

WR-35  
Rev (9-11)

State of West Virginia  
Department of Environmental Protection  
Office of Oil and Gas  
Well Operator's Report of Well Work

DATE: 12-12-2013  
API #: 47-009-00154

Farm name: Thomas Parkinson BRK 8H Operator Well No.: 837060

LOCATION: Elevation: 1,160' Quadrangle: Bethany

District: Buffalo County: Brooke  
Latitude: 6.330' Feet South of 40 Deg. 15 Min. 00 Sec.  
Longitude 13.570' Feet West of 80 Deg. 32 Min. 30 Sec.

Company: Chesapeake Appalachia, L.L.C.

Address:	Casing & Tubing	Used in drilling	Left in well	Cement fill up Cu. Ft.
P.O. Box 18496 Oklahoma City, OK 73154-0496	20"	118'	118'	224 Cu. Ft.
Agent: Eric Gillespie	13 3/8"	363'	363'	404 Cu. Ft.
Inspector: Bill Hendershot & Gayne J. Knitowski	9 5/8"	1,780'	1,780'	819 Cu. Ft.
Date Permit Issued: 2-8-2013	5 1/2"	12,667'	12,667'	3,020 Cu. Ft.
Date Well Work Commenced: 3-9-2013				
Date Well Work Completed: 7-30-2013				
Verbal Plugging:				
Date Permission granted on:				
Rotary <input checked="" type="checkbox"/> Cable <input type="checkbox"/> Rig <input type="checkbox"/>				
Total Vertical Depth (ft): 6072'				
Total Measured Depth (ft): 12671'				
Fresh Water Depth (ft.): 183'				
Salt Water Depth (ft.): 640'				
Is coal being mined in area (N/Y)? N				
Coal Depths (ft.): 318'				
Void(s) encountered (N/Y) Depth(s) N				

OPEN FLOW DATA (If more than two producing formations please include additional data on separate sheet)

Producing formation Marcellus Pay zone depth (ft) 6,280-12,495

Gas: Initial open flow \_\_\_\_\_ MCF/d Oil: Initial open flow \_\_\_\_\_ Bbl/d

Final open flow 3,027\* MCF/d Final open flow 325 Bbl/d

Time of open flow between initial and final tests 48 Hours

Static rock Pressure 3,947\* psig (surface pressure) after 48 Hours \*Calculated

Second producing formation \_\_\_\_\_ Pay zone depth (ft) \_\_\_\_\_

Gas: Initial open flow \_\_\_\_\_ MCF/d Oil: Initial open flow \_\_\_\_\_ Bbl/d

Final open flow \_\_\_\_\_ MCF/d Final open flow \_\_\_\_\_ Bbl/d

Time of open flow between initial and final tests \_\_\_\_\_ Hours

Static rock Pressure \_\_\_\_\_ psig (surface pressure) after \_\_\_\_\_ Hours

I certify under penalty of law that I have personally examined and am familiar with the information contained on this document and all the attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete.

Marlene Williams  
Signature

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Were core samples taken? Yes \_\_\_\_\_ No N

Were cuttings caught during drilling? Yes Y No \_\_\_\_\_

Were Electrical, Mechanical or Geophysical logs recorded on this well? If yes, please list GR, neutron, density, and resistivity  
Open hole logs run from 0-1800' MD; LWD GR from 5335-12671' MD.

**NOTE: IN THE AREA BELOW PUT THE FOLLOWING: 1). DETAILS OF PERFORATED INTERVALS, FRACTURING OR STIMULATING, PHYSICAL CHANGE, ETC. 2). THE WELL LOG WHICH IS A SYSTEMATIC DETAILED GEOLOGICAL RECORD OF THE TOPS AND BOTTOMS OF ALL FORMATIONS, INCLUDING COAL ENCOUNTERED BY THE WELLBORE FROM SURFACE TO TOTAL DEPTH.**

Perforated Intervals, Fracturing, or Stimulating:

See attached

Plug Back Details Including Plug Type and Depth(s):

<u>Formations Encountered:</u>	<u>Top Depth</u>	<u>Bottom Depth</u>
<u>Surface:</u>		

See attached

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**PERFORATION RECORD ATTACHMENT**

Well Number and Name: 837060 Thomas Parkinson BRK 8H

PERFORATION RECORD			STIMULATION RECORD							
Date	Interval Perforated		Date	Interval Treated	Fluid		Propping Agent		Average Injection	
	From	To			Type	Amount	Type	Amount		
6/27/2013	12,120	12,495	6/27/2013	12,120	12,495	Sik wtr	9,050	Sand	539,620	77
6/27/2013	11,671	12,046	6/27/2013	11,671	12,046	Sik wtr	8,977	Sand	538,920	79
6/27/2013	11,221	11,597	6/27/2013	11,221	11,597	Sik wtr	9,200	Sand	540,260	77
6/27/2013	10,772	11,148	6/28/2013	10,772	11,148	Sik wtr	9,179	Sand	541,000	78
6/28/2013	10,323	10,699	6/28/2013	10,323	10,699	Sik wtr	9,183	Sand	538,860	77
6/28/2013	9,875	10,249	6/28/2013	9,875	10,249	Sik wtr	8,973	Sand	540,860	72
6/28/2013	9,424	9,800	6/28/2013	9,424	9,800	Sik wtr	8,930	Sand	540,900	74
6/28/2013	8,975	9,351	6/29/2013	8,975	9,351	Sik wtr	8,882	Sand	542,280	79
6/29/2013	8,526	8,902	6/29/2013	8,526	8,902	Sik wtr	8,798	Sand	542,700	80
6/29/2013	8,077	8,452	6/29/2013	8,077	8,452	Sik wtr	8,721	Sand	537,360	80
6/29/2013	7,628	8,003	6/29/2013	7,628	8,003	Sik wtr	14,229	Sand	543,600	67
6/30/2013	7,178	7,554	6/29/2013	7,178	7,554	Sik wtr	8,893	Sand	411,420	69
6/30/2013	6,729	7,105	6/30/2013	6,729	7,105	Sik wtr	8,715	Sand	540,600	79
6/30/2013	6,280	6,656	6/30/2013	6,280	6,656	Sik wtr	8,859	Sand	540,460	79

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**LATERAL WELLBORE (no vertical pilot hole associated with this well)**

**Maximum TVD of wellbore: 6072 ft TVD @ 12671 ft MD**

Formation/Lithology	Top Depth, MD (ft)	Top Depth, TVD (ft)	Bottom Depth, MD (ft)	Bottom Depth, TVD (ft)
LS/SILT	0	0	318	318
PITTSBURG COAL	318	318	322	322
LS/SILT	322	322	440	440
SHALE	440	440	880	880
SS/SILT/SHALE	880	880	1090	1090
SHALE	1090	1090	1150	1150
SS	1150	1150	1240	1240
SHALE/SS	1240	1240	1330	1330
BIG LIME	1330	1330	1394	1394
BIG INJUN (SS)	1394	1394	1638	1638
SHALE	1638	1638	5828	5798
GENESEO (SH)	5828	5798	5846	5812
TULLY (LS)	5846	5812	5922	5868
HAMILTON (SH)	5922	5868	6164	5975
MARCELLUS (SH)	6164	5975		
TD OF LATERAL			12671	6072

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Regulatory Department

December 16, 2013

**VIA UPS NEXT DAY AIR**

Mr. Gene Smith  
West Virginia Department of Environmental Protection  
Office of Oil & Gas  
601 57<sup>th</sup> Street  
Charleston, WV 25304

Re: WR-35 – Thomas Parkinson BRK 8H (API #9-00154)

Dear Mr. Smith:

Chesapeake Appalachia, L.L.C. submits the *Operator's Final Report of Well Work* in duplicate for the above captioned well(s) located in Brooke County.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete.

If you have any questions or require additional information please feel free to contact me at (405)935-4158 or marlene.williams@chk.com.

Sincerely,

Chesapeake Appalachia, L.L.C

A handwritten signature in blue ink that reads "Marlene Williams".

Marlene Williams  
Regulatory Analyst

Enclosure(s)

cc: West Virginia Geological and Economic Survey

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# Cathedral Energy Services

## Survey Report

<b>Company:</b> Chesapeake Energy Corp	<b>Local Co-ordinate Reference:</b> Well Thomas Parkinson BRK 8H
<b>Project:</b> Brooke County, WV	<b>TVD Reference:</b> WELL @ 1178.0usft (Nomac 37)
<b>Site:</b> Thomas Parkinson	<b>MD Reference:</b> WELL @ 1178.0usft (Nomac 37)
<b>Well:</b> Thomas Parkinson BRK 8H	<b>North Reference:</b> Grid
<b>Wellbore:</b> HZ	<b>Survey Calculation Method:</b> Minimum Curvature
<b>Design:</b> HZ	<b>Database:</b> USA EDM 5000 Multi Users DB

<b>Project</b> Brooke County, WV		
<b>Map System:</b> US State Plane 1927 (Exact solution)	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b> NAD 1927 (NADCON CONUS)		
<b>Map Zone:</b> West Virginia North 4701		Using geodetic scale factor

<b>Site</b> Thomas Parkinson					
<b>Site Position:</b>		<b>Northing:</b>	625,613.82 usft	<b>Latitude:</b>	40° 12' 46.000 N
<b>From:</b> Lat/Long		<b>Easting:</b>	1,702,749.67 usft	<b>Longitude:</b>	80° 33' 51.500 W
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16"	<b>Grid Convergence:</b>	-0.68 °

<b>Well</b> Thomas Parkinson BRK 8H						
<b>Well Position</b>	<b>+N/-S</b>	0.0 usft	<b>Northing:</b>	625,598.76 usft	<b>Latitude:</b>	40° 12' 45.849 N
	<b>+E/-W</b>	0.0 usft	<b>Easting:</b>	1,702,735.40 usft	<b>Longitude:</b>	80° 33' 51.682 W
<b>Position Uncertainty</b>		0.0 usft	<b>Wellhead Elevation:</b>	usft	<b>Ground Level:</b>	1,160.0 usft

<b>Wellbore</b> HZ					
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	2/28/2013	-8.79	67.63	52,892

<b>Design</b> HZ					
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>		<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>
		0.0	0.0	0.0	159.00

<b>Survey Program</b> Date 3/20/2013					
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
100.0	5,350.0	Gyro 2 (HZ)	Gyro	Gyro	
5,429.0	12,671.0	Survey #4 (HZ)	MWD	Geolink MWD	

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
100.0	0.23	285.71	100.0	0.1	-0.2	-0.1	0.23	0.23	
200.0	0.18	299.70	200.0	0.2	-0.5	-0.4	0.07	-0.05	
300.0	0.19	309.58	300.0	0.4	-0.8	-0.6	0.03	0.01	
400.0	0.20	318.52	400.0	0.6	-1.0	-0.9	0.03	0.01	
500.0	0.26	49.66	500.0	0.9	-1.0	-1.2	0.33	0.06	
600.0	1.29	77.62	600.0	1.3	0.3	-1.1	1.07	1.03	
700.0	2.76	81.06	699.9	1.9	3.8	-0.4	1.47	1.47	
800.0	4.70	87.72	799.7	2.4	10.2	1.4	1.98	1.94	
900.0	4.88	89.36	899.4	2.6	18.6	4.2	0.23	0.18	
1,000.0	4.87	88.59	999.0	2.8	27.1	7.1	0.07	-0.01	
1,100.0	5.14	87.28	1,098.6	3.1	35.8	9.9	0.29	0.27	

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<b>Design:</b> HZ	<b>Database:</b> USA EDM 5000 Multi Users DB

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
1,200.0	5.62	84.30	1,198.2	3.8	45.2	12.6	0.56	0.48	
1,300.0	5.73	81.87	1,297.7	5.0	55.0	15.0	0.26	0.11	
1,400.0	5.59	81.49	1,397.2	6.4	64.7	17.2	0.14	-0.14	
1,500.0	4.38	84.41	1,496.8	7.5	73.3	19.3	1.24	-1.21	
1,600.0	3.16	91.57	1,596.6	7.8	79.9	21.3	1.31	-1.22	
1,700.0	1.88	101.04	1,696.5	7.4	84.3	23.3	1.34	-1.28	
1,800.0	1.56	103.16	1,796.5	6.8	87.2	24.9	0.33	-0.32	
1,900.0	0.70	106.68	1,896.4	6.3	89.1	26.0	0.86	-0.86	
2,000.0	0.17	118.18	1,996.4	6.1	89.8	26.5	0.53	-0.53	
2,100.0	0.05	239.04	2,096.4	6.0	89.9	26.6	0.20	-0.12	
2,200.0	0.18	287.47	2,196.4	6.0	89.7	26.6	0.15	0.13	
2,300.0	0.35	284.57	2,296.4	6.1	89.3	26.3	0.17	0.17	
2,400.0	0.28	294.06	2,396.4	6.3	88.8	25.9	0.09	-0.07	
2,500.0	0.40	288.11	2,496.4	6.5	88.2	25.5	0.12	0.12	
2,600.0	0.36	297.79	2,596.4	6.8	87.6	25.1	0.08	-0.04	
2,700.0	0.40	292.52	2,696.4	7.0	87.0	24.6	0.05	0.04	
2,800.0	0.43	302.11	2,796.4	7.4	86.4	24.1	0.08	0.03	
2,900.0	0.47	302.40	2,896.4	7.8	85.7	23.4	0.04	0.04	
3,000.0	0.46	303.90	2,996.4	8.2	85.0	22.8	0.02	-0.01	
3,100.0	0.43	308.37	3,096.4	8.7	84.4	22.1	0.05	-0.03	
3,200.0	0.48	301.79	3,196.4	9.1	83.7	21.5	0.07	0.05	
3,300.0	0.54	310.38	3,296.4	9.7	83.0	20.7	0.10	0.06	
3,400.0	0.60	308.57	3,396.4	10.3	82.3	19.9	0.06	0.06	
3,500.0	0.60	327.01	3,496.4	11.1	81.6	18.9	0.19	0.00	
3,600.0	0.80	348.72	3,596.4	12.2	81.1	17.7	0.33	0.20	
3,700.0	0.82	347.93	3,696.4	13.6	80.9	16.3	0.02	0.02	
3,800.0	0.59	332.13	3,796.4	14.7	80.5	15.1	0.30	-0.23	
3,900.0	0.46	334.42	3,896.4	15.6	80.1	14.2	0.13	-0.13	
4,000.0	0.36	354.66	3,996.4	16.2	79.9	13.5	0.17	-0.10	
4,100.0	0.35	336.50	4,096.4	16.8	79.7	12.9	0.11	-0.01	
4,200.0	0.43	355.30	4,196.3	17.5	79.6	12.2	0.15	0.08	
4,300.0	0.37	351.51	4,296.3	18.2	79.5	11.5	0.07	-0.06	
4,400.0	0.36	355.80	4,396.3	18.8	79.4	10.9	0.03	-0.01	
4,500.0	0.54	341.72	4,496.3	19.6	79.2	10.1	0.21	0.18	
4,600.0	0.54	333.96	4,596.3	20.4	78.9	9.2	0.07	0.00	
4,700.0	0.49	328.20	4,696.3	21.2	78.4	8.3	0.07	-0.05	
4,800.0	0.64	316.81	4,796.3	22.0	77.8	7.4	0.19	0.15	
4,900.0	0.65	316.97	4,896.3	22.8	77.1	6.3	0.01	0.01	
5,000.0	0.70	324.58	4,996.3	23.7	76.3	5.2	0.10	0.05	
5,100.0	0.67	329.56	5,096.3	24.7	75.7	4.0	0.07	-0.03	
5,200.0	0.75	329.70	5,196.3	25.8	75.0	2.8	0.08	0.08	
5,300.0	0.63	338.42	5,296.3	26.9	74.5	1.6	0.16	-0.12	
5,350.0	0.48	339.71	5,346.3	27.3	74.3	1.1	0.30	-0.30	Last Gyro Survey @ 5350' MD
5,429.0	0.20	338.30	5,425.3	27.8	74.2	0.7	0.35	-0.35	
5,461.0	2.70	154.70	5,457.3	27.1	74.5	1.4	9.06	7.81	
5,492.0	5.70	153.80	5,488.2	25.1	75.5	3.6	9.68	9.68	
5,524.0	8.20	151.40	5,519.9	21.7	77.3	7.5	7.86	7.81	
5,555.0	11.60	148.60	5,550.5	17.1	79.9	12.7	11.07	10.97	
5,587.0	14.60	147.00	5,581.6	10.9	83.8	19.8	9.44	9.38	
5,618.0	17.50	147.50	5,611.4	3.7	88.5	28.2	9.37	9.35	
5,650.0	20.30	147.50	5,641.7	-5.0	94.0	38.4	8.75	8.75	
5,681.0	22.70	148.90	5,670.5	-14.7	100.0	49.5	7.92	7.74	
5,712.0	25.70	148.50	5,698.8	-25.5	106.6	62.0	9.69	9.68	

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<b>Wellbore:</b> HZ	<b>Survey Calculation Method:</b> Minimum Curvature
<b>Design:</b> HZ	<b>Database:</b> USA EDM 5000 Multi Users DB

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
5,744.0	28.40	148.50	5,727.3	-37.9	114.2	76.4	8.44	8.44	
5,776.0	31.60	147.50	5,755.0	-51.5	122.7	92.1	10.12	10.00	
5,808.0	34.40	148.20	5,781.9	-66.3	132.0	109.2	8.83	8.75	
5,839.0	37.40	147.50	5,807.0	-81.6	141.6	127.0	9.77	9.68	
5,870.0	40.70	146.90	5,831.0	-98.1	152.2	146.1	10.71	10.65	
5,902.0	45.00	145.40	5,854.5	-116.1	164.3	167.3	13.81	13.44	
5,933.0	49.10	145.00	5,875.6	-134.7	177.3	189.3	13.26	13.23	
5,964.0	53.60	145.60	5,895.0	-154.7	191.1	212.9	14.59	14.52	
5,995.0	58.00	147.40	5,912.4	-176.0	205.2	237.9	14.98	14.19	
6,026.0	62.10	148.30	5,927.9	-198.8	219.5	264.2	13.46	13.23	
6,057.0	66.10	148.70	5,941.4	-222.5	234.1	291.6	12.96	12.90	
6,089.0	69.50	148.60	5,953.5	-247.8	249.5	320.8	10.63	10.63	
6,121.0	72.10	149.50	5,964.0	-273.8	265.0	350.5	8.55	8.13	
6,153.0	74.80	150.60	5,973.1	-300.3	280.3	380.8	9.06	8.44	
6,184.0	76.10	151.20	5,980.9	-326.5	294.9	410.5	4.59	4.19	
6,215.0	76.30	151.20	5,988.3	-352.9	309.4	440.4	0.65	0.65	
6,246.0	78.10	152.30	5,995.2	-379.6	323.7	470.4	6.76	5.81	
6,277.0	80.10	152.60	6,001.0	-406.5	337.8	500.6	6.52	6.45	
6,308.0	82.80	153.00	6,005.7	-433.8	351.8	531.1	8.80	8.71	
6,339.0	85.00	152.30	6,008.9	-461.2	366.0	561.7	7.44	7.10	
6,371.0	87.00	152.40	6,011.2	-489.5	380.8	593.4	6.26	6.25	
6,402.0	89.30	152.60	6,012.2	-516.9	395.1	624.2	7.45	7.42	
6,433.0	89.90	152.80	6,012.4	-544.5	409.3	655.0	2.04	1.94	
6,496.0	90.10	152.40	6,012.4	-600.4	438.3	717.6	0.71	0.32	
6,621.0	88.90	151.90	6,013.5	-710.9	496.7	841.7	1.04	-0.96	
6,747.0	89.30	149.50	6,015.5	-820.8	558.3	966.4	1.93	0.32	
6,873.0	89.10	149.00	6,017.2	-929.1	622.8	1,090.5	0.43	-0.16	
6,997.0	89.30	150.70	6,019.0	-1,036.3	685.0	1,212.9	1.38	0.16	
7,122.0	90.00	151.80	6,019.7	-1,145.9	745.2	1,336.8	1.04	0.56	
7,247.0	89.50	154.50	6,020.3	-1,257.4	801.6	1,461.1	2.20	-0.40	
7,374.0	89.00	157.70	6,021.9	-1,373.5	853.0	1,587.9	2.55	-0.39	
7,499.0	89.40	159.90	6,023.7	-1,490.0	898.2	1,712.9	1.79	0.32	
7,625.0	89.60	159.20	6,024.8	-1,608.0	942.3	1,838.9	0.58	0.16	
7,750.0	89.00	161.10	6,026.3	-1,725.6	984.7	1,963.9	1.59	-0.48	
7,875.0	88.70	161.30	6,028.8	-1,843.9	1,025.0	2,088.7	0.29	-0.24	
8,000.0	89.40	160.00	6,030.9	-1,961.8	1,066.4	2,213.7	1.18	0.56	
8,124.0	89.70	158.30	6,031.9	-2,077.7	1,110.5	2,337.7	1.39	0.24	
8,250.0	89.50	158.70	6,032.7	-2,194.9	1,156.7	2,463.7	0.35	-0.16	
8,376.0	89.70	158.40	6,033.6	-2,312.2	1,202.8	2,589.7	0.29	0.16	
8,502.0	89.70	156.30	6,034.3	-2,428.5	1,251.3	2,715.6	1.67	0.00	
8,628.0	89.00	157.30	6,035.7	-2,544.3	1,300.9	2,841.5	0.97	-0.56	
8,755.0	89.50	158.10	6,037.4	-2,661.8	1,349.1	2,968.4	0.74	0.39	
8,879.0	89.30	157.90	6,038.7	-2,776.7	1,395.6	3,092.4	0.23	-0.16	
9,005.0	89.50	158.80	6,040.0	-2,893.8	1,442.0	3,218.4	0.73	0.16	
9,130.0	89.60	157.70	6,041.0	-3,009.9	1,488.4	3,343.4	0.88	0.08	
9,256.0	89.80	157.90	6,041.6	-3,126.6	1,536.0	3,469.4	0.22	0.16	
9,381.0	89.70	158.40	6,042.2	-3,242.6	1,582.5	3,594.3	0.41	-0.08	
9,508.0	89.40	159.20	6,043.2	-3,361.0	1,628.4	3,721.3	0.67	-0.24	
9,634.0	89.20	160.70	6,044.7	-3,479.3	1,671.6	3,847.3	1.20	-0.16	
9,760.0	90.30	161.80	6,045.3	-3,598.7	1,712.1	3,973.2	1.23	0.87	
9,884.0	90.00	160.90	6,044.9	-3,716.1	1,751.8	4,097.1	0.77	-0.24	
10,009.0	89.00	160.80	6,046.0	-3,834.2	1,792.8	4,222.0	0.80	-0.80	
10,135.0	88.60	160.50	6,048.7	-3,953.1	1,834.5	4,347.9	0.40	-0.32	

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# Cathedral Energy Services

## Survey Report

<b>Company:</b> Chesapeake Energy Corp	<b>Local Co-ordinate Reference:</b> Well Thomas Parkinson BRK 8H
<b>Project:</b> Brooke County, WV	<b>TVD Reference:</b> WELL @ 1178.0usft (Nomac 37)
<b>Site:</b> Thomas Parkinson	<b>MD Reference:</b> WELL @ 1178.0usft (Nomac 37)
<b>Well:</b> Thomas Parkinson BRK 8H	<b>North Reference:</b> Grid
<b>Wellbore:</b> HZ	<b>Survey Calculation Method:</b> Minimum Curvature
<b>Design:</b> HZ	<b>Database:</b> USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100u)	Formations / Comments
10,259.0	88.20	160.90	6,052.1	-4,070.1	1,875.5	4,471.8	0.46	-0.32	
10,385.0	88.90	160.00	6,055.3	-4,188.8	1,917.6	4,597.8	0.90	0.56	
10,512.0	89.20	158.40	6,057.4	-4,307.5	1,962.7	4,724.7	1.28	0.24	
10,639.0	89.00	158.00	6,059.4	-4,425.4	2,009.9	4,851.7	0.35	-0.16	
10,764.0	89.30	159.10	6,061.3	-4,541.7	2,055.6	4,976.7	0.91	0.24	
10,888.0	90.20	157.80	6,061.8	-4,657.0	2,101.1	5,100.7	1.28	0.73	
11,014.0	89.50	158.90	6,062.1	-4,774.1	2,147.6	5,226.7	1.03	-0.56	
11,139.0	90.90	158.00	6,061.7	-4,890.4	2,193.5	5,351.6	1.33	1.12	
11,264.0	90.40	158.40	6,060.3	-5,006.4	2,239.9	5,476.6	0.51	-0.40	
11,392.0	89.00	158.70	6,061.0	-5,125.6	2,286.7	5,604.6	1.12	-1.09	
11,518.0	88.30	158.40	6,063.9	-5,242.8	2,332.8	5,730.6	0.60	-0.56	
11,643.0	88.90	157.10	6,067.0	-5,358.5	2,380.1	5,855.5	1.15	0.48	
11,770.0	91.40	157.30	6,066.6	-5,475.5	2,429.3	5,982.4	1.97	1.97	
11,894.0	91.40	157.40	6,063.6	-5,589.9	2,477.1	6,106.3	0.08	0.00	
12,021.0	90.00	158.10	6,062.1	-5,707.5	2,525.2	6,233.3	1.23	-1.10	
12,146.0	89.70	157.50	6,062.4	-5,823.2	2,572.4	6,358.3	0.54	-0.24	
12,272.0	89.70	160.00	6,063.1	-5,940.6	2,618.0	6,484.3	1.98	0.00	
12,398.0	88.60	161.10	6,064.9	-6,059.4	2,660.0	6,610.2	1.23	-0.87	
12,523.0	88.80	159.90	6,067.8	-6,177.2	2,701.7	6,735.1	0.97	0.16	
12,623.0	88.40	160.60	6,070.2	-6,271.3	2,735.5	6,835.1	0.81	-0.40	Last Cathedral Survey @ 12623' MD
12,671.0	88.40	160.60	6,071.5	-6,316.5	2,751.4	6,883.0	0.00	0.00	PTB @ 12671' MD

Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Thomas Parkinson BRK - hit/miss target - Shape	0.00	360.00	6,072.1	-6,316.5	2,751.2	619,282.26	1,705,486.55	40° 11' 43.753 N	80° 33' 15.268 W
- actual wellpath misses target center by 0.6usft at 12670.9usft MD (6071.5 TVD, -6316.5 N, 2751.4 E)									
- Point									
Thomas Parkinson BRK - actual wellpath misses target center by 10.6usft at 12671.0usft MD (6071.5 TVD, -6316.5 N, 2751.4 E)	0.00	360.00	6,082.1	-6,316.5	2,751.2	619,282.26	1,705,486.55	40° 11' 43.753 N	80° 33' 15.268 W
- Point									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
5,350.0	5,346.3	27.3	74.3	Last Gyro Survey @ 5350' MD
12,623.0	6,070.2	-6,271.3	2,735.5	Last Cathedral Survey @ 12623' MD
12,671.0	6,071.5	-6,316.5	2,751.4	PTB @ 12671' MD

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_

# Hydraulic Fracturing Fluid Product Component Information Disclosure

Fracture Date:	6/27/2013
State:	WEST VIRGINIA
County:	BROOKE
API Number:	4700900154
Operator Name:	CHESAPEAKE APPALACHIA LLC
Well Name and Number:	THOMAS PARKINSON BRK 8H
Longitude:	-80.564356
Latitude:	40.212736
Long/Lat Projection:	NAD27
Production Type:	GAS
True Vertical Depth (TVD):	6,072
Total Water Volume (gal)*:	5,616,912

## Hydraulic Fracturing Fluid Composition:

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (% by Mass)**	Maximum Ingredient Concentration in HF Fluid (% by Mass)**	Comments
Fresh Water	CHESAPEAKE ENERGY	Carrier/Base Fluid	Water	007732-18-5	100.00%	73.83099%	
Recycled Produced Water	CHESAPEAKE ENERGY	Carrier/Base Fluid	Water	007732-18-5	100.00%	12.10046%	
EC6110A	NALCO	Anti-Bacterial Agent	Ethanol Glutaraldehyde (Pentanediol) Quaternary Ammonium Compounds	000064-17-5 000111-30-8 NA	5.00% 60.00% 10.00%	0.00136% 0.01627% 0.00271%	
EC6629A	NALCO	Scale Inhibitor	No Hazardous Components	NONE		0.00000%	
Northern White Sand, 100 Mesh Sand, Acid	SCHLUMBERGER	Proppant - Natural, Acid, Friction Reducer, Gelling Agent, Breaker, Cross Linker, Iron Control Agent, Corrosion Inhibitor	Crystalline silica Hydrogen chloride Guar gum Acrylamide, 2-acrylamido-2-methylpropanesulfonic acid, sodium salt polymer Ammonium sulfate	14808-60-7 7647-01-0 9000-30-0 38193-60-1 7783-20-2	98.59234% 0.90013% 0.15779% 0.12395% 0.11715%	13.97917% 0.12763% 0.02237% 0.01758% 0.01661%	

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			Sodium sulfate	7757-82-6	0.05064%	0.00718%
			Polymer of 2-acrylamido-2-methylpropanesulfonic acid sodium salt and methyl acrylate	136793-29-8	0.01328%	0.00188%
			Diammonium peroxodisulphate	7727-54-0	0.00952%	0.00135%
			Potassium borate	1332-77-0	0.00846%	0.00120%
			Urea	57-13-6	0.00816%	0.00116%
			Sodium erythorbate	6381-77-7	0.00396%	0.00056%
			Potassium hydroxide	1310-58-3	0.00313%	0.00044%
			Methanol	67-56-1	0.00309%	0.00044%
			Glycerol	56-81-5	0.00276%	0.00039%
			Fatty acids, tall-oil	61790-12-3	0.00227%	0.00032%
			Thiourea, polymer with formaldehyde and 1-phenylethanol	68527-49-1	0.00187%	0.00027%
			Non-crystalline silica	7631-86-9	0.00161%	0.00023%
			Alcohols, C14-15, ethoxylated (7EO)	68951-67-7	0.00087%	0.00012%
			Prop-2-yn-1-ol	107-19-7	0.00058%	0.00008%
			Vinylidene chloride/methylacrylate copolymer	25038-72-6	0.00045%	0.00006%
			Alkenes, C>10 a-	64743-02-8	0.00039%	0.00005%
			Tetrasodium ethylenediaminetetraacetate	64-02-8	0.00026%	0.00004%
			Dimethyl siloxanes and silicones	63148-62-9	0.00012%	0.00002%
			Siloxanes and Silicones, di-Me, reaction products with silica	67762-90-7	0.00002%	< 0.00001%
			Magnesium silicate hydrate (talc)	14807-96-6	0.00001%	< 0.00001%
			Octamethylcyclotetrasiloxane	556-67-2	0.00001%	< 0.00001%
			Sodium hydroxide	1310-73-2	0.00001%	< 0.00001%
			Decamethyl cyclopentasiloxane	541-02-6	0.00001%	< 0.00001%
			poly(tetrafluoroethylene)	9002-84-0	0.00001%	< 0.00001%
			Dodecamethylcyclohexasiloxane	540-97-6	< 0.00001%	< 0.00001%
<b>Additional Ingredients Not Listed on MSDS</b>						
EC6110A, EC6629A	NALCO	Anti-Bacterial Agent, Scale Inhibitor	Methanol (Methyl Alcohol)	000067-56-1		0.00594%
			Proprietary Acrylate Polymer	TRADE SECRET		0.00594%
			Proprietary Quaternary Ammonium Salt	TRADE SECRET		0.00594%
			Water	007732-18-5		0.02600%

02/28/2014

\* Total Water Volume sources may include fresh water, produced water, and/or recycled water  
 \*\* Information is based on the maximum potential for concentration and thus the total may be over 100%

"Additional Ingredients Not Listed on MSDS" component information were obtained directly from the supplier. As such, the Operator is not responsible for inaccurate and/or incomplete information. Any questions regarding the content of this information should be directed to the supplier who provided it.

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