



Shell Exploration & Production

Shell Frontier Oil & Gas Inc.
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Houston Texas 77082-3101

FED EX Tracking # 7976 9310.6316

January 24, 2014

Ms. Sarah Roberts
US EPA Region 8
UIC Technical Enforcement Program
Mail Code: 8ENF-UFO
1595 Wynkoop St.
Denver, CO 80202-1129

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GRAND JUNCTION FIELD OFFICE
DIVISION OF
RECLAMATION MINING & SAFETY

P-2010-026

SUBJECT: Shell Frontier Oil & Gas Inc., UIC Area Permit No. CO32210-00000, Submittal of 4th Quarter 2013 Report, ERDD Project, Rio Blanco County, Colorado.

Dear Ms. Roberts:

Per the requirements of Part II Section D and specified in Appendix D of the above referenced UIC permit, Shell Frontier Oil & Gas Inc. (SFOGI) is submitting this quarterly monitoring report for data collected from October 1, 2013 through December 31, 2013 (4th quarter). This includes data associated with the monitoring wells and injection wells, mining interval development, subsidence monitoring, and the groundwater monitoring. This report will not include the 4th quarter radioactive marker log for wells OB02 and OB04, and its interpretation, since it was previously submitted on November 17, 2013.

Also, well circulation was discontinued on September 25th, 2013, due to cancellation of the project. Therefore, there is no injection and production data available for the 4th quarter.

If you have any questions regarding the information in this submittal, please contact me at 281-544-7990.

Sincerely,

Florentino Vuelvas
Staff Environmental Engineer

Attachments (4)

Cc: **FED EX Tracking # 7976 9323 7031**

Paul Daggett

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Attachment 1
Injection Well Data

Injection Well - Q4 2013

Monitored Parameter	October 2013	November 2013	December 2013	Year to Date Volumes
Injected Volume (gallons)	-	-	-	1,620,538
Produced Volume (gallons)	-	-	-	1,468,084
Injected Volume (barrels)	-	-	-	38,584
Produced Volume (barrels)	-	-	-	34,954
Monitored Parameter	October 2013			December 2013
	Minimum	Average	Maximum	
Injection Fluid Temperature at Wellhead (deg F)	n/a	n/a	n/a	n/a
Production Fluid Temperature at Wellhead (deg F)	n/a	n/a	n/a	n/a
Injection Fluid Pressure at Wellhead (psig)	n/a	n/a	n/a	n/a
Production Fluid Pressure at Wellhead (psig)	n/a	n/a	n/a	n/a
Tubing-Casing Annulus Pressure at Wellhead (psig)	0.00	0.00	0.00	0.00
Injection Fluid Flow Rates at Wellhead (gpm)	n/a	n/a	n/a	n/a
Production Fluid Flow Rates at Wellhead (gpm)	n/a	n/a	n/a	n/a
Injection Fluid Flow Rates at Wellhead (bbl/day)	n/a	n/a	n/a	n/a
Production Fluid Flow Rates at Wellhead (bbl/day)	n/a	n/a	n/a	n/a
Injection Fluid Density at Wellhead (lbm/ft3)	n/a	n/a	n/a	n/a
Production Fluid Density at Wellhead (lbm/ft3)	n/a	n/a	n/a	n/a
NaHCO3 produced (tons/day)	0.00	0.00	0.00	0.00
Reservoir Temp at 2,260' (deg F)	141.06	153.37	175.37	123.65
Reservoir Temp at 2,210' (deg F)	139.71	151.68	177.23	124.55
Reservoir Temp at 2,187' (deg F)	140.51	152.93	182.28	124.56
Reservoir Temp at 2,148' (deg F)	141.51	153.35	174.58	125.46
Reservoir Pres at 2,125' (psig)*	395.70	443.08	484.97	359.04
Reservoir Pres at 2,265' (psig)*	673.31	750.99	823.37	654.77
Crown Temp at 2,060' (deg F) - Temperature in cement behind longstring casing)	122.31	134.81	153.00	112.56
Crown Temp at 2,040' (deg F) - Temperature in cement behind longstring casing)	124.12	134.10	153.27	113.38
Crown Temp at 1,990' (deg F) - Temperature in cement behind longstring casing)	117.98	130.78	150.58	108.77
Crown Temp at 1,970' (deg F) - Temperature in cement behind longstring casing)	119.65	130.17	150.00	109.40
Injectate Analysis (mg/L)	n/a	n/a	n/a	n/a
Produced Fluids Analysis (mg/L)	n/a	n/a	n/a	n/a
Monitored Parameter	Q4 2013			December 2013
	Minimum	Average	Maximum	
Injectate Specific Gravity				
Injectate pH				
Injectate Total Dissolved Solids (mg/L)				
Injectate Specific Conductivity (umhos/cm)				

*Reservoir Pressure variations are due to transducer noise.

Attachment 2

Mining Interval Development

Mining Interval Development - Q4 2013

October 2013

Top View

Average temperature at leach well decreased to 152.8 °F. Dissolution expected to stop since the water in cavern is becoming saturated with nahcolite.

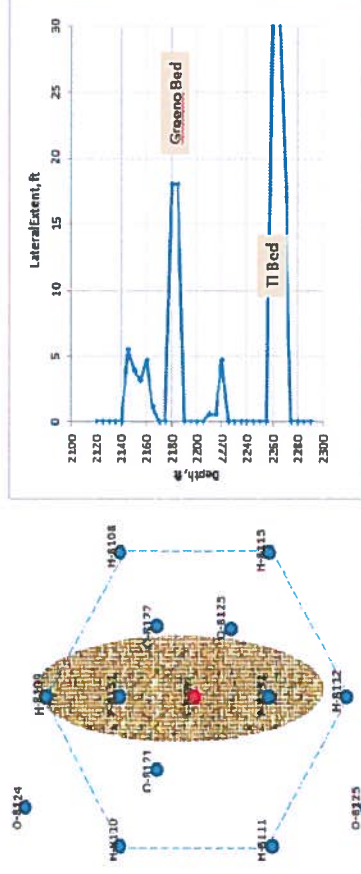
Negligible change in cavern dimensions after September 2013 due to no water injection. No Nahcolite removed (total nahcolite removed from start of project 112.4 tons).

Cavity estimated to have elliptical shape of major axis 36.1 ft and minor axis 8.7 ft. Radius along major axis 18.05 ft and 4.35 ft along minor axis.

There is not a single height for the mining interval. Two zones mined: Greeno (10 ft) and TI beds(7 ft).

See cross section inset for a vertical view of mined zone.

Cross Section



November 2013

Average temperature at leach well decreased to 135 °F. No injection in leach well. No dissolution expected. Cavity dimensions remain the same since October 2013.

No changes in cavity dimensions.

December 2013

Average temperature at leach well decreased to 127.6 °F. No injection in leach well. No dissolution expected. Cavity dimensions remain the same since October 2013.

No changes in cavity dimensions.

Attachment 3
Subsidence Monitoring

Subsidence Monitoring - Q4 2013

Previously submitted November 17, 2013.

Differences between current readings and reference readings for cable OW-8122 (OB02) have been less than +/-0.069 rho which corresponds to a subsurface deformation within the range of 0 and 0.5 inch (12 mm). The maximum difference of -0.069 rho occurred on 10/30/13 at a depth of 197 feet, and is associated with intermittent changes in impedance at a splice. There is no consistent location where the differences have occurred, indicating that they are not associated with deformation.

Table A.1 Cable OW-8122

Date of Reading	Date of Reference	Maximum Difference (rho)	Depth (ft)	Minimum Difference (rho)	Depth (ft)	Average Difference (rho)
7/29/13	6/21/13	0.022	1847	-0.031	1701	0.0036
			1851		1706	
8/12/13	8/1/13	0.005	1274	-0.027	1687	-0.0083
8/19/13	8/4/13	0.026	8	-0.018	218	0.0011
9/8/13	8/4/13	0.029	10	-0.022	1620	-0.0016
9/30/13	8/4/13	0.034	8	0.014	1620	0.0072
			21			
10/30/13	8/4/13	0.059	400	-0.069	197	-0.0004
			415			
12/31/13	8/4/13	0.036	21	-0.033	1617	0.0001

TDR in OB02 (coaxial cable to 2,074 feet).

Attachment 4
Groundwater Monitoring

Groundwater Monitoring - Q4 2013

Water levels have been measured frequently with pressure transducers and periodically with "tapes" since March 2010 through December 2013. Below is a list of dates of tape measurements of the observed water levels.

EDD Ground Water Monitoring Frequency - Water Level Measurements									
138-4-298-UT	138-4-298-A	138-4-298-B	138-4-298-L5	138-4-298-L4	135-4-298-L4				
3/9/2010	3/9/2010	3/9/2010	3/9/2010	3/9/2010	6/8/2011				
4/9/2010	4/9/2010	4/9/2010	4/9/2010	4/9/2010	8/23/2011				
4/20/2010	4/20/2010	4/20/2010	4/20/2010	4/20/2010	10/19/2011				
6/7/2010	6/7/2010	6/7/2010	6/7/2010	6/7/2010	3/27/2012				
8/16/2010	8/16/2010	8/16/2010	8/16/2010	8/16/2010	5/15/2012				
11/8/2010	11/8/2010	11/8/2010	11/8/2010	11/8/2010*	11/27/2012				
3/21/2011	3/21/2011	3/21/2011	3/21/2011	3/21/2011*	2/21/2013				
8/1/2011	8/1/2011	8/1/2011	8/1/2011	6/3/2011*	6/27/2013				
11/15/2012	11/15/2012	11/15/2012	11/15/2012	8/22/2011*	9/12/2013				
5/16/2013	5/16/2013	5/16/2013	5/16/2013	10/17/2011*	10/24/2013				
6/24/2013	6/24/2013	6/24/2013	6/24/2013	8/1/2012*	11/15/2013				
9/12/2013	9/12/2013	9/12/2013	9/12/2013	5/16/2013*	12/16/2013				
12/2/2013	12/2/2013	12/2/2013	12/2/2013	6/24/2013*					
				9/12/2013*					
				12/2/2013*					
				* deepened					

Hydraulic Head (ft. water)

With the exception of a temporary and short-term rise in the water level in the 135-L4 well in October 2010, which was rectified by re-furbishing that well, water levels (water level elevations) have shown only the minor fluctuations characteristic of water levels of the monitored hydrostratigraphic intervals everywhere in the basin. These tape measurements, as well as the more frequent transducer measurements, do not indicate any abnormal pressure/water level changes over the period of record.

The current ground water quality data consists of data collected from five wells on Pad 138, covering the time period from March 2010 through December 2013, and the data for the well on Pad 135, covering the period from June 2011 through December 2013. There are eight samples from the final configuration of the Pad 138 wells and eleven from the Pad 135 well. In addition, the initial and shallower 138-L4 well was also sampled three times prior to recompletion as the current, deeper, 138-L4 well. These two sets of 138-L4 measurements are listed with distinguishing annotations in the table below.

EDD Ground Water Monitoring Frequency - Water Quality Sampling					
138-4-298-UT	138-4-298-A	138-4-298-B	138-4-298-L5	138-4-298-L4	135-4-298-L4
3/10/2010	3/10/2010	3/10/2010	3/10/2010	3/10/2010	6/8/2011
6/8/2010	6/8/2010	6/8/2010	6/8/2010	6/8/2010	8/23/2011
8/18/2010	8/18/2010	8/18/2010	8/17/2010	8/17/2010	10/19/2011
11/10/2010	11/9/2010	11/9/2010	11/9/2010	11/10/2010*	3/27/2012
3/23/2011	3/22/2011	3/22/2011	3/22/2011	3/24/2011*	5/15/2012
6/25/2013	6/26/2013	6/26/2013	6/26/2013	6/6/2011*	11/27/2012
9/25/2013	9/25/2013	9/25/2013	9/18/2013	8/24/2011*	2/21/2013
12/3/2013	12/4/2013	12/18/2013	12/4/2013	10/18/2011*	6/27/2013
				6/25/2013*	9/16/2013
				9/18/2013*	10/24/2013
				12/3/2013*	12/16/2013
				* deepened	

Comparison of the individual analyte data indicate that concentrations have varied as expected for background with no abnormal temporal trends. There have been no concentration increases that approached the numeric protection levels at Pad 138 or the early-indication levels at the 135-L4 well. The consistency of the measured concentrations demonstrate that the Project activities, which involved only installation of production facilities and partial dissolution of sodium bicarbonate mineral in the target zone, have had no effect on measured ground water concentrations. Upon examination of all the data, the water quality measured in all samples for the period of record continues to represent and define unaffected ambient water quality.

Fluid Sampling Results Summary