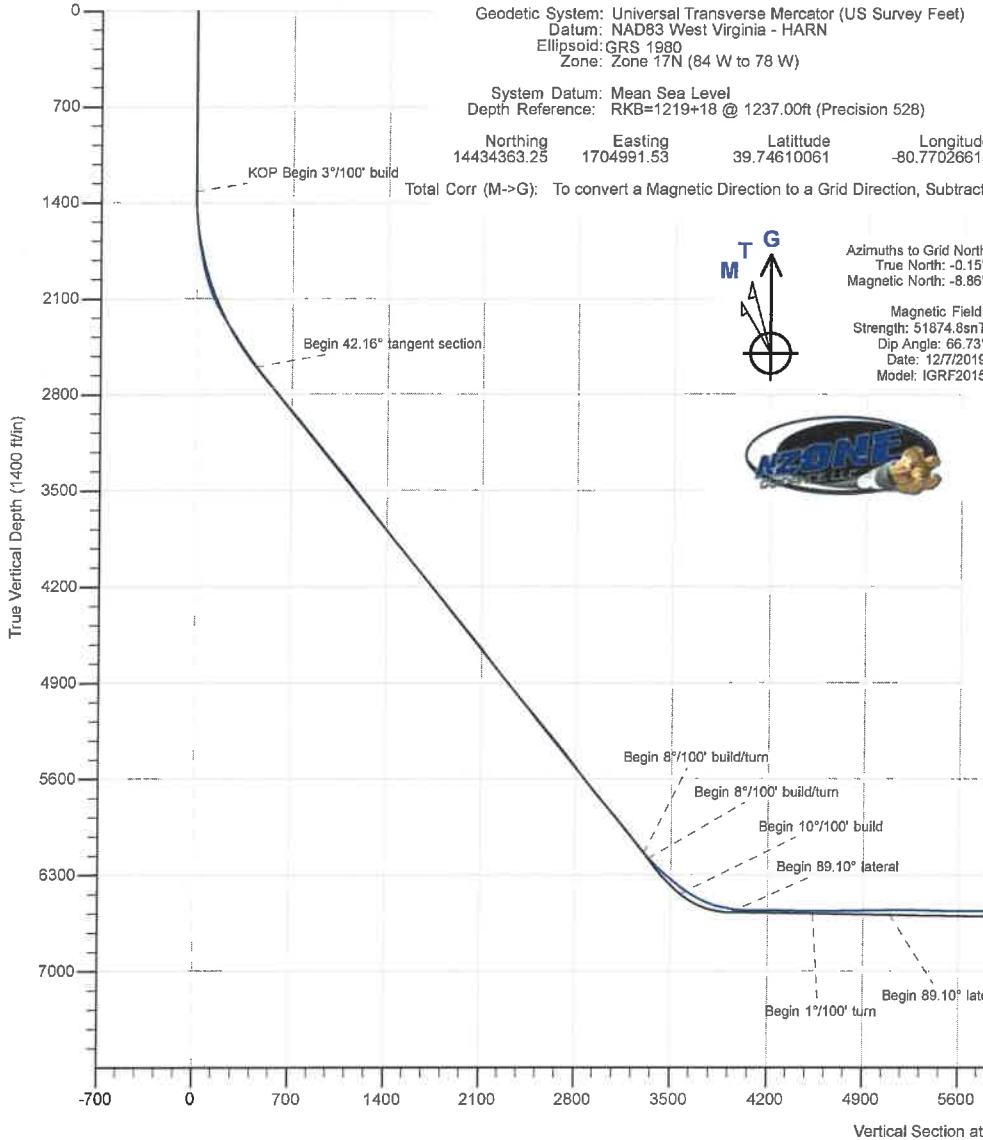




Well: Hillrock 11 HM (O)
Site: Hillrock/Simms
Project: Marshall County, West Virginia
Design: rev1

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Annotation
1	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.000	0.00	
2	1318.00	0.00	0.000	1318.00	0.00	0.00	0.00	0.000	0.00	KOP Begin 3°/100' build
3	2723.33	42.16	113.110	2599.90	-193.95	454.48	3.00	113.110	441.33	Begin 42.16° tangent section
4	7501.73	42.16	113.110	6142.00	-1452.79	3404.38	0.00	0.000	3305.86	Begin 8°/100' build/turn
5	7556.79	38.97	108.436	6183.83	-1465.53	3437.81	8.00	-138.125	3337.15	Begin 8°/100' build/turn
6	7908.90	50.00	148.000	6439.03	-1615.38	3622.00	8.00	81.738	3570.46	Begin 10°/100' build
7	8299.90	89.10	148.000	6573.01	-1913.25	3822.92	10.00	0.000	3927.69	Begin 89.10° lateral
8	8509.90	89.10	148.000	6582.58	-2418.90	4163.98	0.00	0.000	4534.09	Begin 1°/100' turn
9	9480.93	89.10	151.711	6591.57	-2907.36	4459.15	1.00	90.082	5097.75	Begin 89.10° lateral
10	16932.41	89.10	151.711	6709.00	-9468.08	7990.12	0.00	0.000	2388.97	PBHL/TD 16932.41 MD/6709.00 TVD



Geodetic System: Universal Transverse Mercator (US Survey Feet)
 Datum: NAD83 West Virginia - HARN
 Ellipsoid: GRS 1980
 Zone: Zone 17N (84 W to 78 W)

System Datum: Mean Sea Level
 Depth Reference: RKB=1219+18 @ 1237.00ft (Precision 528)

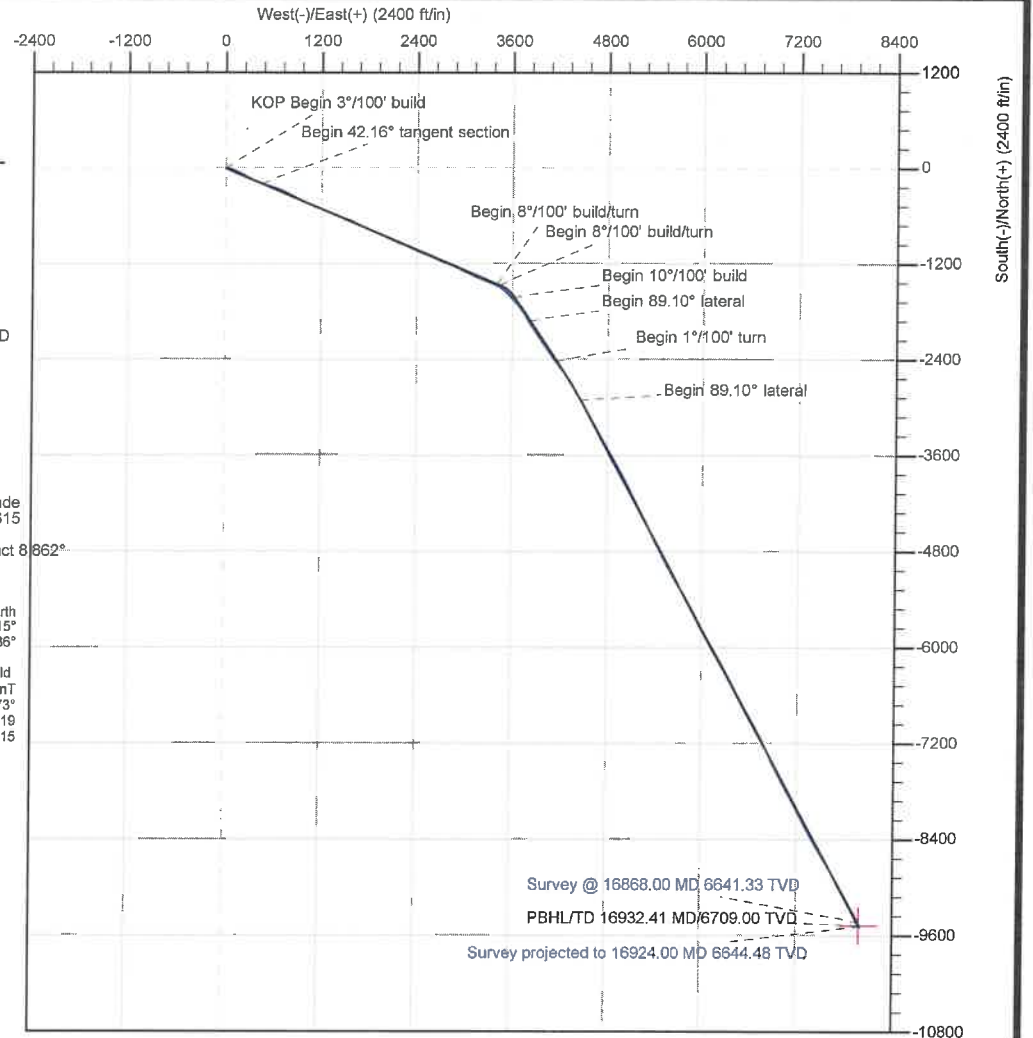
Northing	Easting	Latitude	Longitude
14434363.25	1704991.53	39.74610061	-80.77026615

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.862°



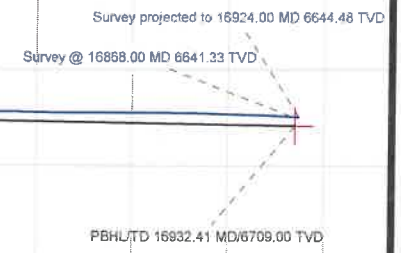
Azimuths to Grid North
 True North: -0.15°
 Magnetic North: -8.86°

Magnetic Field
 Strength: 51874.8nT
 Dip Angle: 66.73°
 Date: 12/7/2019
 Model: IGRF2015



ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSec	Annotation
186.00	0.44	238.930	186.00	-0.37	-0.61	-0.11	MWD surveys
16868.00	86.77	151.890	6641.33	-9437.69	7985.64	12362.85	Survey @ 16868.00 MD 6641.33 TVD
16924.00	86.77	151.890	6644.48	-9487.00	8011.98	12417.53	Survey projected to 16924.00 MD 6644.48 TVD



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 11 HM (O)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Well:	Hillrock 11 HM (O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Project	Marshall County, West Virginia		
Map System:	Universal Transverse Mercator (US Survey Feet)	System Datum:	Mean Sea Level
Geo Datum:	NAD83 West Virginia - HARN		
Map Zone:	Zone 17N (84 W to 78 W)		

Site	Hillrock/Simms				
Site Position:		Northing:	14,434,279.29 usft	Latitude:	39.74587001
From:	Lat/Long	Easting:	1,704,992.60 usft	Longitude:	-80.77026312
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.147 °

Well	Hillrock 11 HM (O)					
Well Position	+N-S	0.00 ft	Northing:	14,434,363.26 usft	Latitude:	39.74610061
	+E-W	0.00 ft	Easting:	1,704,991.53 usft	Longitude:	-80.77026615
Position Uncertainty	0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,219.00 ft	

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	12/7/2019	-8.715	66.726	51,874.83156811

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N-S (ft)	+E-W (ft)	Direction (°)	
	0.00	0.00	0.00	139.840	

Survey Program	Date	12/25/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
186.00	980.00	MWD surf (Original Hole)	MWD	MWD - Standard	
1,073.00	2,782.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,872.00	16,868.00	MWD (Original Hole)	MWD	MWD - Standard	
16,924.00	16,924.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
186.00	0.44	238.930	186.00	-0.37	-0.61	-0.11	0.24	0.24	0.00	
MWD surveys										
216.00	0.29	261.030	216.00	-0.44	-0.79	-0.17	0.68	-0.50	73.67	
246.00	0.27	208.080	246.00	-0.51	-0.89	-0.18	0.83	-0.07	-176.50	
291.00	0.12	278.040	291.00	-0.60	-0.99	-0.18	0.57	-0.33	155.47	
336.00	0.11	212.640	336.00	-0.63	-1.06	-0.20	0.28	-0.02	-145.33	
381.00	0.20	239.370	381.00	-0.71	-1.15	-0.20	0.25	0.20	59.40	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 11 HM (O)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Well:	Hillrock 11 HM (O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
428.00	0.29	288.870	428.00	-0.71	-1.33	-0.32	0.47	0.19	105.32
473.00	0.16	170.070	473.00	-0.74	-1.43	-0.36	0.87	-0.29	-264.00
519.00	0.16	162.680	519.00	-0.86	-1.40	-0.25	0.04	0.00	-16.07
564.00	0.17	181.420	564.00	-0.99	-1.38	-0.14	0.12	0.02	41.64
608.00	0.12	273.750	608.00	-1.05	-1.43	-0.12	0.48	-0.11	209.84
653.00	0.12	248.190	653.00	-1.06	-1.52	-0.17	0.12	0.00	-56.80
698.00	0.11	167.840	698.00	-1.12	-1.56	-0.15	0.33	-0.02	-178.56
743.00	0.17	179.010	743.00	-1.23	-1.55	-0.06	0.15	0.13	24.82
789.00	0.27	219.870	789.00	-1.38	-1.61	0.02	0.39	0.22	88.83
834.00	0.04	56.930	834.00	-1.46	-1.67	0.04	0.69	-0.51	-362.09
884.00	0.14	3.810	883.99	-1.39	-1.65	-0.01	0.24	0.20	-106.24
933.00	0.05	98.330	932.99	-1.33	-1.63	-0.03	0.31	-0.18	192.90
980.00	0.63	28.590	979.99	-1.11	-1.48	-0.11	1.31	1.23	-148.38
1,073.00	0.65	30.480	1,072.99	-0.20	-0.97	-0.47	0.03	0.02	2.03
1,168.00	0.85	33.160	1,167.98	0.85	-0.31	-0.85	0.21	0.21	2.82
1,263.00	0.90	47.140	1,262.97	1.95	0.62	-1.09	0.23	0.05	14.72
1,359.00	2.41	76.180	1,358.93	2.94	3.13	-0.23	1.75	1.57	30.25
1,454.00	5.14	86.820	1,453.71	3.66	9.32	3.22	2.95	2.87	11.20
1,549.00	8.20	92.060	1,548.06	3.65	20.35	10.33	3.28	3.22	5.52
1,644.00	10.41	97.940	1,641.81	2.22	35.62	21.27	2.53	2.33	6.19
1,739.00	10.81	108.920	1,735.19	-1.85	52.55	35.31	2.17	0.42	11.56
1,832.00	12.23	116.030	1,826.32	-9.00	69.65	51.80	2.16	1.53	7.65
1,927.00	16.17	114.330	1,918.40	-18.87	90.76	72.95	4.17	4.15	-1.79
2,022.00	20.55	112.130	2,008.54	-30.61	118.27	99.67	4.67	4.61	-2.32
2,117.00	25.77	114.320	2,095.86	-45.41	152.56	133.09	5.57	5.49	2.31
2,213.00	30.35	118.380	2,180.56	-65.54	192.94	174.52	5.17	4.77	4.23
2,308.00	32.61	121.000	2,261.58	-90.14	236.00	221.09	2.78	2.38	2.76
2,403.00	34.39	119.260	2,340.79	-116.44	281.36	270.44	2.13	1.87	-1.83
2,497.00	35.95	116.500	2,417.64	-141.73	329.21	320.64	2.37	1.66	-2.94
2,591.00	37.95	113.360	2,492.76	-165.51	380.45	371.85	2.93	2.13	-3.34
2,686.00	39.52	110.740	2,566.87	-187.80	435.54	424.42	2.39	1.65	-2.76
2,782.00	42.85	108.620	2,639.11	-209.04	495.07	479.04	3.76	3.47	-2.21
2,872.00	43.21	106.490	2,704.90	-227.56	553.61	530.95	1.66	0.40	-2.37
2,966.00	43.17	107.280	2,773.44	-246.25	615.17	584.93	0.58	-0.04	0.84
3,060.00	43.12	111.420	2,842.04	-267.53	675.80	640.30	3.01	-0.05	4.40
3,154.00	42.88	115.730	2,910.80	-293.16	734.53	697.76	3.14	-0.26	4.59
3,250.00	41.76	118.840	2,981.79	-322.76	791.96	757.43	2.47	-1.17	3.24
3,345.00	40.79	117.050	3,053.19	-352.14	847.32	815.57	1.81	-1.02	-1.88
3,439.00	41.82	115.130	3,123.80	-379.41	903.04	872.35	1.74	1.10	-2.04
3,533.00	42.08	113.930	3,193.71	-405.50	960.20	929.16	0.90	0.28	-1.28
3,628.00	42.56	115.080	3,263.96	-432.03	1,018.40	986.96	0.96	0.51	1.21
3,722.00	42.57	115.710	3,333.19	-459.29	1,075.84	1,044.85	0.45	0.01	0.67
3,817.00	41.80	114.380	3,403.58	-486.30	1,133.63	1,102.76	1.24	-0.81	-1.40

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 11 HM (O)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Well:	Hillrock 11 HM (O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
3,912.00	41.26	112.760	3,474.70	-511.49	1,191.35	1,159.24	1.27	-0.57	-1.71
4,007.00	41.34	111.530	3,546.07	-535.13	1,249.43	1,214.75	0.86	0.08	-1.29
4,102.00	40.65	110.810	3,617.78	-557.63	1,307.54	1,269.43	0.88	-0.73	-0.76
4,196.00	41.55	111.510	3,688.61	-579.94	1,365.16	1,323.65	1.08	0.96	0.74
4,290.00	41.92	112.690	3,758.76	-603.49	1,423.14	1,379.03	0.92	0.39	1.26
4,386.00	41.57	112.200	3,830.39	-627.89	1,482.21	1,435.78	0.50	-0.36	-0.51
4,481.00	42.33	112.260	3,901.04	-651.92	1,541.00	1,492.05	0.80	0.80	0.06
4,576.00	42.35	113.180	3,971.26	-676.63	1,600.02	1,549.00	0.65	0.02	0.97
4,671.00	42.21	116.030	4,041.55	-703.23	1,658.11	1,606.80	2.02	-0.15	3.00
4,766.00	42.01	114.950	4,112.03	-730.65	1,715.61	1,664.83	0.79	-0.21	-1.14
4,860.00	41.46	113.970	4,182.18	-756.56	1,772.57	1,721.37	0.91	-0.59	-1.04
4,955.00	41.94	113.360	4,253.11	-781.92	1,830.45	1,778.08	0.66	0.51	-0.64
5,049.00	43.22	113.070	4,322.32	-806.99	1,888.90	1,834.94	1.38	1.36	-0.31
5,143.00	43.94	113.790	4,390.42	-832.76	1,948.36	1,892.98	0.93	0.77	0.77
5,238.00	42.38	116.310	4,459.72	-860.25	2,007.23	1,951.95	2.45	-1.64	2.65
5,333.00	40.57	114.490	4,530.90	-887.25	2,064.05	2,009.23	2.29	-1.91	-1.92
5,427.00	42.79	113.790	4,601.10	-912.80	2,121.09	2,065.55	2.41	2.36	-0.74
5,522.00	41.45	109.900	4,671.57	-936.53	2,180.19	2,121.80	3.09	-1.41	-4.09
5,616.00	40.40	112.580	4,742.60	-958.82	2,237.58	2,175.84	2.18	-1.12	2.85
5,711.00	41.26	114.660	4,814.49	-983.71	2,294.48	2,231.56	1.69	0.91	2.19
5,806.00	41.85	114.730	4,885.58	-1,010.04	2,351.73	2,288.61	0.62	0.62	0.07
5,901.00	42.98	114.090	4,955.71	-1,036.51	2,410.08	2,346.47	1.27	1.19	-0.67
5,996.00	43.56	113.720	5,024.88	-1,062.90	2,469.61	2,405.03	0.67	0.61	-0.39
6,089.00	43.96	112.180	5,092.05	-1,087.98	2,528.84	2,462.39	1.22	0.43	-1.66
6,184.00	43.02	111.240	5,160.98	-1,112.16	2,589.58	2,520.05	1.20	-0.99	-0.99
6,280.00	43.17	111.650	5,231.08	-1,136.14	2,650.63	2,577.75	0.33	0.16	0.43
6,375.00	42.99	112.670	5,300.47	-1,160.62	2,710.72	2,635.21	0.76	-0.19	1.07
6,469.00	42.50	113.220	5,369.50	-1,185.49	2,769.47	2,692.10	0.66	-0.52	0.59
6,565.00	39.70	114.660	5,441.84	-1,211.07	2,827.15	2,748.86	3.08	-2.92	1.50
6,659.00	39.51	113.730	5,514.26	-1,235.63	2,881.81	2,802.88	0.66	-0.20	-0.99
6,754.00	40.55	112.890	5,587.00	-1,259.81	2,937.92	2,857.54	1.23	1.09	-0.88
6,848.00	41.28	115.290	5,658.04	-1,284.94	2,994.11	2,912.99	1.84	0.78	2.55
6,943.00	42.01	116.430	5,729.03	-1,312.48	3,050.92	2,970.67	1.11	0.77	1.20
7,039.00	42.58	115.440	5,800.04	-1,340.73	3,109.01	3,029.72	0.91	0.59	-1.03
7,134.00	43.51	114.200	5,869.47	-1,367.94	3,167.87	3,088.48	1.32	0.98	-1.31
7,229.00	42.16	110.380	5,939.14	-1,392.45	3,227.60	3,145.73	3.08	-1.42	-4.02
7,324.00	41.79	112.710	6,009.78	-1,415.78	3,286.69	3,201.67	1.69	-0.39	2.45
7,463.00	42.73	112.780	6,112.65	-1,451.92	3,372.89	3,284.89	0.68	0.68	0.05
7,557.00	43.52	120.080	6,181.30	-1,480.51	3,430.34	3,343.78	5.37	0.84	7.77
7,652.00	47.43	128.510	6,247.96	-1,518.73	3,486.09	3,408.95	7.54	4.12	8.87
7,748.00	49.10	134.930	6,311.90	-1,566.40	3,539.47	3,479.80	5.28	1.74	6.69
7,841.00	52.09	137.300	6,370.94	-1,618.20	3,589.25	3,551.50	3.77	3.22	2.55
7,937.00	55.96	137.920	6,427.32	-1,675.57	3,641.61	3,629.11	4.06	4.03	0.65
7,984.00	59.30	139.060	6,452.48	-1,705.30	3,667.91	3,668.79	7.40	7.11	2.43

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 11 HM (O)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Well:	Hillrock 11 HM (O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
8,032.00	62.37	143.540	6,475.88	-1,738.01	3,694.08	3,710.67	10.36	6.40	9.33
8,079.00	68.35	145.560	6,495.47	-1,772.80	3,718.83	3,753.22	13.31	12.72	4.30
8,127.00	73.14	146.790	6,511.29	-1,810.44	3,744.04	3,798.25	10.27	9.98	2.56
8,174.00	75.56	149.340	6,523.97	-1,848.85	3,767.97	3,843.03	7.33	5.15	5.43
8,222.00	77.85	149.960	6,535.01	-1,889.15	3,791.57	3,889.06	4.93	4.77	1.29
8,269.00	77.89	149.340	6,544.89	-1,928.81	3,814.79	3,934.34	1.29	0.09	-1.32
8,317.00	82.59	148.020	6,553.02	-1,969.21	3,839.38	3,981.07	10.16	9.79	-2.75
8,412.00	91.16	145.650	6,558.20	-2,048.53	3,891.23	4,075.13	9.36	9.02	-2.49
8,507.00	90.73	146.180	6,556.63	-2,127.20	3,944.46	4,169.58	0.72	-0.45	0.56
8,602.00	89.27	145.120	6,556.63	-2,205.63	3,998.06	4,264.09	1.90	-1.54	-1.12
8,696.00	88.66	144.860	6,558.33	-2,282.60	4,051.98	4,357.69	0.71	-0.65	-0.28
8,792.00	89.89	144.250	6,559.54	-2,360.80	4,107.65	4,453.36	1.43	1.28	-0.64
8,886.00	89.54	145.300	6,560.01	-2,437.59	4,161.86	4,547.01	1.18	-0.37	1.12
8,982.00	90.46	143.370	6,560.01	-2,515.58	4,217.83	4,642.70	2.23	0.96	-2.01
9,076.00	90.02	143.450	6,559.62	-2,591.05	4,273.86	4,736.52	0.48	-0.47	0.09
9,172.00	91.12	147.850	6,558.66	-2,670.29	4,328.01	4,832.00	4.72	1.15	4.58
9,267.00	90.15	150.490	6,557.61	-2,751.85	4,376.69	4,925.73	2.96	-1.02	2.78
9,362.00	90.77	150.930	6,556.84	-2,834.70	4,423.17	5,019.02	0.80	0.65	0.46
9,457.00	90.77	151.010	6,555.57	-2,917.76	4,469.26	5,112.22	0.08	0.00	0.08
9,551.00	89.49	151.280	6,555.35	-3,000.09	4,514.63	5,204.40	1.39	-1.36	0.29
9,646.00	88.92	151.360	6,556.67	-3,083.42	4,560.21	5,297.49	0.61	-0.60	0.08
9,741.00	88.88	150.400	6,558.50	-3,166.40	4,606.44	5,390.71	1.01	-0.04	-1.01
9,835.00	88.18	150.130	6,560.91	-3,247.99	4,653.04	5,483.13	0.80	-0.74	-0.29
9,929.00	89.27	151.360	6,563.00	-3,329.98	4,698.97	5,575.40	1.75	1.16	1.31
10,023.00	90.37	149.870	6,563.29	-3,411.88	4,745.09	5,667.74	1.97	1.17	-1.59
10,118.00	89.89	150.400	6,563.08	-3,494.27	4,792.40	5,761.21	0.75	-0.51	0.56
10,213.00	91.38	151.190	6,562.03	-3,577.18	4,838.74	5,854.47	1.78	1.57	0.83
10,308.00	90.73	150.750	6,560.28	-3,660.23	4,884.84	5,947.67	0.83	-0.68	-0.46
10,404.00	90.37	149.870	6,559.36	-3,743.62	4,932.38	6,042.07	0.99	-0.38	-0.92
10,498.00	89.93	152.240	6,559.11	-3,825.88	4,977.87	6,134.26	2.56	-0.47	2.52
10,593.00	89.41	152.680	6,559.66	-3,910.11	5,021.80	6,226.97	0.72	-0.55	0.46
10,688.00	88.92	153.650	6,561.04	-3,994.87	5,064.68	6,319.40	1.14	-0.52	1.02
10,783.00	90.11	153.910	6,561.84	-4,080.09	5,106.65	6,411.59	1.28	1.25	0.27
10,878.00	89.85	153.470	6,561.88	-4,165.25	5,148.75	6,503.83	0.54	-0.27	-0.46
10,973.00	89.58	153.300	6,562.35	-4,250.18	5,191.31	6,596.19	0.34	-0.28	-0.18
11,067.00	89.10	153.300	6,563.43	-4,334.15	5,233.55	6,687.60	0.51	-0.51	0.00
11,163.00	88.70	153.120	6,565.28	-4,419.83	5,276.81	6,780.98	0.46	-0.42	-0.19
11,257.00	88.31	152.950	6,567.73	-4,503.58	5,319.42	6,872.47	0.45	-0.41	-0.18
11,353.00	88.53	152.770	6,570.38	-4,588.98	5,363.19	6,965.96	0.30	0.23	-0.19
11,448.00	88.31	152.680	6,573.00	-4,673.38	5,406.71	7,058.54	0.25	-0.23	-0.09
11,543.00	88.04	152.950	6,576.02	-4,757.85	5,450.09	7,151.06	0.40	-0.28	0.28
11,637.00	87.52	152.770	6,579.66	-4,841.43	5,492.94	7,242.58	0.59	-0.55	-0.19
11,731.00	88.75	152.860	6,582.72	-4,925.01	5,535.86	7,334.13	1.31	1.31	0.10

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 11 HM (O)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Well:	Hillrock 11 HM (O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,826.00	90.02	150.660	6,583.74	-5,008.69	5,580.80	7,427.07	2.67	1.34	-2.32
11,921.00	90.51	149.870	6,583.30	-5,091.18	5,627.92	7,520.50	0.98	0.52	-0.83
12,015.00	90.33	149.520	6,582.61	-5,172.33	5,675.35	7,613.11	0.42	-0.19	-0.37
12,110.00	89.85	148.990	6,582.46	-5,253.98	5,723.92	7,706.83	0.75	-0.51	-0.56
12,205.00	91.30	149.690	6,581.51	-5,335.69	5,772.36	7,800.52	1.69	1.53	0.74
12,299.00	90.86	151.010	6,579.74	-5,417.36	5,818.85	7,892.92	1.48	-0.47	1.40
12,394.00	90.90	151.800	6,578.28	-5,500.77	5,864.31	7,985.98	0.83	0.04	0.83
12,490.00	87.87	151.980	6,579.31	-5,585.43	5,909.54	8,079.85	3.16	-3.16	0.19
12,585.00	87.87	151.800	6,582.84	-5,669.16	5,954.27	8,172.69	0.19	0.00	-0.19
12,680.00	87.30	151.450	6,586.84	-5,752.67	5,999.38	8,265.60	0.70	-0.60	-0.37
12,773.00	89.01	152.600	6,589.84	-5,834.76	6,042.98	8,356.46	2.22	1.84	1.24
12,868.00	88.57	152.330	6,591.84	-5,918.98	6,086.88	8,449.14	0.54	-0.46	-0.28
12,963.00	90.07	151.280	6,592.97	-6,002.70	6,131.76	8,542.06	1.93	1.58	-1.11
13,058.00	89.80	151.100	6,593.08	-6,085.94	6,177.54	8,635.21	0.34	-0.28	-0.19
13,153.00	88.44	151.280	6,594.54	-6,169.17	6,223.32	8,728.34	1.44	-1.43	0.19
13,247.00	88.09	151.190	6,597.38	-6,251.53	6,268.53	8,820.44	0.38	-0.37	-0.10
13,342.00	89.14	151.980	6,599.68	-6,335.06	6,313.72	8,913.42	1.38	1.11	0.83
13,437.00	90.73	151.720	6,599.79	-6,418.82	6,358.54	9,006.34	1.70	1.67	-0.27
13,532.00	89.98	152.160	6,599.20	-6,502.65	6,403.23	9,099.23	0.92	-0.79	0.46
13,627.00	89.58	152.240	6,599.56	-6,586.69	6,447.53	9,192.02	0.43	-0.42	0.08
13,722.00	89.23	151.980	6,600.55	-6,670.65	6,491.97	9,284.85	0.46	-0.37	-0.27
13,817.00	90.81	151.280	6,600.52	-6,754.23	6,537.11	9,377.84	1.82	1.66	-0.74
13,912.00	89.89	150.310	6,599.94	-6,837.15	6,583.46	9,471.11	1.41	-0.97	-1.02
14,007.00	89.45	149.340	6,600.48	-6,919.28	6,631.21	9,564.66	1.12	-0.46	-1.02
14,102.00	89.14	152.160	6,601.65	-7,002.15	6,677.62	9,657.93	2.99	-0.33	2.97
14,196.00	89.45	153.390	6,602.81	-7,085.73	6,720.62	9,749.54	1.35	0.33	1.31
14,291.00	89.41	154.440	6,603.75	-7,171.05	6,762.39	9,841.68	1.11	-0.04	1.11
14,386.00	88.92	155.060	6,605.14	-7,256.96	6,802.91	9,933.47	0.83	-0.52	0.65
14,481.00	90.42	154.620	6,605.69	-7,342.94	6,843.30	10,025.23	1.65	1.58	-0.46
14,576.00	90.11	152.070	6,605.25	-7,427.84	6,885.91	10,117.59	2.70	-0.33	-2.68
14,670.00	89.63	152.070	6,605.46	-7,510.89	6,929.94	10,209.46	0.51	-0.51	0.00
14,766.00	89.41	151.980	6,606.26	-7,595.67	6,974.97	10,303.29	0.25	-0.23	-0.09
14,861.00	88.97	152.240	6,607.61	-7,679.63	7,019.41	10,396.11	0.54	-0.46	0.27
14,957.00	88.53	152.240	6,609.70	-7,764.56	7,064.11	10,489.85	0.46	-0.46	0.00
15,052.00	89.93	152.240	6,610.98	-7,848.61	7,108.35	10,582.62	1.47	1.47	0.00
15,147.00	89.71	152.070	6,611.28	-7,932.61	7,152.72	10,675.44	0.29	-0.23	-0.18
15,242.00	89.54	152.070	6,611.90	-8,016.55	7,197.22	10,768.28	0.18	-0.18	0.00
15,337.00	89.01	151.980	6,613.10	-8,100.44	7,241.78	10,861.13	0.57	-0.56	-0.09
15,432.00	90.68	152.160	6,613.36	-8,184.37	7,286.28	10,953.97	1.77	1.76	0.19
15,527.00	90.29	152.070	6,612.55	-8,268.34	7,330.70	11,046.80	0.42	-0.41	-0.09
15,622.00	90.11	151.360	6,612.22	-8,351.99	7,375.72	11,139.76	0.77	-0.19	-0.75
15,717.00	89.93	151.190	6,612.19	-8,435.30	7,421.38	11,232.88	0.26	-0.19	-0.18
15,810.00	89.58	150.930	6,612.59	-8,516.69	7,466.38	11,324.10	0.47	-0.38	-0.28

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 11 HM (O)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Well:	Hillrock 11 HM (O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
15,905.00	89.41	150.220	6,613.42	-8,599.43	7,513.05	11,417.43	0.77	-0.18	-0.75
16,000.00	89.19	149.430	6,614.58	-8,681.55	7,560.80	11,510.98	0.86	-0.23	-0.83
16,095.00	88.97	148.990	6,616.11	-8,763.15	7,609.42	11,604.70	0.52	-0.23	-0.46
16,190.00	88.66	148.200	6,618.07	-8,844.21	7,658.91	11,698.58	0.89	-0.33	-0.83
16,285.00	88.88	150.490	6,620.11	-8,925.91	7,707.33	11,792.24	2.42	0.23	2.41
16,380.00	88.57	150.840	6,622.23	-9,008.71	7,753.87	11,885.53	0.49	-0.33	0.37
16,475.00	88.31	151.280	6,624.81	-9,091.82	7,799.82	11,978.68	0.54	-0.27	0.46
16,570.00	87.91	151.190	6,627.95	-9,175.05	7,845.51	12,071.76	0.43	-0.42	-0.09
16,665.00	87.65	151.540	6,631.63	-9,258.36	7,891.00	12,164.77	0.46	-0.27	0.37
16,760.00	87.38	152.680	6,635.75	-9,342.25	7,935.40	12,257.51	1.23	-0.28	1.20
16,855.00	86.77	151.890	6,640.59	-9,426.24	7,979.52	12,350.16	1.05	-0.64	-0.83
16,868.00	86.77	151.890	6,641.33	-9,437.69	7,985.64	12,362.85	0.00	0.00	0.00
Survey @ 16868.00 MD 6641.33 TVD									
16,924.00	86.77	151.890	6,644.48	-9,487.00	8,011.98	12,417.53	0.00	0.00	0.00
Survey projected to 16924.00 MD 6644.48 TVD									

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
186.00	186.00	-0.37	-0.61	MWD surveys
16,868.00	6,641.33	-9,437.69	7,985.64	Survey @ 16868.00 MD 6641.33 TVD

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 11 HM (O)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Well:	Hillrock 11 HM (O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Project	Marshall County, West Virginia		
Map System:	Universal Transverse Mercator (US Survey Feet)	System Datum:	Mean Sea Level
Geo Datum:	NAD83 West Virginia - HARN		
Map Zone:	Zone 17N (84 W to 78 W)		

Site	Hillrock/Simms				
Site Position:		Northing:	14,434,279.29 usft	Latitude:	39.74587001
From:	Lat/Long	Easting:	1,704,992.60 usft	Longitude:	-80.77026312
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.147 °

Well	Hillrock 11 HM (O)					
Well Position	+N/-S	0.00 ft	Northing:	14,434,363.26 usft	Latitude:	39.74610061
	+E/-W	0.00 ft	Easting:	1,704,991.53 usft	Longitude:	-80.77026615
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,219.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	12/7/2019	-8.715	66.726	51,874.83156811

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.00	0.00	0.00	139.840	

Survey Program	Date	12/25/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
186.00	980.00	MWD surf (Original Hole)	MWD	MWD - Standard	
1,073.00	2,782.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,872.00	16,868.00	MWD (Original Hole)	MWD	MWD - Standard	
16,924.00	16,924.00	Projection (Original Hole)	MWD	MWD - Standard	

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.00	0.00	0.000	0.00	0.00	0.00	14,434,363.26	1,704,991.53	39.74610061	-80.77026615
186.00	0.44	238.930	186.00	-0.37	-0.61	14,434,362.89	1,704,990.92	39.74609960	-80.77026833
MWD surveys									
216.00	0.29	261.030	216.00	-0.44	-0.79	14,434,362.82	1,704,990.75	39.74609941	-80.77026895
246.00	0.27	208.080	246.00	-0.51	-0.89	14,434,362.74	1,704,990.64	39.74609921	-80.77026933
291.00	0.12	278.040	291.00	-0.60	-0.99	14,434,362.65	1,704,990.54	39.74609897	-80.77026968
336.00	0.11	212.640	336.00	-0.63	-1.06	14,434,362.62	1,704,990.47	39.74609889	-80.77026993
381.00	0.20	239.370	381.00	-0.71	-1.15	14,434,362.55	1,704,990.38	39.74609868	-80.77027025
428.00	0.29	288.870	428.00	-0.71	-1.33	14,434,362.54	1,704,990.20	39.74609867	-80.77027090

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 11 HM (O)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Well:	Hillrock 11 HM (O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
473.00	0.16	170.070	473.00	-0.74	-1.43	14,434,362.52	1,704,990.10	39.74609860	-80.77027125
519.00	0.16	162.680	519.00	-0.86	-1.40	14,434,362.40	1,704,990.13	39.74609826	-80.77027114
564.00	0.17	181.420	564.00	-0.99	-1.38	14,434,362.27	1,704,990.15	39.74609791	-80.77027108
608.00	0.12	273.750	608.00	-1.05	-1.43	14,434,362.21	1,704,990.10	39.74609774	-80.77027125
653.00	0.12	248.190	653.00	-1.06	-1.52	14,434,362.19	1,704,990.01	39.74609770	-80.77027158
698.00	0.11	167.840	698.00	-1.12	-1.56	14,434,362.13	1,704,989.97	39.74609754	-80.77027170
743.00	0.17	179.010	743.00	-1.23	-1.55	14,434,362.02	1,704,989.98	39.74609724	-80.77027166
789.00	0.27	219.870	789.00	-1.38	-1.61	14,434,361.87	1,704,989.92	39.74609682	-80.77027191
834.00	0.04	56.930	834.00	-1.46	-1.67	14,434,361.80	1,704,989.86	39.74609662	-80.77027210
884.00	0.14	3.810	883.99	-1.39	-1.65	14,434,361.87	1,704,989.88	39.74609682	-80.77027204
933.00	0.05	98.330	932.99	-1.33	-1.63	14,434,361.93	1,704,989.90	39.74609697	-80.77027195
980.00	0.63	28.590	979.99	-1.11	-1.48	14,434,362.15	1,704,990.05	39.74609759	-80.77027143
1,073.00	0.65	30.480	1,072.99	-0.20	-0.97	14,434,363.05	1,704,990.56	39.74610006	-80.77026960
1,168.00	0.85	33.160	1,167.98	0.85	-0.31	14,434,364.11	1,704,991.22	39.74610295	-80.77026725
1,263.00	0.90	47.140	1,262.97	1.95	0.62	14,434,365.20	1,704,992.15	39.74610596	-80.77026392
1,359.00	2.41	76.180	1,358.93	2.94	3.13	14,434,366.20	1,704,994.66	39.74610868	-80.77025497
1,454.00	5.14	86.820	1,453.71	3.66	9.32	14,434,366.91	1,705,000.85	39.74611059	-80.77023295
1,549.00	8.20	92.060	1,548.06	3.65	20.35	14,434,366.91	1,705,011.88	39.74611049	-80.77019373
1,644.00	10.41	97.940	1,641.81	2.22	35.62	14,434,365.48	1,705,027.15	39.74610646	-80.77013941
1,739.00	10.81	108.920	1,735.19	-1.85	52.55	14,434,361.40	1,705,044.08	39.74609515	-80.77007922
1,832.00	12.23	116.030	1,826.32	-9.00	69.65	14,434,354.25	1,705,061.18	39.74607539	-80.77001844
1,927.00	16.17	114.330	1,918.40	-18.87	90.76	14,434,344.38	1,705,082.29	39.74604814	-80.76994345
2,022.00	20.55	112.130	2,008.54	-30.61	118.27	14,434,332.64	1,705,109.80	39.74601571	-80.76984568
2,117.00	25.77	114.320	2,095.86	-45.41	152.56	14,434,317.85	1,705,144.09	39.74597483	-80.76972383
2,213.00	30.35	118.380	2,180.56	-65.54	192.94	14,434,297.71	1,705,184.47	39.74591925	-80.76958036
2,308.00	32.61	121.000	2,261.58	-90.14	236.00	14,434,273.12	1,705,227.53	39.74585140	-80.76942737
2,403.00	34.39	119.260	2,340.79	-116.44	281.36	14,434,246.82	1,705,272.89	39.74577885	-80.76926627
2,497.00	35.95	116.500	2,417.64	-141.73	329.21	14,434,221.53	1,705,320.75	39.74570906	-80.76909623
2,591.00	37.95	113.360	2,492.76	-165.51	380.45	14,434,197.75	1,705,371.98	39.74564340	-80.76891417
2,686.00	39.52	110.740	2,566.87	-187.80	435.54	14,434,175.46	1,705,427.07	39.74558179	-80.76871838
2,782.00	42.85	108.620	2,639.11	-209.04	495.07	14,434,154.21	1,705,486.59	39.74552302	-80.76850683
2,872.00	43.21	106.490	2,704.90	-227.56	553.61	14,434,135.69	1,705,545.14	39.74547175	-80.76829871
2,966.00	43.17	107.280	2,773.44	-246.25	615.17	14,434,117.01	1,705,606.70	39.74542000	-80.76807987
3,060.00	43.12	111.420	2,842.04	-267.53	675.80	14,434,095.72	1,705,667.33	39.74536110	-80.76786440
3,154.00	42.88	115.730	2,910.80	-293.16	734.53	14,434,070.10	1,705,726.06	39.74529032	-80.76765570
3,250.00	41.76	118.840	2,981.79	-322.76	791.96	14,434,040.49	1,705,783.49	39.74520861	-80.76745164
3,345.00	40.79	117.050	3,053.19	-352.14	847.32	14,434,011.12	1,705,838.84	39.74512754	-80.76725499
3,439.00	41.82	115.130	3,123.80	-379.41	903.04	14,433,983.85	1,705,894.57	39.74505224	-80.76705701
3,533.00	42.08	113.930	3,193.71	-405.50	960.20	14,433,957.76	1,705,951.73	39.74498019	-80.76685389
3,628.00	42.56	115.080	3,263.96	-432.03	1,018.40	14,433,931.23	1,706,009.93	39.74490692	-80.76664710
3,722.00	42.57	115.710	3,333.19	-459.29	1,075.84	14,433,903.96	1,706,067.37	39.74483162	-80.76644301
3,817.00	41.80	114.380	3,403.58	-486.30	1,133.63	14,433,876.95	1,706,125.16	39.74475703	-80.76623766
3,912.00	41.26	112.760	3,474.70	-511.49	1,191.35	14,433,851.76	1,706,182.88	39.74468744	-80.76603254
4,007.00	41.34	111.530	3,546.07	-535.13	1,249.43	14,433,828.13	1,706,240.96	39.74462212	-80.76582616
4,102.00	40.65	110.810	3,617.78	-557.63	1,307.54	14,433,805.62	1,706,299.07	39.74455989	-80.76561964
4,196.00	41.55	111.510	3,688.61	-579.94	1,365.16	14,433,783.31	1,706,356.69	39.74449821	-80.76541485
4,290.00	41.92	112.690	3,758.76	-603.49	1,423.14	14,433,759.77	1,706,414.66	39.74443314	-80.76520882
4,386.00	41.57	112.200	3,830.39	-627.89	1,482.21	14,433,735.37	1,706,473.74	39.74436569	-80.76499889
4,481.00	42.33	112.260	3,901.04	-651.92	1,541.00	14,433,711.34	1,706,532.53	39.74429928	-80.76478998
4,576.00	42.35	113.180	3,971.26	-676.63	1,600.02	14,433,686.63	1,706,591.54	39.74423099	-80.76458026
4,671.00	42.21	116.030	4,041.55	-703.23	1,658.11	14,433,660.03	1,706,649.64	39.74415751	-80.76437382
4,766.00	42.01	114.950	4,112.03	-730.65	1,715.61	14,433,632.61	1,706,707.14	39.74408181	-80.76416953
4,860.00	41.46	113.970	4,182.18	-756.56	1,772.57	14,433,606.70	1,706,764.10	39.74401024	-80.76396715
4,955.00	41.94	113.360	4,253.11	-781.92	1,830.45	14,433,581.33	1,706,821.98	39.74394016	-80.76376147
5,049.00	43.22	113.070	4,322.32	-806.99	1,888.90	14,433,556.27	1,706,880.43	39.74387089	-80.76355376

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 11 HM (O)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Well:	Hillrock 11 HM (O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,143.00	43.94	113.790	4,390.42	-832.76	1,948.36	14,433,530.50	1,706,939.88	39.74379969	-80.76334250
5,238.00	42.38	116.310	4,459.72	-860.25	2,007.23	14,433,503.01	1,706,998.75	39.74372377	-80.76313333
5,333.00	40.57	114.490	4,530.90	-887.25	2,064.05	14,433,476.01	1,707,055.57	39.74364921	-80.76293145
5,427.00	42.79	113.790	4,601.10	-912.80	2,121.09	14,433,450.45	1,707,112.61	39.74357861	-80.76272877
5,522.00	41.45	109.900	4,671.57	-936.53	2,180.19	14,433,426.73	1,707,171.72	39.74351303	-80.76251873
5,616.00	40.40	112.580	4,742.60	-958.82	2,237.58	14,433,404.44	1,707,229.11	39.74345140	-80.76231479
5,711.00	41.26	114.660	4,814.49	-983.71	2,294.48	14,433,379.55	1,707,286.00	39.74338262	-80.76211261
5,806.00	41.85	114.730	4,885.58	-1,010.04	2,351.73	14,433,353.22	1,707,343.26	39.74330990	-80.76190918
5,901.00	42.98	114.090	4,955.71	-1,036.51	2,410.08	14,433,326.74	1,707,401.61	39.74323676	-80.76170186
5,996.00	43.56	113.720	5,024.88	-1,062.90	2,469.61	14,433,300.36	1,707,461.14	39.74316387	-80.76149033
6,089.00	43.96	112.180	5,092.05	-1,087.98	2,528.84	14,433,275.28	1,707,520.36	39.74309457	-80.76127986
6,184.00	43.02	111.240	5,160.98	-1,112.16	2,589.58	14,433,251.09	1,707,581.10	39.74302769	-80.76106401
6,280.00	43.17	111.650	5,231.08	-1,136.14	2,650.63	14,433,227.11	1,707,642.15	39.74296139	-80.76084707
6,375.00	42.99	112.670	5,300.47	-1,160.62	2,710.72	14,433,202.64	1,707,702.24	39.74289374	-80.76063353
6,469.00	42.50	113.220	5,369.50	-1,185.49	2,769.47	14,433,177.77	1,707,761.00	39.74282501	-80.76042475
6,565.00	39.70	114.660	5,441.84	-1,211.07	2,827.15	14,433,152.19	1,707,818.68	39.74275432	-80.76021981
6,659.00	39.51	113.730	5,514.26	-1,235.63	2,881.81	14,433,127.63	1,707,873.33	39.74268647	-80.76002560
6,754.00	40.55	112.890	5,587.00	-1,259.81	2,937.92	14,433,103.45	1,707,929.45	39.74261967	-80.75982620
6,848.00	41.28	115.290	5,658.04	-1,284.94	2,994.11	14,433,078.32	1,707,985.64	39.74255023	-80.75962655
6,943.00	42.01	116.430	5,729.03	-1,312.48	3,050.92	14,433,050.78	1,708,042.44	39.74247419	-80.75942475
7,039.00	42.58	115.440	5,800.04	-1,340.73	3,109.01	14,433,022.53	1,708,100.54	39.74239618	-80.75921834
7,134.00	43.51	114.200	5,869.47	-1,367.94	3,167.87	14,432,995.32	1,708,159.39	39.74232101	-80.75900923
7,229.00	42.16	110.380	5,939.14	-1,392.45	3,227.60	14,432,970.80	1,708,219.12	39.74225324	-80.75879699
7,324.00	41.79	112.710	6,009.78	-1,415.78	3,286.69	14,432,947.48	1,708,278.21	39.74218875	-80.75858701
7,463.00	42.73	112.780	6,112.65	-1,451.92	3,372.89	14,432,911.34	1,708,364.42	39.74208886	-80.75828068
7,557.00	43.52	120.080	6,181.30	-1,480.51	3,430.34	14,432,882.75	1,708,421.86	39.74200992	-80.75807659
7,652.00	47.43	128.510	6,247.96	-1,518.73	3,486.09	14,432,844.53	1,708,477.61	39.74190453	-80.75787864
7,748.00	49.10	134.930	6,311.90	-1,566.40	3,539.47	14,432,796.86	1,708,530.99	39.74177323	-80.75768920
7,841.00	52.09	137.300	6,370.94	-1,618.20	3,589.25	14,432,745.06	1,708,580.77	39.74163060	-80.75751262
7,937.00	55.96	137.920	6,427.32	-1,675.57	3,641.61	14,432,687.68	1,708,633.13	39.74147265	-80.75732691
7,984.00	59.30	139.060	6,452.48	-1,705.30	3,667.91	14,432,657.96	1,708,659.43	39.74139081	-80.75723364
8,032.00	62.37	143.540	6,475.88	-1,738.01	3,694.08	14,432,625.25	1,708,685.61	39.74130079	-80.75714084
8,079.00	68.35	145.560	6,495.47	-1,772.80	3,718.83	14,432,590.45	1,708,710.36	39.74120505	-80.75705313
8,127.00	73.14	146.790	6,511.29	-1,810.44	3,744.04	14,432,552.82	1,708,735.57	39.74110150	-80.75696381
8,174.00	75.56	149.340	6,523.97	-1,848.85	3,767.97	14,432,514.41	1,708,759.50	39.74099585	-80.75687906
8,222.00	77.85	149.960	6,535.01	-1,889.15	3,791.57	14,432,474.10	1,708,783.10	39.74088497	-80.75679549
8,269.00	77.89	149.340	6,544.89	-1,928.81	3,814.79	14,432,434.45	1,708,806.32	39.74077590	-80.75671328
8,317.00	82.59	148.020	6,553.02	-1,969.21	3,839.38	14,432,394.05	1,708,830.90	39.74066478	-80.75662621
8,412.00	91.16	145.650	6,558.20	-2,048.53	3,891.23	14,432,314.73	1,708,882.75	39.74044655	-80.75644254
8,507.00	90.73	146.180	6,556.63	-2,127.20	3,944.46	14,432,236.06	1,708,935.98	39.74023010	-80.75625393
8,602.00	89.27	145.120	6,556.63	-2,205.63	3,998.06	14,432,157.63	1,708,989.58	39.74001431	-80.75606402
8,696.00	88.66	144.860	6,558.33	-2,282.60	4,051.98	14,432,080.66	1,709,043.50	39.73980251	-80.75587295
8,792.00	89.89	144.250	6,559.54	-2,360.80	4,107.65	14,432,002.46	1,709,099.17	39.73958733	-80.75567569
8,886.00	89.54	145.300	6,560.01	-2,437.59	4,161.86	14,431,925.67	1,709,153.39	39.73937605	-80.75548357
8,982.00	90.46	143.370	6,560.01	-2,515.58	4,217.83	14,431,847.68	1,709,209.35	39.73916145	-80.75528523
9,076.00	90.02	143.450	6,559.62	-2,591.05	4,273.86	14,431,772.21	1,709,265.39	39.73895375	-80.75508665
9,172.00	91.12	147.850	6,558.66	-2,670.29	4,328.01	14,431,692.97	1,709,319.54	39.73873575	-80.75489479
9,267.00	90.15	150.490	6,557.61	-2,751.85	4,376.69	14,431,611.41	1,709,368.22	39.73851139	-80.75472243
9,362.00	90.77	150.930	6,556.84	-2,834.70	4,423.17	14,431,528.56	1,709,414.69	39.73828351	-80.75455791
9,457.00	90.77	151.010	6,555.57	-2,917.76	4,469.26	14,431,445.50	1,709,460.79	39.73805506	-80.75439475
9,551.00	89.49	151.280	6,555.35	-3,000.09	4,514.63	14,431,363.18	1,709,506.15	39.73782863	-80.75423419
9,646.00	88.92	151.360	6,556.67	-3,083.42	4,560.21	14,431,279.84	1,709,551.74	39.73759942	-80.75407284
9,741.00	88.88	150.400	6,558.50	-3,166.40	4,606.44	14,431,196.86	1,709,597.96	39.73737119	-80.75390923
9,835.00	88.18	150.130	6,560.91	-3,247.99	4,653.04	14,431,115.27	1,709,644.57	39.73714676	-80.75374424
9,929.00	89.27	151.360	6,563.00	-3,329.98	4,698.97	14,431,033.28	1,709,690.49	39.73692125	-80.75358168

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 11 HM (O)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Well:	Hillrock 11 HM (O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
10,023.00	90.37	149.870	6,563.29	-3,411.88	4,745.09	14,430,951.38	1,709,736.61	39.73669597	-80.75341842
10,118.00	89.89	150.400	6,563.08	-3,494.27	4,792.40	14,430,869.00	1,709,783.92	39.73646937	-80.75325096
10,213.00	91.38	151.190	6,562.03	-3,577.18	4,838.74	14,430,786.08	1,709,830.27	39.73624131	-80.75308690
10,308.00	90.73	150.750	6,560.28	-3,660.23	4,884.84	14,430,703.03	1,709,876.36	39.73601288	-80.75292376
10,404.00	90.37	149.870	6,559.36	-3,743.62	4,932.38	14,430,619.64	1,709,923.90	39.73578350	-80.75275545
10,498.00	89.93	152.240	6,559.11	-3,825.88	4,977.87	14,430,537.39	1,709,969.39	39.73555727	-80.75259445
10,593.00	89.41	152.680	6,559.66	-3,910.11	5,021.80	14,430,453.15	1,710,013.32	39.73532561	-80.75243904
10,688.00	88.92	153.650	6,561.04	-3,994.87	5,064.68	14,430,368.40	1,710,056.20	39.73509251	-80.75228735
10,783.00	90.11	153.910	6,561.84	-4,080.09	5,106.65	14,430,283.18	1,710,098.17	39.73485815	-80.75213889
10,878.00	89.85	153.470	6,561.88	-4,165.25	5,148.75	14,430,198.02	1,710,140.27	39.73462396	-80.75198996
10,973.00	89.58	153.300	6,562.35	-4,250.18	5,191.31	14,430,113.08	1,710,182.83	39.73439039	-80.75183941
11,067.00	89.10	153.300	6,563.43	-4,334.15	5,233.55	14,430,029.11	1,710,225.07	39.73415946	-80.75169002
11,163.00	88.70	153.120	6,565.28	-4,419.83	5,276.81	14,429,943.43	1,710,268.33	39.73392383	-80.75153688
11,257.00	88.31	152.950	6,567.73	-4,503.58	5,319.42	14,429,859.68	1,710,310.94	39.73369349	-80.75138625
11,353.00	88.53	152.770	6,570.38	-4,588.98	5,363.19	14,429,774.29	1,710,354.71	39.73345864	-80.75123139
11,448.00	88.31	152.680	6,573.00	-4,673.38	5,406.71	14,429,689.88	1,710,398.23	39.73322650	-80.75107743
11,543.00	88.04	152.950	6,576.02	-4,757.85	5,450.09	14,429,605.42	1,710,441.61	39.73299421	-80.75092396
11,637.00	87.52	152.770	6,579.66	-4,841.43	5,492.94	14,429,521.83	1,710,484.46	39.73276433	-80.75077238
11,731.00	88.75	152.860	6,582.72	-4,925.01	5,535.86	14,429,438.26	1,710,527.38	39.73253449	-80.75062054
11,826.00	90.02	150.660	6,583.74	-5,008.69	5,580.80	14,429,354.58	1,710,572.32	39.73230434	-80.75046151
11,921.00	90.51	149.870	6,583.30	-5,091.18	5,627.92	14,429,272.09	1,710,619.44	39.73207744	-80.75029473
12,015.00	90.33	149.520	6,582.61	-5,172.33	5,675.35	14,429,190.94	1,710,666.87	39.73185421	-80.75012683
12,110.00	89.85	148.990	6,582.46	-5,253.98	5,723.92	14,429,109.29	1,710,715.44	39.73162961	-80.74995490
12,205.00	91.30	149.690	6,581.51	-5,335.69	5,772.36	14,429,027.58	1,710,763.88	39.73140483	-80.74978341
12,299.00	90.86	151.010	6,579.74	-5,417.36	5,818.85	14,428,945.90	1,710,810.37	39.73118017	-80.74961886
12,394.00	90.90	151.800	6,578.28	-5,500.77	5,864.31	14,428,862.50	1,710,855.83	39.73095077	-80.74945799
12,490.00	87.87	151.980	6,579.31	-5,585.43	5,909.54	14,428,777.84	1,710,901.06	39.73071792	-80.74929797
12,585.00	87.87	151.800	6,582.84	-5,669.16	5,954.27	14,428,694.10	1,710,945.79	39.73048761	-80.74913971
12,680.00	87.30	151.450	6,586.84	-5,752.67	5,999.38	14,428,610.59	1,710,990.89	39.73025792	-80.74898011
12,773.00	89.01	152.600	6,589.84	-5,834.76	6,042.98	14,428,528.51	1,711,034.49	39.73003215	-80.74882585
12,868.00	88.57	152.330	6,591.84	-5,918.98	6,086.88	14,428,444.29	1,711,078.40	39.72980052	-80.74867052
12,963.00	90.07	151.280	6,592.97	-6,002.70	6,131.76	14,428,360.57	1,711,123.28	39.72957026	-80.74851173
13,058.00	89.80	151.100	6,593.08	-6,085.94	6,177.54	14,428,277.33	1,711,169.06	39.72934130	-80.74834973
13,153.00	88.44	151.280	6,594.54	-6,169.17	6,223.32	14,428,194.10	1,711,214.84	39.72911238	-80.74818775
13,247.00	88.09	151.190	6,597.38	-6,251.53	6,268.53	14,428,111.74	1,711,260.05	39.72888584	-80.74802776
13,342.00	89.14	151.980	6,599.68	-6,335.06	6,313.72	14,428,028.21	1,711,305.24	39.72865610	-80.74786786
13,437.00	90.73	151.720	6,599.79	-6,418.82	6,358.54	14,427,944.45	1,711,350.06	39.72842572	-80.74770930
13,532.00	89.98	152.160	6,599.20	-6,502.65	6,403.23	14,427,860.62	1,711,394.75	39.72819515	-80.74755120
13,627.00	89.58	152.240	6,599.56	-6,586.69	6,447.53	14,427,776.58	1,711,439.05	39.72796402	-80.74739446
13,722.00	89.23	151.980	6,600.55	-6,670.65	6,491.97	14,427,692.62	1,711,483.49	39.72773310	-80.74723726
13,817.00	90.81	151.280	6,600.52	-6,754.23	6,537.11	14,427,609.03	1,711,528.63	39.72750320	-80.74707755
13,912.00	89.89	150.310	6,599.94	-6,837.15	6,583.46	14,427,526.11	1,711,574.98	39.72727511	-80.74691353
14,007.00	89.45	149.340	6,600.48	-6,919.28	6,631.21	14,427,443.99	1,711,622.73	39.72704921	-80.74674453
14,102.00	89.14	152.160	6,601.65	-7,002.15	6,677.62	14,427,361.12	1,711,669.14	39.72682125	-80.74658030
14,196.00	89.45	153.390	6,602.81	-7,085.73	6,720.62	14,427,277.54	1,711,712.14	39.72659139	-80.74642820
14,291.00	89.41	154.440	6,603.75	-7,171.05	6,762.39	14,427,192.22	1,711,753.91	39.72636576	-80.74628051
14,386.00	88.92	155.060	6,605.14	-7,256.96	6,802.91	14,427,106.31	1,711,794.43	39.72612050	-80.74613726
14,481.00	90.42	154.620	6,605.69	-7,342.94	6,843.30	14,427,020.33	1,711,834.81	39.72588405	-80.74599449
14,576.00	90.11	152.070	6,605.25	-7,427.84	6,885.91	14,426,935.43	1,711,877.43	39.72565057	-80.74584378
14,670.00	89.63	152.070	6,605.46	-7,510.89	6,929.94	14,426,852.38	1,711,921.46	39.72542215	-80.74568803
14,766.00	89.41	151.980	6,606.26	-7,595.67	6,974.97	14,426,767.60	1,711,966.49	39.72518897	-80.74552873
14,861.00	88.97	152.240	6,607.61	-7,679.63	7,019.41	14,426,683.64	1,712,010.92	39.72495805	-80.74537155
14,957.00	88.53	152.240	6,609.70	-7,764.56	7,064.11	14,426,598.71	1,712,055.62	39.72472446	-80.74521342
15,052.00	89.93	152.240	6,610.98	-7,848.61	7,108.35	14,426,514.66	1,712,099.87	39.72449327	-80.74505692
15,147.00	89.71	152.070	6,611.28	-7,932.61	7,152.72	14,426,430.66	1,712,144.24	39.72426223	-80.74489996

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 11 HM (O)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+18 @ 1237.00ft (Precision 528)
Well:	Hillrock 11 HM (O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
15,242.00	89.54	152.070	6,611.90	-8,016.55	7,197.22	14,426,346.73	1,712,188.74	39.72403138	-80.74474256
15,337.00	89.01	151.980	6,613.10	-8,100.44	7,241.78	14,426,262.83	1,712,233.30	39.72380064	-80.74458494
15,432.00	90.68	152.160	6,613.36	-8,184.37	7,286.28	14,426,178.90	1,712,277.79	39.72356979	-80.74442754
15,527.00	90.29	152.070	6,612.55	-8,268.34	7,330.70	14,426,094.94	1,712,322.22	39.72333885	-80.74427038
15,622.00	90.11	151.360	6,612.22	-8,351.99	7,375.72	14,426,011.28	1,712,367.24	39.72310875	-80.74411114
15,717.00	89.93	151.190	6,612.19	-8,435.30	7,421.38	14,425,927.97	1,712,412.89	39.72287960	-80.74394961
15,810.00	89.58	150.930	6,612.59	-8,516.69	7,466.38	14,425,846.59	1,712,457.90	39.72265574	-80.74379039
15,905.00	89.41	150.220	6,613.42	-8,599.43	7,513.05	14,425,763.84	1,712,504.57	39.72242814	-80.74362526
16,000.00	89.19	149.430	6,614.58	-8,681.55	7,560.80	14,425,681.72	1,712,552.31	39.72220224	-80.74345628
16,095.00	88.97	148.990	6,616.11	-8,763.15	7,609.42	14,425,600.13	1,712,600.94	39.72197777	-80.74328419
16,190.00	88.66	148.200	6,618.07	-8,844.21	7,658.91	14,425,519.06	1,712,650.43	39.72175475	-80.74310901
16,285.00	88.88	150.490	6,620.11	-8,925.91	7,707.33	14,425,437.36	1,712,698.85	39.72153000	-80.74293763
16,380.00	88.57	150.840	6,622.23	-9,008.71	7,753.87	14,425,354.56	1,712,745.38	39.72130224	-80.74277300
16,475.00	88.31	151.280	6,624.81	-9,091.82	7,799.82	14,425,271.46	1,712,791.33	39.72107365	-80.74261043
16,570.00	87.91	151.190	6,627.95	-9,175.05	7,845.51	14,425,188.23	1,712,837.02	39.72084471	-80.74244879
16,665.00	87.65	151.540	6,631.63	-9,258.36	7,891.00	14,425,104.91	1,712,882.52	39.72061554	-80.74228785
16,760.00	87.38	152.680	6,635.75	-9,342.25	7,935.40	14,425,021.02	1,712,926.91	39.72038481	-80.74213083
16,855.00	86.77	151.890	6,640.59	-9,426.24	7,979.52	14,424,937.03	1,712,971.04	39.72015380	-80.74197477
16,868.00	86.77	151.890	6,641.33	-9,437.69	7,985.64	14,424,925.59	1,712,977.15	39.72012231	-80.74195314
Survey @ 16868.00 MD 6641.33 TVD									
16,924.00	86.77	151.890	6,644.48	-9,487.00	8,011.98	14,424,876.27	1,713,003.49	39.71998667	-80.74185996
Survey projected to 16924.00 MD 6644.48 TVD									

Design Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
186.00	186.00	-0.37	-0.61	MWD surveys
16,868.00	6,641.33	-9,437.69	7,985.64	Survey @ 16868.00 MD 6641.33 TVD
16,924.00	6,644.48	-9,487.00	8,011.98	Survey projected to 16924.00 MD 6644.48 TVD