

**Project Rulison
Monitoring Results
For Water Vapor in Gas at the
Holmes Mesa Compressor Station,
Garfield County, Colorado**

**U.S. Department of Energy Office of Legacy Management
Grand Junction, Colorado**

Date Sampled:

2 September 2011

Purpose:

Natural gas from local wells in the Parachute field is sent by pipelines to the Holmes Mesa Compressor Station in Garfield County, Colorado. The U.S. Department of Energy (DOE) currently monitors natural gas wells at their respective well heads that supply gas to this compressor station. DOE has collected water-vapor samples for baseline analysis from another compressor station in the area. The result of this sampling provides DOE and the stakeholders with a background baseline.

Samples Collected:

Four condensed-water-vapor samples were collected at the Holmes Mesa Compressor Station. No natural-gas samples were collected.

Sample Locations:

Samples were collected from various process units at the Holmes Mesa Compressor Station.

Summary of Results:

No analytical result exceeded its respective screening level.

Table 1. Sample Collection Locations

Sample Name	Unit Location Name	Comment
Holmes_Mesa_Plantinput	Slug catcher	The slug catcher is the compressor station input.
Holmes_Mesa_TEG	Triethylene glycol regeneration unit	Condensation collection tank after TEG regeneration
Holmes_Mesa_FlareKOBox	Station flash tank	The flare knock-out box was dry. The flash tank is upstream.
Holmes_Mesa_CompositeFlashSwag	Accumulation tank	The sample was collected as the accumulation tank was pumped into a tanker truck.

Sample Collection Notes:

A condensed-water sample was collected at the compressor station input (slug catcher), the gas-drying unit (triethylene glycol regeneration unit), the station flash tank (instead of the flare knock-out box), and from an accumulation tank that captures water and petroleum condensate (from the flash tank and the slug catcher).

Monitoring Protocol:

The *Rulison Monitoring Plan* (July 2010, LMS/RUL/S06178) provides guidance regarding the type and frequency of sample collection as a function of distance and heading from the Rulison detonation point; it also specifies the types of analyses. A copy of the monitoring plan is available at <http://www.lm.doe.gov/Rulison/Documents.aspx>

Table 2a. Gas-Phase Screening and Action Concentrations for Tritium Sample Results

Analyte	Reporting Units	Screening Conc.	Action Conc.	Comment
Tritium	TU	19,293	TBD	5.183×10^{-6} pCi/cc/TU

Table 2b. Liquid-Phase Screening and Action Concentrations for Tritium and Various Analytical Method Results

Analyte	Reporting Units	Screening Conc.	Action Conc.	Comment
Tritium	pCi/L	800	TBD	20,000 pCi/L = EPA drinking water standard
Lab Method				
Gross alpha	pCi/L	3x background	TBD	
Gross beta	pCi/L	3x background	TBD	
High-resolution gamma spectroscopy	pCi/L	20	TBD	Based on cesium-137

Table 3 Notes: See the Rulison Monitoring Plan, Table 2, for response scenarios when the screening and/or action concentrations are exceeded.
 The derived air effluent concentration for 50 mrem-per-year dose from tritium exposure is 0.10 pCi (tritium) / (cc of methane).
 TU: tritium unit
 pCi/cc/TU: picocurie per cubic centimeter per tritium unit
 pCi/L: picocuries per liter
 TBD: to be determined

Results:

Four liquid samples were collected.

Laboratory Qualifiers:

A “detect” is a laboratory result greater than the laboratory’s reporting threshold or minimum detectable concentration (MDC).

A “nondetect” is a laboratory result that is less than the laboratory’s MDC for that sample. The laboratory qualifies a “nondetect” with a “U.”

Data Validation Qualifiers:

A laboratory result less than three times the one-sigma total propagated uncertainty is considered a “nondetect” and assigned the data qualifier “U.” Three times the one-sigma propagated uncertainty is called the Decision Level Concentration.

A “detect” result greater than 3-times the sample MDC is assigned the data qualifier “J.”

Results summaries:

Analytic results for each sample are listed after Table 4. The common prefix — HolmesMesa — is omitted from the sample collection location columns in Table 3.

Table 3a. Summary of Tritium Results for Liquid-Phase Samples, Based on Laboratory Assigned Qualifiers

Collection Location	Number of Samples	Tritium Result		
		Detect	Nondetect	NA
Plantinput	1	0	1	0
TEG	1	0	1	0
FlareKObox	1	0	1	0
CompositeFlashSwag*	1	0	1	0

NA: Missing or not applicable

* AccumulationTank

Table 3b. Summary of Gross Alpha/Beta Results for Liquid Phase-Samples, Based on Laboratory Assigned Qualifiers

Collection Location	Number of Samples	Gross Alpha Result			Gross Beta Result		
		Detect	Nondetect	NA	Detect	Nondetect	NA
Plantinput	1	1	0	0	1	0	0
TEG	1	0	1	0	0	1	0
FlareKObox	1	1	0	0	1	0	0
CompositeFlashSwag*	1	0	1	0	1	0	0

NA: Missing or not applicable * AccumulationTank

Data validation assigned a “J” to the Plantinput gross-alpha result and “U” to the FlareKOBox gross-alpha result. A “J” was assigned to the Accumulation Tank gross-beta result.

Table 3c. Summary of Potassium-40 Results for Liquid-Phase Samples, Based on Laboratory Assigned Qualifiers

Collection Location	Number of Samples	Potassium-40 Result		
		Detect	Nondetect	NA
Plantinput	1	0	1	0
TEG	1	0	1	0
FlareKObox	1	0	1	0
CompositeFlashSwag*	1	0	1	0

NA: Missing or not applicable * AccumulationTank

Table 4. Statistics for Detected Gross-Beta Results

Counting Statistic	Gross Beta	Units
Number of detects	3	NA
Maximum	497.0	pCi/L
Third quartile	325.0	pCi/L
Mean	229.3	pCi/L
Median	153.0	pCi/L
First quartile	95.4	pCi/L
Minimum	37.8	pCi/L

NA: Missing or not applicable

Liquid-Phase Sample Results

RESULTS REPORT
RIN: 11084060
Site: Rulison Site
Location: Holmes_Mesa_CompositeFlashSwag
Ticket Number: JKV 379
Report Date: 10/07/2011

Parameter	Units	Sample Date	ID	Result	TPU ¹	Lab	Qualifiers Data	QA
CHLORIDE	MG/L	09/02/2011	N001	5400				#
GROSS ALPHA	pCi/L	09/02/2011	N001	20.5	14.5	U		#
GROSS BETA	pCi/L	09/02/2011	N001	37.8	19.5		J	#
H-3	pCi/L	09/02/2011	N001	-104	172	U		#
Actinium-228	pCi/L	09/02/2011	N001	7.58	24.8	U		#
Americium-241	pCi/L	09/02/2011	N001	7.1	19.6	U		#
Antimony-125	pCi/L	09/02/2011	N001	-3.52	11.1	U		#
Cerium-144	pCi/L	09/02/2011	N001	-1.06	19.5	U		#
Cesium-134	pCi/L	09/02/2011	N001	-3.14	4.84	U		#
Cesium-137	pCi/L	09/02/2011	N001	1.8	4.8	U		#
Cobalt-60	pCi/L	09/02/2011	N001	0.108	5.72	U		#
Europium-152	pCi/L	09/02/2011	N001	14	24.2	U		#
Europium-154	pCi/L	09/02/2011	N001	20.2	26.2	U		#
Europium-155	pCi/L	09/02/2011	N001	2.79	9.67	U		#
Lead-212	pCi/L	09/02/2011	N001	3.04	9.34	U		#
Potassium-40	pCi/L	09/02/2011	N001	18.8	92.5	U		#
Promethium-144	pCi/L	09/02/2011	N001	8.65	5.2		U	#
Promethium-146	pCi/L	09/02/2011	N001	3.86	5.17	U		#
Ruthenium-106	pCi/L	09/02/2011	N001	0	43.4	U		#
Thorium-234	pCi/L	09/02/2011	N001	54.4	117	U		#
Uranium-235	pCi/L	09/02/2011	N001	26	18.5	U		#
Uranium-238	pCi/L	09/02/2011	N001	54.4	117	U		#
Yttrium-88	pCi/L	09/02/2011	N001	0.638	8.45	U		#

¹ TPU – Total Propagated Uncertainty reported at 2-sigma.

RESULTS REPORT**RIN: 11084060****Site: Rulison Site****Location: Holmes_Mesa_FlareKOBBox****Ticket Number: JJV 140****Report Date: 10/07/2011**

Parameter	Units	Sample Date	ID	Result	TPU ¹	Lab	Qualifiers Data	QA
CHLORIDE	MG/L	09/02/2011	N001	0.66				#
GROSS ALPHA	pCi/L	09/02/2011	N001	11.1	7.22		J	#
GROSS BETA	pCi/L	09/02/2011	N001	153	28.3			#
H-3	pCi/L	09/02/2011	N001	83.9	187	U		#
Actinium-228	pCi/L	09/02/2011	N001	1.25	20.8	U		#
Americium-241	pCi/L	09/02/2011	N001	0.476	4.24	U		#
Antimony-125	pCi/L	09/02/2011	N001	-6.6	7.22	U		#
Cerium-144	pCi/L	09/02/2011	N001	-2.12	13.8	U		#
Cesium-134	pCi/L	09/02/2011	N001	0.382	3.28	U		#
Cesium-137	pCi/L	09/02/2011	N001	0.744	3.2	U		#
Cobalt-60	pCi/L	09/02/2011	N001	-0.401	3.57	U		#
Europium-152	pCi/L	09/02/2011	N001	0.725	17.3	U		#
Europium-154	pCi/L	09/02/2011	N001	6.32	17.8	U		#
Europium-155	pCi/L	09/02/2011	N001	2.37	5.77	U		#
Lead-212	pCi/L	09/02/2011	N001	1.7	7.52	U		#
Potassium-40	pCi/L	09/02/2011	N001	12.5	76.3	U		#
Promethium-144	pCi/L	09/02/2011	N001	1.96	3.86	U		#
Promethium-146	pCi/L	09/02/2011	N001	0.624	3.45	U		#
Ruthenium-106	pCi/L	09/02/2011	N001	-15.9	30.7	U		#
Thorium-234	pCi/L	09/02/2011	N001	-2.46	49.3	U		#
Uranium-235	pCi/L	09/02/2011	N001	12.2	22.6	U		#
Uranium-238	pCi/L	09/02/2011	N001	-2.46	49.3	U		#
Yttrium-88	pCi/L	09/02/2011	N001	-0.113	8.02	U		#

¹TPU – Total Propagated Uncertainty reported at 2-sigma.

RESULTS REPORT**RIN: 11084060****Site: Rulison Site****Location: Holmes_Mesa_Plantinput****Ticket Number: JJV 138****Report Date: 10/07/2011**

Parameter	Units	Sample Date	Sample ID	Result	TPU ¹	Lab	Qualifiers Data	QA
CHLORIDE	MG/L	09/02/2011	N001	6700				#
GROSS ALPHA	pCi/L	09/02/2011	N001	61.9	25.9		J	#
GROSS BETA	pCi/L	09/02/2011	N001	497	85.4			#
H-3	pCi/L	09/02/2011	N001	-9.84	171	U		#

¹TPU – Total Propagated Uncertainty reported at 2-sigma.

RESULTS REPORT**RIN: 11084060****Site: Rulison Site****Location: Holmes_Mesa_TEG****Ticket Number: JJV 139****Report Date: 10/07/2011**

Parameter	Units	Sample Date	Sample ID	Result	TPU ¹	Lab	Qualifiers Data	QA
CHLORIDE	MG/L	09/02/2011	N001	0.2		U		#
GROSS ALPHA	pCi/L	09/02/2011	N001	-0.772	4.35	U		#
GROSS BETA	pCi/L	09/02/2011	N001	3.25	8.07	U		#
H-3	pCi/L	09/02/2011	N001	91	179	U		#

¹TPU – Total Propagated Uncertainty reported at 2-sigma.