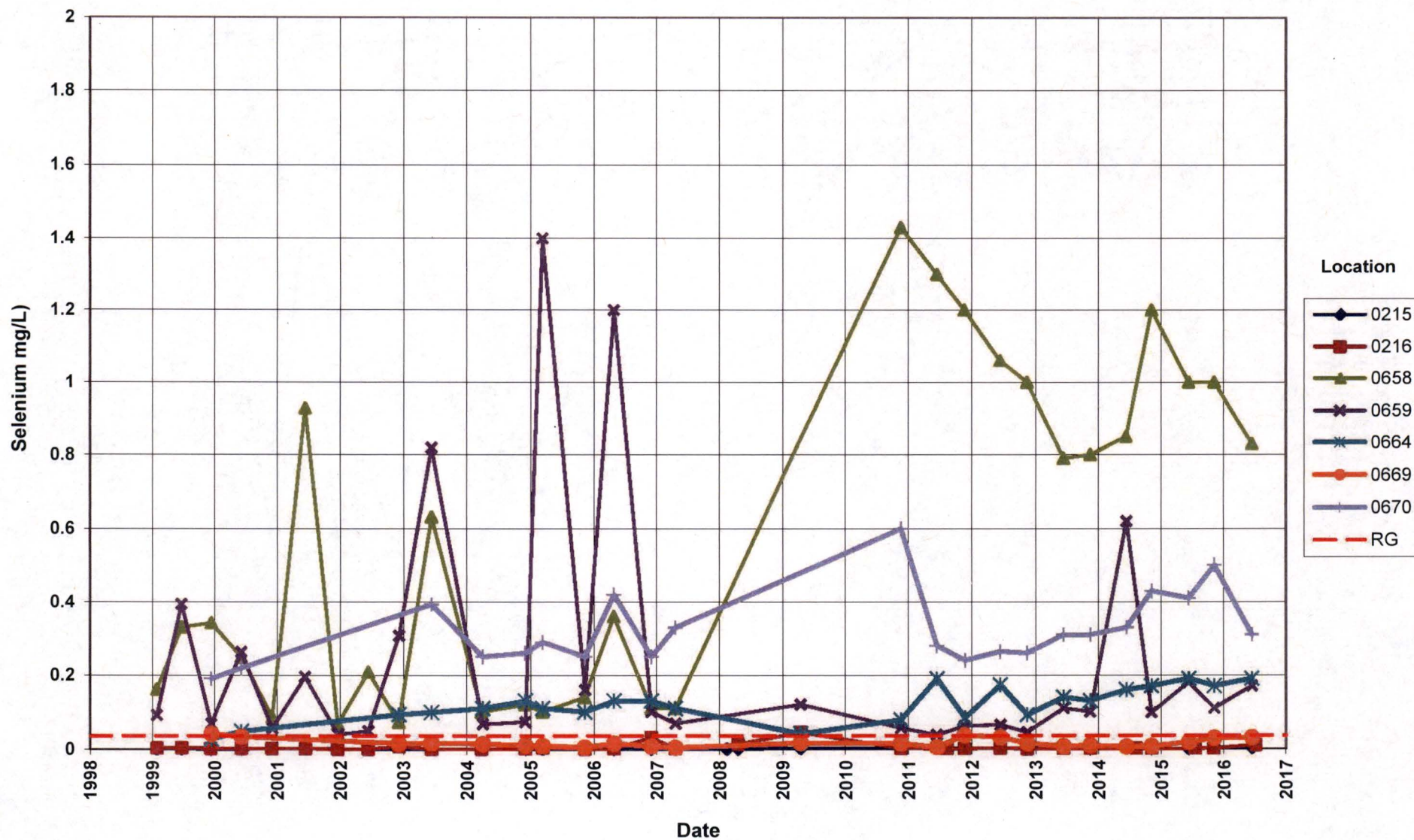


**Rifle New Processing Site**  
**Nitrate/Nitrite as N Concentration**  
**On-Site Wells**  
 Remediation Goal (RG) = 10 mg/L

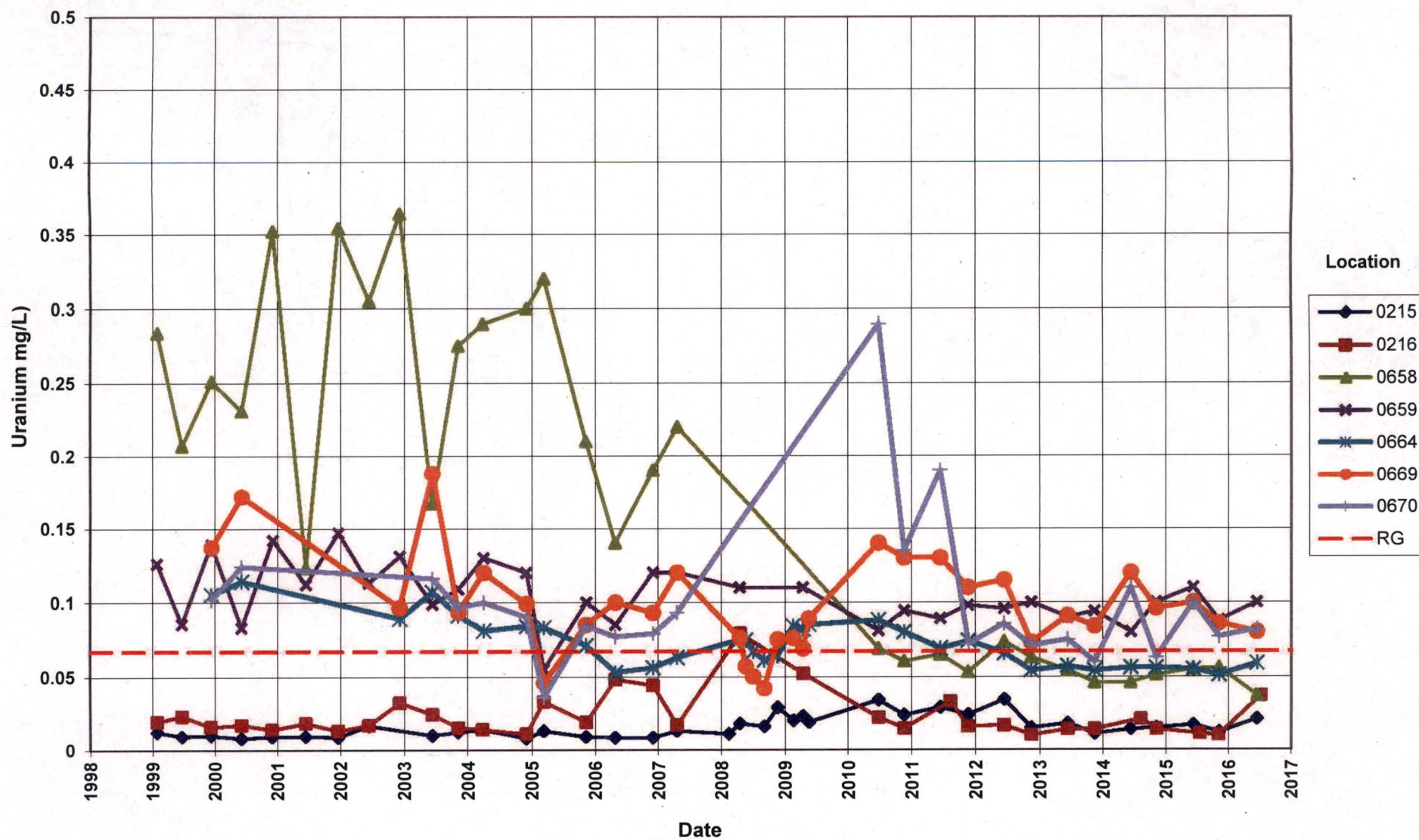




**Rifle New Processing Site  
Selenium Concentration  
On-Site Wells**  
Remediation Goal (RG) = 0.036 mg/L

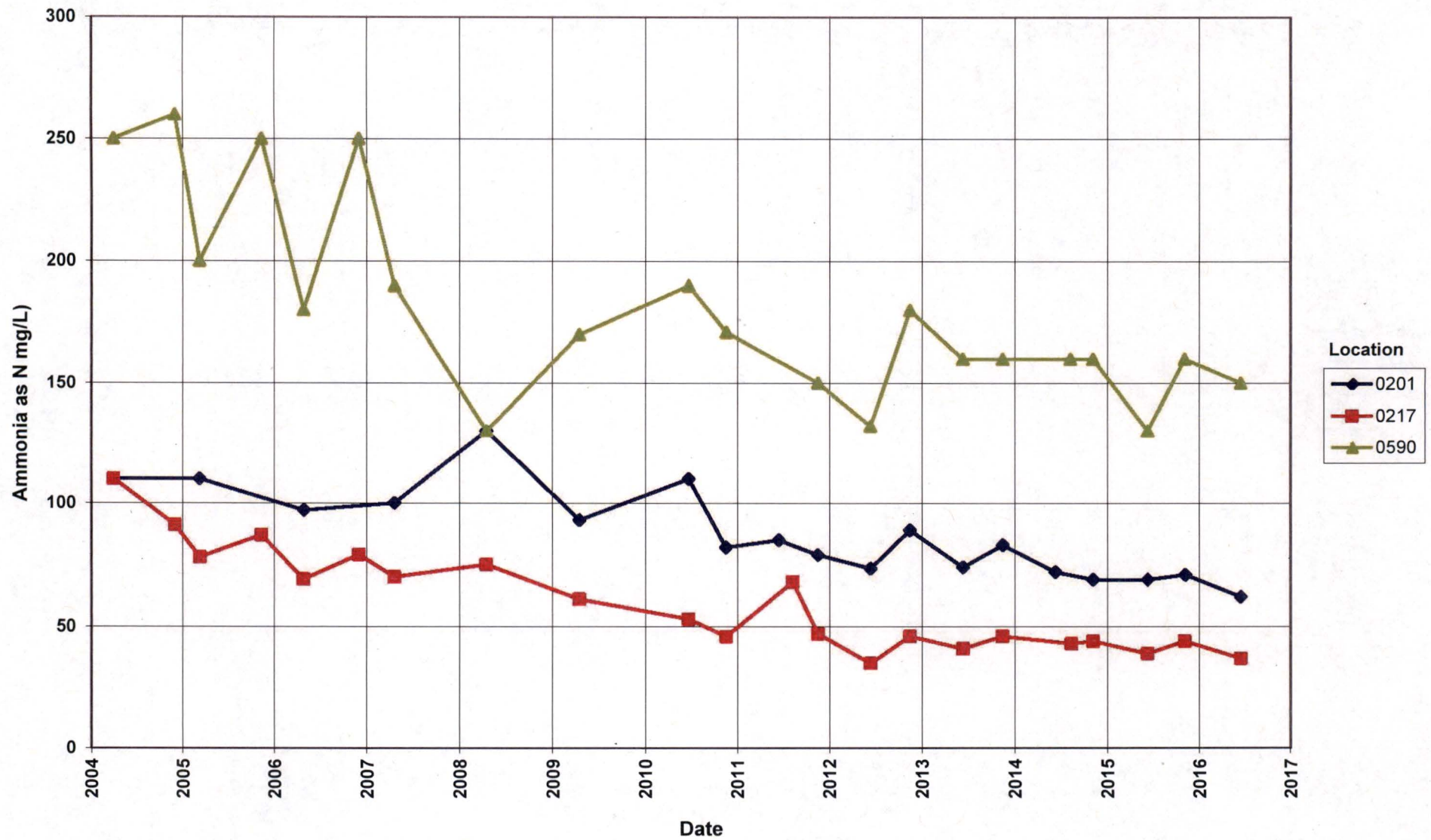


**Rifle New Processing Site  
Uranium Concentration  
On-Site Wells**  
Remediation Goal (RG) = 0.067 mg/L

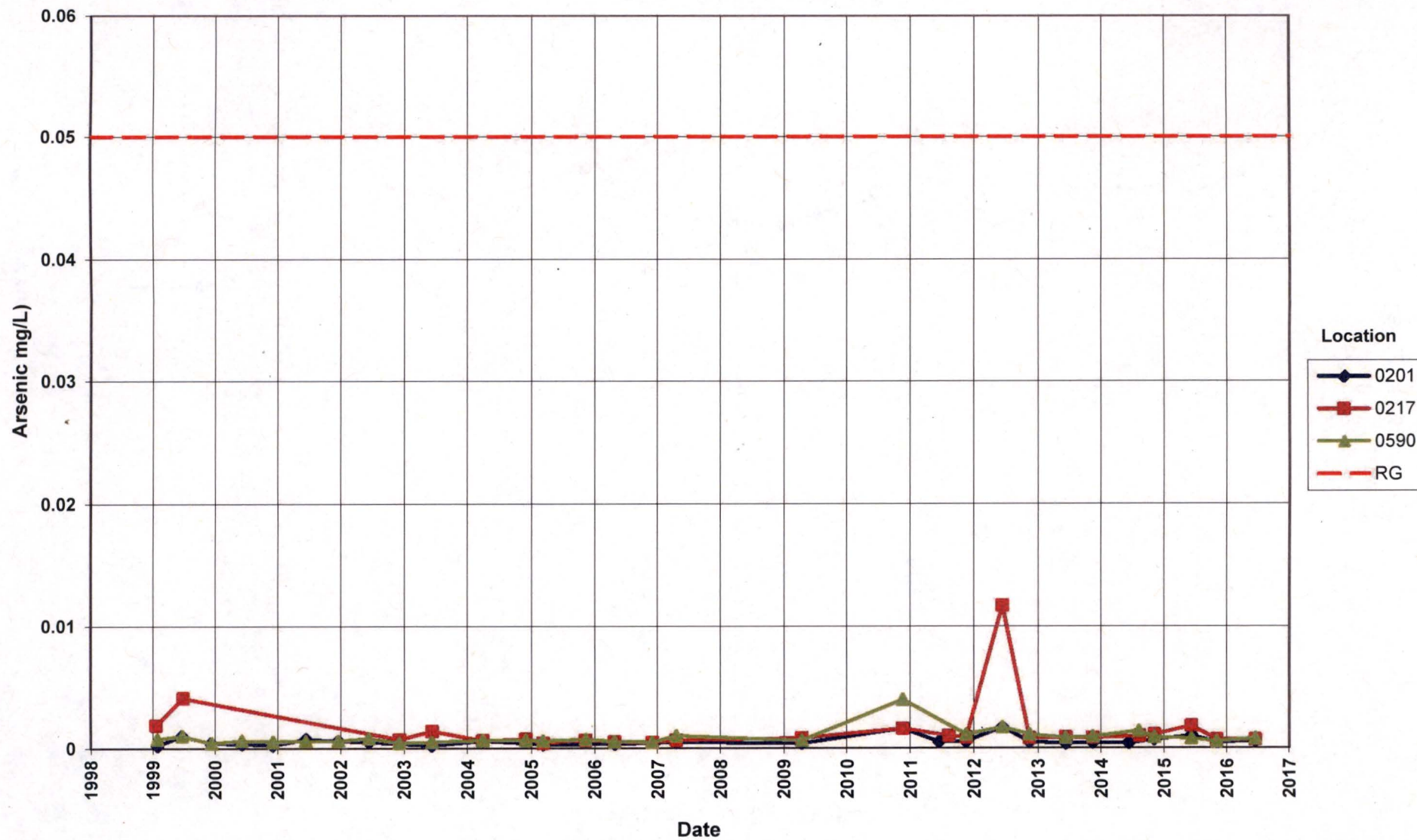




Rifle New Processing Site  
Ammonia as N Concentration  
Adjacent to Site Wells

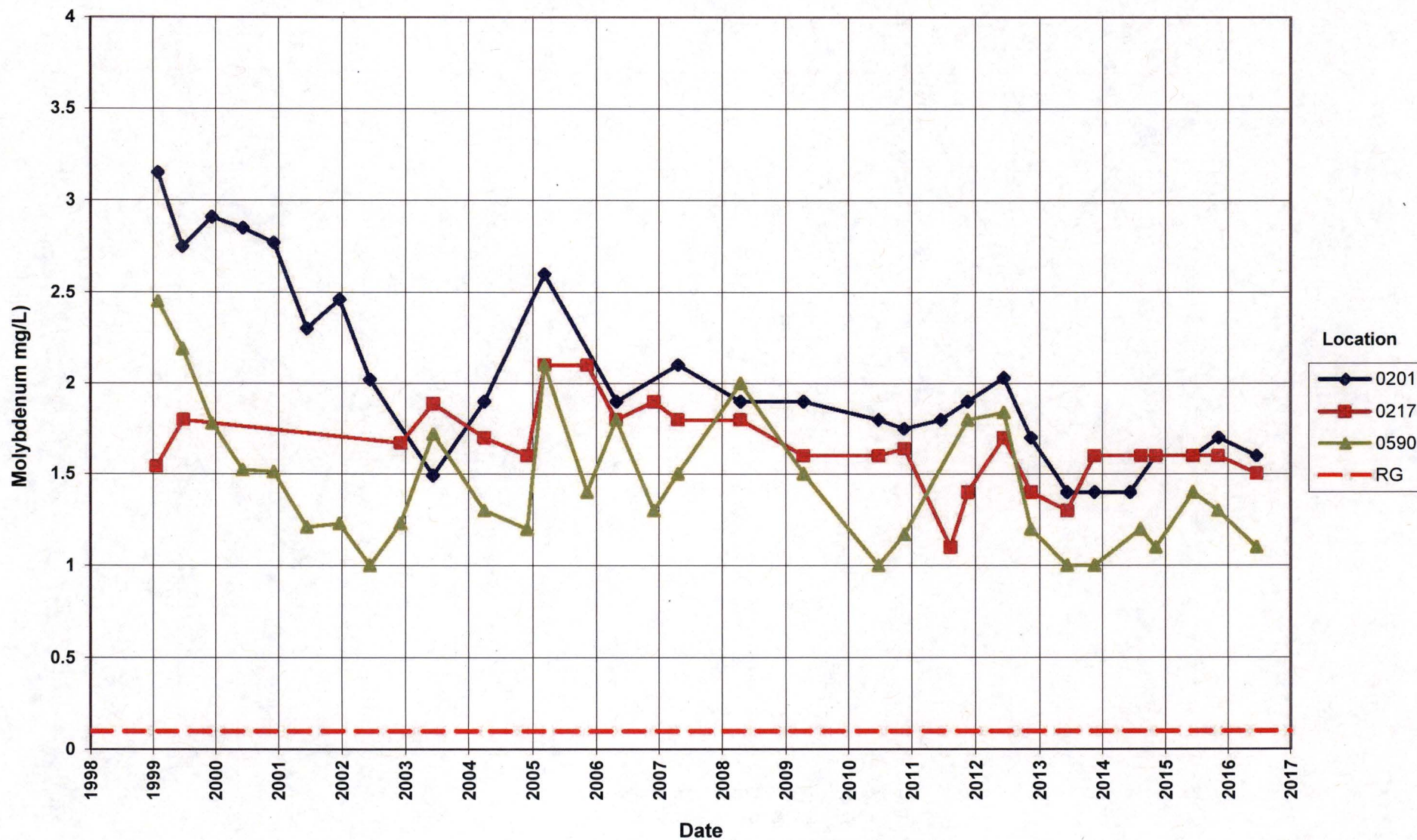


**Rifle New Processing Site  
Arsenic Concentration  
Adjacent to Site Wells**  
Remediation Goal (RG) = 0.05 mg/L



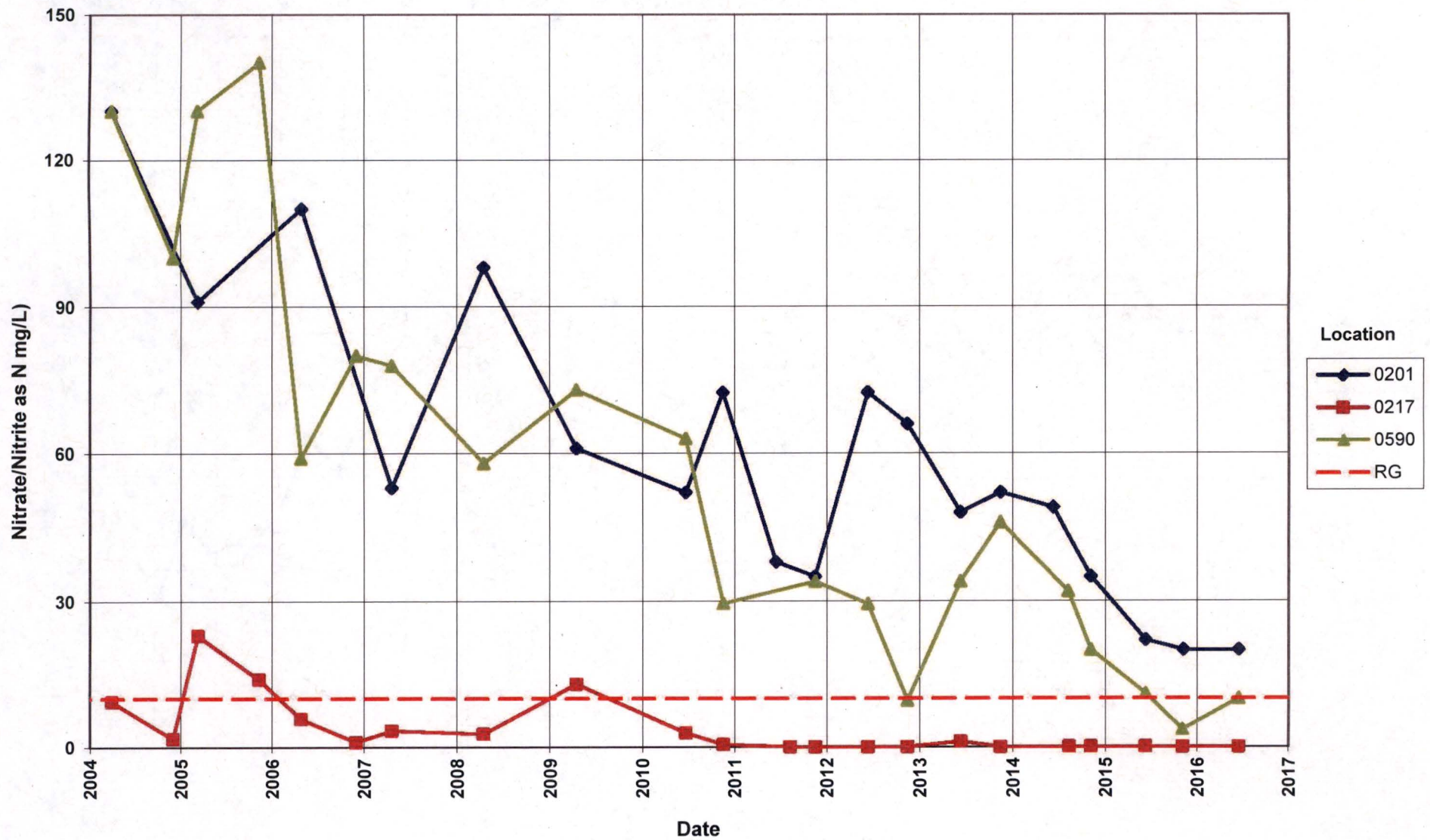


Rifle New Processing Site  
Molybdenum Concentration  
Adjacent to Site Wells  
Remediation Goal (RG) = 0.1 mg/L

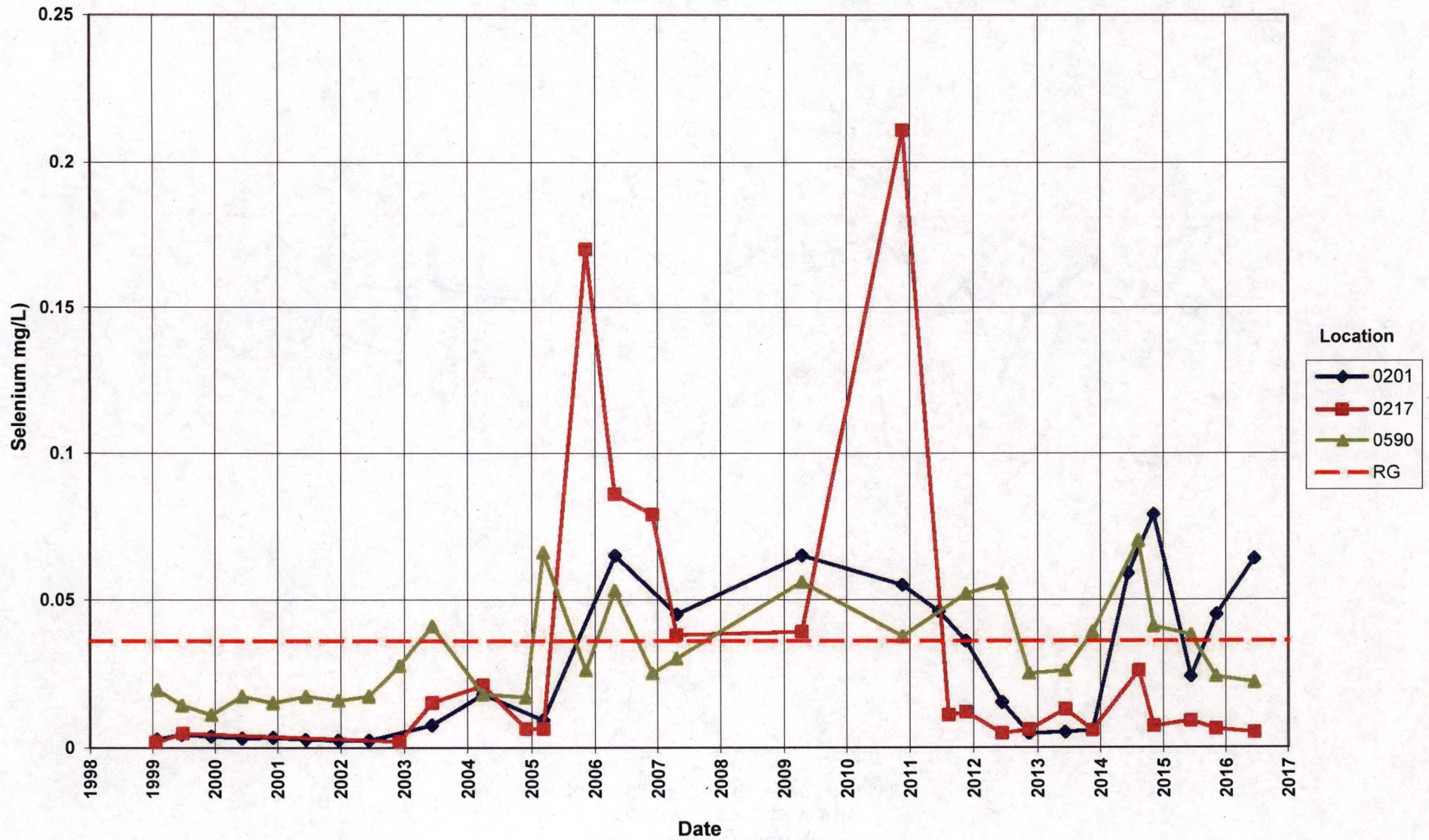




Rifle New Processing Site  
Nitrate/Nitrite as N Concentration  
Adjacent to Site Wells  
Remediation Goal (RG) = 10 mg/L

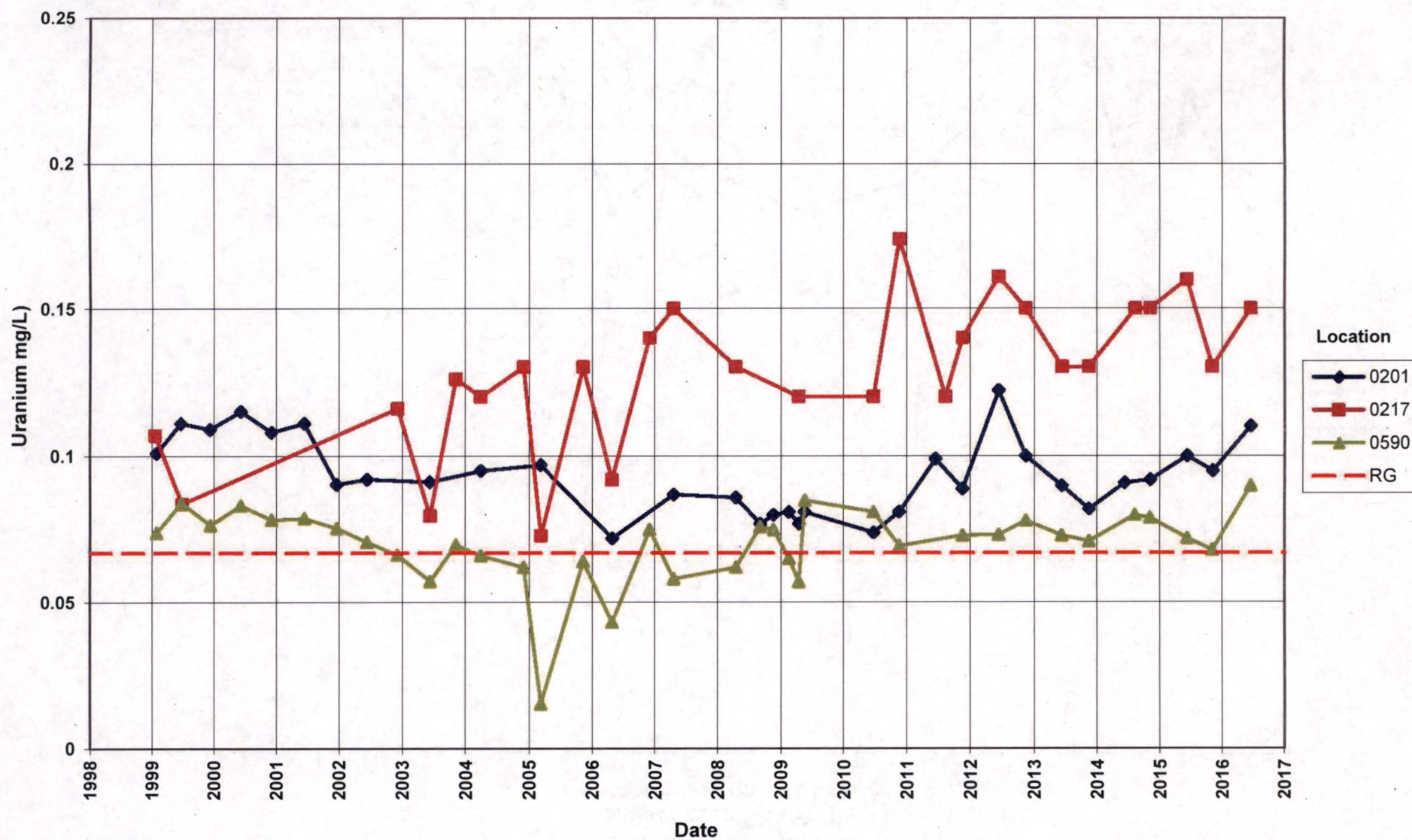


**Rifle New Processing Site  
Selenium Concentration  
Adjacent to Site Wells**  
Remediation Goal (RG) = 0.036 mg/L



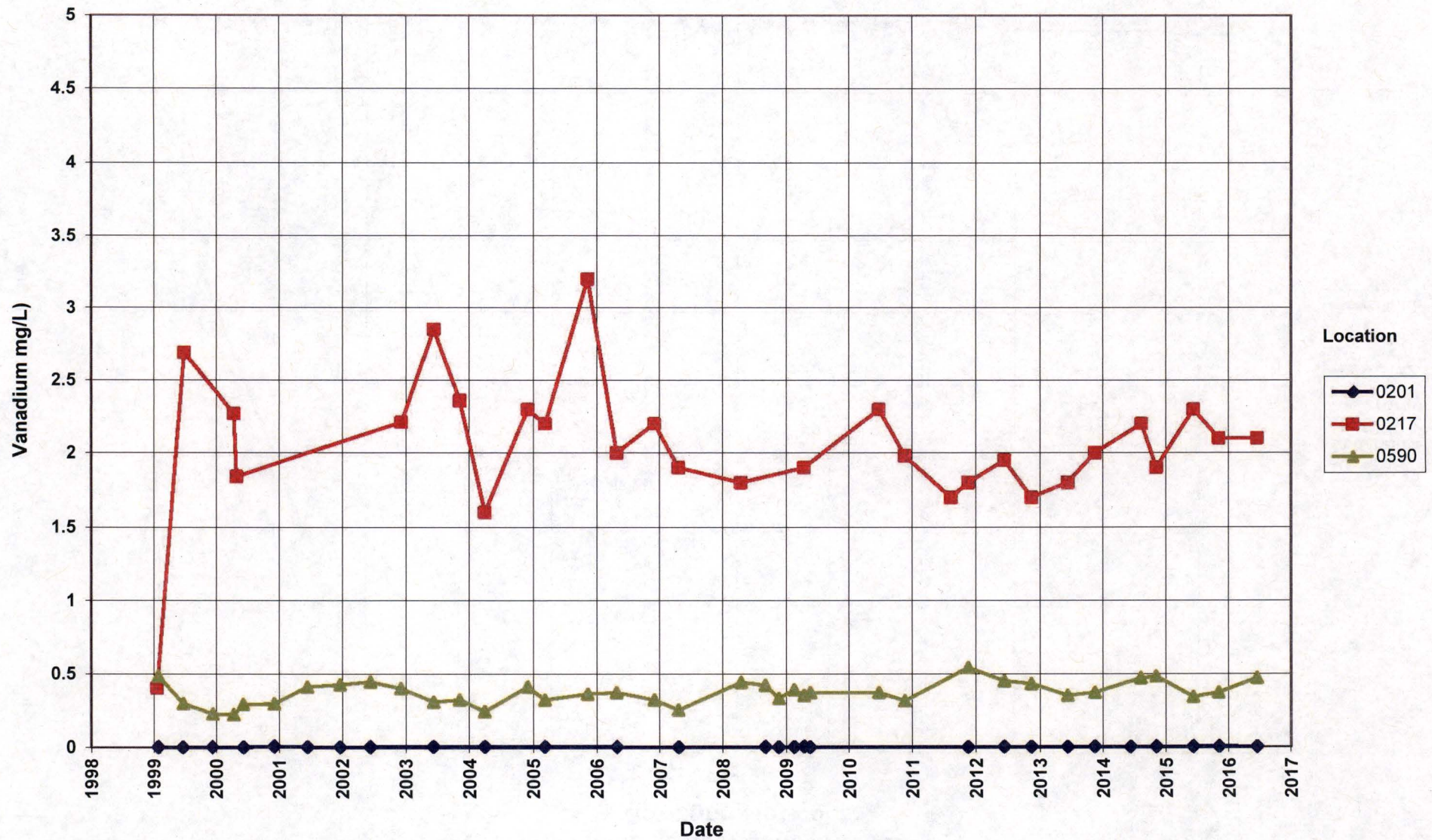


**Rifle New Processing Site  
Uranium Concentration  
Adjacent to Site Wells**  
Remediation Goal (RG) = 0.067 mg/L



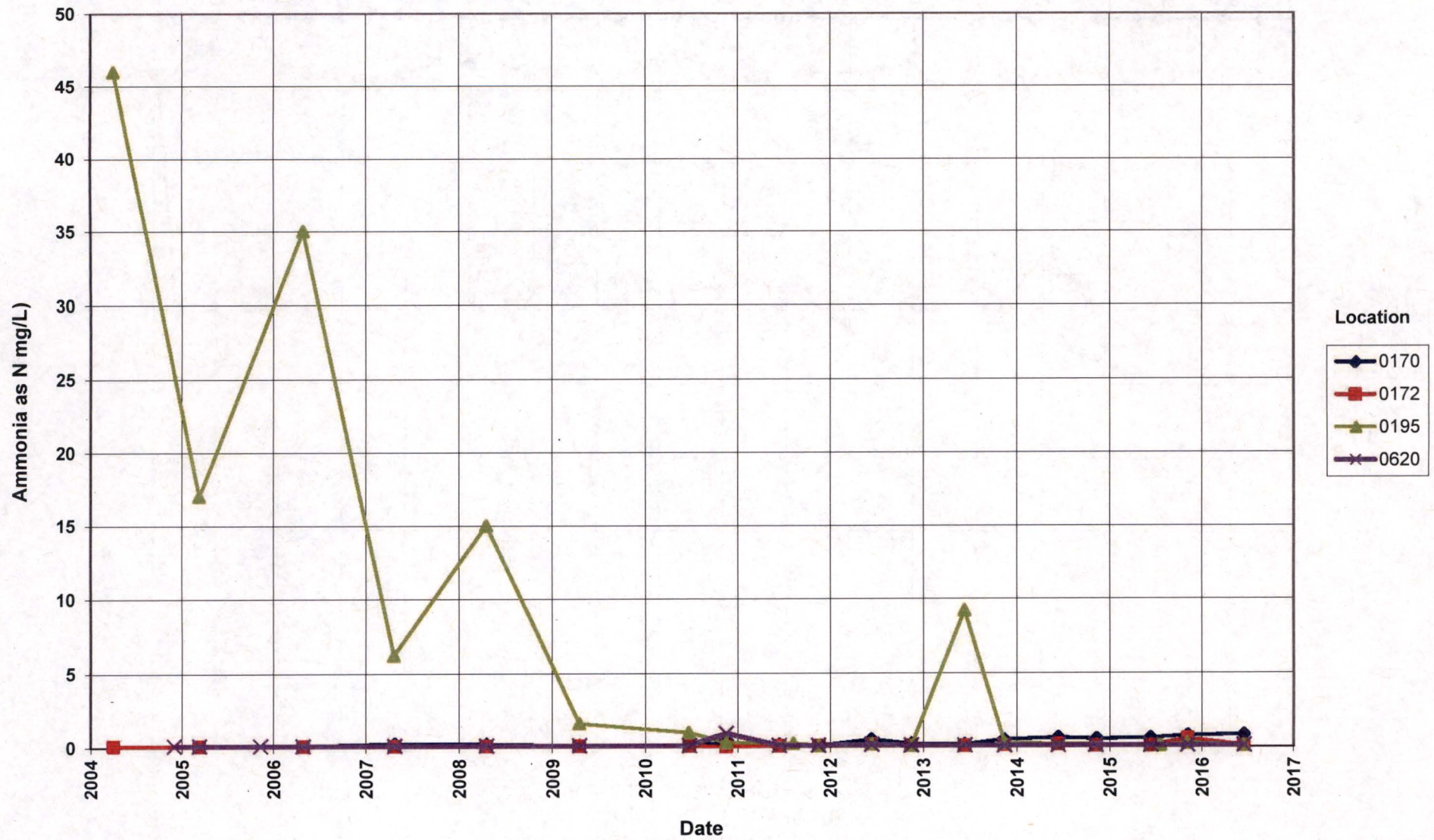


**Rifle New Processing Site  
Vanadium Concentration  
Adjacent to Site Wells**  
Remediation Goal (RG) = 50 mg/L

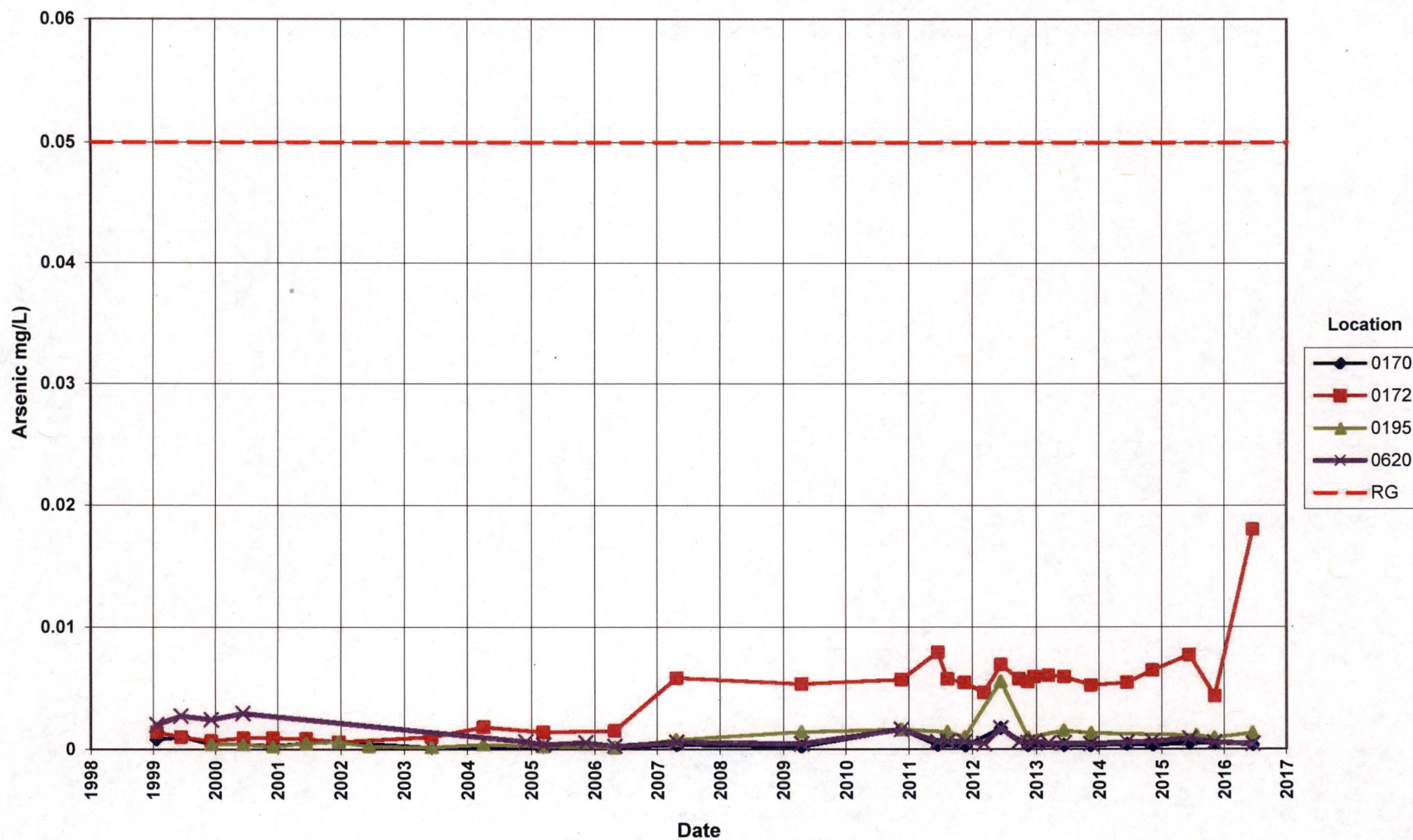




Rifle New Processing Site  
Ammonia as N Concentration  
Downgradient wells

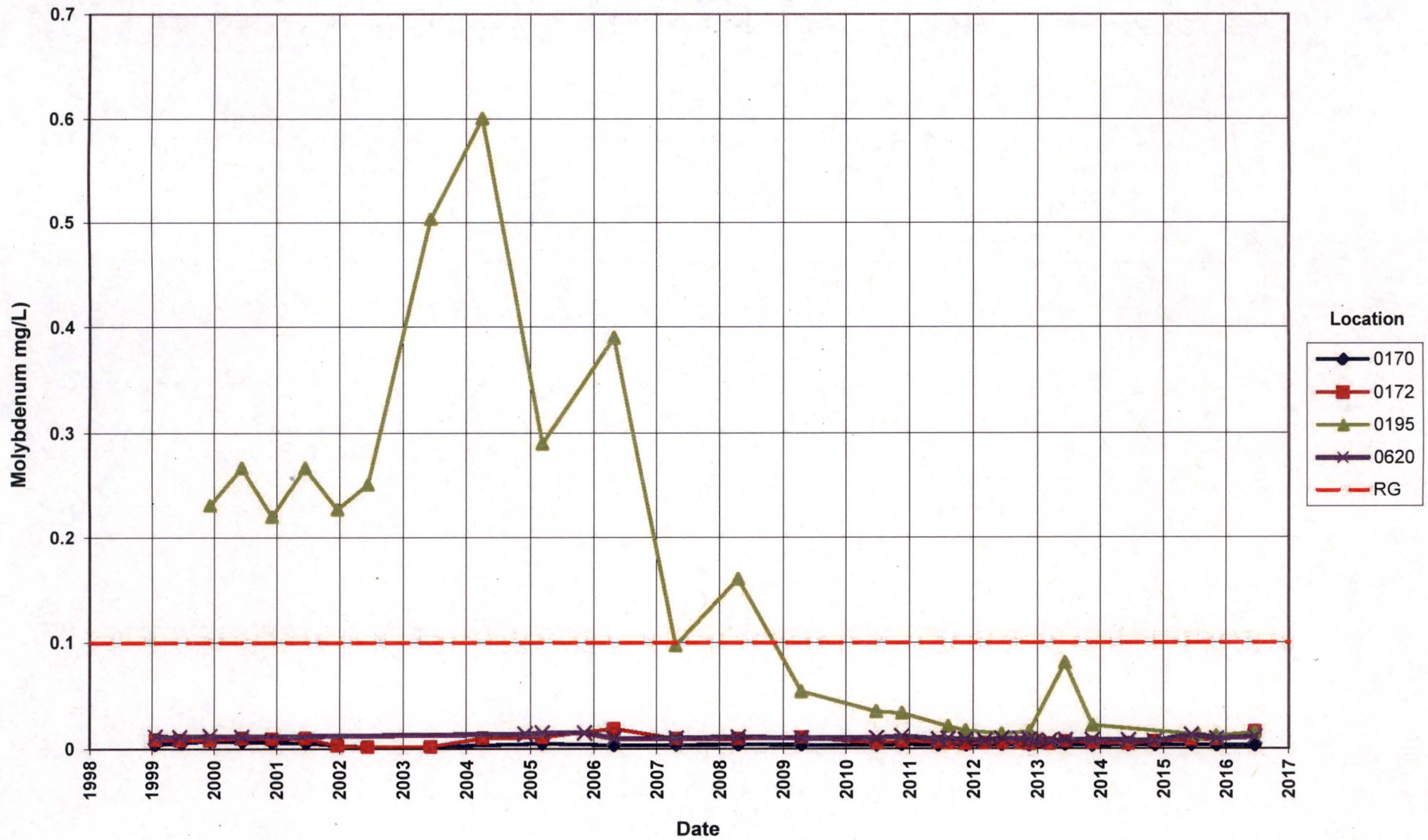


Rifle New Processing Site  
Arsenic Concentration  
Downgradient wells  
Remediation Goal (RG) = 0.05 mg/L

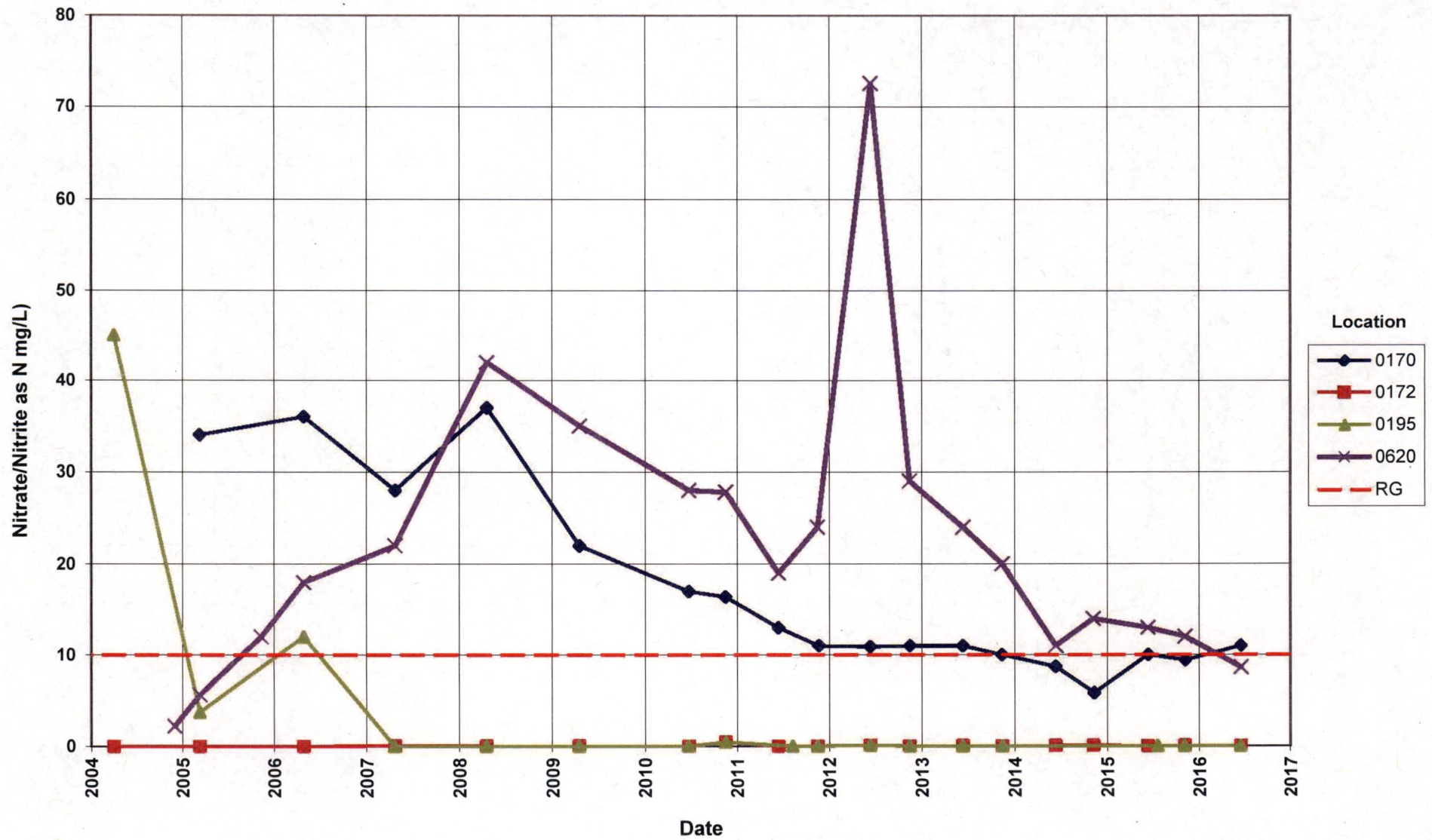




**Rifle New Processing Site  
Molybdenum Concentration  
Downgradient wells**  
Remediation Goal (RG) = 0.1 mg/L

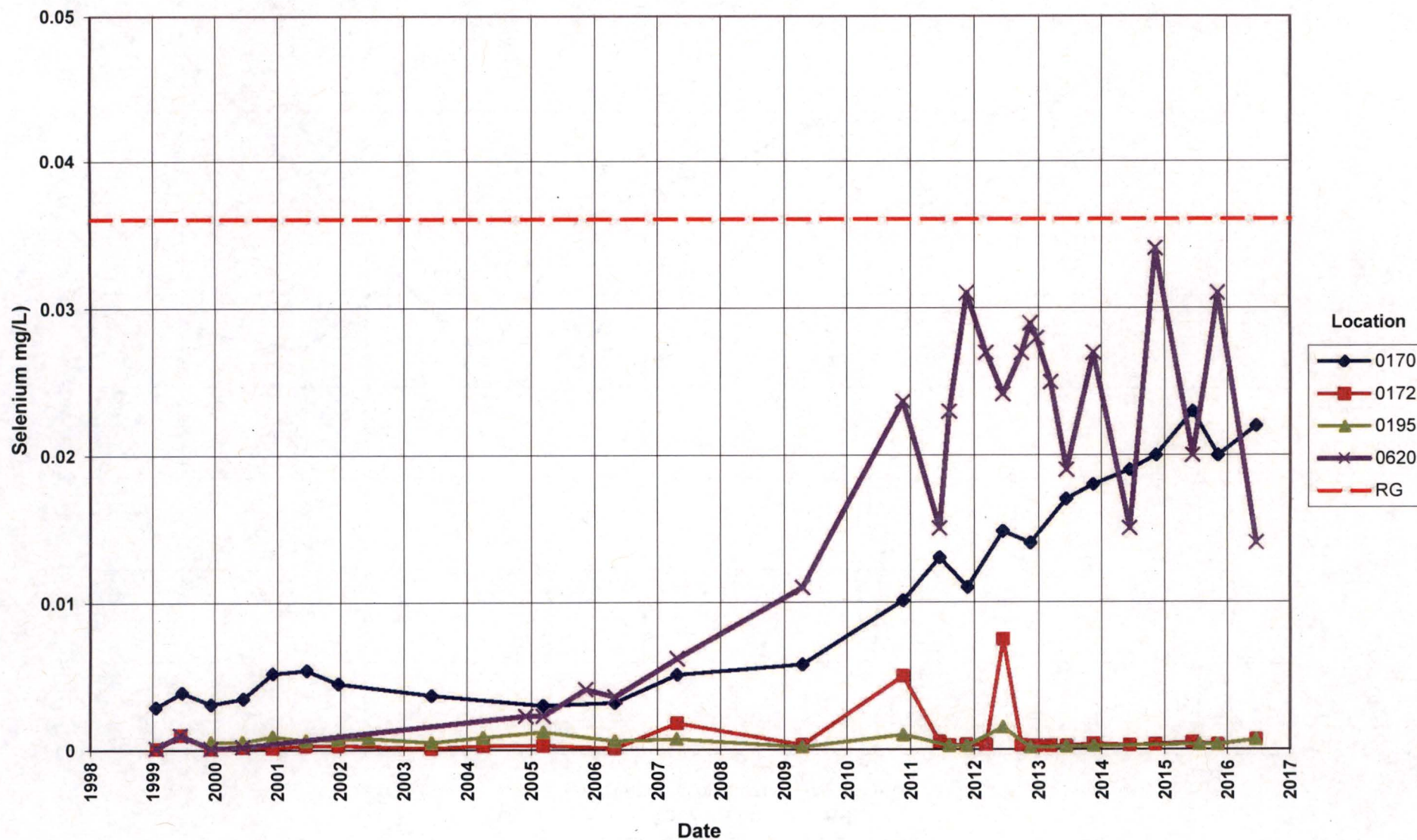


Rifle New Processing Site  
Nitrate/Nitrite as N Concentration  
Downgradient wells  
Remediation Goal (RG) = 10 mg/L

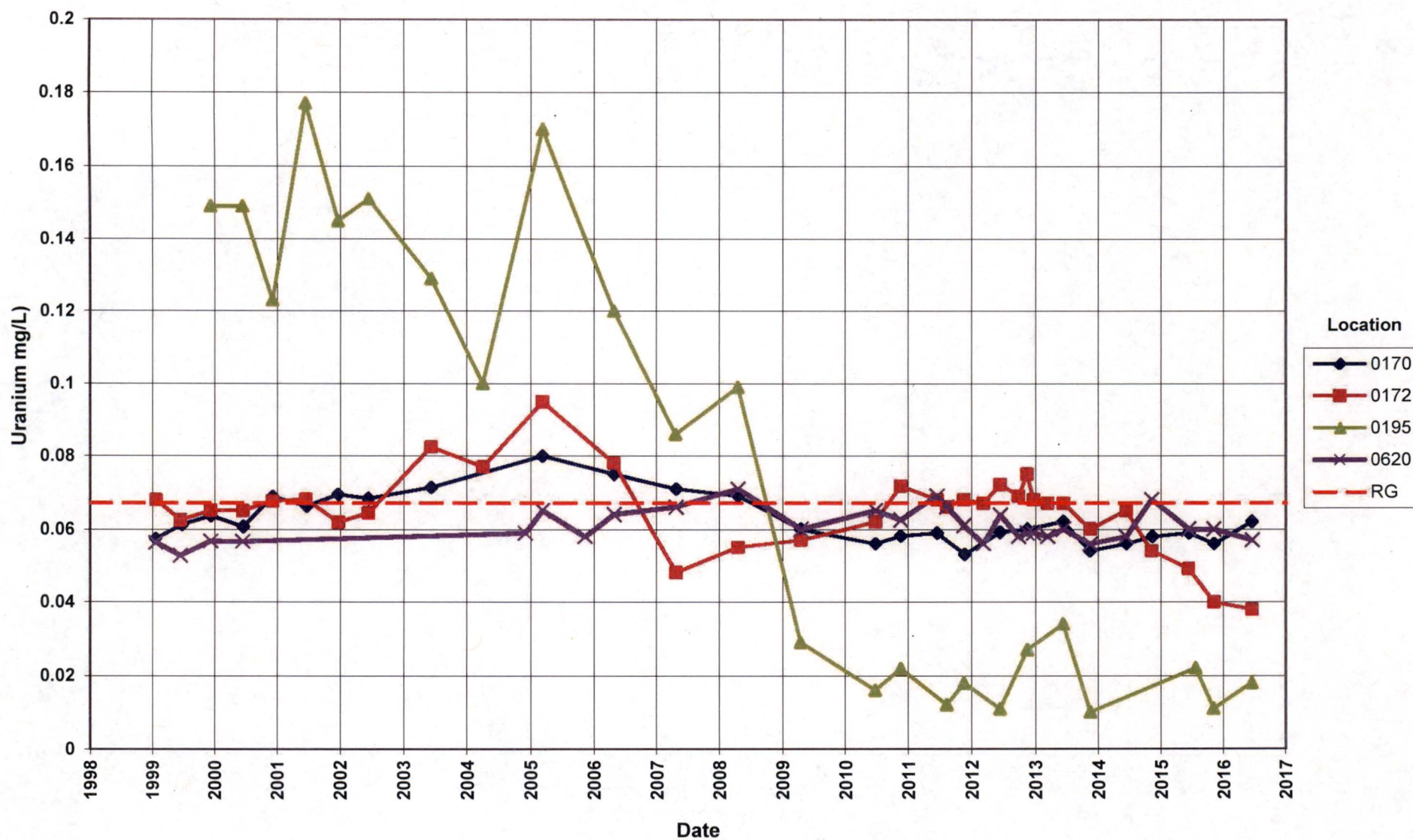




**Rifle New Processing Site  
Selenium Concentration  
Downgradient wells**  
Remediation Goal (RG) = 0.036 mg/L

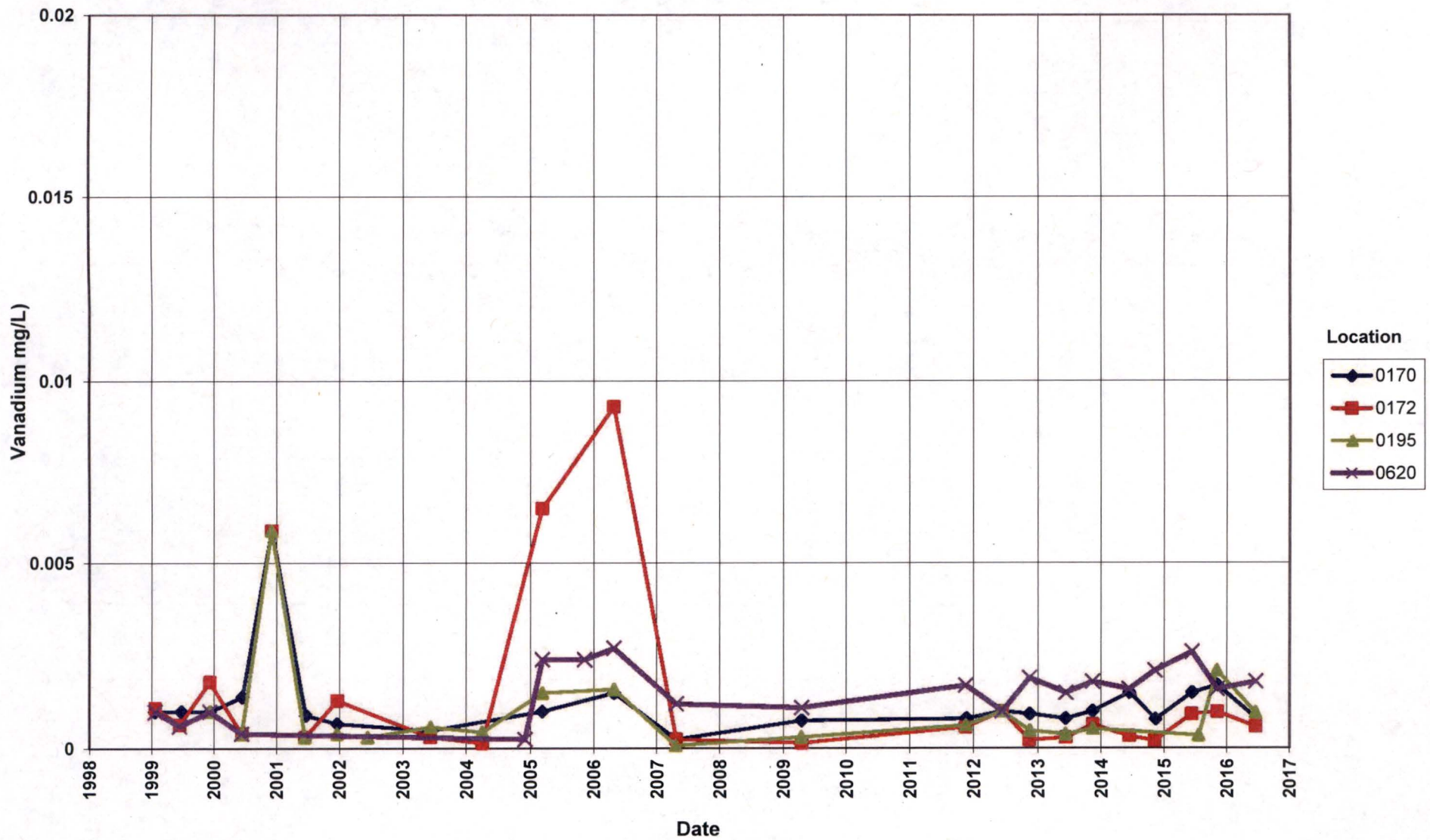


Rifle New Processing Site  
Uranium Concentration  
Downgradient wells  
Remediation Goal (RG) = 0.067 mg/L





**Rifle New Processing Site  
Vanadium Concentration  
Downgradient wells**  
Remediation Goal (RG) = 50 mg/L



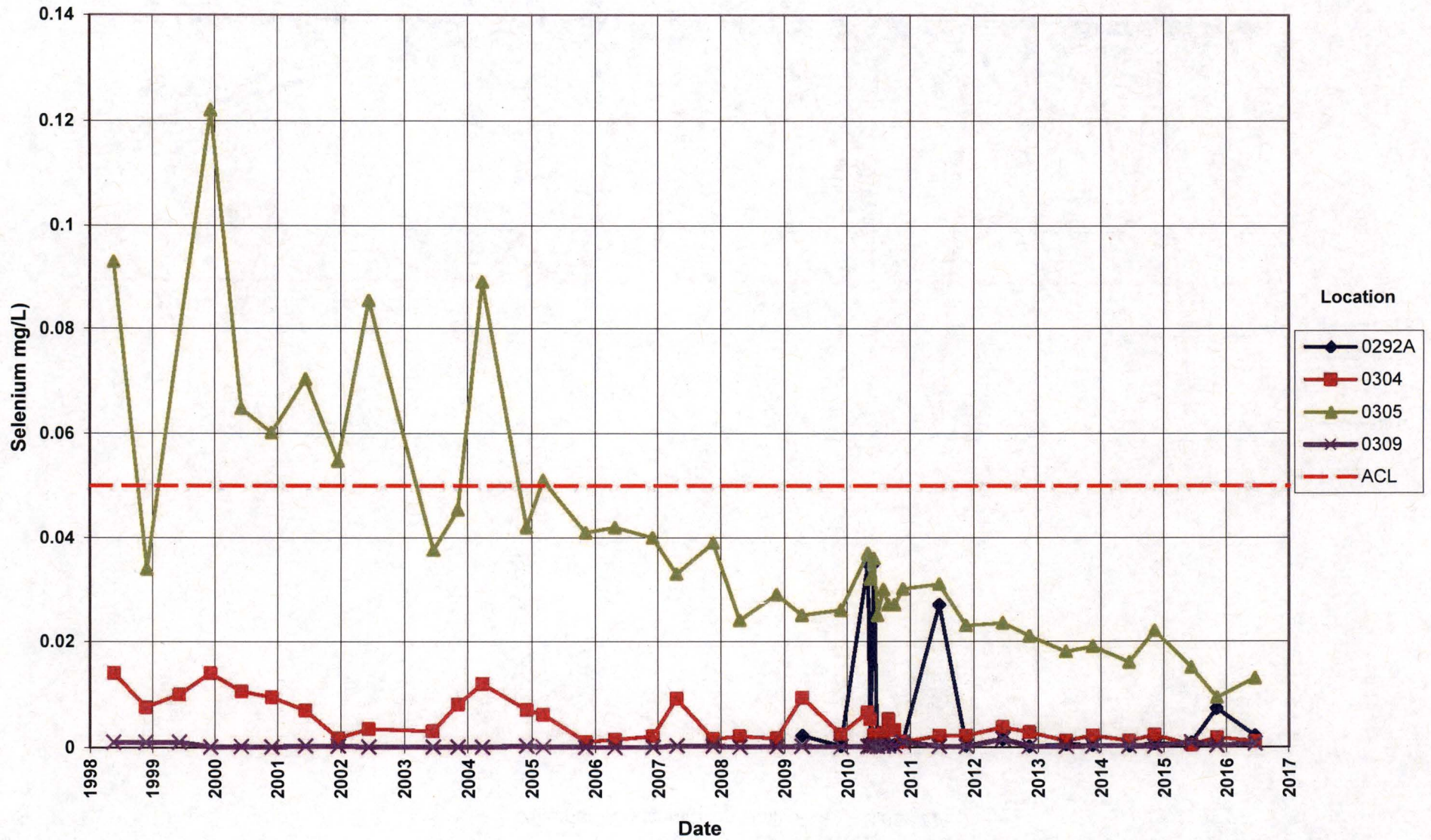
**Old Rifle**

**Groundwater Time-Concentration Graphs**



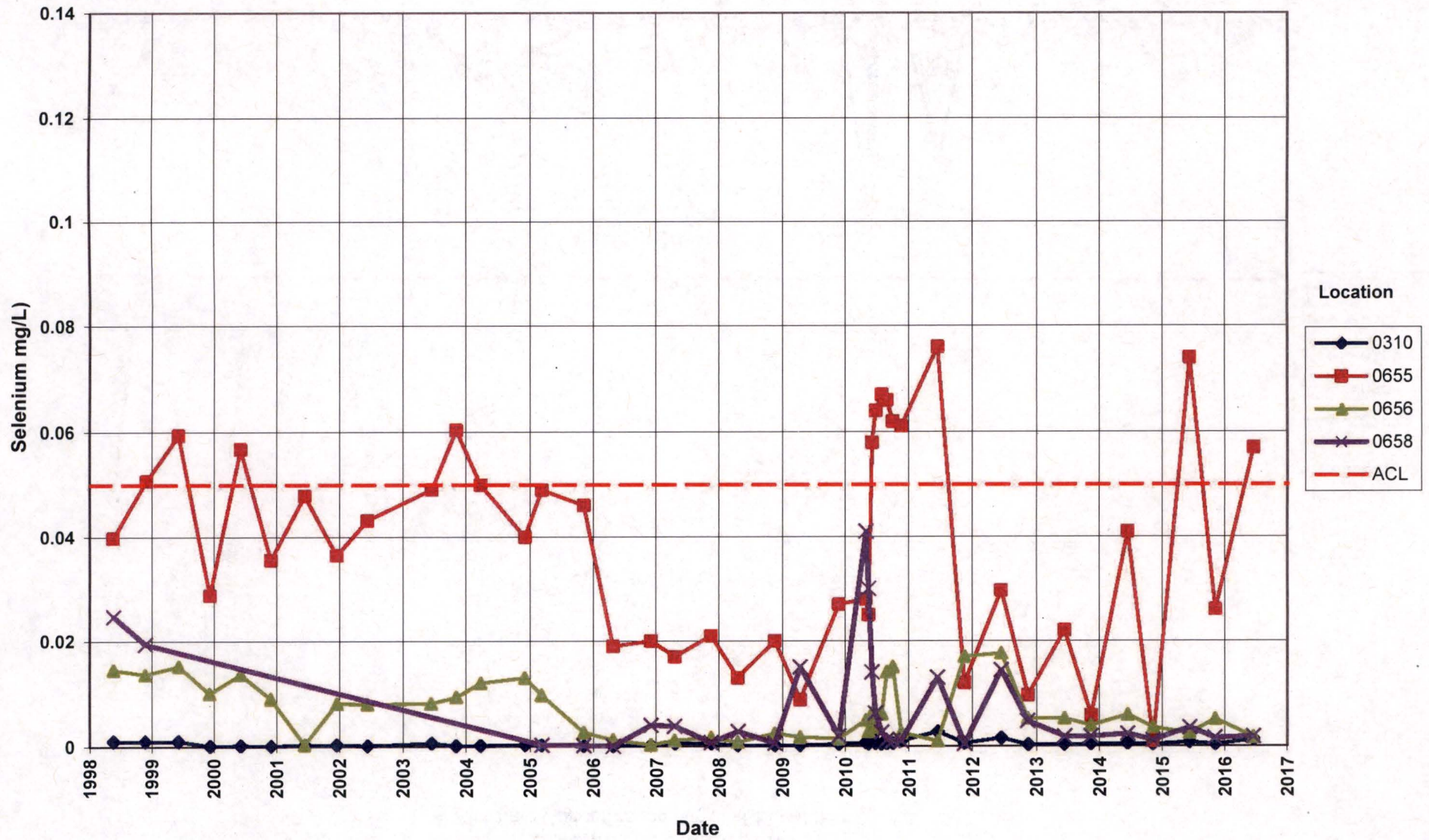
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**Rifle Old Processing Site  
Selenium Concentration**  
Alternate Concentration Limit (ACL) = 0.05 mg/L

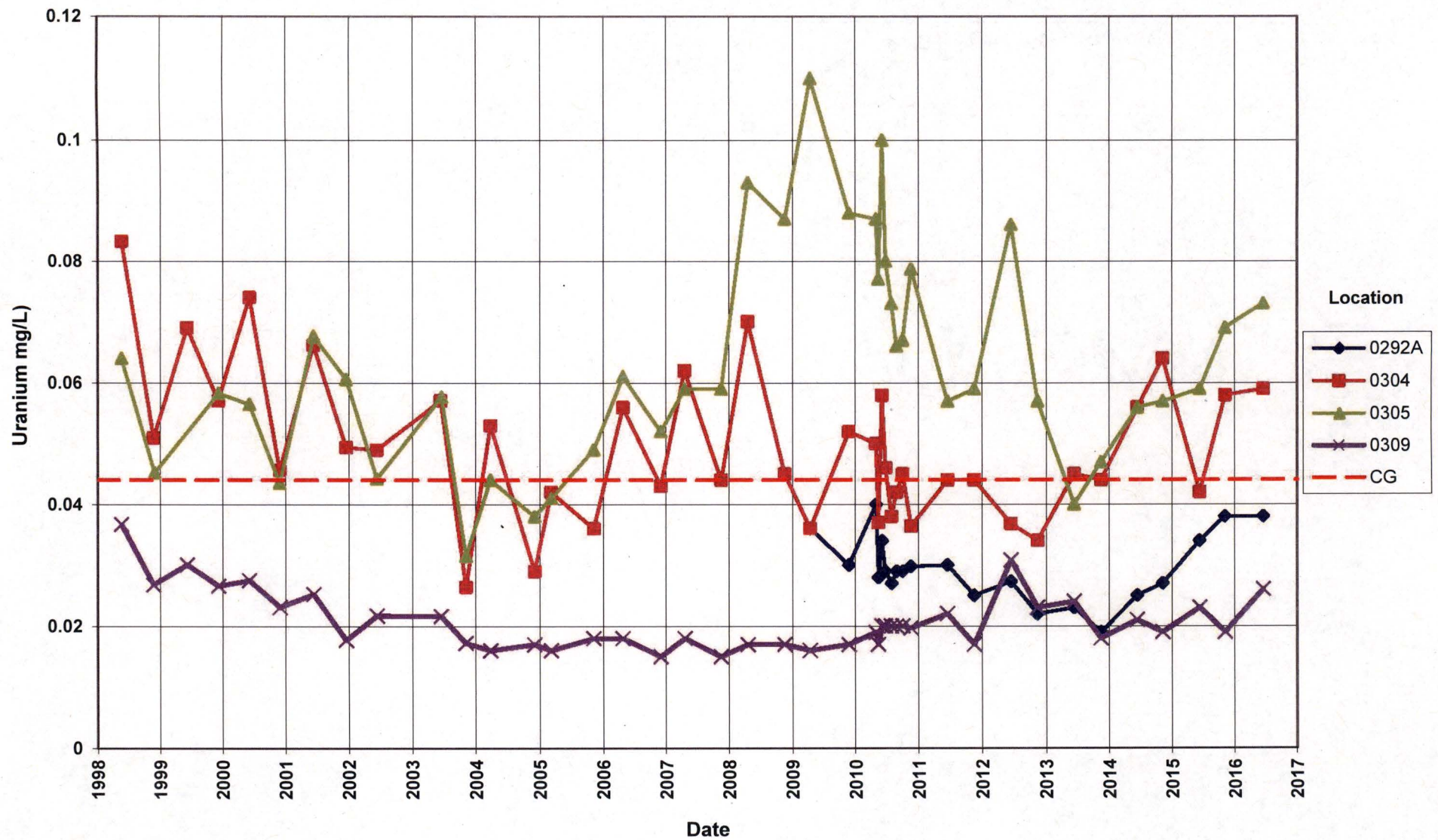




**Rifle Old Processing Site**  
**Selenium Concentration**  
Alternate Concentration Limit (ACL) = 0.05 mg/L

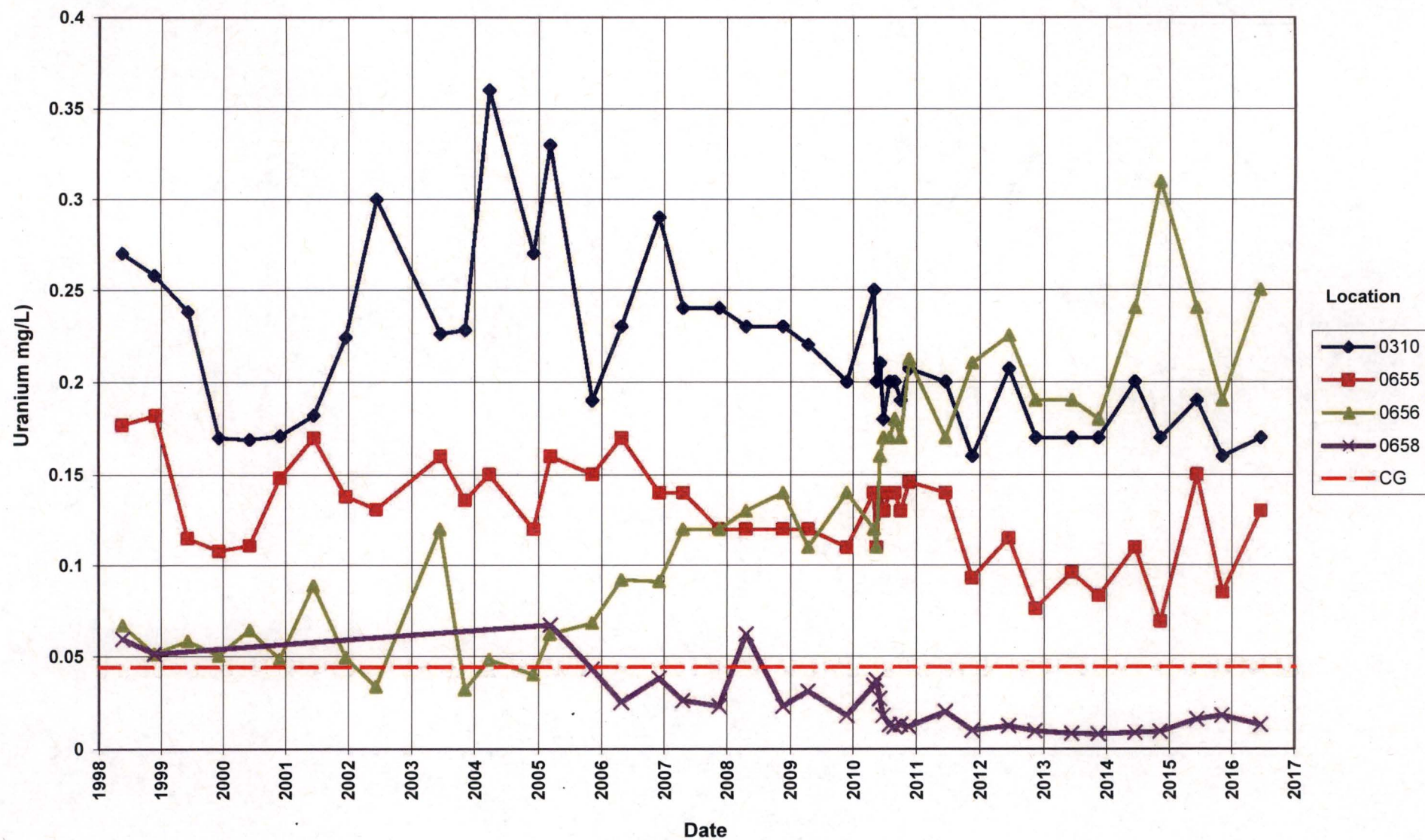


Rifle Old Processing Site  
Uranium Concentration  
Cleanup Goal (CG) = 0.044 mg/L

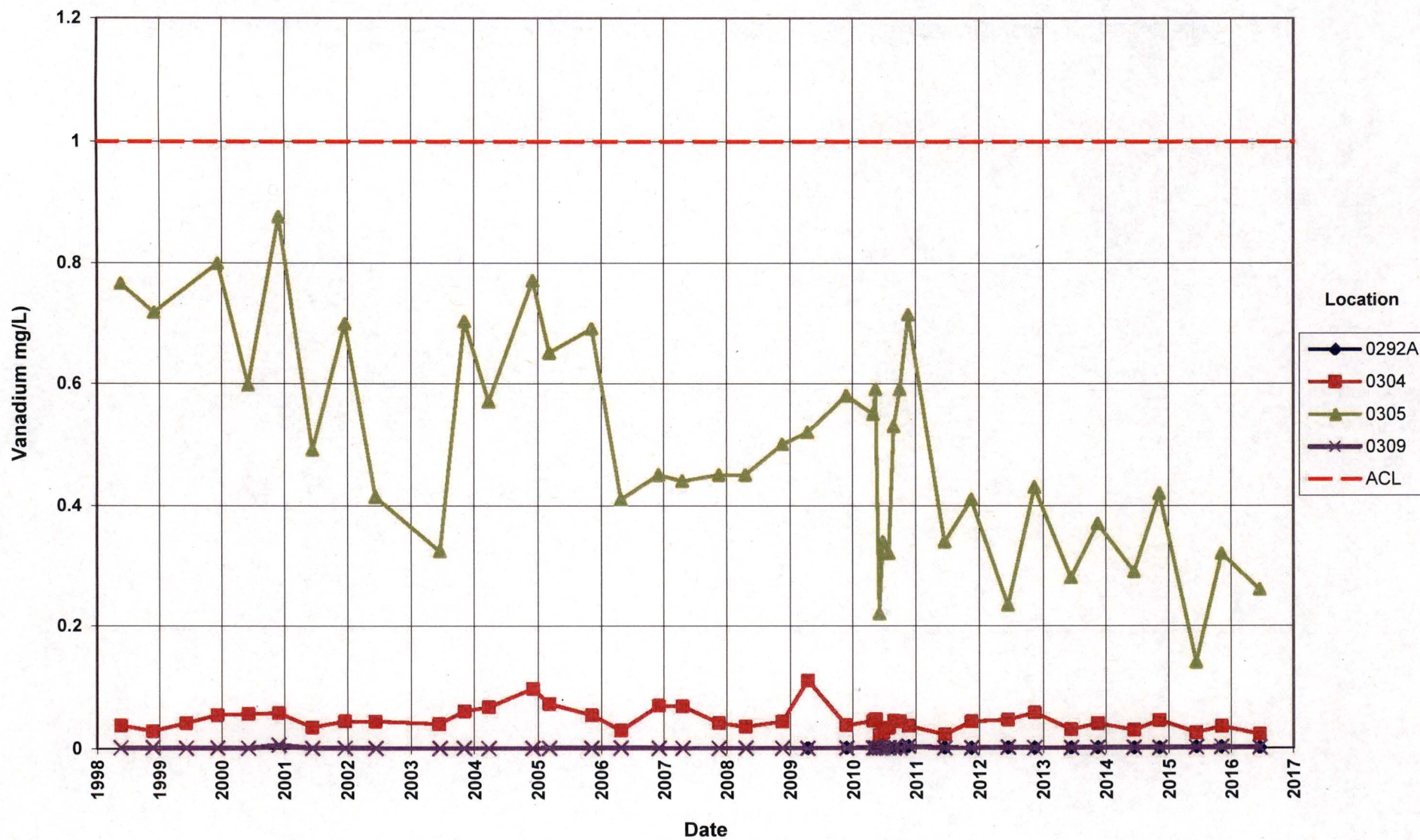




**Rifle Old Processing Site  
Uranium Concentration**  
Cleanup Goal (CG) = 0.044 mg/L

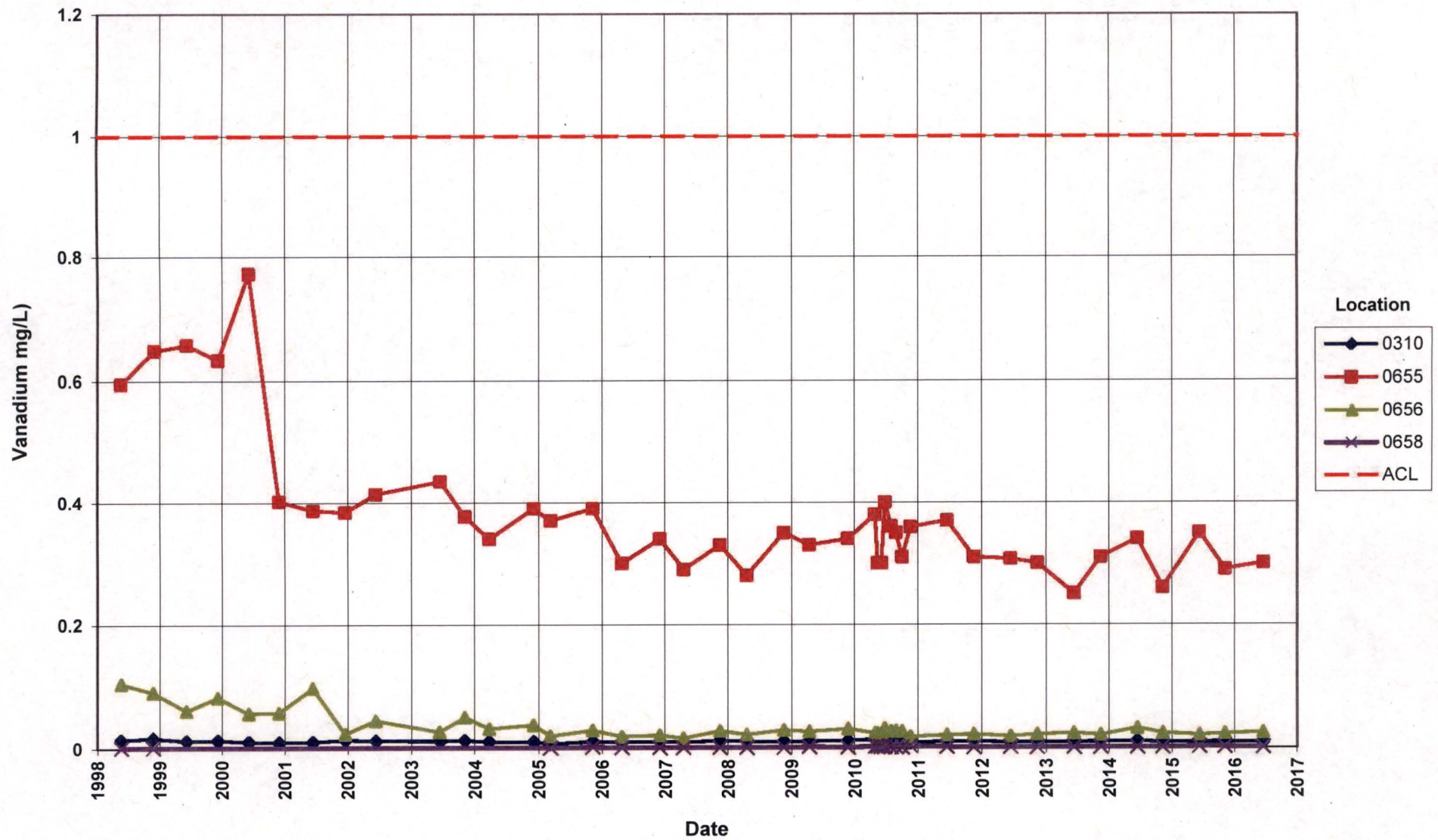


**Rifle Old Processing Site**  
**Vanadium Concentration**  
Alternate Concentration Limit (ACL) = 1.0 mg/L





**Rifle Old Processing Site**  
**Vanadium Concentration**  
Alternate Concentration Limit (ACL) = 1.0 mg/L



## **Attachment 4**

### **Assessment of Anomalous Data**

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## **Potential Outliers Report**

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## Potential Outliers Report

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

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

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

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

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

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