

Data Validation Package

January 2016
Groundwater Sampling at the
Gnome-Coach, New Mexico, Site

June 2016



U.S. DEPARTMENT OF
ENERGY

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Management

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Sampling Event Summary

Site: Gnome-Coach, New Mexico, Site

Sampling Period: January 27, 2016

Annual sampling was conducted January 27, 2016, to monitor groundwater for potential radionuclide contamination at the Gnome-Coach site in New Mexico. Samples were collected from wells USGS-1, USGS-4, and USGS-8 during this monitoring event as specified in the *Long-Term Surveillance and Maintenance Plan for the Gnome-Coach, New Mexico, Site* and in accordance with the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated). A duplicate sample was collected from well USGS-8 and water levels were measured in all the monitoring wells onsite. Refer to the sample location map for well locations.

Samples were analyzed by GEL Laboratories in Charleston, South Carolina. Samples were analyzed for gamma-emitting radionuclides by high-resolution gamma spectrometry, strontium-90, and tritium. The sample from well USGS-1 was analyzed for tritium using the enrichment method to achieve a lower minimum detectable concentration (MDC). Radionuclide contaminants were detected in wells USGS-4 and USGS-8. The detection of radionuclides in these wells is not unusual. Radionuclide time-concentration graphs are included in this Data Validation Package for these wells. Analytical data obtained from this and past sampling events are also available in electronic format on the U.S. Department of Energy Office of Legacy Management Geospatial Environmental Mapping System website at <http://gems.lm.doe.gov/#site=GNO>.


Richard C. Findlay, Site Lead
Navarro Research and Engineering, Inc.

2-1-2017
Date

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Gnome-Coach, New Mexico, Sample Location Map

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Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	Gnome-Coach, New Mexico	Date(s) of Water Sampling	January 27, 2016
Date(s) of Verification	June 7, 2016	Name of Verifier	Stephen Donovan

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures?	Yes	
List any Program Directives or other documents, SOPs, instructions.		Work Order letter dated December 28, 2015.
2. Were the sampling locations specified in the planning documents sampled?	Yes	
3. Were field equipment calibrations conducted as specified in the above-named documents?	Yes	Calibrations were performed on January 22, 2016.
4. Was an operational check of the field equipment conducted daily?	Yes	
Did the operational checks meet criteria?	Yes	
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	Yes	
6. Were wells categorized correctly?	Yes	The well categories are provided in the Sampling Protocol section on page 15.
7. Were the following conditions met when purging a Category I well:		
Was one pump/tubing volume purged prior to sampling?	Yes	
Did the water level stabilize prior to sampling?	Yes	
Did pH, specific conductance, and turbidity measurements meet criteria prior to sampling?	Yes	
Was the flow rate less than 500 mL/min?	Yes	

Water Sampling Field Activities Verification Checklist (continued)

	Response (Yes, No, NA)	Comments
8. Were the following conditions met when purging a Category II well:		
Was the flow rate less than 500 mL/min?	NA	There were no Category II wells.
Was one pump/tubing volume removed prior to sampling?		
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	A duplicate sample was collected at locations USGS-8.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	NA	An equipment blank was not required.
11. Were trip blanks prepared and included with each shipment of VOC samples?	NA	
12. Were the true identities of the QC samples documented?	Yes	
13. Were samples collected in the containers specified?	Yes	
14. Were samples filtered and preserved as specified?	Yes	
15. Were the number and types of samples collected as specified?	Yes	
16. Were chain of custody records completed and was sample custody maintained?	Yes	
17. Was all pertinent information documented on the field data sheets?	Yes	
18. Was the presence or absence of ice in the cooler documented at every sample location?	NA	Sample cooling was not required.
19. Were water levels measured at the locations specified in the planning documents?	Yes	

Laboratory Performance Assessment

General Information

Report Number (RIN): 16017604
Sample Event: January 27, 2016
Site(s): Gnome-Coach Site
Laboratory: GEL Laboratories, Charleston, South Carolina
Work Order No.: 390853
Analysis: Metals, Wet Chemistry, Radiochemistry
Validator: Stephen Donovan
Review Date: June 6, 2016

This validation was performed according to the *Environmental Procedures Catalog*, (LMS/POL/S04325, continually updated) “Standard Practice for Validation of Environmental Data.” The procedure was applied at Level 3, Data Validation. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Gamma Spectrometry	GAM-A-001	EPA 901.1	EPA 901.1
Strontium-90	GPC-A-009	EPA 905.0, Modified	EPA 905.0, Modified
Tritium	LSC-A-001	EPA 906.0, Modified	EPA 906.0, Modified
Tritium, enrichment method	LMR-17	DOE EML HASL 300	DOE EML HASL 300

Data Qualifier Summary

None of the analytical results required qualification.

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received four water samples on February 5, 2016, accompanied by a Chain of Custody (COC) form. The air waybill numbers were listed on the Sample Receipt and Review Form. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions.

Preservation and Holding Times

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

Detection and Quantitation Limits

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

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

The reported MDCs for radiochemical analytes demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear curve. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. Calibration and laboratory spike standards were prepared from independent sources.

Radiochemical Analysis

Gamma Spectrometry

Annual calibration of the detectors used to analyze these samples was performed between August and October 2015. Daily calibration checks were performed on February 11, 2016.

Tritium

The tritium quench calibration curve was generated on August 1 and 16, 2015. Sample quench values were within the calibration range for all samples. Daily calibration checks were performed on March 21 and April 8, 2016.

Strontium-90

Annual calibration of the detectors used to analyze these samples was performed on February 13, 2016. Daily calibration checks were performed on April 29 and May 4, 2016.

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. The radiochemistry method blank results were less than the DLC with the exception of one strontium-90 blank. The strontium-90 concentration in the samples associated with this blank was much greater than the blank concentration, requiring no further action.

Matrix Spike Analysis

Matrix spike (MS) samples are used to measure method performance in the sample matrix. The MS data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike. The matrix spike data met the recovery acceptance criteria.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative error ratio (RER) for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) was less than 3, indicating acceptable precision.

Laboratory Control Sample

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

Completeness

Results were reported in the correct units for all analytes requested using contract-required laboratory qualifiers. The analytical report included the MDCs for all analytes and all required supporting documentation.

Electronic Data Deliverable (EDD) File

The EDD file arrived on May 16, 2016. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 16017604 Lab Code: GEN Validator: Validation Date: 6/6/2016
Project: Gnome-Coach Site Analysis Type: ☐ Metals ☐ General Chem ☐ Rad ☐ Organics
of Samples: 4 Matrix: Water Requested Analysis Completed: Yes

Chain of Custody

Present: OK Signed: OK Dated: OK

Sample

Integrity: OK Preservation: OK Temperature: OK

Select Quality Parameters

- ☒ Holding Times
- ☒ Detection Limits
- ☐ Field/Trip Blanks
- ☒ Field Duplicates

All analyses were completed within the applicable holding times.

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

There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Radiochemistry Data Validation Worksheet

Page 1 of 2

RIN: 16017604

Lab Code: GEN

Date Due: 5/5/2016

Matrix: Water

Site Code: GNO01

Date Completed: 5/5/2016

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate RER
2443	Actinium-228	02/12/2016						0.37
2443	Americium-241	02/12/2016						0.17
Blank_Spike	Americium-241	02/12/2016				113		
2443	Antimony-125	02/12/2016						1.21
2443	Cerium-144	02/12/2016						1.07
Blank_Spike	Cerium-144	02/12/2016						
2443	Cesium-134	02/12/2016						0.44
2443	Cesium-137	02/12/2016						0.14
Blank_Spike	Cesium-137	02/12/2016				107		
2443	Cobalt-60	02/12/2016						0.69
Blank_Spike	Cobalt-60	02/12/2016				103		
2443	Europium-152	02/12/2016						0.28
2443	Europium-154	02/12/2016						1.06
Blank_Spike	Europium-154	02/12/2016						
2443	Europium-155	02/12/2016						0.55
2443	Lead-212	02/12/2016						0.95
Blank_Spike	Lead-212	02/12/2016						
2443	Potassium-40	02/12/2016						0.03
2443	Promethium-144	02/12/2016						0.37
Blank_Spike	Promethium-144	02/12/2016						
2443	Promethium-146	02/12/2016						0.17
2443	Ruthenium-106	02/12/2016						1.01
Blank_Spike	Ruthenium-106	02/12/2016						
USGS-1	Strontium-90	04/29/2016			86			
USGS-1	Strontium-90	04/29/2016			90			0.83
Blank_Spike	Strontium-90	04/29/2016			90	96.4		
Blank_Spike	Strontium-90	04/29/2016			84	109		
2443	Strontium-90	04/29/2016			89			
USGS-1	Strontium-90	04/29/2016			85		94.6	
Blank	Strontium-90	04/29/2016	-0.391	U	85			
Blank	Strontium-90	04/29/2016	1.86		81			
2443	Strontium-90	05/04/2016			93			

SAMPLE MANAGEMENT SYSTEM

Radiochemistry Data Validation Worksheet

Page 2 of 2

RIN: 16017604 **Lab Code:** GEN **Date Due:** 5/5/2016
Matrix: Water **Site Code:** GNO01 **Date Completed:** 5/5/2016

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate RER
USGS-4	Strontium-90	05/04/2016			91			
USGS-8	Strontium-90	05/04/2016			84			
2443	Strontium-90	05/04/2016			88			0.74
2443	Thorium-234	02/12/2016						1.44
2443	Tritium	03/21/2016						0.22
USGS-1	Tritium	03/21/2016						1.41
Blank_Spike	Tritium	03/21/2016				104		
Blank_Spike	Tritium	03/21/2016				110		
2443	Tritium	03/21/2016					107	
USGS-1	Tritium	03/21/2016					99.1	
Blank	Tritium	03/29/2016	58.5000	U				
Blank	Tritium	03/29/2016	12.7000	U				
USGS-1	Tritium	04/08/2016						
Blank_Spike	Tritium	04/09/2016				113		
Blank_Spike	Tritium	04/09/2016			100	64.4		
Blank_Spike	Tritium	04/09/2016			100	71.9		
Blank	Tritium	04/09/2016	0.3500	U				
2443	Uranium-235	02/12/2016						0.34
Blank_Spike	Uranium-235	02/12/2016						
2443	Uranium-238	02/12/2016						1.44
2443	Yttrium-88	02/12/2016						0.05
Blank_Spike	Yttrium-88	02/12/2016						

Sampling Quality Control Assessment

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

Sampling Protocol

Wells USGS-4 and USGS-8 were sampled using dedicated bladder pumps. Data from these wells are qualified with an “F” flag in the database indicating the well was purged and sampled using the low-flow sampling method. Well USGS-1 was sampled with a high flow dedicated submersible pump. The data from this well were not qualified.

Equipment Blank Assessment

An equipment blank was not required.

Field Duplicate Assessment

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. A duplicate sample was collected from location USGS-8. For radiochemical measurements, the relative error ratio (the ratio of the absolute difference between the sample and duplicate results and the sum of the 1-sigma uncertainties) is used to evaluate duplicate results and should be less than 3. All duplicate results met these criteria demonstrating acceptable precision.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

Page 1 of 1

RIN: 16017604 Lab Code: GEN Project: Gnome-Coach Site Validation Date: 6/6/2016

Duplicate: 2443

Sample: USGS-8

Analyte	Sample				Duplicate				RPD	RER	Units
	Result	Flag	Error	Dilution	Result	Flag	Error	Dilution			
Actinium-228	-4.06	U	16.3	1.00	-4.36	U	16.8	1.00		0	pCi/L
Americium-241	-9.49	U	22.6	1.00	4.54	U	20.5	1.00		0.9	pCi/L
Antimony-125	-2.49	U	9.64	1.00	-6.42	U	12.1	1.00		0.5	pCi/L
Cerium-144	-14	U	24.2	1.00	19.7	U	25.5	1.00		1.9	pCi/L
Cesium-134	-1.7	U	3.67	1.00	-1.67	U	3.41	1.00		0	pCi/L
Cesium-137	142		15.8	1.00	166		19.6	1.00	15.58	1.9	pCi/L
Cobalt-60	-1.34	U	3.63	1.00	1.38	U	3.55	1.00		1.0	pCi/L
Europium-152	-0.372	U	9.81	1.00	6.42	U	17.3	1.00		0.7	pCi/L
Europium-154	-1.6	U	7.89	1.00	-1.61	U	10.2	1.00		0	pCi/L
Europium-155	0.841	U	14.2	1.00	-4.57	U	12.8	1.00		0.6	pCi/L
Lead-212	5.12	U	10.5	1.00	2.73	U	9.52	1.00		0.3	pCi/L
Potassium-40	60.6	U	68.1	1.00	5.38	U	55.7	1.00		1.2	pCi/L
Promethium-144	0.932	U	3.48	1.00	-1.32	U	3.74	1.00		0.9	pCi/L
Promethium-146	4.71	U	8.36	1.00	-2.17	U	5.17	1.00		1.4	pCi/L
Ruthenium-106	18.2	U	31.4	1.00	0.827	U	33.4	1.00		0.7	pCi/L
Strontium-90	2410		380	1.00	2270		356	1.00	5.98	0.5	pCi/L
Thorium-234	137	U	310	1.00	-21.5	U	202	1.00		0.8	pCi/L
Tritium	16400		3240	1.00	16100		3170	1.00	1.85	0.1	pCi/L
Uranium-235	-4.33	U	28.4	1.00	-3.34	U	28.9	1.00		0	pCi/L
Uranium-238	137	U	310	1.00	-21.5	U	202	1.00		0.8	pCi/L
Yttrium-88	0.359	U	3.29	1.00	0.797	U	3.69	1.00		0.2	pCi/L

Certification

All laboratory analytical quality control criteria were met except as qualified in this report. The data qualifiers listed on the SEEPro database reports are defined on the last page of each report. All data in this package are considered validated and available for use.

Laboratory Coordinator: Stephen Donovan 6-16-2016
Stephen Donovan Date

Data Validation Lead: Stephen Donovan 6-16-2016
Stephen Donovan Date

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Attachment 1

Assessment of Anomalous Data

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Potential Outliers Report

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Potential Outliers Report

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

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

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

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

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

Data Validation Outliers Report - No Field Parameters

Comparison: All historical Data Beginning 1/1/2006

Laboratory: GEL Laboratories

RIN: 16017604

Report Date: 6/7/2016

Site Code	Location Code	Sample ID	Sample Date	Analyte	Current	Qualifiers		Historical Maximum			Historical Minimum			Number of Data Points		Statistical Outlier
					Result	Lab	Data	Result	Lab	Data	Result	Lab	Data	N	N Below Detect	
GNO01	USGS-4	N001	01/27/2016	Tritium	5240		F	22300			6030		F	8	0	No
GNO01	USGS-8	N002	01/27/2016	Tritium	16100		F	30000			16400		F	9	0	No

STATISTICAL TESTS:

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

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

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

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

Attachment 2

Data Presentation

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Groundwater Quality Data

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Groundwater Quality Data by Location (USEE100) FOR SITE GNO01, Gnome-Coach Site

REPORT DATE: 6/7/2016

Location: USGS-1 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)			Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	01/27/2016	N001	520	-	533	13.3	U		#	25.4	17.4
Alkalinity, Total (as CaCO ₃)	mg/L	01/27/2016	N001	520	-	533	80			#		
Americium-241	pCi/L	01/27/2016	N001	520	-	533	13.1	U		#	32.1	19.8
Antimony-125	pCi/L	01/27/2016	N001	520	-	533	1.35	U		#	15.3	8.47
Cerium-144	pCi/L	01/27/2016	N001	520	-	533	-3.31	U		#	37.1	21.7
Cesium-134	pCi/L	01/27/2016	N001	520	-	533	-883	U		#	6.34	3.57
Cesium-137	pCi/L	01/27/2016	N001	520	-	533	-1.22	U		#	6.08	3.45
Cobalt-60	pCi/L	01/27/2016	N001	520	-	533	-1.21	U		#	6.03	3.38
Dissolved Oxygen	mg/L	01/27/2016	N001	520	-	533	4.34			#		
Europium-152	pCi/L	01/27/2016	N001	520	-	533	4.83	U		#	17.1	9.49
Europium-154	pCi/L	01/27/2016	N001	520	-	533	-12.3	U		#	17.5	14
Europium-155	pCi/L	01/27/2016	N001	520	-	533	-1	U		#	18.5	10.6
Lead-212	pCi/L	01/27/2016	N001	520	-	533	0.709	U		#	11.7	10.3
Oxidation Reduction Potential	mV	01/27/2016	N001	520	-	533	45.5			#		
pH	s.u.	01/27/2016	N001	520	-	533	6.99			#		
Potassium-40	pCi/L	01/27/2016	N001	520	-	533	-31.8	U		#	82.8	50.4
Promethium-144	pCi/L	01/27/2016	N001	520	-	533	0	U		#	6.28	8.09
Promethium-146	pCi/L	01/27/2016	N001	520	-	533	4.41	U		#	8.25	4.78

Groundwater Quality Data by Location (USEE100) FOR SITE GNO01, Gnome-Coach Site

REPORT DATE: 6/7/2016

Location: USGS-1 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ruthenium-106	pCi/L	01/27/2016	N001	520	-	533	-17.2	U		#	53.3	31.4
Specific Conductance	umhos /cm	01/27/2016	N001	520	-	533	4531			#		
Strontium-90	pCi/L	01/27/2016	N001	520	-	533	-.347	U		#	0.974	0.449
Temperature	C	01/27/2016	N001	520	-	533	17.23			#		
Thorium-234	pCi/L	01/27/2016	N001	520	-	533	76.5	U		#	310	226
Tritium	pCi/L	01/27/2016	N001	520	-	533	1.28	U		#	2.91	1.73
Tritium	pCi/L	01/27/2016	N001	520	-	533	116	U		#	364	214
Turbidity	NTU	01/27/2016	N001	520	-	533	5.74			#		
Uranium-235	pCi/L	01/27/2016	N001	520	-	533	24.9	U		#	35.2	30.6
Uranium-238	pCi/L	01/27/2016	N001	520	-	533	76.5	U		#	310	226
Yttrium-88	pCi/L	01/27/2016	N001	520	-	533	1.19	U		#	7.96	3.84

Groundwater Quality Data by Location (USEE100) FOR SITE GNO01, Gnome-Coach Site

REPORT DATE: 6/7/2016

Location: USGS-4 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)			Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	01/27/2016	N001	473	-	512	7.2	U	F	#	25	14.3
Alkalinity, Total (as CaCO ₃)	mg/L	01/27/2016	N001	473	-	512	90		F	#		
Americium-241	pCi/L	01/27/2016	N001	473	-	512	-11.2	U	F	#	38	23.1
Antimony-125	pCi/L	01/27/2016	N001	473	-	512	-3.09	U	F	#	16.5	9.85
Cerium-144	pCi/L	01/27/2016	N001	473	-	512	18.6	U	F	#	39	23.8
Cesium-134	pCi/L	01/27/2016	N001	473	-	512	2.63	U	F	#	7.13	4.07
Cesium-137	pCi/L	01/27/2016	N001	473	-	512	0.247	U	F	#	6.03	6.34
Cobalt-60	pCi/L	01/27/2016	N001	473	-	512	5.13	U	F	#	6.73	4.86
Dissolved Oxygen	mg/L	01/27/2016	N001	473	-	512	2.02		F	#		
Europium-152	pCi/L	01/27/2016	N001	473	-	512	6.86	U	F	#	18.5	10.6
Europium-154	pCi/L	01/27/2016	N001	473	-	512	3.67	U	F	#	19.4	10
Europium-155	pCi/L	01/27/2016	N001	473	-	512	7.21	U	F	#	21.6	12.8
Lead-212	pCi/L	01/27/2016	N001	473	-	512	0.88	U	F	#	11.9	8.59
Oxidation Reduction Potential	mV	01/27/2016	N001	473	-	512	-63.1		F	#		
pH	s.u.	01/27/2016	N001	473	-	512	6.87		F	#		
Potassium-40	pCi/L	01/27/2016	N001	473	-	512	12.6	U	F	#	87.9	49.9
Promethium-144	pCi/L	01/27/2016	N001	473	-	512	1.41	U	F	#	6.59	3.61
Promethium-146	pCi/L	01/27/2016	N001	473	-	512	0.348	U	F	#	6.73	4.13

Groundwater Quality Data by Location (USEE100) FOR SITE GNO01, Gnome-Coach Site

REPORT DATE: 6/7/2016

Location: USGS-4 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)			Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Ruthenium-106	pCi/L	01/27/2016	N001	473	-	512	-5.06	U	F	#	54.5	30.5
Specific Conductance	umhos /cm	01/27/2016	N001	473	-	512	5890		F	#		
Strontium-90	pCi/L	01/27/2016	N001	473	-	512	1420		F	#	0.63	225
Temperature	C	01/27/2016	N001	473	-	512	19.7		F	#		
Thorium-234	pCi/L	01/27/2016	N001	473	-	512	-218	U	F	#	342	245
Tritium	pCi/L	01/27/2016	N001	473	-	512	5240		F	#	342	1080
Turbidity	NTU	01/27/2016	N001	473	-	512	2.3		F	#		
Uranium-235	pCi/L	01/27/2016	N001	473	-	512	19.2	U	F	#	33.5	32
Uranium-238	pCi/L	01/27/2016	N001	473	-	512	-218	U	F	#	342	245
Yttrium-88	pCi/L	01/27/2016	N001	473	-	512	0.365	U	F	#	8.2	4.25

Groundwater Quality Data by Location (USEE100) FOR SITE GNO01, Gnome-Coach Site

REPORT DATE: 6/7/2016

Location: USGS-8 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)			Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	01/27/2016	N001	463	-	495	-4.06	U	F	#	26.2	16.3
Actinium-228	pCi/L	01/27/2016	N002	463	-	495	-4.36	U	F	#	26.8	16.8
Alkalinity, Total (as CaCO ₃)	mg/L	01/27/2016	N001	463	-	495	36		F	#		
Americium-241	pCi/L	01/27/2016	N001	463	-	495	-9.49	U	F	#	34.2	22.6
Americium-241	pCi/L	01/27/2016	N002	463	-	495	4.54	U	F	#	36.6	20.5
Antimony-125	pCi/L	01/27/2016	N001	463	-	495	-2.49	U	F	#	16.8	9.64
Antimony-125	pCi/L	01/27/2016	N002	463	-	495	-6.42	U	F	#	17	12.1
Cerium-144	pCi/L	01/27/2016	N001	463	-	495	-14	U	F	#	38.9	24.2
Cerium-144	pCi/L	01/27/2016	N002	463	-	495	19.7	U	F	#	42.5	25.5
Cesium-134	pCi/L	01/27/2016	N001	463	-	495	-1.7	U	F	#	6.38	3.67
Cesium-134	pCi/L	01/27/2016	N002	463	-	495	-1.67	U	F	#	5.82	3.41
Cesium-137	pCi/L	01/27/2016	N001	463	-	495	142		F	#	6.16	15.8
Cesium-137	pCi/L	01/27/2016	N002	463	-	495	166		F	#	6.53	19.6
Cobalt-60	pCi/L	01/27/2016	N001	463	-	495	-1.34	U	F	#	5.31	3.63
Cobalt-60	pCi/L	01/27/2016	N002	463	-	495	1.38	U	F	#	7.13	3.55
Dissolved Oxygen	mg/L	01/27/2016	N001	463	-	495	1.46		F	#		
Europium-152	pCi/L	01/27/2016	N001	463	-	495	-.372	U	F	#	17.6	9.81
Europium-152	pCi/L	01/27/2016	N002	463	-	495	6.42	U	F	#	19.3	17.3

Groundwater Quality Data by Location (USEE100) FOR SITE GNO01, Gnome-Coach Site

REPORT DATE: 6/7/2016

Location: USGS-8 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)			Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Europium-154	pCi/L	01/27/2016	N001	463	-	495	-1.6	U	F	#	14.4	7.89
Europium-154	pCi/L	01/27/2016	N002	463	-	495	-1.61	U	F	#	19.2	10.2
Europium-155	pCi/L	01/27/2016	N001	463	-	495	0.841	U	F	#	22.1	14.2
Europium-155	pCi/L	01/27/2016	N002	463	-	495	-4.57	U	F	#	21.4	12.8
Lead-212	pCi/L	01/27/2016	N001	463	-	495	5.12	U	F	#	13	10.5
Lead-212	pCi/L	01/27/2016	N002	463	-	495	2.73	U	F	#	13.3	9.52
Oxidation Reduction Potential	mV	01/27/2016	N001	463	-	495	-118.8		F	#		
pH	s.u.	01/27/2016	N001	463	-	495	7.11		F	#		
Potassium-40	pCi/L	01/27/2016	N001	463	-	495	60.6	U	F	#	61.5	68.1
Potassium-40	pCi/L	01/27/2016	N002	463	-	495	5.38	U	F	#	70.2	55.7
Promethium-144	pCi/L	01/27/2016	N001	463	-	495	0.932	U	F	#	6.19	3.48
Promethium-144	pCi/L	01/27/2016	N002	463	-	495	-1.32	U	F	#	6.56	3.74
Promethium-146	pCi/L	01/27/2016	N001	463	-	495	4.71	U	F	#	9.29	8.36
Promethium-146	pCi/L	01/27/2016	N002	463	-	495	-2.17	U	F	#	8.62	5.17
Ruthenium-106	pCi/L	01/27/2016	N001	463	-	495	18.2	U	F	#	56.4	31.4
Ruthenium-106	pCi/L	01/27/2016	N002	463	-	495	0.827	U	F	#	61.8	33.4
Specific Conductance	umhos /cm	01/27/2016	N001	463	-	495	5911		F	#		
Strontium-90	pCi/L	01/27/2016	N001	463	-	495	2410		F	#	0.704	380

Groundwater Quality Data by Location (USEE100) FOR SITE GNO01, Gnome-Coach Site

REPORT DATE: 6/7/2016

Location: USGS-8 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)			Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Strontium-90	pCi/L	01/27/2016	N002	463	-	495	2270		F	#	0.58	356
Temperature	C	01/27/2016	N001	463	-	495	18.64		F	#		
Thorium-234	pCi/L	01/27/2016	N001	463	-	495	137	U	F	#	279	310
Thorium-234	pCi/L	01/27/2016	N002	463	-	495	-21.5	U	F	#	325	202
Tritium	pCi/L	01/27/2016	N001	463	-	495	16400		F	#	343	3240
Tritium	pCi/L	01/27/2016	N002	463	-	495	16100		F	#	346	3170
Turbidity	NTU	01/27/2016	N001	463	-	495	3.99		F	#		
Uranium-235	pCi/L	01/27/2016	N001	463	-	495	-4.33	U	F	#	39.9	28.4
Uranium-235	pCi/L	01/27/2016	N002	463	-	495	-3.34	U	F	#	41.5	28.9
Uranium-238	pCi/L	01/27/2016	N001	463	-	495	137	U	F	#	279	310
Uranium-238	pCi/L	01/27/2016	N002	463	-	495	-21.5	U	F	#	325	202
Yttrium-88	pCi/L	01/27/2016	N001	463	-	495	0.359	U	F	#	6.64	3.29
Yttrium-88	pCi/L	01/27/2016	N002	463	-	495	0.797	U	F	#	7.58	3.69

SAMPLE ID CODES: 000X = Filtered sample (0.45 µm). N00X = Unfiltered sample. X = replicate number.

LAB QUALIFIERS:

* Replicate analysis not within control limits.
> Result above upper detection limit.
A TIC is a suspected aldol-condensation product.
B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
C Pesticide result confirmed by GC-MS.
D Analyte determined in diluted sample.
E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
H Holding time expired, value suspect.
I Increased detection limit due to required dilution.
J Estimated
N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
P > 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
U Analytical result below detection limit.
W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X,Y,Z Laboratory defined qualifier, see case narrative.

DATA QUALIFIERS:

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

QA QUALIFIER:

Validated according to quality assurance guidelines.

Static Water Level Data

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STATIC WATER LEVELS (USEE700) FOR SITE GNO01, Gnome-Coach Site
REPORT DATE: 6/17/2016

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)
LRL-7		3442.52	01/27/2016	12:30:00	461.63	2980.89
USGS-4		3413.72	01/27/2016	12:57:00	428.95	2984.77
USGS-4		3413.72	01/27/2016	15:06:10	428.83	2986.42
USGS-8		3411.25	01/27/2016	13:03:00	421.7	2989.55
USGS-8		3411.25	01/27/2016	16:25:50	421.26	2991.7
Well DD-1		3397.49	01/27/2016	14:20:00	977.42	2420.07

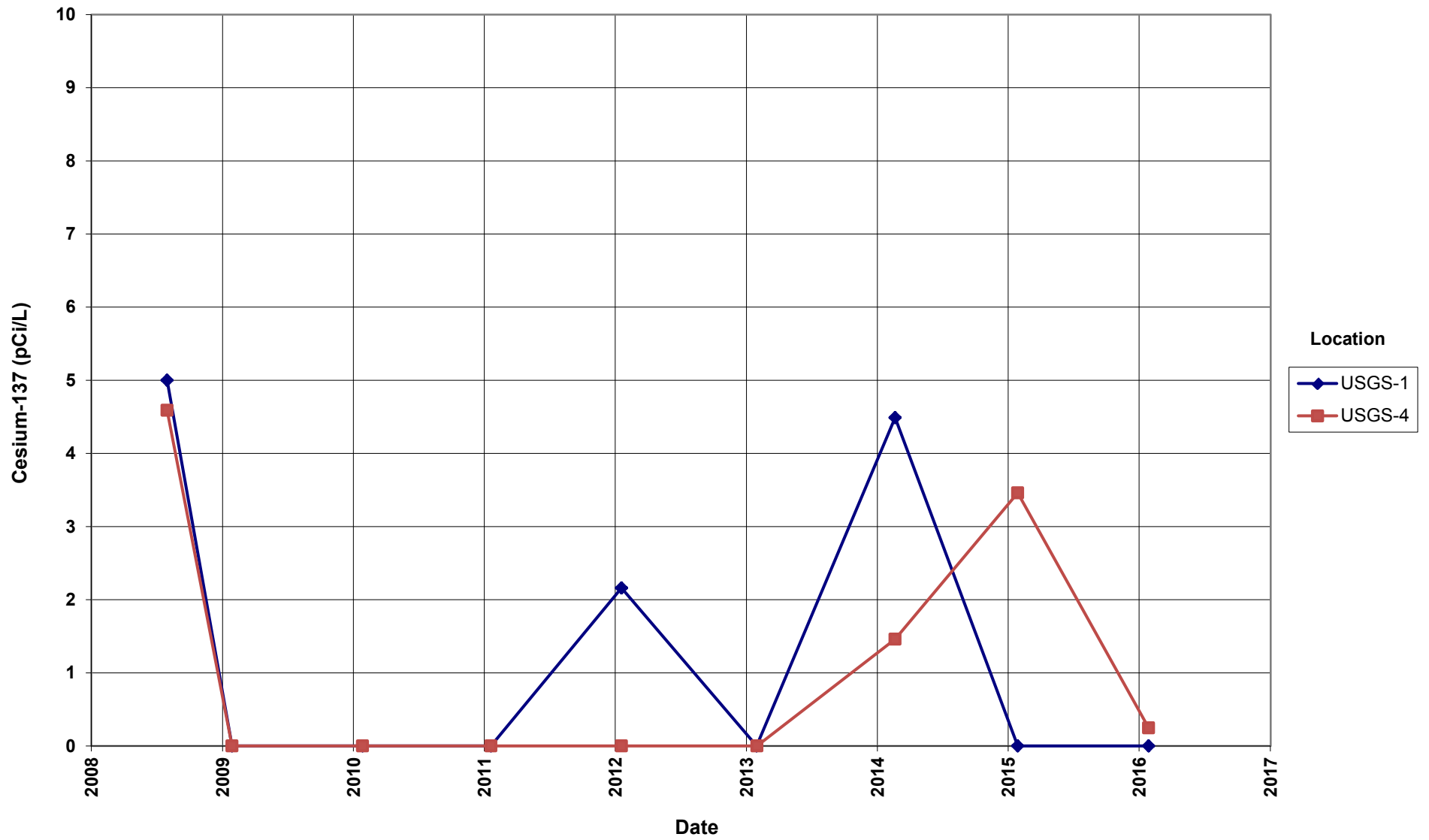
FLOW CODES: B BACKGROUND C CROSS GRADIENT D DOWNGRADIENT F OFFSITE
N UNKNOWN O ONSITE U UPGRADIENT

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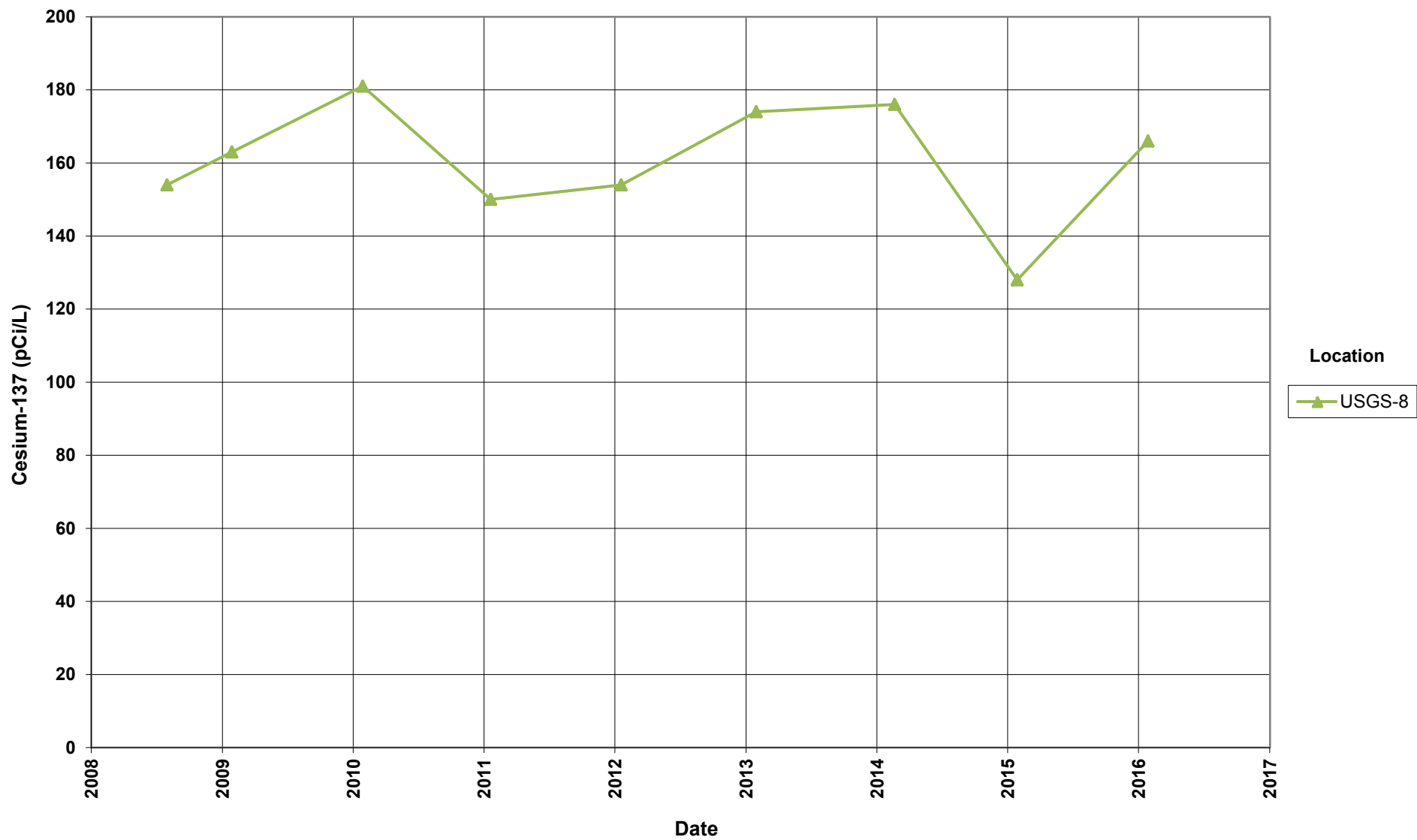
Time-Concentration Graphs

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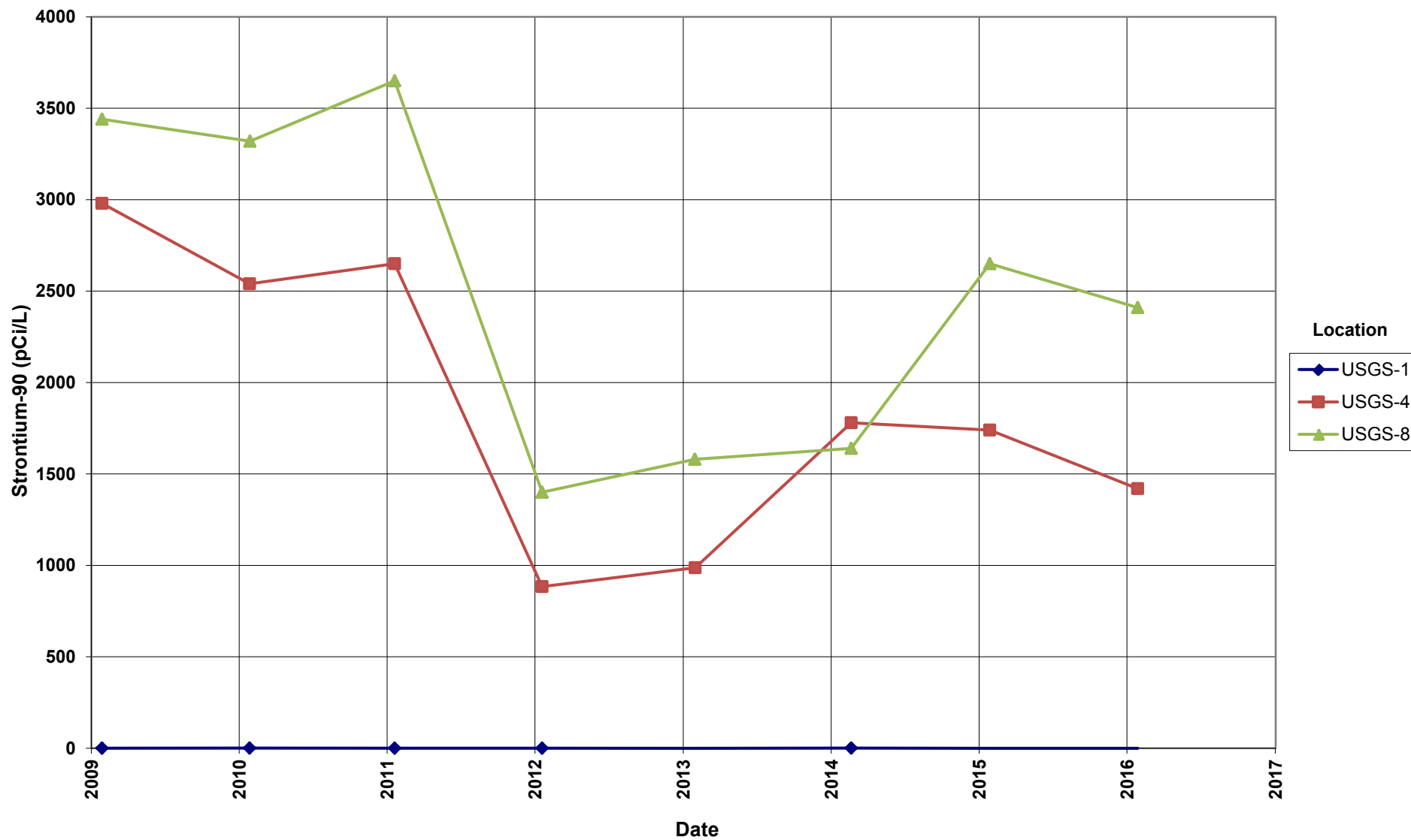
Gnome-Coach Site Cesium-137 Concentration



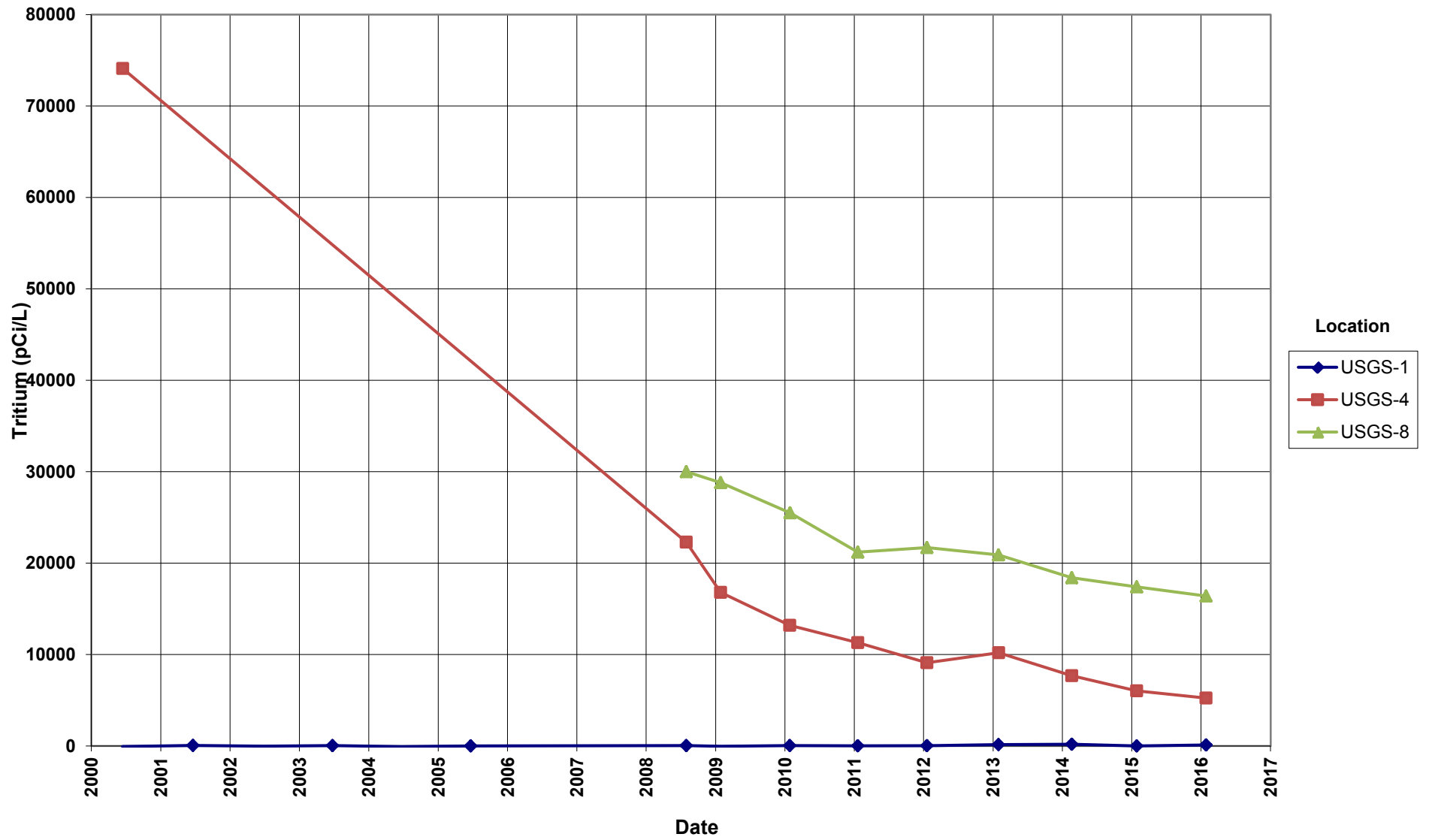
Gnome-Coach Site Cesium-137 Concentration



Gnome-Coach Site Strontium-90 Concentration



Gnome-Coach Site Tritium Concentration



Attachment 3

Sampling and Analysis Work Order

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December 28, 2015

Task Assignment 104
Control Number 16-0195

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

SUBJECT: Contract No. DE-LM0000421, Navarro Research & Engineering, Inc. (Navarro)
Task Assignment 104 LTS&M-Nevada Off Sites and Monticello Site
January 2016 Environmental Sampling at the Gnome-Coach, New Mexico, Site

REFERENCE: Task Assignment 104, 1-104-1-04-617, Gnome-Coach, New Mexico, Site

Dear Ms. Dayvault:

The purpose of this letter is to inform you of the upcoming sampling event at the Gnome-Coach, New Mexico, site. Enclosed are the map and tables specifying sample locations and analytes for monitoring at the Gnome-Coach site. Water quality data will be collected from this site as part of the routine environmental sampling currently scheduled to begin the week of January 25, 2016.

The following list shows the monitoring wells scheduled to be sampled during this event.

Monitoring Wells

USGS-1 USGS-4 USGS-8

All samples will be collected as directed in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*. The U.S. Bureau of Land Management has been notified of the scheduled sampling event.

Please contact me at (970) 248-6419 if you have any questions.

Sincerely,

A handwritten signature in blue ink that reads "Richard C. Findlay".

Richard C. Findlay
Site Lead

RCF/lcg/bkb

Enclosures (3)

Jalena Dayvault
Control Number 16-0195
Page 2

cc: (electronic)

Christina Pennal, DOE
Beverly Cook, Navarro
Steve Donovan, Navarro
Richard Findlay, Navarro
Lauren Goodknight, Navarro
Kenneth Karp, Navarro
Diana Osborne, Navarro
EDD Delivery
rc-grand.junction
File: GNO 400.02

<p align="center">Sampling Frequencies for Locations at Gnome-Coach, New Mexico</p>
--

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
LRL-7					X	Bladder pump; not sampled per R. Findlay, 1/11/12
USGS-1			X			Electric pump
USGS-4			X			Bladder pump
USGS-8			X			Bladder pump

Annual sampling conducted in January

Constituent Sampling Breakdown

Site	Gnome-Coach		Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Analyte	Groundwater	Surface Water			
Approx. No. Samples/yr	3	0			
Field Measurements					
Alkalinity	X				
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride					
Chromium					
Gamma Spec	X		10 pCi/L	Gamma Spectrometry	GAM-A-001
Gross Alpha					
Gross Beta					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium					
Radium-226					
Radium-228					
Selenium					
Silica					
Sodium					
Strontium-90	X		1 pCi/L	Gas Proportional Counter	GPC-A-009
Sulfate					
Sulfide					

Total Dissolved Solids					
Total Organic Carbon					
Tritium	X		400 pCi/L	Liquid Scintillation	LSC-A-001
Enriched Tritium	USGS-1 only		10 pCi/L	Liquid Scintillation	LMR-15
Uranium					
Vanadium					
Zinc					
Total No. of Analytes	4	0			

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

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Attachment 4

Trip Report

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Memorandum

DATE: February 5, 2016
TO: Rick Findlay
FROM: Rob Rice
SUBJECT: Trip Report (Annual Sampling and Site Inspection)

Site: Gnome/Coach, New Mexico Test Site

Dates of Sampling Event: January 26-28, 2016

Team Members: Rob Rice and Jennifer Graham.

Number of Locations Sampled: Samples collected from 3 onsite monitoring wells will be analyzed for gamma spectrometry, tritium, enriched tritium (USGS-1 only), and strontium-90. Samples were collected and monitoring well purge water was contained as specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*.

Locations Not Sampled/Reason: All scheduled locations were sampled.

Location Specific Information: Power to the dedicated pump at USGS-1 was off upon arrival. Power was turned to off when sampling completed.

Quality Control Sample Cross Reference: The following is the false identification assigned to the quality control sample.

False ID	Ticket Number	True ID	Sample Type	Associated Matrix
2443	OCU 526	USGS-8	Duplicate	Groundwater

Requisition Index Number (RIN) Assigned: Samples were assigned to RIN 16017604. Field data sheets can be found in \\crow\SMS\16017604\FieldData.

Sample Shipment: Samples were shipped via FedEx Ground from Grand Junction to GEL Laboratories on February 2, 2016.

Water Level Measurements: Water levels are presented in the following table and have been uploaded to SEEPro.

Site Code	Well ID	Date	Time	DTW (ft)	Comments
GN001	USGS-1	01/27/2016	12:15	437.38	Pump off when sampling team arrived.
GN001	LRL-7	01/27/2016	12:30	461.63	
GN001	USGS-4	01/27/2016	12:57	428.95	
GN001	USGS-4	01/27/2016	13:55	428.83	
GN001	USGS-8	01/27/2016	13:03	421.70	
GN001	USGS-8	01/27/2016	15:18	421.26	
GN001	DD-1	01/27/2016	14:20	977.42	

DTW = Depth to Water (all measurements obtained from north top of casing)

Ft = Feet

ID = Identification

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. Samples were collected according to the SAP.

Equipment: All equipment functioned properly.

Dataloggers: Dataloggers were downloaded and checked for accuracy by the site lead.

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

Safety Issues: None

Access Issues: None

General Information: Persistent hydrocarbon smell in the air. Upon leaving the site, it was noted that a nearby pumping facility was burning off waste gas. The initial attempt at post trip ops check indicated very low DO measurements in open air. A subsequent ops check was conducted off site; DO criteria were met. Well USGS-4 may have a check valve problem; water was back-flowing somewhat between cycles. The flow meter at well USGS-1 indicated 2,426,200 gallons of water (photograph 1) had been removed from the well since the flow meter was installed on January 27, 2015. The transducer in well USGS-8 could not be downloaded and was replaced during this sampling event. The transducer will be sent to In-Situ in an attempt to recover the data.

Immediate Actions Taken: None

Future Actions Required or Suggested: Investigate USGS-4 bladder pump, replace if check valve is failing.



Photograph 1. Flow meter at well USGS-1 showing gallons removed.

cc: (electronic)
Jalena Dayvault, DOE
Steve Donovan, Navarro
Rick Findlay, Navarro
EDD Delivery

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