



Well: Hillrock 09 HM (M)
Site: Hillrock/Simms
Project: Marshall County, West Virginia
Design: rev3
Rig: Precision 528

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	1418.00	0.00	0.000	1418.00	0.00	0.00	0.00	0.000	0.00	KOP Begin 2°/100' build
3	2188.31	15.41	115.399	2179.06	-44.15	92.99	2.00	115.399	88.42	Begin 15.41° tangent
4	6185.98	15.41	115.399	6033.09	-499.68	1052.36	0.00	0.000	1000.64	Begin 8°/100' build/turn
5	6645.91	50.00	142.539	6415.85	-671.67	1220.51	8.00	35.692	1237.10	Begin 10°/100' build/turn
6	7042.74	89.10	150.001	6552.00	-976.41	1420.19	10.00	11.733	1601.42	Begin 89.10° lateral
7	17386.99	89.10	150.001	6715.00	-9933.75	6591.55	0.00	0.000	1921.64	PBHL/TD 17386.99 MD/6715.00 TVD

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSec	Annotation
217.00	0.09	210.450	217.00	-0.15	-0.09	0.07	MWD surveys
17322.00	89.05	149.250	6658.84	-9883.06	6554.95	11859.15	Survey @ 17322.00 MD 6658.84 TVD
17375.00	89.05	149.250	6659.71	-9928.60	6582.04	11912.07	Survey projected to 17375.00 MD 6659.71 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)

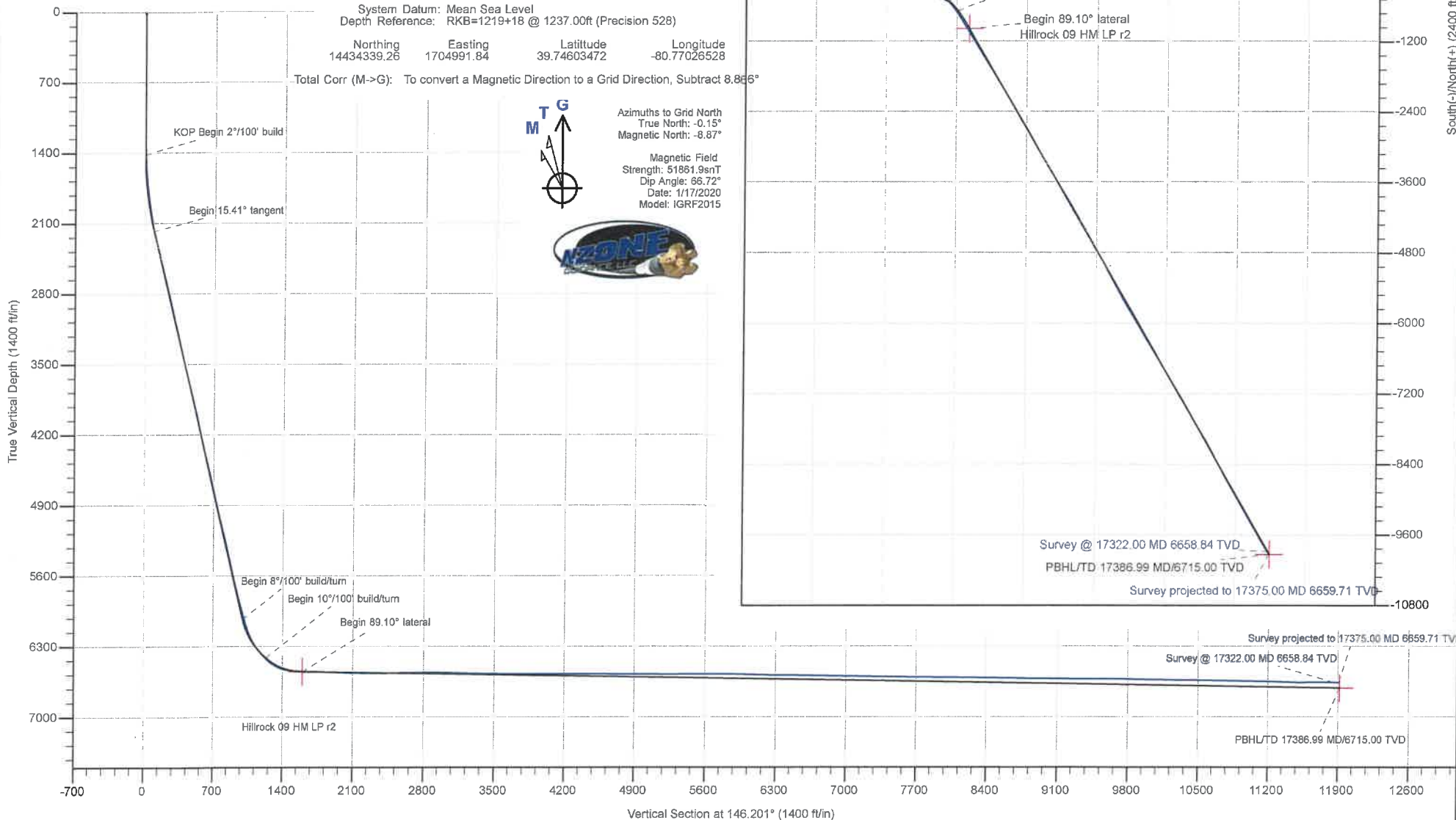
Northing: 14434339.26 Easting: 1704991.84 Latitude: 39.74603472 Longitude: -80.77026528

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.86°



Azimuths to Grid North
 True North: -0.15°
 Magnetic North: -8.87°

Magnetic Field
 Strength: 51861.9snT
 Dip Angle: 66.72°
 Date: 1/17/2020
 Model: IGRF2015



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 09 HM (M)
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 09 HM (M)	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 09 HM (M)					
Well Position	+N/-S	0.00 ft	Northing:	14,434,339.26 usft	Latitude:	39.74603472
	+E/-W	0.00 ft	Easting:	1,704,991.84 usft	Longitude:	-80.77026528
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	1/17/2020	-8.719	66.716	51,861.86239533

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	146.201	

Survey Program	Date 2/4/2020				
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
217.00	933.00	MWD surf (Original Hole)	MWD	MWD - Standard	
979.00	2,656.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,774.00	17,322.00	MWD (Original Hole)	MWD	MWD - Standard	
17,375.00	17,375.00	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	
217.00	0.09	210.450	217.00	-0.15	-0.09	0.07	0.04	0.04	0.00	
MWD surveys										
247.00	0.31	257.900	247.00	-0.18	-0.18	0.05	0.86	0.73	158.17	
292.00	0.42	90.530	292.00	-0.21	-0.13	0.10	1.61	0.24	-371.93	
338.00	0.33	234.910	338.00	-0.29	-0.07	0.20	1.55	-0.20	313.87	
383.00	0.34	225.090	383.00	-0.46	-0.27	0.23	0.13	0.02	-21.82	
429.00	0.44	151.230	429.00	-0.71	-0.28	0.43	1.03	0.22	-160.57	

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Well:	Hillrock 09 HM (M)	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)
474.00	0.03	82.550	474.00	-0.86	-0.19	0.61	0.96	-0.91	-152.62
520.00	0.25	344.640	520.00	-0.76	-0.20	0.52	0.56	0.48	-212.85
565.00	0.04	180.650	565.00	-0.68	-0.23	0.44	0.64	-0.47	-364.42
610.00	0.23	82.570	610.00	-0.69	-0.14	0.49	0.53	0.42	-217.96
655.00	0.19	241.150	655.00	-0.71	-0.12	0.53	0.92	-0.09	352.40
700.00	0.26	353.220	700.00	-0.64	-0.19	0.43	0.83	0.16	249.04
745.00	0.11	302.050	745.00	-0.52	-0.24	0.30	0.47	-0.33	-113.71
791.00	0.34	289.320	791.00	-0.45	-0.41	0.15	0.51	0.50	-27.67
836.00	0.04	89.740	836.00	-0.41	-0.52	0.05	0.84	-0.67	356.49
885.00	0.19	118.570	885.00	-0.45	-0.43	0.13	0.32	0.31	58.84
933.00	0.22	101.310	933.00	-0.50	-0.27	0.27	0.14	0.06	-35.96
979.00	0.58	114.560	978.99	-0.62	0.03	0.53	0.80	0.78	28.80
1,073.00	0.70	106.370	1,072.99	-0.98	1.01	1.37	0.16	0.13	-8.71
1,169.00	0.90	98.730	1,168.98	-1.26	2.32	2.33	0.24	0.21	-7.96
1,263.00	0.90	104.770	1,262.97	-1.56	3.76	3.39	0.10	0.00	6.43
1,357.00	1.06	98.750	1,356.95	-1.88	5.34	4.53	0.20	0.17	-6.40
1,451.00	1.12	100.520	1,450.94	-2.18	7.10	5.76	0.07	0.06	1.88
1,545.00	4.07	104.510	1,544.83	-3.18	11.23	8.89	3.14	3.14	4.24
1,641.00	7.07	108.300	1,640.37	-5.89	20.14	16.10	3.15	3.13	3.95
1,736.00	7.75	114.960	1,734.57	-10.43	31.50	26.19	1.15	0.72	7.01
1,830.00	7.93	120.700	1,827.70	-16.41	42.82	37.46	0.85	0.19	6.11
1,924.00	8.41	110.320	1,920.75	-22.11	54.84	48.88	1.65	0.51	-11.04
2,019.00	10.42	105.700	2,014.46	-26.85	69.63	61.05	2.26	2.12	-4.86
2,113.00	13.11	110.090	2,106.48	-32.81	87.83	76.13	3.01	2.86	4.67
2,208.00	15.67	116.190	2,198.50	-42.18	109.47	95.94	3.13	2.69	6.42
2,303.00	15.75	122.630	2,289.96	-54.79	131.84	118.87	1.84	0.08	6.78
2,398.00	15.28	128.630	2,381.50	-69.56	152.48	142.63	1.76	-0.49	6.32
2,493.00	14.20	121.530	2,473.38	-83.47	172.19	165.15	2.21	-1.14	-7.47
2,588.00	14.65	115.580	2,565.39	-94.75	192.96	186.08	1.63	0.47	-6.26
2,656.00	15.07	114.930	2,631.12	-102.19	208.73	201.03	0.66	0.62	-0.96
2,774.00	15.57	113.280	2,744.92	-114.92	237.19	227.44	0.56	0.42	-1.40
2,869.00	15.61	117.550	2,836.43	-125.87	260.24	249.36	1.21	0.04	4.49
2,964.00	14.91	117.000	2,928.08	-137.33	282.46	271.25	0.75	-0.74	-0.58
3,059.00	14.95	117.910	3,019.88	-148.61	304.18	292.70	0.25	0.04	0.96
3,154.00	15.28	113.030	3,111.59	-159.25	326.53	313.97	1.38	0.35	-5.14
3,248.00	14.99	114.300	3,202.33	-169.09	349.00	334.66	0.47	-0.31	1.35
3,343.00	14.68	118.360	3,294.17	-179.87	370.80	355.74	1.14	-0.33	4.27
3,437.00	14.17	111.420	3,385.21	-189.73	391.99	375.72	1.92	-0.54	-7.38
3,532.00	14.31	115.750	3,477.29	-199.08	413.39	395.39	1.13	0.15	4.56
3,626.00	15.53	115.030	3,568.12	-209.45	435.26	416.18	1.31	1.30	-0.77
3,721.00	16.90	113.340	3,659.34	-220.30	459.46	438.66	1.53	1.44	-1.78
3,815.00	16.49	118.230	3,749.39	-232.02	483.76	461.92	1.56	-0.44	5.20
3,910.00	16.99	118.900	3,840.36	-245.11	507.79	486.16	0.56	0.53	0.71

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4,004.00	15.31	117.130	3,930.65	-257.41	530.86	509.21	1.86	-1.79	-1.88
4,099.00	14.39	119.770	4,022.47	-268.99	552.27	530.75	1.20	-0.97	2.78
4,194.00	13.82	116.960	4,114.61	-279.99	572.63	551.22	0.94	-0.60	-2.96
4,289.00	14.30	114.480	4,206.77	-290.00	593.42	571.10	0.81	0.51	-2.61
4,384.00	15.95	114.620	4,298.47	-300.30	615.97	592.20	1.74	1.74	0.15
4,477.00	16.83	113.370	4,387.69	-310.96	639.94	614.40	1.02	0.95	-1.34
4,572.00	16.40	118.820	4,478.73	-322.88	664.32	637.86	1.70	-0.45	5.74
4,668.00	15.17	119.970	4,571.11	-335.69	687.07	661.17	1.32	-1.28	1.20
4,763.00	15.22	115.150	4,662.79	-347.20	709.13	683.00	1.33	0.05	-5.07
4,857.00	15.93	111.420	4,753.34	-357.16	732.31	704.17	1.31	0.76	-3.97
4,953.00	15.02	116.830	4,845.86	-367.58	755.68	725.83	1.78	-0.95	5.64
5,048.00	14.80	115.740	4,937.67	-378.41	777.59	747.02	0.38	-0.23	-1.15
5,142.00	15.64	113.210	5,028.37	-388.62	800.05	767.99	1.14	0.89	-2.69
5,236.00	17.45	111.300	5,118.47	-398.73	824.83	790.18	2.01	1.93	-2.03
5,331.00	16.70	115.040	5,209.29	-409.68	850.47	813.55	1.40	-0.79	3.94
5,427.00	14.87	116.650	5,301.67	-421.05	873.98	836.07	1.96	-1.91	1.68
5,522.00	14.58	114.580	5,393.55	-431.49	895.75	856.85	0.63	-0.31	-2.18
5,617.00	14.23	115.350	5,485.56	-441.46	917.17	877.06	0.42	-0.37	0.81
5,712.00	14.10	115.220	5,577.67	-451.39	938.19	897.01	0.14	-0.14	-0.14
5,807.00	16.09	118.070	5,669.39	-462.52	960.28	918.54	2.24	2.09	3.00
5,902.00	16.18	118.780	5,760.65	-475.09	983.50	941.90	0.23	0.09	0.75
5,997.00	18.29	117.290	5,851.38	-488.29	1,008.35	966.70	2.27	2.22	-1.57
6,044.00	17.93	115.060	5,896.05	-494.74	1,021.46	979.35	1.66	-0.77	-4.74
6,139.00	17.63	113.740	5,986.51	-506.73	1,047.87	1,004.00	0.53	-0.32	-1.39
6,233.00	18.20	132.020	6,076.02	-522.30	1,071.83	1,030.26	5.99	0.61	19.45
6,328.00	21.05	140.810	6,165.52	-545.46	1,093.64	1,061.65	4.31	3.00	9.25
6,423.00	28.79	142.300	6,251.61	-576.83	1,118.45	1,101.52	8.17	8.15	1.57
6,518.00	37.32	142.920	6,331.16	-617.98	1,149.86	1,153.19	8.99	8.98	0.65
6,596.00	42.73	142.830	6,390.87	-657.96	1,180.12	1,203.25	6.94	6.94	-0.12
6,613.00	43.74	143.620	6,403.25	-667.29	1,187.10	1,214.88	6.74	5.94	4.65
6,669.00	49.41	145.730	6,441.73	-700.48	1,210.57	1,255.51	10.49	10.13	3.77
6,708.00	54.02	146.260	6,465.89	-725.85	1,227.68	1,286.12	11.87	11.82	1.36
6,755.00	61.10	146.170	6,491.08	-758.79	1,249.73	1,325.76	15.06	15.06	-0.19
6,803.00	68.04	146.610	6,511.68	-794.88	1,273.70	1,369.08	14.48	14.46	0.92
6,850.00	74.51	149.420	6,526.77	-832.62	1,297.25	1,413.54	14.88	13.77	5.98
6,898.00	79.69	148.630	6,537.48	-872.72	1,321.32	1,460.26	10.91	10.79	-1.65
6,945.00	85.41	148.540	6,543.57	-912.47	1,345.61	1,506.80	12.17	12.17	-0.19
6,993.00	87.03	148.100	6,546.73	-953.23	1,370.76	1,554.66	3.50	3.38	-0.92
7,087.00	89.49	148.010	6,549.59	-1,032.95	1,420.47	1,648.56	2.62	2.62	-0.10
7,132.00	89.19	147.930	6,550.11	-1,071.10	1,444.33	1,693.54	0.69	-0.67	-0.18
7,183.00	88.35	148.890	6,551.20	-1,114.53	1,471.04	1,744.49	2.50	-1.65	1.88
7,277.00	87.69	148.370	6,554.45	-1,194.74	1,519.94	1,838.34	0.89	-0.70	-0.55
7,373.00	87.69	148.450	6,558.32	-1,276.45	1,570.19	1,934.19	0.08	0.00	0.08
7,467.00	86.68	148.280	6,562.94	-1,356.39	1,619.44	2,028.01	1.09	-1.07	-0.18

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7,562.00	88.26	148.890	6,567.13	-1,437.38	1,668.90	2,122.83	1.78	1.66	0.64
7,658.00	89.63	149.250	6,568.90	-1,519.71	1,718.24	2,218.70	1.48	1.43	0.38
7,753.00	90.81	148.450	6,568.53	-1,601.01	1,767.38	2,313.59	1.50	1.24	-0.84
7,848.00	91.16	147.840	6,566.90	-1,681.69	1,817.51	2,408.52	0.74	0.37	-0.64
7,942.00	90.81	148.280	6,565.28	-1,761.45	1,867.23	2,502.46	0.60	-0.37	0.47
8,037.00	91.43	150.390	6,563.43	-1,843.14	1,915.67	2,597.29	2.31	0.65	2.22
8,132.00	90.86	150.210	6,561.53	-1,925.64	1,962.73	2,692.03	0.63	-0.60	-0.19
8,226.00	90.46	149.420	6,560.44	-2,006.89	2,009.98	2,785.84	0.94	-0.43	-0.84
8,320.00	89.76	149.420	6,560.26	-2,087.82	2,057.81	2,879.69	0.74	-0.74	0.00
8,414.00	89.25	149.250	6,561.08	-2,168.67	2,105.75	2,973.54	0.57	-0.54	-0.18
8,509.00	88.04	149.160	6,563.32	-2,250.25	2,154.37	3,068.38	1.28	-1.27	-0.09
8,604.00	88.13	148.720	6,566.50	-2,331.59	2,203.35	3,163.22	0.47	0.09	-0.46
8,699.00	87.47	148.540	6,570.14	-2,412.64	2,252.77	3,258.07	0.72	-0.69	-0.19
8,795.00	89.27	149.860	6,572.87	-2,495.06	2,301.90	3,353.89	2.32	1.88	1.38
8,889.00	89.23	150.040	6,574.11	-2,576.42	2,348.97	3,447.68	0.20	-0.04	0.19
8,984.00	89.98	150.300	6,574.76	-2,658.83	2,396.23	3,542.45	0.84	0.79	0.27
9,079.00	89.32	149.950	6,575.34	-2,741.20	2,443.54	3,637.22	0.79	-0.69	-0.37
9,174.00	90.42	150.560	6,575.56	-2,823.68	2,490.68	3,731.98	1.32	1.16	0.64
9,269.00	89.71	150.040	6,575.45	-2,906.20	2,537.74	3,826.74	0.93	-0.75	-0.55
9,364.00	90.73	150.650	6,575.08	-2,988.76	2,584.75	3,921.49	1.25	1.07	0.64
9,458.00	90.20	149.950	6,574.32	-3,070.41	2,631.32	4,015.24	0.93	-0.56	-0.74
9,554.00	89.85	150.650	6,574.28	-3,153.79	2,678.88	4,111.00	0.82	-0.36	0.73
9,648.00	89.45	151.180	6,574.85	-3,235.94	2,724.57	4,204.68	0.71	-0.43	0.56
9,744.00	91.56	150.480	6,574.01	-3,319.75	2,771.36	4,300.35	2.32	2.20	-0.73
9,839.00	90.86	150.560	6,572.00	-3,402.44	2,818.10	4,395.06	0.74	-0.74	0.08
9,934.00	88.97	148.280	6,572.14	-3,484.21	2,866.43	4,489.90	3.12	-1.99	-2.40
10,028.00	88.40	148.280	6,574.30	-3,564.15	2,915.84	4,583.82	0.61	-0.61	0.00
10,122.00	89.76	148.630	6,575.81	-3,644.25	2,965.01	4,677.73	1.49	1.45	0.37
10,217.00	89.89	148.630	6,576.10	-3,725.36	3,014.46	4,772.64	0.14	0.14	0.00
10,312.00	89.67	148.810	6,576.46	-3,806.55	3,063.78	4,867.55	0.30	-0.23	0.19
10,406.00	89.71	149.070	6,576.97	-3,887.07	3,112.28	4,961.44	0.28	0.04	0.28
10,501.00	89.49	148.890	6,577.63	-3,968.49	3,161.24	5,056.33	0.30	-0.23	-0.19
10,596.00	89.98	150.390	6,578.07	-4,050.45	3,209.25	5,151.15	1.66	0.52	1.58
10,690.00	89.80	150.040	6,578.25	-4,132.04	3,255.95	5,244.92	0.42	-0.19	-0.37
10,785.00	90.46	150.650	6,578.04	-4,214.59	3,302.95	5,339.67	0.95	0.69	0.64
10,881.00	90.11	151.090	6,577.56	-4,298.45	3,349.68	5,435.35	0.59	-0.36	0.46
10,976.00	90.07	150.650	6,577.41	-4,381.43	3,395.92	5,530.04	0.47	-0.04	-0.46
11,071.00	89.49	150.480	6,577.78	-4,464.17	3,442.61	5,624.76	0.64	-0.61	-0.18
11,164.00	90.51	151.350	6,577.78	-4,545.44	3,487.82	5,717.44	1.44	1.10	0.94
11,259.00	90.42	151.180	6,577.01	-4,628.74	3,533.49	5,812.07	0.20	-0.09	-0.18
11,354.00	88.79	150.830	6,577.66	-4,711.82	3,579.54	5,906.73	1.75	-1.72	-0.37
11,449.00	88.66	150.040	6,579.78	-4,794.43	3,626.40	6,001.45	0.84	-0.14	-0.83
11,544.00	88.62	151.000	6,582.03	-4,877.11	3,673.13	6,096.15	1.01	-0.04	1.01

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 09 HM (M)
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 09 HM (M)	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)
11,638.00	88.31	151.180	6,584.55	-4,959.37	3,718.56	6,189.77	0.38	-0.33	0.19
11,733.00	89.71	151.180	6,586.19	-5,042.58	3,764.35	6,284.40	1.47	1.47	0.00
11,828.00	89.27	151.620	6,587.03	-5,125.99	3,809.82	6,379.00	0.65	-0.46	0.46
11,923.00	88.35	152.230	6,589.01	-5,209.79	3,854.52	6,473.51	1.16	-0.97	0.64
12,018.00	89.98	151.270	6,590.39	-5,293.46	3,899.48	6,568.05	1.99	1.72	-1.01
12,113.00	89.67	150.740	6,590.68	-5,376.56	3,945.53	6,662.71	0.65	-0.33	-0.56
12,208.00	88.66	150.830	6,592.07	-5,459.46	3,991.89	6,757.40	1.07	-1.06	0.09
12,303.00	87.96	151.530	6,594.87	-5,542.66	4,037.67	6,852.00	1.04	-0.74	0.74
12,398.00	89.36	150.040	6,597.09	-5,625.55	4,084.02	6,946.66	2.15	1.47	-1.57
12,493.00	88.84	150.390	6,598.58	-5,707.98	4,131.21	7,041.42	0.66	-0.55	0.37
12,587.00	89.58	149.860	6,599.88	-5,789.48	4,178.02	7,135.19	0.97	0.79	-0.56
12,682.00	89.27	149.510	6,600.83	-5,871.49	4,225.97	7,230.00	0.49	-0.33	-0.37
12,777.00	89.10	149.070	6,602.18	-5,953.16	4,274.48	7,324.86	0.50	-0.18	-0.46
12,872.00	89.63	148.370	6,603.24	-6,034.34	4,323.81	7,419.76	0.92	0.56	-0.74
12,967.00	89.23	149.070	6,604.18	-6,115.53	4,373.13	7,514.66	0.85	-0.42	0.74
13,061.00	89.05	149.160	6,605.59	-6,196.19	4,421.38	7,608.53	0.21	-0.19	0.10
13,157.00	88.75	149.510	6,607.43	-6,278.75	4,470.33	7,704.37	0.48	-0.31	0.36
13,252.00	88.57	150.040	6,609.66	-6,360.82	4,518.14	7,799.16	0.59	-0.19	0.56
13,348.00	90.59	148.370	6,610.36	-6,443.27	4,567.28	7,895.01	2.73	2.10	-1.74
13,443.00	90.33	148.450	6,609.60	-6,524.19	4,617.04	7,989.94	0.29	-0.27	0.08
13,538.00	89.98	148.890	6,609.34	-6,605.34	4,666.44	8,084.85	0.59	-0.37	0.46
13,633.00	89.54	149.070	6,609.74	-6,686.75	4,715.40	8,179.74	0.50	-0.46	0.19
13,728.00	89.14	149.600	6,610.83	-6,768.46	4,763.85	8,274.59	0.70	-0.42	0.56
13,823.00	87.87	149.510	6,613.31	-6,850.33	4,811.97	8,369.39	1.34	-1.34	-0.09
13,917.00	90.07	148.720	6,615.00	-6,930.98	4,860.21	8,463.25	2.49	2.34	-0.84
14,012.00	89.98	148.810	6,614.96	-7,012.21	4,909.47	8,558.15	0.13	-0.09	0.09
14,106.00	89.23	149.420	6,615.61	-7,092.88	4,957.72	8,652.03	1.03	-0.80	0.65
14,201.00	87.96	149.770	6,617.94	-7,174.79	5,005.78	8,746.83	1.39	-1.34	0.37
14,296.00	89.36	150.300	6,620.16	-7,257.07	5,053.22	8,841.59	1.58	1.47	0.56
14,391.00	88.84	150.740	6,621.65	-7,339.75	5,099.96	8,936.31	0.72	-0.55	0.46
14,486.00	88.35	150.560	6,623.98	-7,422.54	5,146.51	9,030.99	0.55	-0.52	-0.19
14,581.00	90.24	150.390	6,625.15	-7,505.19	5,193.32	9,125.72	2.00	1.99	-0.18
14,676.00	89.76	150.390	6,625.15	-7,587.78	5,240.26	9,220.46	0.51	-0.51	0.00
14,771.00	89.01	150.830	6,626.17	-7,670.55	5,286.88	9,315.18	0.92	-0.79	0.46
14,866.00	90.77	149.510	6,626.35	-7,752.96	5,334.13	9,409.94	2.32	1.85	-1.39
14,961.00	90.24	148.980	6,625.51	-7,834.59	5,382.71	9,504.80	0.79	-0.56	-0.56
15,056.00	89.89	148.010	6,625.41	-7,915.59	5,432.36	9,599.73	1.09	-0.37	-1.02
15,151.00	89.27	147.750	6,626.10	-7,996.05	5,482.86	9,694.68	0.71	-0.65	-0.27
15,245.00	89.01	150.920	6,627.51	-8,076.88	5,530.79	9,788.52	3.38	-0.28	3.37
15,340.00	88.40	151.790	6,629.66	-8,160.23	5,576.32	9,883.11	1.12	-0.64	0.92
15,435.00	88.18	151.790	6,632.50	-8,243.91	5,621.21	9,977.62	0.23	-0.23	0.00
15,530.00	89.98	151.530	6,634.02	-8,327.51	5,666.30	10,072.17	1.91	1.89	-0.27
15,624.00	89.63	151.530	6,634.34	-8,410.14	5,711.11	10,165.76	0.37	-0.37	0.00

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 09 HM (M)
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 09 HM (M)	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)
15,719.00	88.70	152.060	6,635.72	-8,493.85	5,756.00	10,260.30	1.13	-0.98	0.56
15,814.00	89.89	150.830	6,636.89	-8,577.29	5,801.41	10,354.89	1.80	1.25	-1.29
15,908.00	89.41	150.300	6,637.47	-8,659.15	5,847.60	10,448.61	0.76	-0.51	-0.56
16,002.00	88.75	148.890	6,638.98	-8,740.21	5,895.17	10,542.43	1.66	-0.70	-1.50
16,095.00	88.26	149.770	6,641.40	-8,820.17	5,942.59	10,635.26	1.08	-0.53	0.95
16,191.00	89.67	150.300	6,643.14	-8,903.32	5,990.53	10,731.03	1.57	1.47	0.55
16,285.00	89.10	150.740	6,644.15	-8,985.15	6,036.79	10,824.76	0.77	-0.61	0.47
16,380.00	88.62	151.530	6,646.04	-9,068.33	6,082.64	10,919.38	0.97	-0.51	0.83
16,475.00	90.20	150.830	6,647.02	-9,151.55	6,128.43	11,014.02	1.82	1.66	-0.74
16,570.00	89.45	150.560	6,647.31	-9,234.39	6,174.93	11,108.72	0.84	-0.79	-0.28
16,665.00	88.48	149.770	6,649.02	-9,316.79	6,222.18	11,203.48	1.32	-1.02	-0.83
16,760.00	87.96	149.770	6,651.97	-9,398.83	6,269.99	11,298.25	0.55	-0.55	0.00
16,855.00	87.47	150.480	6,655.76	-9,481.14	6,317.27	11,392.95	0.91	-0.52	0.75
16,949.00	89.23	148.280	6,658.47	-9,561.99	6,365.13	11,486.76	3.00	1.87	-2.34
17,044.00	90.55	149.510	6,658.65	-9,643.33	6,414.20	11,581.65	1.90	1.39	1.29
17,139.00	90.29	149.420	6,657.95	-9,725.15	6,462.47	11,676.49	0.29	-0.27	-0.09
17,233.00	89.76	149.950	6,657.91	-9,806.30	6,509.91	11,770.32	0.80	-0.56	0.56
17,322.00	89.05	149.250	6,658.84	-9,883.06	6,554.95	11,859.15	1.12	-0.80	-0.79
Survey @ 17322.00 MD 6658.84 TVD									
17,375.00	89.05	149.250	6,659.71	-9,928.60	6,582.04	11,912.07	0.00	0.00	0.00
Survey projected to 17375.00 MD 6659.71 TVD									

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
217.00	217.00	-0.15	-0.09	MWD surveys
17,322.00	6,658.84	-9,883.06	6,554.95	Survey @ 17322.00 MD 6658.84 TVD

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 09 HM (M)
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 09 HM (M)	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 09 HM (M)					
Well Position	+N/-S	0.00 ft	Northing:	14,434,339.26 usft	Latitude:	39.74603472
	+E/-W	0.00 ft	Easting:	1,704,991.84 usft	Longitude:	-80.77026528
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	1/17/2020	-8.719	66.716	51,861.86239533

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	146.201	

Survey Program	Date 2/4/2020				
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
217.00	933.00	MWD surf (Original Hole)	MWD	MWD - Standard	
979.00	2,656.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,774.00	17,322.00	MWD (Original Hole)	MWD	MWD - Standard	
17,375.00	17,375.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey										
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	14,434,339.26	1,704,991.84	39.74603472	-80.77026528	
217.00	0.09	210.450	217.00	-0.15	-0.09	14,434,339.12	1,704,991.75	39.74603432	-80.77026559	
MWD surveys										
247.00	0.31	257.900	247.00	-0.18	-0.18	14,434,339.08	1,704,991.66	39.74603422	-80.77026591	
292.00	0.42	90.530	292.00	-0.21	-0.13	14,434,339.05	1,704,991.71	39.74603414	-80.77026575	
338.00	0.33	234.910	338.00	-0.29	-0.07	14,434,338.97	1,704,991.77	39.74603393	-80.77026554	
383.00	0.34	225.090	383.00	-0.46	-0.27	14,434,338.81	1,704,991.56	39.74603347	-80.77026625	
429.00	0.44	151.230	429.00	-0.71	-0.28	14,434,338.55	1,704,991.55	39.74603278	-80.77026630	
474.00	0.03	82.550	474.00	-0.86	-0.19	14,434,338.40	1,704,991.65	39.74603236	-80.77026596	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 09 HM (M)
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 09 HM (M)	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)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
520.00	0.25	344.640	520.00	-0.76	-0.20	14,434,338.50	1,704,991.63	39.74603263	-80.77026601
565.00	0.04	180.650	565.00	-0.68	-0.23	14,434,338.58	1,704,991.61	39.74603285	-80.77026610
610.00	0.23	82.570	610.00	-0.69	-0.14	14,434,338.58	1,704,991.70	39.74603284	-80.77026579
655.00	0.19	241.150	655.00	-0.71	-0.12	14,434,338.55	1,704,991.72	39.74603277	-80.77026570
700.00	0.26	353.220	700.00	-0.64	-0.19	14,434,338.62	1,704,991.64	39.74603295	-80.77026598
745.00	0.11	302.050	745.00	-0.52	-0.24	14,434,338.74	1,704,991.59	39.74603329	-80.77026615
791.00	0.34	289.320	791.00	-0.45	-0.41	14,434,338.81	1,704,991.43	39.74603348	-80.77026674
836.00	0.04	89.740	836.00	-0.41	-0.52	14,434,338.86	1,704,991.32	39.74603361	-80.77026713
885.00	0.19	118.570	885.00	-0.45	-0.43	14,434,338.82	1,704,991.41	39.74603350	-80.77026682
933.00	0.22	101.310	933.00	-0.50	-0.27	14,434,338.76	1,704,991.57	39.74603334	-80.77026625
979.00	0.58	114.560	978.99	-0.62	0.03	14,434,338.65	1,704,991.87	39.74603303	-80.77026519
1,073.00	0.70	106.370	1,072.99	-0.98	1.01	14,434,338.29	1,704,992.85	39.74603203	-80.77026169
1,169.00	0.90	98.730	1,168.98	-1.26	2.32	14,434,338.01	1,704,994.16	39.74603126	-80.77025704
1,263.00	0.90	104.770	1,262.97	-1.56	3.76	14,434,337.71	1,704,995.60	39.74603042	-80.77025191
1,357.00	1.06	98.750	1,356.95	-1.88	5.34	14,434,337.39	1,704,997.17	39.74602953	-80.77024631
1,451.00	1.12	100.520	1,450.94	-2.18	7.10	14,434,337.09	1,704,998.94	39.74602869	-80.77024004
1,545.00	4.07	104.510	1,544.83	-3.18	11.23	14,434,336.08	1,705,003.07	39.74602591	-80.77022535
1,641.00	7.07	108.300	1,640.37	-5.89	20.14	14,434,333.37	1,705,011.98	39.74601841	-80.77019368
1,736.00	7.75	114.960	1,734.57	-10.43	31.50	14,434,328.84	1,705,023.34	39.74600586	-80.77015331
1,830.00	7.93	120.700	1,827.70	-16.41	42.82	14,434,322.85	1,705,034.66	39.74598934	-80.77011309
1,924.00	8.41	110.320	1,920.75	-22.11	54.84	14,434,317.15	1,705,046.68	39.74597361	-80.77007037
2,019.00	10.42	105.700	2,014.46	-26.85	69.63	14,434,312.41	1,705,061.47	39.74596050	-80.77001781
2,113.00	13.11	110.090	2,106.48	-32.81	87.83	14,434,306.45	1,705,079.67	39.74594399	-80.76995311
2,208.00	15.67	116.190	2,198.50	-42.18	109.47	14,434,297.09	1,705,101.30	39.74591812	-80.76987623
2,303.00	15.75	122.630	2,289.96	-54.79	131.84	14,434,284.47	1,705,123.68	39.74588331	-80.76979675
2,398.00	15.28	128.630	2,381.50	-69.56	152.48	14,434,269.70	1,705,144.31	39.74584261	-80.76972346
2,493.00	14.20	121.530	2,473.38	-83.47	172.19	14,434,255.79	1,705,164.03	39.74580427	-80.76965346
2,588.00	14.65	115.580	2,565.39	-94.75	192.96	14,434,244.51	1,705,184.80	39.74577314	-80.76957967
2,656.00	15.07	114.930	2,631.12	-102.19	208.73	14,434,237.07	1,705,200.57	39.74575260	-80.76952363
2,774.00	15.57	113.280	2,744.92	-114.92	237.19	14,434,224.35	1,705,229.03	39.74571746	-80.76942250
2,869.00	15.61	117.550	2,836.43	-125.87	260.24	14,434,213.40	1,705,252.07	39.74568722	-80.76934062
2,964.00	14.91	117.000	2,928.08	-137.33	282.46	14,434,201.94	1,705,274.29	39.74565559	-80.76926167
3,059.00	14.95	117.910	3,019.88	-148.61	304.18	14,434,190.65	1,705,296.01	39.74562444	-80.76918451
3,154.00	15.28	113.030	3,111.59	-159.25	326.53	14,434,180.02	1,705,318.36	39.74559508	-80.76910509
3,248.00	14.99	114.300	3,202.33	-169.09	349.00	14,434,170.17	1,705,340.84	39.74556788	-80.76902521
3,343.00	14.68	118.360	3,294.17	-179.87	370.80	14,434,159.40	1,705,362.63	39.74553813	-80.76894779
3,437.00	14.17	111.420	3,385.21	-189.73	391.99	14,434,149.54	1,705,383.83	39.74551090	-80.76887248
3,532.00	14.31	115.750	3,477.29	-199.08	413.39	14,434,140.19	1,705,405.23	39.74548508	-80.76879644
3,626.00	15.53	115.030	3,568.12	-209.45	435.26	14,434,129.82	1,705,427.09	39.74545644	-80.76871874
3,721.00	16.90	113.340	3,659.34	-220.30	459.46	14,434,118.96	1,705,451.29	39.74542647	-80.76863274
3,815.00	16.49	118.230	3,749.39	-232.02	483.76	14,434,107.24	1,705,475.59	39.74539410	-80.76854639
3,910.00	16.99	118.900	3,840.36	-245.11	507.79	14,434,094.15	1,705,499.63	39.74535799	-80.76846102
4,004.00	15.31	117.130	3,930.65	-257.41	530.86	14,434,081.86	1,705,522.69	39.74532406	-80.76837906
4,099.00	14.39	119.770	4,022.47	-268.99	552.27	14,434,070.28	1,705,544.10	39.74529210	-80.76830301
4,194.00	13.82	116.960	4,114.61	-279.99	572.63	14,434,059.27	1,705,564.46	39.74526173	-80.76823067
4,289.00	14.30	114.480	4,206.77	-290.00	593.42	14,434,049.27	1,705,585.26	39.74523410	-80.76815680
4,384.00	15.95	114.620	4,298.47	-300.30	615.97	14,434,038.96	1,705,607.80	39.74520566	-80.76807669
4,477.00	16.83	113.370	4,387.69	-310.96	639.94	14,434,028.30	1,705,631.78	39.74517620	-80.76799149
4,572.00	16.40	118.820	4,478.73	-322.88	664.32	14,434,016.38	1,705,656.15	39.74514329	-80.76790488
4,668.00	15.17	119.970	4,571.11	-335.69	687.07	14,434,003.57	1,705,678.91	39.74510795	-80.76782404
4,763.00	15.22	115.150	4,662.79	-347.20	709.13	14,433,992.06	1,705,700.97	39.74507618	-80.76774568
4,857.00	15.93	111.420	4,753.34	-357.16	732.31	14,433,982.11	1,705,724.14	39.74504868	-80.76766331
4,953.00	15.02	116.830	4,845.86	-367.58	755.68	14,433,971.68	1,705,747.51	39.74501988	-80.76758028
5,048.00	14.80	115.740	4,937.67	-378.41	777.59	14,433,960.85	1,705,769.43	39.74498999	-80.76750242
5,142.00	15.64	113.210	5,028.37	-388.62	800.05	14,433,950.65	1,705,791.89	39.74496180	-80.76742261



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 09 HM (M)
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 09 HM (M)	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	
5,236.00	17.45	111.300	5,118.47	-398.73	824.83	14,433,940.53	1,705,816.67	39.74493385	-80.76733455	
5,331.00	16.70	115.040	5,209.29	-409.68	850.47	14,433,929.58	1,705,842.30	39.74490359	-80.76724344	
5,427.00	14.87	116.650	5,301.67	-421.05	873.98	14,433,918.22	1,705,865.81	39.74487221	-80.76715991	
5,522.00	14.58	114.580	5,393.55	-431.49	895.75	14,433,907.78	1,705,887.58	39.74484338	-80.76708257	
5,617.00	14.23	115.350	5,485.56	-441.46	917.17	14,433,897.80	1,705,909.01	39.74481584	-80.76700644	
5,712.00	14.10	115.220	5,577.67	-451.39	938.19	14,433,887.87	1,705,930.03	39.74478842	-80.76693175	
5,807.00	16.09	118.070	5,669.39	-462.52	960.28	14,433,876.75	1,705,952.11	39.74475770	-80.76685327	
5,902.00	16.18	118.780	5,760.65	-475.09	983.50	14,433,864.18	1,705,975.33	39.74472302	-80.76677079	
5,997.00	18.29	117.290	5,851.38	-488.29	1,008.35	14,433,850.97	1,706,000.18	39.74468657	-80.76668251	
6,044.00	17.93	115.060	5,896.05	-494.74	1,021.46	14,433,844.52	1,706,013.29	39.74466878	-80.76663593	
6,139.00	17.63	113.740	5,986.51	-506.73	1,047.87	14,433,832.54	1,706,039.71	39.74463567	-80.76654207	
6,233.00	18.20	132.020	6,076.02	-522.30	1,071.83	14,433,816.97	1,706,063.66	39.74459274	-80.76645699	
6,328.00	21.05	140.810	6,165.52	-545.46	1,093.64	14,433,793.81	1,706,085.47	39.74452897	-80.76637961	
6,423.00	28.79	142.300	6,251.61	-576.83	1,118.45	14,433,762.43	1,706,110.28	39.74444264	-80.76629165	
6,518.00	37.32	142.920	6,331.16	-617.98	1,149.86	14,433,721.28	1,706,141.69	39.74432940	-80.76618029	
6,596.00	42.73	142.830	6,390.87	-657.96	1,180.12	14,433,681.30	1,706,171.96	39.74421938	-80.76607298	
6,613.00	43.74	143.620	6,403.25	-667.29	1,187.10	14,433,671.98	1,706,178.93	39.74419372	-80.76604827	
6,669.00	49.41	145.730	6,441.73	-700.48	1,210.57	14,433,638.79	1,706,202.41	39.74410241	-80.76590442	
6,708.00	54.02	146.260	6,465.89	-725.85	1,227.68	14,433,613.42	1,706,219.52	39.74403261	-80.76596506	
6,755.00	61.10	146.170	6,491.08	-758.79	1,249.73	14,433,580.47	1,706,241.56	39.74394197	-80.76582631	
6,803.00	68.04	146.610	6,511.68	-794.88	1,273.70	14,433,544.39	1,706,265.54	39.74384270	-80.76574135	
6,850.00	74.51	149.420	6,526.77	-832.62	1,297.25	14,433,506.65	1,706,289.08	39.74373889	-80.76565794	
6,898.00	79.69	148.630	6,537.48	-872.72	1,321.32	14,433,466.55	1,706,313.16	39.74362859	-80.76557266	
6,945.00	85.41	148.540	6,543.57	-912.47	1,345.61	14,433,426.79	1,706,337.44	39.74351923	-80.76548665	
6,993.00	87.03	148.100	6,546.73	-953.23	1,370.76	14,433,386.03	1,706,362.59	39.74340712	-80.76539755	
7,087.00	89.49	148.010	6,549.59	-1,032.95	1,420.47	14,433,306.31	1,706,412.30	39.74318783	-80.76522146	
7,132.00	89.19	147.930	6,550.11	-1,071.10	1,444.33	14,433,268.17	1,706,436.17	39.74308289	-80.76513692	
7,183.00	88.35	148.890	6,551.20	-1,114.53	1,471.04	14,433,224.73	1,706,462.87	39.74296342	-80.76504231	
7,277.00	87.69	148.370	6,554.45	-1,194.74	1,519.94	14,433,144.52	1,706,511.78	39.74274279	-80.76486908	
7,373.00	87.69	148.450	6,558.32	-1,276.45	1,570.19	14,433,062.82	1,706,562.03	39.74251803	-80.76469110	
7,467.00	86.68	148.280	6,562.94	-1,356.39	1,619.44	14,432,982.88	1,706,611.27	39.74229815	-80.76451666	
7,562.00	88.26	148.890	6,567.13	-1,437.38	1,668.90	14,432,901.89	1,706,660.74	39.74207537	-80.76434145	
7,658.00	89.63	149.250	6,568.90	-1,519.71	1,718.24	14,432,819.56	1,706,710.07	39.74184890	-80.76416672	
7,753.00	90.81	148.450	6,568.53	-1,601.01	1,767.38	14,432,738.26	1,706,759.21	39.74162528	-80.76391510	
7,848.00	91.16	147.840	6,566.90	-1,681.69	1,817.51	14,432,657.58	1,706,809.34	39.74140334	-80.76379267	
7,942.00	90.81	148.280	6,565.28	-1,761.45	1,867.23	14,432,577.82	1,706,859.06	39.74118395	-80.76363897	
8,037.00	91.43	150.390	6,563.43	-1,843.14	1,915.67	14,432,496.13	1,706,907.50	39.74095924	-80.76346742	
8,132.00	90.86	150.210	6,561.53	-1,925.64	1,962.73	14,432,413.62	1,706,954.56	39.74073232	-80.76330079	
8,226.00	90.46	149.420	6,560.44	-2,006.89	2,009.98	14,432,332.38	1,707,001.82	39.74050885	-80.76313344	
8,320.00	89.76	149.420	6,560.26	-2,087.82	2,057.81	14,432,251.45	1,707,049.64	39.74028626	-80.76296408	
8,414.00	89.25	149.250	6,561.08	-2,168.67	2,105.75	14,432,170.60	1,707,097.58	39.74006386	-80.76279431	
8,509.00	88.04	149.160	6,563.32	-2,250.25	2,154.37	14,432,089.02	1,707,146.20	39.73983947	-80.76262211	
8,604.00	88.13	148.720	6,566.50	-2,331.59	2,203.35	14,432,007.68	1,707,195.19	39.73961574	-80.76244862	
8,699.00	87.47	148.540	6,570.14	-2,412.64	2,252.77	14,431,926.63	1,707,244.60	39.73939279	-80.76227360	
8,795.00	89.27	149.860	6,572.87	-2,495.06	2,301.90	14,431,844.21	1,707,293.74	39.73916608	-80.76209960	
8,889.00	89.23	150.040	6,574.11	-2,576.42	2,348.97	14,431,762.85	1,707,340.80	39.73894230	-80.76193294	
8,984.00	89.98	150.300	6,574.76	-2,658.83	2,396.23	14,431,680.44	1,707,388.06	39.73871563	-80.76176562	
9,079.00	89.32	149.950	6,575.34	-2,741.20	2,443.54	14,431,598.07	1,707,435.38	39.73848906	-80.76159808	
9,174.00	90.42	150.560	6,575.56	-2,823.68	2,490.68	14,431,515.59	1,707,482.51	39.73826220	-80.76143120	
9,269.00	89.71	150.040	6,575.45	-2,906.20	2,537.74	14,431,433.07	1,707,529.58	39.73803524	-80.76126455	
9,364.00	90.73	150.650	6,575.08	-2,988.76	2,584.75	14,431,350.51	1,707,576.58	39.73780817	-80.76109814	
9,458.00	90.20	149.950	6,574.32	-3,070.41	2,631.32	14,431,268.86	1,707,623.15	39.73758360	-80.76093325	
9,554.00	89.85	150.650	6,574.28	-3,153.79	2,678.88	14,431,185.48	1,707,670.71	39.73735425	-80.76076485	
9,648.00	89.45	151.180	6,574.85	-3,235.94	2,724.57	14,431,103.33	1,707,716.41	39.73712832	-80.76060310	
9,744.00	91.56	150.480	6,574.01	-3,319.75	2,771.36	14,431,019.52	1,707,763.19	39.73689779	-80.76043747	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 09 HM (M)
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 09 HM (M)	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
9,839.00	90.86	150.560	6,572.00	-3,402.44	2,818.10	14,430,936.83	1,707,809.93	39.73667038	-80.76027199
9,934.00	88.97	148.280	6,572.14	-3,484.21	2,866.43	14,430,855.06	1,707,858.26	39.73644544	-80.76010087
10,028.00	88.40	148.280	6,574.30	-3,564.15	2,915.84	14,430,775.12	1,707,907.67	39.73622555	-80.75992588
10,122.00	89.76	148.630	6,575.81	-3,644.25	2,965.01	14,430,695.02	1,707,956.84	39.73600521	-80.75975174
10,217.00	89.89	148.630	6,576.10	-3,725.36	3,014.46	14,430,613.91	1,708,006.29	39.73578209	-80.75957661
10,312.00	89.67	148.810	6,576.46	-3,806.55	3,063.78	14,430,532.72	1,708,055.61	39.73555876	-80.75940193
10,406.00	89.71	149.070	6,576.97	-3,887.07	3,112.28	14,430,452.20	1,708,104.11	39.73533726	-80.75923019
10,501.00	89.49	148.890	6,577.63	-3,968.49	3,161.24	14,430,370.79	1,708,153.07	39.73511332	-80.75905683
10,596.00	89.98	150.390	6,578.07	-4,050.45	3,209.25	14,430,288.82	1,708,201.08	39.73488786	-80.75888683
10,690.00	89.80	150.040	6,578.25	-4,132.04	3,255.95	14,430,207.24	1,708,247.78	39.73466346	-80.75872152
10,785.00	90.46	150.650	6,578.04	-4,214.59	3,302.95	14,430,124.68	1,708,294.78	39.73443639	-80.75855512
10,881.00	90.11	151.090	6,577.56	-4,298.45	3,349.68	14,430,040.82	1,708,341.51	39.73420575	-80.75838970
10,976.00	90.07	150.650	6,577.41	-4,381.43	3,395.92	14,429,957.84	1,708,387.75	39.73397751	-80.75822600
11,071.00	89.49	150.480	6,577.78	-4,464.17	3,442.61	14,429,875.10	1,708,434.44	39.73374995	-80.75806074
11,164.00	90.51	151.350	6,577.78	-4,545.44	3,487.82	14,429,793.83	1,708,479.65	39.73352642	-80.75790072
11,259.00	90.42	151.180	6,577.01	-4,628.74	3,533.49	14,429,710.54	1,708,525.32	39.73329732	-80.75773907
11,354.00	88.79	150.830	6,577.66	-4,711.82	3,579.54	14,429,627.45	1,708,571.36	39.73306880	-80.75757608
11,449.00	88.66	150.040	6,579.78	-4,794.43	3,626.40	14,429,544.84	1,708,618.23	39.73284158	-80.75741019
11,544.00	88.62	151.000	6,582.03	-4,877.11	3,673.13	14,429,462.16	1,708,664.96	39.73261418	-80.75724475
11,638.00	88.31	151.180	6,584.55	-4,959.37	3,718.56	14,429,379.91	1,708,710.39	39.73238794	-80.75708396
11,733.00	89.71	151.180	6,586.19	-5,042.58	3,764.35	14,429,296.69	1,708,756.18	39.73215906	-80.75692190
11,828.00	89.27	151.620	6,587.03	-5,125.99	3,809.82	14,429,213.28	1,708,801.65	39.73192967	-80.75676096
11,923.00	88.35	152.230	6,589.01	-5,209.79	3,854.52	14,429,129.48	1,708,846.35	39.73169919	-80.75660278
12,018.00	89.98	151.270	6,590.39	-5,293.46	3,899.48	14,429,045.81	1,708,891.31	39.73146907	-80.75644368
12,113.00	89.67	150.740	6,590.68	-5,376.56	3,945.53	14,428,962.72	1,708,937.36	39.73124053	-80.75628070
12,208.00	88.66	150.830	6,592.07	-5,459.46	3,991.89	14,428,879.81	1,708,983.72	39.73101250	-80.75611659
12,303.00	87.96	151.530	6,594.87	-5,542.66	4,037.67	14,428,796.62	1,709,029.50	39.73078368	-80.75595458
12,398.00	89.36	150.040	6,597.09	-5,625.55	4,084.02	14,428,713.73	1,709,075.85	39.73055569	-80.75579052
12,493.00	88.84	150.390	6,598.58	-5,707.98	4,131.21	14,428,631.29	1,709,123.04	39.73032894	-80.75562349
12,587.00	89.58	149.860	6,599.88	-5,789.48	4,178.02	14,428,549.79	1,709,169.85	39.73010477	-80.75545776
12,682.00	89.27	149.510	6,600.83	-5,871.49	4,225.97	14,428,467.78	1,709,217.80	39.72987919	-80.75528801
12,777.00	89.10	149.070	6,602.18	-5,953.16	4,274.48	14,428,386.12	1,709,266.31	39.72965454	-80.75511626
12,872.00	89.63	148.370	6,603.24	-6,034.34	4,323.81	14,428,304.93	1,709,315.63	39.72943122	-80.75494163
12,967.00	89.23	149.070	6,604.18	-6,115.53	4,373.13	14,428,223.75	1,709,364.96	39.72920788	-80.75476699
13,061.00	89.05	149.160	6,605.59	-6,196.19	4,421.38	14,428,143.08	1,709,413.20	39.72898600	-80.75459617
13,157.00	88.75	149.510	6,607.43	-6,278.75	4,470.33	14,428,060.52	1,709,462.16	39.72875890	-80.75442287
13,252.00	88.57	150.040	6,609.66	-6,360.82	4,518.14	14,427,978.46	1,709,509.97	39.72853317	-80.75425362
13,348.00	90.59	148.370	6,610.36	-6,443.27	4,567.28	14,427,896.01	1,709,559.11	39.72830636	-80.75407964
13,443.00	90.33	148.450	6,609.60	-6,524.19	4,617.04	14,427,815.09	1,709,608.87	39.72808375	-80.75390344
13,538.00	89.98	148.890	6,609.34	-6,605.34	4,666.44	14,427,733.94	1,709,658.27	39.72786053	-80.75372854
13,633.00	89.54	149.070	6,609.74	-6,686.75	4,715.40	14,427,652.53	1,709,707.22	39.72763657	-80.75355522
13,728.00	89.14	149.600	6,610.83	-6,768.46	4,763.85	14,427,570.82	1,709,755.67	39.72741181	-80.75338370
13,823.00	87.87	149.510	6,613.31	-6,850.33	4,811.97	14,427,488.95	1,709,803.79	39.72718660	-80.75321336
13,917.00	90.07	148.720	6,615.00	-6,930.98	4,860.21	14,427,408.29	1,709,852.03	39.72696474	-80.75304258
14,012.00	89.98	148.810	6,614.96	-7,012.21	4,909.47	14,427,327.06	1,709,901.30	39.72674129	-80.75286817
14,106.00	89.23	149.420	6,615.61	-7,092.88	4,957.72	14,427,246.40	1,709,949.55	39.72651939	-80.75269735
14,201.00	87.96	149.770	6,617.94	-7,174.79	5,005.78	14,427,164.49	1,709,997.61	39.72629408	-80.75252721
14,296.00	89.36	150.300	6,620.16	-7,257.07	5,053.22	14,427,082.21	1,710,045.05	39.72606776	-80.75235931
14,391.00	88.84	150.740	6,621.65	-7,339.75	5,099.96	14,426,999.52	1,710,091.79	39.72584032	-80.75219387
14,486.00	88.35	150.560	6,623.98	-7,422.54	5,146.51	14,426,916.74	1,710,138.34	39.72561263	-80.75202913
14,581.00	90.24	150.390	6,625.15	-7,505.19	5,193.32	14,426,834.09	1,710,185.15	39.72538528	-80.75186346
14,676.00	89.76	150.390	6,625.15	-7,587.78	5,240.26	14,426,751.50	1,710,232.09	39.72515810	-80.75169733
14,771.00	89.01	150.830	6,626.17	-7,670.55	5,286.88	14,426,668.73	1,710,278.71	39.72493044	-80.75153235
14,866.00	90.77	149.510	6,626.35	-7,752.96	5,334.13	14,426,586.32	1,710,325.96	39.72470376	-80.75136511
14,961.00	90.24	148.980	6,625.51	-7,834.59	5,382.71	14,426,504.69	1,710,374.54	39.72447920	-80.75119315

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 09 HM (M)
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 09 HM (M)	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)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
15,056.00	89.89	148.010	6,625.41	-7,915.59	5,432.36	14,426,423.69	1,710,424.18	39.72425638	-80.75101739
15,151.00	89.27	147.750	6,626.10	-7,996.05	5,482.86	14,426,343.23	1,710,474.69	39.72403504	-80.75083855
15,245.00	89.01	150.920	6,627.51	-8,076.88	5,530.79	14,426,262.40	1,710,522.62	39.72381267	-80.75066889
15,340.00	88.40	151.790	6,629.66	-8,160.23	5,576.32	14,426,179.05	1,710,568.15	39.72358342	-80.75050779
15,435.00	88.18	151.790	6,632.50	-8,243.91	5,621.21	14,426,095.37	1,710,613.04	39.72335327	-80.75034898
15,530.00	89.98	151.530	6,634.02	-8,327.51	5,666.30	14,426,011.77	1,710,658.13	39.72312334	-80.75018945
15,624.00	89.63	151.530	6,634.34	-8,410.14	5,711.11	14,425,929.14	1,710,702.93	39.72289606	-80.75003091
15,719.00	88.70	152.060	6,635.72	-8,493.85	5,756.00	14,425,845.43	1,710,747.83	39.72266583	-80.74987208
15,814.00	89.89	150.830	6,636.89	-8,577.29	5,801.41	14,425,762.00	1,710,793.23	39.72243635	-80.74971143
15,908.00	89.41	150.300	6,637.47	-8,659.15	5,847.60	14,425,680.13	1,710,839.43	39.72221117	-80.74954796
16,002.00	88.75	148.890	6,638.98	-8,740.21	5,895.17	14,425,599.07	1,710,886.99	39.72198819	-80.74937960
16,095.00	88.26	149.770	6,641.40	-8,820.17	5,942.59	14,425,519.11	1,710,934.42	39.72176823	-80.74921175
16,191.00	89.67	150.300	6,643.14	-8,903.32	5,990.53	14,425,435.96	1,710,982.36	39.72153950	-80.74904209
16,285.00	89.10	150.740	6,644.15	-8,985.15	6,036.79	14,425,354.13	1,711,028.61	39.72131443	-80.74887840
16,380.00	88.62	151.530	6,646.04	-9,068.33	6,082.64	14,425,270.95	1,711,074.46	39.72108564	-80.74871616
16,475.00	90.20	150.830	6,647.02	-9,151.55	6,128.43	14,425,187.73	1,711,120.25	39.72085673	-80.74855415
16,570.00	89.45	150.560	6,647.31	-9,234.39	6,174.93	14,425,104.89	1,711,166.75	39.72062886	-80.74838961
16,665.00	88.48	149.770	6,649.02	-9,316.79	6,222.18	14,425,022.49	1,711,214.01	39.72040222	-80.74822238
16,760.00	87.96	149.770	6,651.97	-9,398.83	6,269.99	14,424,940.45	1,711,261.81	39.72017654	-80.74805319
16,855.00	87.47	150.480	6,655.76	-9,481.14	6,317.27	14,424,858.14	1,711,309.10	39.71995013	-80.74788587
16,949.00	89.23	148.280	6,658.47	-9,561.99	6,365.13	14,424,777.29	1,711,356.95	39.71972772	-80.74771649
17,044.00	90.55	149.510	6,658.65	-9,643.33	6,414.20	14,424,695.96	1,711,406.02	39.71950396	-80.74754278
17,139.00	90.29	149.420	6,657.95	-9,725.15	6,462.47	14,424,614.13	1,711,454.29	39.71927888	-80.74737196
17,233.00	89.76	149.950	6,657.91	-9,806.30	6,509.91	14,424,532.99	1,711,501.74	39.71905566	-80.74720405
17,322.00	89.05	149.250	6,658.84	-9,883.06	6,554.95	14,424,456.23	1,711,546.77	39.71884451	-80.74704467
Survey @ 17322.00 MD 6658.84 TVD									
17,375.00	89.05	149.250	6,659.71	-9,928.60	6,582.04	14,424,410.69	1,711,573.86	39.71871923	-80.74694877
Survey projected to 17375.00 MD 6659.71 TVD									

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
217.00	217.00	-0.15	-0.09	MWD surveys
17,322.00	6,658.84	-9,883.06	6,554.95	Survey @ 17322.00 MD 6658.84 TVD
17,375.00	6,659.71	-9,928.60	6,582.04	Survey projected to 17375.00 MD 6659.71 TVD