

Company:	Chesapeake Energy Corp.	Local Geodetic Reference:	Well: Thomas Parkinson BRK3H
Project:	Brooke County, WV	TWD Reference:	Well @ 1740usft (Nomac 37)
Site:	Thomas Parkinson	MD Reference:	Well @ 1740usft (Nomac 37)
Well:	Thomas Parkinson BRK3H	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Design:	HZ	Database:	USAEOM 5000 Multi User DB

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

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

Well:	Thomas Parkinson BRK3H					
Well Position	+N/-S	0.0 usft	Northing:	625,613.81 usft	Latitude:	40° 12' 46.000 N
	+E/-W	0.0 usft	Easting:	1,702,749.67 usft	Longitude:	80° 33' 51.500 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	1,160.0 usft

Wellbore:	HZ				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	2/8/2013	-8.79	67.63	52,898

Design:	HZ				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	340.10	

Survey Program	Date	3/5/2013			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.0	5,335.0	Survey #1 (HZ)	Gyro	Gyro	
5,357.0	12,033.0	Survey #2 (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 (°/100)	Formations/Comments
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
100.0	0.24	305.69	100.0	0.1	-0.2	0.2	0.24	0.24	
200.0	0.22	239.45	200.0	0.1	-0.5	0.3	0.25	-0.02	
300.0	0.26	206.77	300.0	-0.2	-0.8	0.1	0.14	0.04	
400.0	0.10	241.35	400.0	-0.4	-1.0	-0.1	0.19	-0.16	
500.0	0.32	267.40	500.0	-0.5	-1.3	0.0	0.23	0.22	
600.0	0.16	254.98	600.0	-0.5	-1.7	0.1	0.17	-0.16	
700.0	0.37	235.16	700.0	-0.7	-2.1	0.0	0.23	0.21	
800.0	0.05	220.47	800.0	-0.9	-2.4	-0.1	0.32	-0.32	
900.0	0.31	195.70	900.0	-1.2	-2.5	-0.3	0.27	0.26	
1,000.0	0.29	198.97	1,000.0	-1.7	-2.7	-0.7	0.03	-0.02	
1,100.0	0.22	262.86	1,100.0	-2.0	-2.9	-0.9	0.28	-0.07	

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MORGANTOWN, WV

Company	Chesapeake Energy Corp.	Local Coordinate Reference	Well: Thomas Parkinson BRK 3H
Project	Brooke County, WV	TWD Reference	Well: 3, 1172.0usft(Nomad 3H)
Site	Thomas Parkinson	MD Reference	Well: 3, 1172.0usft(Nomad 3H)
Well	Thomas Parkinson BRK 3H	North Reference	Grid
Wellbore	HZ	Survey Calculation Method	Minimum Curvature
Designer	HZ	Database	US: 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 (°/100m)	Formations / Comments
1,200.0	0.27	254.37	1,200.0	-2.1	-3.4	-0.8	0.06	0.05	
1,300.0	0.24	195.42	1,300.0	-2.3	-3.6	-1.0	0.25	-0.03	
1,400.0	0.23	139.52	1,400.0	-2.7	-3.6	-1.3	0.22	-0.01	
1,500.0	0.30	325.88	1,500.0	-2.6	-3.6	-1.3	0.53	0.07	
1,600.0	0.19	331.69	1,600.0	-2.3	-3.8	-0.8	0.11	-0.11	
1,700.0	0.22	338.85	1,700.0	-2.0	-4.0	-0.5	0.04	0.03	
1,800.0	0.10	301.22	1,800.0	-1.7	-4.1	-0.2	0.15	-0.12	
1,900.0	0.48	248.52	1,900.0	-1.8	-4.6	-0.2	0.43	0.38	
2,000.0	0.63	256.72	2,000.0	-2.1	-5.5	-0.1	0.17	0.15	
2,100.0	0.49	256.66	2,100.0	-2.3	-6.4	0.0	0.14	-0.14	
2,200.0	0.34	261.82	2,200.0	-2.5	-7.2	0.1	0.15	-0.15	
2,300.0	0.61	270.69	2,300.0	-2.5	-8.0	0.3	0.28	0.27	
2,400.0	0.63	266.18	2,400.0	-2.5	-9.1	0.7	0.05	0.02	
2,500.0	0.64	251.40	2,500.0	-2.8	-10.1	0.9	0.16	0.01	
2,600.0	0.65	288.74	2,600.0	-2.8	-11.2	1.2	0.41	0.01	
2,700.0	0.74	293.34	2,699.9	-2.3	-12.3	2.0	0.11	0.09	
2,800.0	0.50	312.42	2,799.9	-1.8	-13.2	2.8	0.31	-0.24	
2,900.0	0.41	280.83	2,899.9	-1.4	-13.9	3.4	0.26	-0.09	
3,000.0	0.48	265.70	2,999.9	-1.4	-14.7	3.7	0.14	0.07	
3,100.0	0.55	310.38	3,099.9	-1.1	-15.5	4.2	0.40	0.07	
3,200.0	0.24	301.83	3,199.9	-0.7	-16.0	4.8	0.31	-0.31	
3,300.0	0.41	327.57	3,299.9	-0.3	-16.4	5.3	0.22	0.17	
3,400.0	0.64	289.59	3,399.9	0.2	-17.1	6.0	0.41	0.23	
3,500.0	0.49	302.24	3,499.9	0.6	-18.0	6.7	0.19	-0.15	
3,600.0	0.95	339.44	3,599.9	1.7	-18.6	7.9	0.63	0.46	
3,700.0	0.74	316.72	3,699.9	2.9	-19.4	9.3	0.39	-0.21	
3,800.0	0.78	338.56	3,799.9	4.0	-20.1	10.6	0.29	0.04	
3,900.0	0.21	309.98	3,899.9	4.8	-20.5	11.4	0.60	-0.57	
4,000.0	0.22	335.92	3,999.9	5.0	-20.7	11.8	0.10	0.01	
4,100.0	0.39	341.25	4,099.9	5.5	-20.9	12.3	0.17	0.17	
4,200.0	0.64	345.22	4,199.9	6.4	-21.1	13.2	0.25	0.25	
4,300.0	0.23	354.12	4,299.9	7.1	-21.3	14.0	0.41	-0.41	
4,400.0	0.59	310.55	4,399.9	7.7	-21.7	14.6	0.45	0.36	
4,500.0	0.44	298.08	4,499.9	8.2	-22.4	15.3	0.19	-0.15	
4,600.0	0.60	338.37	4,599.9	8.9	-23.0	16.1	0.39	0.16	
4,700.0	0.39	314.89	4,699.9	9.6	-23.4	17.0	0.29	-0.21	
4,800.0	0.96	295.46	4,799.9	10.2	-24.4	17.9	0.61	0.57	
4,900.0	1.02	293.59	4,899.8	10.9	-26.0	19.1	0.07	0.06	
5,000.0	0.69	320.19	4,999.8	11.7	-27.2	20.3	0.51	-0.33	
5,100.0	0.86	312.46	5,099.8	12.7	-28.1	21.5	0.20	0.17	
5,200.0	0.98	319.34	5,199.8	13.8	-29.2	23.0	0.16	0.12	
5,300.0	0.75	303.75	5,299.8	14.9	-30.3	24.3	0.33	-0.23	
5,335.0	0.82	310.35	5,334.8	15.2	-30.7	24.7	0.33	0.20	Last Cathedral Survey @ 5,335' MD
5,357.0	0.40	327.50	5,356.8	15.3	-30.9	24.9	2.06	-1.91	
5,388.0	1.80	14.00	5,387.8	15.9	-30.8	25.4	5.01	4.52	
5,419.0	4.70	29.70	5,418.7	17.5	-30.0	26.6	9.70	9.35	
5,451.0	7.30	32.90	5,450.5	20.3	-28.3	28.7	8.19	8.13	
5,483.0	10.10	36.40	5,482.2	24.3	-25.5	31.5	8.90	8.75	
5,514.0	12.40	37.20	5,512.6	29.1	-21.9	34.8	7.44	7.42	
5,546.0	14.70	37.80	5,543.7	35.1	-17.3	38.9	7.20	7.19	
5,578.0	16.50	36.20	5,574.5	41.9	-12.2	43.6	5.78	5.63	
5,608.0	18.50	36.00	5,603.1	49.2	-6.8	48.6	6.67	6.67	
5,639.0	20.30	35.80	5,632.3	57.6	-0.8	54.4	5.81	5.81	

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MORGANTOWN, WV

Company:	Chesapeake Energy Corp	Local Coordinate Reference:	WELL: Thomas Parkinson BRK 3H
Project:	Brooke County, WV	TWD Reference:	WELL: Q1178.0USF (Nomac 3)
Site:	Thomas Parkinson	ND Reference:	WELL: Q1178.0USF (Nomac 3)
Well:	Thomas Parkinson BRK 3H	North Reference:	Grid
Wellbore:	HZ	Survey Generation Method:	Minimum Curvature
Region:	HZ	Database:	USF EDM 5000.MD User: DB

Measured Depth (usf)	Inclination (°)	Azimuth (°)	Vertical Depth (usf)	±N/S (usf)	±E/W (usf)	Vertical Section (usf)	Dogleg Rate (°/100usf)	Build Rate (°/100m)	Formations / Comments
5,671.0	21.50	35.90	5,662.2	66.8	5.9	60.8	3.75	3.75	
5,702.0	23.50	37.70	5,690.9	76.3	13.0	67.3	6.82	6.45	
5,734.0	24.90	38.30	5,720.1	86.6	21.1	74.3	4.44	4.38	
5,766.0	27.30	38.60	5,748.8	97.7	29.8	81.7	7.51	7.50	
5,798.0	29.80	37.50	5,776.9	109.7	39.2	89.8	7.98	7.81	
5,830.0	32.90	30.50	5,804.2	123.5	48.5	99.6	14.93	9.69	
5,862.0	36.10	24.40	5,830.6	139.6	56.8	111.9	14.71	10.00	
5,893.0	39.30	18.90	5,855.2	157.2	63.8	126.1	14.97	10.32	
5,924.0	42.60	13.50	5,878.6	176.7	69.4	142.5	15.60	10.65	
5,956.0	47.10	10.10	5,901.3	198.8	74.0	161.7	15.93	14.06	
5,987.0	51.70	7.20	5,921.4	222.1	77.5	182.4	16.45	14.84	
6,018.0	56.50	5.10	5,939.6	247.0	80.2	205.0	16.43	15.48	
6,048.0	61.20	1.80	5,955.1	272.6	81.7	228.6	18.27	15.66	
6,080.0	67.00	359.90	5,969.1	301.4	82.1	255.5	18.89	18.12	
6,112.0	71.20	358.40	5,980.5	331.3	81.7	283.7	13.84	13.12	
6,143.0	73.50	353.60	5,989.9	360.8	79.6	312.1	16.51	7.42	
6,174.0	76.80	352.00	5,997.9	390.5	75.8	341.3	11.76	10.65	
6,206.0	82.10	350.40	6,003.7	421.6	71.0	372.2	17.28	16.56	
6,237.0	87.50	349.90	6,006.5	452.0	65.7	402.6	17.49	17.42	
6,267.0	91.10	349.80	6,006.9	481.5	60.5	432.1	12.00	12.00	
6,298.0	91.90	347.80	6,006.1	511.9	54.4	462.8	6.95	2.58	
6,361.0	92.10	344.80	6,003.9	573.0	39.5	525.4	4.77	0.32	
6,425.0	92.70	344.40	6,001.2	634.7	22.6	589.1	1.13	0.94	
6,488.0	92.90	344.10	5,998.1	695.3	5.5	651.9	0.57	0.32	
6,552.0	91.70	344.40	5,995.6	756.8	-11.9	715.7	1.93	-1.87	
6,614.0	92.60	345.00	5,993.2	816.6	-28.2	777.4	1.74	1.45	
6,676.0	92.50	344.70	5,990.5	876.3	-44.4	839.1	0.51	-0.16	
6,738.0	92.40	344.20	5,987.8	936.0	-61.0	900.9	0.82	-0.16	
6,861.0	91.60	346.40	5,983.5	1,054.9	-92.2	1,023.3	1.90	-0.65	
6,987.0	89.90	348.90	5,981.9	1,178.0	-119.2	1,148.2	2.40	-1.35	
7,112.0	89.70	347.20	5,982.3	1,300.3	-145.0	1,272.0	1.37	-0.16	
7,239.0	90.40	347.30	5,982.2	1,424.1	-173.1	1,398.0	0.56	0.55	
7,365.0	90.30	346.40	5,981.4	1,546.8	-201.7	1,523.1	0.72	-0.08	
7,492.0	90.80	345.80	5,980.2	1,670.1	-232.2	1,649.4	0.61	0.39	
7,617.0	89.70	346.60	5,979.7	1,791.5	-262.1	1,773.7	1.09	-0.88	
7,742.0	89.70	345.90	5,980.3	1,912.9	-291.8	1,898.0	0.56	0.00	
7,868.0	90.40	345.00	5,980.2	2,034.9	-323.4	2,023.4	0.90	0.56	
7,994.0	90.80	346.90	5,978.9	2,157.1	-354.0	2,148.8	1.54	0.32	
8,118.0	90.80	349.30	5,977.2	2,278.4	-379.6	2,271.5	1.94	0.00	
8,243.0	91.20	350.20	5,975.0	2,401.4	-401.8	2,394.7	0.79	0.32	
8,369.0	91.60	350.00	5,971.9	2,525.5	-423.5	2,518.8	0.35	0.32	
8,496.0	91.60	348.60	5,968.4	2,650.2	-447.0	2,644.1	1.10	0.00	
8,621.0	91.10	347.70	5,965.4	2,772.5	-472.7	2,767.8	0.82	-0.40	
8,746.0	89.80	348.20	5,964.4	2,894.7	-498.8	2,891.7	1.11	-1.04	
8,872.0	90.30	349.20	5,964.3	3,018.3	-523.5	3,016.2	0.89	0.40	
8,998.0	90.80	349.20	5,963.1	3,142.0	-547.1	3,140.6	0.40	0.40	
9,125.0	91.00	347.80	5,961.1	3,266.5	-572.4	3,266.3	1.11	0.16	
9,251.0	90.20	343.40	5,959.8	3,388.5	-603.7	3,391.6	3.55	-0.63	
9,378.0	90.90	342.20	5,958.6	3,509.8	-641.3	3,518.5	1.09	0.55	
9,504.0	89.60	341.60	5,958.0	3,629.5	-680.4	3,644.4	1.14	-1.03	
9,630.0	91.10	340.50	5,957.3	3,748.7	-721.3	3,770.4	1.48	1.19	
9,755.0	92.00	339.90	5,953.9	3,866.3	-763.7	3,895.3	0.87	0.72	
9,882.0	90.90	340.10	5,950.7	3,985.6	-807.1	4,022.3	0.88	-0.87	

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**WV GEOLOGICAL SURVEY**  
MORGANTOWN, WV



# Cathedral Energy Services

## Survey Report

Company:	Chesapeake Energy Corp	Local Coordinate Reference:	Well: Thomas Parkinson BRK 31
Project:	Brooke County, WV	TVD Reference:	Well: G1778.0usft (Nomac 37)
Site:	Thomas Parkinson	MD Reference:	Well: G1778.0usft (Nomac 37)
Well:	Thomas Parkinson BRK 31	North Reference:	Grid
Wellbore:	HZ	Survey Calculation Method:	Minimum Curvature
Basin:	HZ	Database:	USA EDM 5000 MWD Users DB

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	±N-S (usft)	±E-W (usft)	Vertical Section (usft)	Dogleg Rate (1/100usft)	Build Rate (1/100usft)	Formations/Comments
10,007.0	89.90	342.10	5,949.8	4,103.8	-847.6	4,147.3	1.79	-0.80	
10,132.0	90.20	342.50	5,949.7	4,222.9	-885.6	4,272.2	0.40	0.24	
10,258.0	90.00	341.30	5,949.5	4,342.7	-924.7	4,398.1	0.97	-0.16	
10,382.0	90.80	341.70	5,948.6	4,460.3	-964.1	4,522.1	0.72	0.65	
10,507.0	91.20	340.30	5,946.4	4,578.4	-1,004.8	4,647.0	1.16	0.32	
10,631.0	91.20	339.40	5,943.8	4,694.8	-1,047.5	4,771.0	0.73	0.00	
10,757.0	90.40	338.90	5,942.1	4,812.5	-1,092.3	4,897.0	0.75	-0.63	
10,882.0	90.80	337.00	5,940.7	4,928.4	-1,139.2	5,021.9	1.55	0.32	
11,008.0	89.00	338.10	5,941.0	5,044.8	-1,187.3	5,147.7	1.67	-1.43	
11,133.0	89.90	337.80	5,942.2	5,160.7	-1,234.3	5,272.6	0.76	0.72	
11,259.0	89.30	341.10	5,943.0	5,278.6	-1,278.5	5,398.6	2.66	-0.48	
11,385.0	89.20	342.80	5,944.7	5,398.4	-1,317.5	5,524.5	1.35	-0.08	
11,511.0	89.30	344.60	5,946.3	5,519.3	-1,352.9	5,650.3	1.43	0.08	
11,636.0	89.80	338.40	5,947.3	5,637.8	-1,392.5	5,775.2	4.98	0.40	
11,761.0	91.40	338.10	5,946.0	5,753.9	-1,438.8	5,900.1	1.30	1.28	
11,889.0	92.30	338.10	5,941.9	5,872.6	-1,486.6	6,027.9	0.70	0.70	
11,985.0	93.20	337.70	5,937.3	5,961.5	-1,522.6	6,123.8	1.03	0.94	Last Cathedral Survey @ 11985' MD
12,033.0	93.20	337.70	5,934.6	6,005.8	-1,540.8	6,171.6	0.00	0.00	Projection to Bit @ 12033' MD

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 - Point	0.00	360.00	5,935.4	6,009.3	-1,534.5	631,623.04	1,701,215.17	40° 13' 45.200 N	80° 34' 12.200 W
Interp @ 5995.2 (Thoma - actual wellpath misses target center by 15.7usft at 6307.2usft MD (6005.8 TVD, 520.9 N, 52.5 E) - Point	0.00	0.00	5,995.2	517.8	41.3	626,131.59	1,702,791.00	40° 12' 51.121 N	80° 33' 51.046 W
Hardline Corner 50' Rad - actual wellpath misses target center by 3687.0usft at 5.6usft MD (5.6 TVD, 0.0 N, 0.0 E) - Circle (radius 50.0)	0.00	0.00	0.0	3,615.7	-721.8	629,229.49	1,702,027.87	40° 13' 21.644 N	80° 34' 1.356 W

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		±N-S (usft)	±E-W (usft)	
5,335.0	5,334.8	15.2	-30.7	Last Cathedral Survey @ 5,335' MD
11,985.0	5,937.3	5,961.5	-1,522.6	Last Cathedral Survey @ 11985' MD
12,033.0	5,934.6	6,005.8	-1,540.8	Projection to Bit @ 12033' MD

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

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