



Well: Fitzgerald 02 HM (slot Q)
Site: Fitzgerald
Project: Marshall County, West Virginia NAD83 UTM 17N
Design: rev7
Rig: Nabors X08

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
1	2988.09	40.48	269.260	2876.25	-19.28	-468.31	0.00	0.00	29.39	Survey @ 2988.09 MD 2876.25 TVD
2	3188.09	40.48	269.260	3028.37	-20.95	-598.13	0.00	0.00	33.87	KOP Begin 3°/100' build/turn
3	3566.05	51.76	270.909	3289.95	-20.18	-870.09	3.00	6.60	38.97	Begin 51.76° tangent
4	4534.33	51.76	270.909	3889.31	-8.12	-1630.48	0.00	0.00	43.34	Begin 2°/100' drop/turn
5	4656.74	50.71	268.071	3965.97	-8.95	-1725.90	2.00	-116.23	46.23	Begin 50.71° tangent
6	8357.06	50.71	268.071	6309.24	-105.35	-4588.10	0.00	0.00	204.43	Begin 8°/100' build/turn
7	9056.10	55.00	196.183	6768.07	-414.35	-4968.97	8.00	-109.95	521.59	Begin 10°/100' build/turn
8	9605.15	89.00	149.791	6944.00	-905.72	-4887.18	10.00	-62.23	1011.08	Begin 89.00° lateral
9	18934.72	89.00	149.791	7107.00	-8967.10	-193.74	0.00	0.00	8969.19	PBHL/TD 18934.72 MD 7107.00 TVD

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Fitzgerald-02HM LP r7	6944.00	-905.65	-4887.1314453643.392	1736288.241	39.798775000	-80.658664000	
Fitzgerald-02HM BHL r7	7107.00	-8967.10	-193.7414445581.954	1740981.617	39.776586000	-80.642069000	

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSect	Annotation
152.09	0.05	145.510	152.09	-0.05	0.03	0.05	MWD surveys
18851.00	88.75	149.530	7073.10	-8921.41	-220.02	8924.08	Survey @ 18851.00 MD 7073.10 TVD
18905.00	88.75	149.530	7074.28	-8967.94	-192.64	8970.01	Survey Proj. to 18905.00 MD 7074.28 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=1292.91+33.09 @ 1326.00ft (Nabors X08)

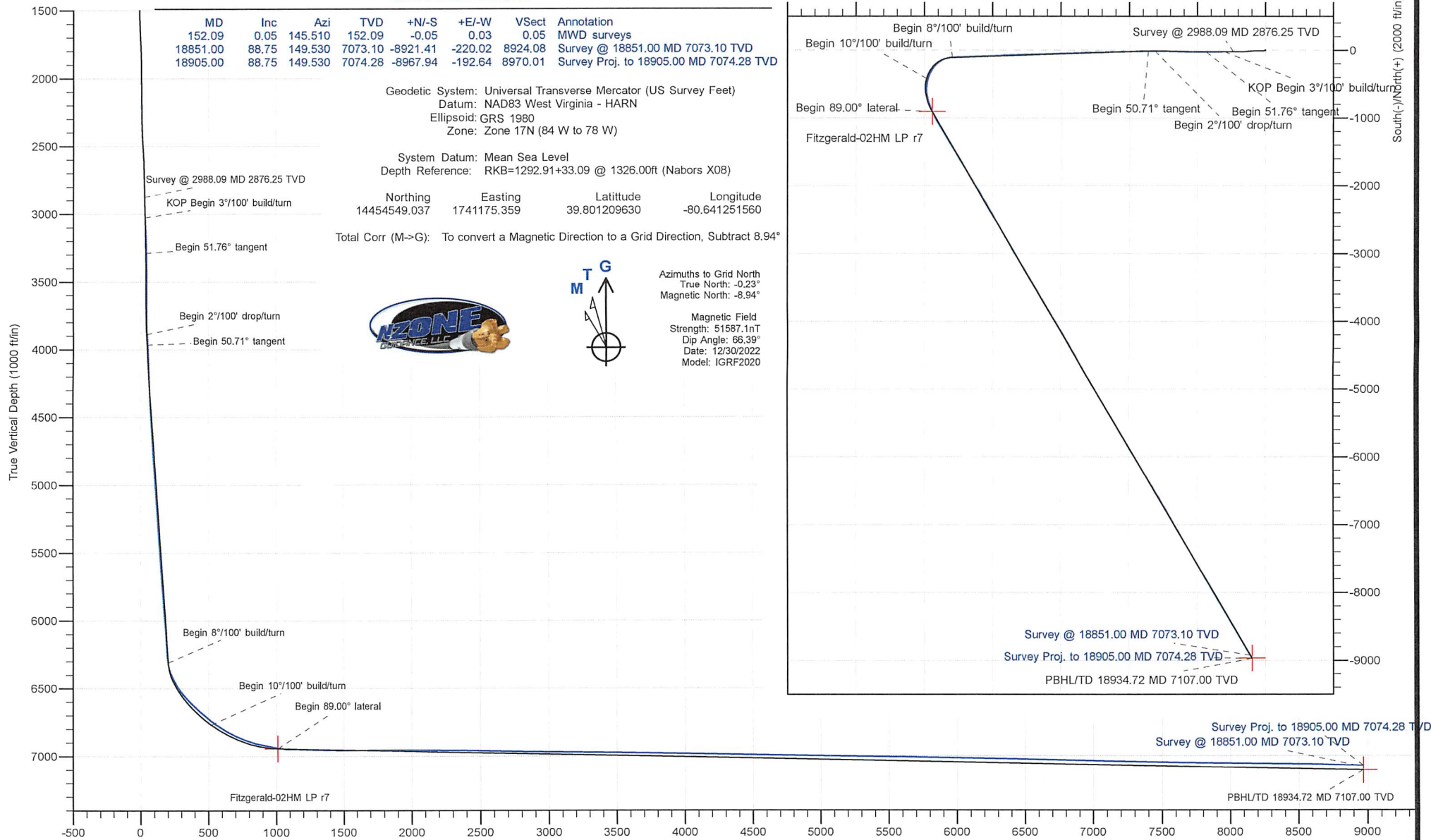
Northing	Easting	Latitude	Longitude
14454549.037	1741175.359	39.801209630	-80.641251560

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.94°



Azimuths to Grid North
 True North: -0.23°
 Magnetic North: -8.94°

Magnetic Field
 Strength: 51587.1nT
 Dip Angle: 66.39°
 Date: 12/30/2022
 Model: IGRF2020



Vertical Section at 181.238° (1000 ft/in)

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Fitzgerald 02 HM (slot Q)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1292.91+33.09 @ 1326.00ft (Nabors X08)
Site:	Fitzgerald	MD Reference:	RKB=1292.91+33.09 @ 1326.00ft (Nabors X08)
Well:	Fitzgerald 02 HM (slot Q)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Decv0422v16

Project	Marshall County, West Virginia NAD83 UTM 17N		
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	Fitzgerald				
Site Position:		Northing:	14,454,567.732 usft	Latitude:	39.801261840
From:	Lat/Long	Easting:	1,741,096.260 usft	Longitude:	-80.641532920
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.23 °

Well	Fitzgerald 02 HM (slot Q)					
Well Position	+N/-S	0.00 ft	Northing:	14,454,549.037 usft	Latitude:	39.801209630
	+E/-W	0.00 ft	Easting:	1,741,175.359 usft	Longitude:	-80.641251560
Position Uncertainty	0.00 ft		Wellhead Elevation:	ft	Ground Level:	1,292.91 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	12/30/2022	-8.71	66.39	51,587.10932633

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	181.240	

Survey Program	Date	1/12/2023			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
21.09	977.09	MWD surf (Original Hole)	MWD	MWD - Standard	
1,036.09	2,988.09	MWD int (Original Hole)	MWD	MWD - Standard	
3,072.00	18,851.00	MWD (Original Hole)	MWD	MWD - Standard	
18,905.00	18,905.00	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	14,454,549.037	1,741,175.359	39.801209630	-80.641251560	
21.09	0.00	0.000	21.09	0.00	0.00	14,454,549.037	1,741,175.359	39.801209630	-80.641251560	
152.09	0.05	145.510	152.09	-0.05	0.03	14,454,548.990	1,741,175.391	39.801209500	-80.641251445	
MWD surveys										
197.09	0.05	279.090	197.09	-0.06	0.02	14,454,548.977	1,741,175.383	39.801209464	-80.641251475	
241.09	0.32	266.240	241.09	-0.07	-0.12	14,454,548.972	1,741,175.242	39.801209452	-80.641251979	
285.09	0.23	269.150	285.09	-0.07	-0.33	14,454,548.963	1,741,175.031	39.801209428	-80.641252730	
329.09	0.32	291.240	329.09	-0.03	-0.53	14,454,549.006	1,741,174.828	39.801209549	-80.641253451	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Fitzgerald 02 HM (slot Q)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1292.91+33.09 @ 1326.00ft (Nabors X08)
Site:	Fitzgerald	MD Reference:	RKB=1292.91+33.09 @ 1326.00ft (Nabors X08)
Well:	Fitzgerald 02 HM (slot Q)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Decv0422v16

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
373.09	0.35	252.880	373.09	-0.03	-0.77	14,454,549.011	1,741,174.585	39.801209566	-80.641254316
418.09	0.47	259.730	418.09	-0.10	-1.09	14,454,548.938	1,741,174.272	39.801209368	-80.641255432
462.09	0.66	275.930	462.08	-0.11	-1.52	14,454,548.932	1,741,173.842	39.801209356	-80.641256961
506.09	0.66	292.040	506.08	0.02	-2.00	14,454,549.053	1,741,173.355	39.801209694	-80.641258694
550.09	0.69	283.070	550.08	0.17	-2.50	14,454,549.208	1,741,172.862	39.801210125	-80.641260446
594.09	0.81	268.040	594.08	0.22	-3.07	14,454,549.257	1,741,172.294	39.801210267	-80.641262471
639.09	0.58	287.850	639.07	0.28	-3.60	14,454,549.316	1,741,171.759	39.801210435	-80.641264374
683.09	0.71	270.570	683.07	0.35	-4.08	14,454,549.387	1,741,171.274	39.801210635	-80.641266098
727.09	0.37	270.800	727.07	0.35	-4.50	14,454,549.392	1,741,170.860	39.801210652	-80.641267575
771.09	0.36	254.190	771.07	0.32	-4.77	14,454,549.356	1,741,170.585	39.801210557	-80.641268554
815.09	0.35	259.080	815.07	0.26	-5.04	14,454,549.293	1,741,170.320	39.801210387	-80.641269499
860.09	0.56	283.560	860.06	0.28	-5.39	14,454,549.319	1,741,169.971	39.801210461	-80.641270740
904.09	0.55	287.020	904.06	0.39	-5.80	14,454,549.431	1,741,169.560	39.801210774	-80.641272202
948.09	0.79	273.530	948.06	0.47	-6.30	14,454,549.511	1,741,169.055	39.801211000	-80.641273997
977.09	0.81	269.890	977.06	0.49	-6.71	14,454,549.523	1,741,168.651	39.801211037	-80.641275437
1,036.09	0.97	276.390	1,036.05	0.54	-7.62	14,454,549.578	1,741,167.737	39.801211198	-80.641278688
1,081.09	0.88	281.150	1,081.04	0.65	-8.34	14,454,549.687	1,741,167.020	39.801211506	-80.641281242
1,125.09	0.97	287.070	1,125.04	0.82	-9.03	14,454,549.862	1,741,166.332	39.801211993	-80.641283687
1,168.09	0.84	280.380	1,168.03	0.99	-9.68	14,454,550.026	1,741,165.674	39.801212450	-80.641286027
1,217.09	0.65	359.430	1,217.03	1.33	-10.04	14,454,550.368	1,741,165.318	39.801213395	-80.641287290
1,261.09	1.11	17.770	1,261.02	1.99	-9.91	14,454,551.024	1,741,165.446	39.801215193	-80.641286827
1,305.09	1.28	27.470	1,305.01	2.83	-9.56	14,454,551.865	1,741,165.803	39.801217501	-80.641285544
1,349.09	1.86	53.630	1,349.00	3.69	-8.75	14,454,552.725	1,741,166.604	39.801219853	-80.641282678
1,394.09	2.32	56.250	1,393.97	4.63	-7.41	14,454,553.664	1,741,167.950	39.801222417	-80.641277875
1,438.09	2.36	55.870	1,437.93	5.63	-5.92	14,454,554.667	1,741,169.440	39.801225155	-80.641272554
1,482.09	1.36	70.080	1,481.91	6.32	-4.68	14,454,555.353	1,741,170.681	39.801227026	-80.641268126
1,526.09	1.22	82.210	1,525.90	6.56	-3.72	14,454,555.595	1,741,171.636	39.801227678	-80.641264723
1,571.09	0.87	138.920	1,570.89	6.36	-3.02	14,454,555.402	1,741,172.335	39.801227142	-80.641262236
1,615.09	1.29	192.540	1,614.88	5.63	-2.91	14,454,554.667	1,741,172.447	39.801225121	-80.641261848
1,659.09	2.41	212.330	1,658.86	4.36	-3.51	14,454,553.402	1,741,171.845	39.801221653	-80.641264010
1,703.09	3.77	224.590	1,702.80	2.55	-5.02	14,454,551.590	1,741,170.334	39.801216694	-80.641269414
1,748.09	4.83	231.700	1,747.67	0.32	-7.55	14,454,549.362	1,741,167.809	39.801210604	-80.641278437
1,792.09	4.87	244.680	1,791.51	-1.62	-10.69	14,454,547.415	1,741,164.667	39.801205292	-80.641289652
1,836.09	5.97	255.090	1,835.32	-3.01	-14.59	14,454,546.027	1,741,160.767	39.801201524	-80.641303556
1,880.09	7.43	261.430	1,879.01	-4.02	-19.62	14,454,545.015	1,741,155.743	39.801198798	-80.641321460
1,924.09	9.01	263.320	1,922.56	-4.85	-25.85	14,454,544.190	1,741,149.507	39.801196601	-80.641343673
1,968.09	10.76	265.790	1,965.91	-5.55	-33.37	14,454,543.488	1,741,141.988	39.801194755	-80.641370453
2,013.09	12.33	267.630	2,010.00	-6.06	-42.36	14,454,542.980	1,741,132.998	39.801193462	-80.641402470
2,057.09	13.50	269.630	2,052.88	-6.28	-52.19	14,454,542.753	1,741,123.168	39.801192945	-80.641437471
2,101.09	14.79	271.620	2,095.55	-6.16	-62.94	14,454,542.879	1,741,112.418	39.801193408	-80.641475744
2,145.09	16.10	271.730	2,137.96	-5.82	-74.65	14,454,543.222	1,741,100.705	39.801194479	-80.641517440
2,189.09	17.30	271.070	2,180.10	-5.51	-87.29	14,454,543.528	1,741,088.066	39.801195459	-80.641562438
2,233.09	18.87	271.150	2,221.93	-5.24	-100.95	14,454,543.793	1,741,074.410	39.801196337	-80.641611055
2,278.09	20.38	270.010	2,264.31	-5.10	-116.06	14,454,543.940	1,741,059.298	39.801196908	-80.641664857
2,322.09	21.61	268.360	2,305.39	-5.33	-131.82	14,454,543.710	1,741,043.537	39.801196448	-80.641720977
2,366.09	22.34	267.620	2,346.19	-5.91	-148.28	14,454,543.131	1,741,027.083	39.801195039	-80.641779569
2,410.09	23.12	265.060	2,386.78	-7.00	-165.24	14,454,542.039	1,741,010.120	39.801192229	-80.641839976
2,454.09	24.73	264.200	2,426.99	-8.67	-183.00	14,454,540.365	1,740,992.356	39.801187826	-80.641903247
2,498.09	26.14	263.810	2,466.73	-10.65	-201.80	14,454,538.390	1,740,973.563	39.801182608	-80.641970187
2,543.09	27.54	264.310	2,506.88	-12.75	-222.00	14,454,536.290	1,740,953.355	39.801177062	-80.642042165
2,587.09	28.70	266.360	2,545.69	-14.43	-242.67	14,454,534.610	1,740,932.689	39.801172677	-80.642115771
2,631.09	29.89	266.660	2,584.06	-15.74	-264.16	14,454,533.301	1,740,911.199	39.801169317	-80.642192300
2,675.09	31.17	266.670	2,621.96	-17.04	-286.47	14,454,532.001	1,740,888.886	39.801165991	-80.642271762
2,719.09	32.49	267.750	2,659.34	-18.16	-309.65	14,454,530.875	1,740,865.709	39.801163155	-80.642354297

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Site:	Fitzgerald	MD Reference:	RKB=1292.91+33.09 @ 1326.00ft (Nabors X08)
Well:	Fitzgerald 02 HM (slot Q)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Decv0422v16

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
2,763.09	33.39	269.650	2,696.27	-18.70	-333.57	14,454,530.337	1,740,841.793	39.801161940	-80.642439457	
2,807.09	34.34	270.220	2,732.80	-18.73	-358.08	14,454,530.311	1,740,817.275	39.801162137	-80.642526751	
2,851.09	35.65	270.000	2,768.85	-18.68	-383.32	14,454,530.359	1,740,792.041	39.801162544	-80.642616592	
2,896.09	37.73	270.040	2,804.93	-18.67	-410.20	14,454,530.368	1,740,765.156	39.801162865	-80.642712314	
2,940.09	39.18	269.180	2,839.38	-18.86	-437.57	14,454,530.179	1,740,737.795	39.801162645	-80.642809735	
2,988.09	40.48	269.260	2,876.25	-19.28	-468.31	14,454,529.760	1,740,707.054	39.801161833	-80.642919192	
3,072.00	43.43	269.590	2,938.64	-19.84	-524.40	14,454,529.202	1,740,650.965	39.801160914	-80.643118897	
3,166.00	44.26	268.090	3,006.44	-21.16	-589.49	14,454,527.878	1,740,585.868	39.801157989	-80.643350687	
3,260.00	44.79	269.060	3,073.45	-22.80	-655.38	14,454,526.241	1,740,519.976	39.801154216	-80.643585314	
3,353.00	46.07	269.670	3,138.72	-23.53	-721.63	14,454,525.511	1,740,453.729	39.801152934	-80.643821188	
3,447.00	48.40	269.850	3,202.54	-23.81	-790.64	14,454,525.224	1,740,384.725	39.801152900	-80.644066875	
3,483.00	49.93	269.410	3,226.08	-23.99	-817.87	14,454,525.047	1,740,357.489	39.801152711	-80.644163848	
3,576.00	50.20	270.020	3,285.78	-24.34	-889.18	14,454,524.693	1,740,286.181	39.801152517	-80.644417739	
3,670.00	50.07	270.110	3,346.03	-24.26	-961.33	14,454,524.775	1,740,214.031	39.801153529	-80.644674621	
3,763.00	51.21	271.170	3,405.01	-23.45	-1,033.23	14,454,525.583	1,740,142.133	39.801156533	-80.644930595	
3,857.00	51.87	271.170	3,463.47	-21.95	-1,106.82	14,454,527.086	1,740,068.543	39.801161462	-80.645192584	
3,951.00	51.60	271.170	3,521.69	-20.44	-1,180.61	14,454,528.593	1,739,994.754	39.801166403	-80.645455281	
4,046.00	51.60	270.990	3,580.70	-19.04	-1,255.04	14,454,529.996	1,739,920.317	39.801171067	-80.645720289	
4,140.00	51.56	271.080	3,639.11	-17.71	-1,328.68	14,454,531.327	1,739,846.682	39.801175520	-80.645982440	
4,233.00	51.69	271.260	3,696.84	-16.22	-1,401.57	14,454,532.815	1,739,773.789	39.801180400	-80.646241948	
4,327.00	51.56	271.080	3,755.20	-14.72	-1,475.25	14,454,534.320	1,739,700.112	39.801185332	-80.646504247	
4,422.00	51.52	271.170	3,814.29	-13.26	-1,549.62	14,454,535.781	1,739,625.737	39.801190149	-80.646769030	
4,517.00	51.38	270.990	3,873.49	-11.86	-1,623.91	14,454,537.181	1,739,551.455	39.801194800	-80.647033487	
4,611.00	49.71	269.230	3,933.23	-11.70	-1,696.48	14,454,537.334	1,739,478.883	39.801196005	-80.647291870	
4,706.00	50.95	268.530	3,993.87	-13.14	-1,769.59	14,454,535.901	1,739,405.775	39.801192860	-80.647552185	
4,799.00	50.95	268.530	4,052.46	-14.99	-1,841.79	14,454,534.048	1,739,333.575	39.801188552	-80.647809271	
4,893.00	50.90	268.710	4,111.71	-16.75	-1,914.74	14,454,532.290	1,739,260.622	39.801184514	-80.648069037	
4,987.00	50.99	268.790	4,170.94	-18.34	-1,987.72	14,454,530.698	1,739,187.645	39.801180928	-80.648328889	
5,081.00	51.03	268.710	4,230.08	-19.93	-2,060.76	14,454,529.104	1,739,114.601	39.801177339	-80.648588979	
5,176.00	51.08	268.710	4,289.80	-21.60	-2,134.63	14,454,527.441	1,739,040.733	39.801173567	-80.648852000	
5,270.00	50.46	268.620	4,349.24	-23.29	-2,207.42	14,454,525.745	1,738,967.940	39.801169693	-80.649111198	
5,364.00	50.46	268.620	4,409.09	-25.04	-2,279.89	14,454,523.999	1,738,895.470	39.801165679	-80.649369244	
5,458.00	50.46	268.710	4,468.93	-26.73	-2,352.36	14,454,522.310	1,738,822.999	39.801161820	-80.649627295	
5,552.00	50.33	268.530	4,528.85	-28.47	-2,424.77	14,454,520.566	1,738,750.597	39.801157808	-80.649885099	
5,647.00	50.46	268.880	4,589.41	-30.13	-2,497.94	14,454,518.912	1,738,677.423	39.801154052	-80.650145652	
5,742.00	50.33	268.180	4,649.98	-32.00	-2,571.11	14,454,517.035	1,738,604.254	39.801149682	-80.650406188	
5,835.00	50.42	268.180	4,709.29	-34.28	-2,642.71	14,454,514.760	1,738,532.659	39.801144202	-80.650661129	
5,929.00	50.46	268.090	4,769.16	-36.64	-2,715.14	14,454,512.401	1,738,460.227	39.801138501	-80.650919047	
6,025.00	50.24	267.830	4,830.41	-39.27	-2,789.01	14,454,509.770	1,738,386.359	39.801132067	-80.651182086	
6,119.00	50.33	268.180	4,890.48	-41.78	-2,861.27	14,454,507.253	1,738,314.095	39.801125927	-80.651439409	
6,214.00	50.81	267.920	4,950.81	-44.28	-2,934.61	14,454,504.756	1,738,240.760	39.801119853	-80.651700546	
6,308.00	50.51	268.180	5,010.40	-46.76	-3,007.26	14,454,502.282	1,738,168.103	39.801113835	-80.651959269	
6,402.00	50.11	268.000	5,070.43	-49.17	-3,079.56	14,454,499.871	1,738,095.809	39.801107986	-80.652216696	
6,496.00	49.67	267.920	5,130.99	-51.73	-3,151.40	14,454,497.312	1,738,023.963	39.801101725	-80.652472533	
6,590.00	49.32	267.920	5,192.05	-54.32	-3,222.83	14,454,494.718	1,737,952.538	39.801095362	-80.652726872	
6,685.00	48.48	267.560	5,254.50	-57.14	-3,294.36	14,454,491.897	1,737,881.006	39.801088376	-80.652981594	
6,779.00	51.25	268.270	5,315.08	-59.75	-3,366.17	14,454,489.291	1,737,809.195	39.801081985	-80.653237304	
6,873.00	52.09	268.270	5,373.38	-61.97	-3,439.87	14,454,487.065	1,737,735.491	39.801076656	-80.653499751	
6,968.00	52.04	268.270	5,431.78	-64.23	-3,514.77	14,454,484.803	1,737,660.598	39.801071240	-80.653766431	
7,063.00	52.18	268.350	5,490.13	-66.45	-3,589.71	14,454,482.592	1,737,585.658	39.801065963	-80.654033280	
7,157.00	52.04	268.270	5,547.86	-68.63	-3,663.86	14,454,480.404	1,737,511.506	39.801060742	-80.654297319	
7,252.00	52.13	268.440	5,606.23	-70.78	-3,738.78	14,454,478.253	1,737,436.590	39.801055628	-80.654564082	
7,346.00	51.12	267.830	5,664.59	-73.18	-3,812.43	14,454,475.857	1,737,362.938	39.801049830	-80.654826346	
7,440.00	51.03	267.650	5,723.65	-76.06	-3,885.50	14,454,472.974	1,737,289.866	39.801042684	-80.655086551	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Fitzgerald 02 HM (slot Q)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1292.91+33.09 @ 1326.00ft (Nabors X08)
Site:	Fitzgerald	MD Reference:	RKB=1292.91+33.09 @ 1326.00ft (Nabors X08)
Well:	Fitzgerald 02 HM (slot Q)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Decv0422v16

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
7,534.00	50.55	267.740	5,783.07	-78.99	-3,958.28	14,454,470.044	1,737,217.091	39.801035409	-80.655345700
7,628.00	50.59	267.560	5,842.78	-81.97	-4,030.82	14,454,467.067	1,737,144.546	39.801028000	-80.655604028
7,722.00	50.68	267.740	5,902.40	-84.95	-4,103.43	14,454,464.087	1,737,071.934	39.801020583	-80.655862597
7,816.00	50.64	267.650	5,961.99	-87.87	-4,176.07	14,454,461.163	1,736,999.294	39.801013321	-80.656121266
7,911.00	50.64	267.740	6,022.23	-90.83	-4,249.47	14,454,458.209	1,736,925.901	39.801005982	-80.656382612
8,006.00	50.59	268.180	6,082.51	-93.44	-4,322.84	14,454,455.595	1,736,852.522	39.800999577	-80.656643904
8,100.00	50.64	268.180	6,142.16	-95.75	-4,395.46	14,454,453.288	1,736,779.906	39.800994005	-80.656902477
8,194.00	50.51	268.180	6,201.86	-98.06	-4,468.03	14,454,450.982	1,736,707.332	39.800988436	-80.657160902
8,288.00	50.59	268.180	6,261.58	-100.36	-4,540.58	14,454,448.677	1,736,634.784	39.800982868	-80.657419233
8,383.00	49.63	264.220	6,322.52	-105.17	-4,613.29	14,454,443.865	1,736,562.079	39.800970418	-80.657678157
8,430.00	48.40	257.630	6,353.37	-110.74	-4,648.29	14,454,438.294	1,736,527.078	39.800955485	-80.657802853
8,477.00	47.65	251.130	6,384.82	-120.13	-4,681.91	14,454,428.906	1,736,493.458	39.800930058	-80.657922680
8,524.00	47.08	246.210	6,416.66	-132.69	-4,714.10	14,454,416.343	1,736,461.266	39.800895895	-80.658037467
8,571.00	46.68	241.460	6,448.80	-147.81	-4,744.88	14,454,401.228	1,736,430.490	39.800854708	-80.658147247
8,618.00	46.95	236.710	6,480.97	-165.41	-4,774.26	14,454,383.629	1,736,401.107	39.800806683	-80.658252102
8,665.00	47.96	231.270	6,512.77	-185.76	-4,802.24	14,454,363.275	1,736,373.125	39.800751080	-80.658352005
8,712.00	49.45	225.640	6,543.80	-209.18	-4,828.64	14,454,339.859	1,736,346.730	39.800687051	-80.658446300
8,760.00	49.93	220.230	6,574.86	-235.96	-4,853.55	14,454,313.075	1,736,321.819	39.800613758	-80.658535356
8,807.00	49.93	215.800	6,605.13	-264.29	-4,875.69	14,454,284.752	1,736,299.678	39.800536206	-80.658614571
8,854.00	50.07	211.670	6,635.34	-294.22	-4,895.68	14,454,254.821	1,736,279.692	39.800454220	-80.658686134
8,901.00	50.64	207.100	6,665.34	-325.74	-4,913.42	14,454,223.299	1,736,261.948	39.800367839	-80.658749738
8,949.00	51.38	202.520	6,695.55	-359.59	-4,929.06	14,454,189.448	1,736,246.308	39.800275038	-80.658805882
8,996.00	52.18	198.750	6,724.64	-394.14	-4,942.06	14,454,154.900	1,736,233.306	39.800180299	-80.658852644
9,043.00	54.11	194.880	6,752.83	-430.13	-4,952.92	14,454,118.910	1,736,222.446	39.800081574	-80.658891797
9,090.00	56.35	191.100	6,779.64	-467.74	-4,961.58	14,454,081.300	1,736,213.788	39.799978378	-80.658923134
9,138.00	58.95	187.060	6,805.33	-507.77	-4,967.96	14,454,041.271	1,736,207.411	39.799868516	-80.658946379
9,185.00	61.80	182.750	6,828.57	-548.46	-4,971.43	14,454,000.581	1,736,203.941	39.799756809	-80.658959286
9,232.00	64.48	177.920	6,849.81	-590.36	-4,971.65	14,453,958.674	1,736,203.717	39.799641723	-80.658960652
9,279.00	67.60	172.990	6,868.91	-633.16	-4,968.23	14,453,915.884	1,736,207.141	39.799524175	-80.658949042
9,327.00	70.77	169.300	6,885.97	-677.47	-4,961.31	14,453,871.569	1,736,214.060	39.799402404	-80.658925009
9,374.00	74.20	166.230	6,900.11	-721.26	-4,951.80	14,453,827.781	1,736,223.567	39.799282053	-80.658891756
9,421.00	77.10	163.680	6,911.76	-765.22	-4,939.98	14,453,783.819	1,736,235.391	39.799161198	-80.658850257
9,468.00	78.81	161.040	6,921.57	-809.02	-4,926.05	14,453,740.022	1,736,249.321	39.799040776	-80.658801255
9,515.00	79.52	158.400	6,930.41	-852.31	-4,910.05	14,453,696.726	1,736,265.321	39.798921708	-80.658744879
9,562.00	81.54	155.680	6,938.14	-894.99	-4,891.96	14,453,654.047	1,736,283.405	39.798804312	-80.658681072
9,609.00	84.92	152.950	6,943.68	-937.04	-4,871.74	14,453,611.999	1,736,303.633	39.798688624	-80.658609627
9,656.00	88.22	150.760	6,946.49	-978.40	-4,849.61	14,453,570.639	1,736,325.760	39.798574810	-80.658531410
9,702.00	88.22	151.200	6,947.92	-1,018.61	-4,827.30	14,453,530.434	1,736,348.064	39.798464163	-80.658452546
9,797.00	88.75	150.050	6,950.43	-1,101.36	-4,780.72	14,453,447.680	1,736,394.647	39.798236410	-80.658287824
9,892.00	88.48	149.700	6,952.73	-1,183.50	-4,733.06	14,453,365.534	1,736,442.312	39.798010323	-80.658119241
9,986.00	88.97	149.180	6,954.82	-1,264.43	-4,685.27	14,453,284.612	1,736,490.093	39.797787589	-80.657950229
10,080.00	89.54	149.350	6,956.04	-1,345.22	-4,637.24	14,453,203.823	1,736,538.129	39.797565218	-80.657780309
10,174.00	89.85	149.530	6,956.54	-1,426.16	-4,589.45	14,453,122.881	1,736,585.922	39.797342431	-80.657611259
10,269.00	89.80	149.260	6,956.83	-1,507.92	-4,541.08	14,453,041.115	1,736,634.288	39.797117374	-80.657440181
10,364.00	89.76	148.910	6,957.20	-1,589.43	-4,492.27	14,452,959.613	1,736,683.095	39.796893036	-80.657267529
10,457.00	90.11	149.000	6,957.31	-1,669.11	-4,444.31	14,452,879.934	1,736,731.056	39.796673715	-80.657097865
10,551.00	90.24	148.910	6,957.02	-1,749.64	-4,395.84	14,452,799.399	1,736,779.532	39.796452036	-80.656926379
10,646.00	90.46	149.000	6,956.44	-1,831.03	-4,346.84	14,452,718.008	1,736,828.524	39.796228002	-80.656753072
10,741.00	90.11	149.530	6,955.97	-1,912.69	-4,298.29	14,452,636.354	1,736,877.074	39.796003247	-80.656581340
10,834.00	89.67	149.440	6,956.14	-1,992.81	-4,251.07	14,452,556.235	1,736,924.296	39.795782724	-80.656414319
10,929.00	90.07	149.700	6,956.36	-2,074.72	-4,202.96	14,452,474.322	1,736,972.413	39.795557265	-80.656244140
11,023.00	89.49	149.610	6,956.72	-2,155.84	-4,155.47	14,452,393.201	1,737,019.901	39.795333986	-80.656076184
11,118.00	89.10	150.050	6,957.89	-2,237.96	-4,107.73	14,452,311.077	1,737,067.641	39.795107949	-80.655907349
11,212.00	88.75	150.320	6,959.65	-2,319.51	-4,061.00	14,452,229.534	1,737,114.370	39.794883519	-80.655742107

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Fitzgerald 02 HM (slot Q)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1292.91+33.09 @ 1326.00ft (Nabors X08)
Site:	Fitzgerald	MD Reference:	RKB=1292.91+33.09 @ 1326.00ft (Nabors X08)
Well:	Fitzgerald 02 HM (slot Q)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Decv0422v16

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
11,307.00	88.92	150.320	6,961.58	-2,402.03	-4,013.97	14,452,147.015	1,737,161.400	39.794656405	-80.655575807
11,401.00	88.97	149.970	6,963.31	-2,483.54	-3,967.18	14,452,065.504	1,737,208.185	39.794432062	-80.655410363
11,495.00	89.23	150.140	6,964.79	-2,564.98	-3,920.27	14,451,984.063	1,737,255.101	39.794207908	-80.655244457
11,589.00	89.36	150.230	6,965.95	-2,646.53	-3,873.53	14,451,902.511	1,737,301.835	39.793983454	-80.655079202
11,683.00	89.23	150.140	6,967.10	-2,728.08	-3,826.80	14,451,820.960	1,737,348.568	39.793759000	-80.654913949
11,777.00	89.27	149.790	6,968.33	-2,809.45	-3,779.75	14,451,739.589	1,737,395.613	39.793535039	-80.654747583
11,871.00	89.32	149.610	6,969.49	-2,890.61	-3,732.33	14,451,658.437	1,737,443.035	39.793311671	-80.654579875
11,966.00	89.93	149.700	6,970.11	-2,972.59	-3,684.34	14,451,576.454	1,737,491.028	39.793086019	-80.654410146
12,059.00	89.67	149.700	6,970.44	-3,052.88	-3,637.42	14,451,496.159	1,737,537.949	39.792865011	-80.654244213
12,154.00	89.85	149.530	6,970.84	-3,134.83	-3,589.37	14,451,414.209	1,737,586.000	39.792639446	-80.654074279
12,248.00	89.36	149.350	6,971.48	-3,215.78	-3,541.57	14,451,333.268	1,737,633.792	39.792416656	-80.653905255
12,342.00	89.45	149.880	6,972.46	-3,296.86	-3,494.03	14,451,252.184	1,737,681.335	39.792193475	-80.653737120
12,436.00	89.01	149.610	6,973.72	-3,378.05	-3,446.67	14,451,170.995	1,737,728.693	39.791970008	-80.653569649
12,530.00	89.19	150.140	6,975.20	-3,459.34	-3,399.50	14,451,089.702	1,737,775.864	39.791746256	-80.653402843
12,625.00	88.97	149.610	6,976.73	-3,541.50	-3,351.83	14,451,007.545	1,737,823.537	39.791520125	-80.653234264
12,720.00	88.84	149.610	6,978.54	-3,623.43	-3,303.78	14,450,925.613	1,737,871.587	39.791294608	-80.653064340
12,815.00	89.01	149.610	6,980.32	-3,705.36	-3,255.73	14,450,843.680	1,737,919.637	39.791069090	-80.652894417
12,908.00	89.27	149.610	6,981.72	-3,785.58	-3,208.69	14,450,763.467	1,737,966.679	39.790848305	-80.652728061
13,002.00	89.05	149.350	6,983.10	-3,866.54	-3,160.96	14,450,682.500	1,738,014.411	39.790625440	-80.652559261
13,097.00	89.23	149.530	6,984.52	-3,948.34	-3,112.66	14,450,600.705	1,738,062.707	39.790400297	-80.652388464
13,192.00	89.19	149.790	6,985.83	-4,030.32	-3,064.68	14,450,518.724	1,738,110.690	39.790174646	-80.652218786
13,286.00	89.41	149.700	6,986.98	-4,111.51	-3,017.32	14,450,437.534	1,738,158.048	39.789951172	-80.652051322
13,380.00	89.36	149.700	6,987.99	-4,192.67	-2,969.89	14,450,356.379	1,738,205.471	39.789727797	-80.651883628
13,475.00	89.27	149.090	6,989.13	-4,274.43	-2,921.53	14,450,274.620	1,738,253.833	39.789502748	-80.651712600
13,569.00	89.32	149.440	6,990.28	-4,355.22	-2,873.50	14,450,193.829	1,738,301.869	39.789280364	-80.651542718
13,663.00	89.45	150.050	6,991.29	-4,436.41	-2,826.14	14,450,112.638	1,738,349.228	39.789056887	-80.651375256
13,756.00	88.97	150.320	6,992.57	-4,517.09	-2,779.90	14,450,031.956	1,738,395.463	39.788834821	-80.651211788
13,850.00	89.14	150.140	6,994.12	-4,598.67	-2,733.24	14,449,950.373	1,738,442.130	39.788610274	-80.651046799
13,944.00	89.05	150.050	6,995.61	-4,680.15	-2,686.38	14,449,868.899	1,738,488.989	39.788386026	-80.650881123
14,038.00	89.01	149.970	6,997.20	-4,761.55	-2,639.40	14,449,787.496	1,738,535.968	39.788161971	-80.650715020
14,133.00	89.05	149.970	6,998.81	-4,843.79	-2,591.86	14,449,705.261	1,738,583.504	39.787935622	-80.650546946
14,226.00	88.97	150.140	7,000.41	-4,924.36	-2,545.45	14,449,624.688	1,738,629.919	39.787713852	-80.650382839
14,320.00	89.14	150.320	7,001.97	-5,005.94	-2,498.78	14,449,543.105	1,738,676.586	39.787489305	-80.650217855
14,414.00	89.32	150.410	7,003.23	-5,087.64	-2,452.30	14,449,461.409	1,738,723.062	39.787264447	-80.650053551
14,508.00	89.23	150.410	7,004.42	-5,169.37	-2,405.89	14,449,379.675	1,738,769.474	39.787039488	-80.649889474
14,602.00	89.41	150.320	7,005.53	-5,251.07	-2,359.41	14,449,297.976	1,738,815.951	39.786814626	-80.649725169
14,695.00	89.41	150.760	7,006.49	-5,332.04	-2,313.68	14,449,217.006	1,738,861.688	39.786591770	-80.649563491
14,790.00	89.36	149.880	7,007.51	-5,414.57	-2,266.64	14,449,134.475	1,738,908.724	39.786364615	-80.649397208
14,884.00	89.27	149.610	7,008.63	-5,495.76	-2,219.28	14,449,053.285	1,738,956.082	39.786141137	-80.649229761
14,980.00	89.45	149.700	7,009.71	-5,578.61	-2,170.78	14,448,970.442	1,739,004.579	39.785913109	-80.649058287
15,074.00	89.41	149.260	7,010.64	-5,659.58	-2,123.05	14,448,889.470	1,739,052.313	39.785690226	-80.648889502
15,168.00	89.01	149.440	7,011.94	-5,740.44	-2,075.13	14,448,808.610	1,739,100.229	39.785467649	-80.648720070
15,264.00	88.97	149.440	7,013.63	-5,823.09	-2,026.33	14,448,725.958	1,739,149.032	39.785240140	-80.648547507
15,357.00	89.10	149.440	7,015.20	-5,903.16	-1,979.05	14,448,645.888	1,739,196.310	39.785019737	-80.648380336
15,452.00	89.01	149.530	7,016.76	-5,984.99	-1,930.82	14,448,564.057	1,739,244.541	39.784794489	-80.648209799
15,545.00	89.10	149.530	7,018.30	-6,065.14	-1,883.67	14,448,483.912	1,739,291.693	39.784573882	-80.648043077
15,640.00	89.05	149.260	7,019.83	-6,146.89	-1,835.31	14,448,402.156	1,739,340.053	39.784348840	-80.647872083
15,734.00	88.84	149.350	7,021.56	-6,227.71	-1,787.33	14,448,321.340	1,739,388.029	39.784126380	-80.647702444
15,829.00	88.92	149.530	7,023.42	-6,309.50	-1,739.04	14,448,239.552	1,739,436.321	39.783901247	-80.647531691
15,923.00	88.88	149.180	7,025.22	-6,390.36	-1,691.14	14,448,158.695	1,739,484.225	39.783678676	-80.647362308
16,018.00	88.88	149.530	7,027.08	-6,472.07	-1,642.72	14,448,076.978	1,739,532.639	39.783453739	-80.647191126
16,112.00	88.92	149.790	7,028.88	-6,553.18	-1,595.25	14,447,995.867	1,739,580.112	39.783230474	-80.647023283
16,206.00	88.88	149.350	7,030.69	-6,634.22	-1,547.65	14,447,914.831	1,739,627.713	39.783007414	-80.646854987
16,299.00	88.92	149.440	7,032.47	-6,714.25	-1,500.31	14,447,834.801	1,739,675.052	39.782787120	-80.646687609

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Fitzgerald 02 HM (slot Q)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1292.91+33.09 @ 1326.00ft (Nabors X08)
Site:	Fitzgerald	MD Reference:	RKB=1292.91+33.09 @ 1326.00ft (Nabors X08)
Well:	Fitzgerald 02 HM (slot Q)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Decv0422v16

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
16,393.00	88.88	149.530	7,034.28	-6,795.21	-1,452.59	14,447,753.836	1,739,722.773	39.782564251	-80.646518886
16,487.00	88.79	149.970	7,036.19	-6,876.40	-1,405.24	14,447,672.652	1,739,770.118	39.782340788	-80.646351506
16,582.00	88.75	150.140	7,038.23	-6,958.70	-1,357.83	14,447,590.353	1,739,817.528	39.782114261	-80.646183911
16,676.00	88.75	150.050	7,040.28	-7,040.16	-1,310.98	14,447,508.889	1,739,864.381	39.781890031	-80.646018285
16,771.00	88.75	149.880	7,042.35	-7,122.39	-1,263.44	14,447,426.665	1,739,911.920	39.781663709	-80.645850233
16,865.00	88.84	150.050	7,044.33	-7,203.75	-1,216.40	14,447,345.306	1,739,958.959	39.781439764	-80.645683947
16,960.00	88.75	149.970	7,046.33	-7,286.01	-1,168.93	14,447,263.043	1,740,006.434	39.781213336	-80.645516124
17,054.00	88.79	150.050	7,048.34	-7,367.40	-1,121.95	14,447,181.648	1,740,053.409	39.780989293	-80.645350070
17,147.00	88.84	150.230	7,050.27	-7,448.04	-1,075.66	14,447,101.011	1,740,099.702	39.780767342	-80.645186434
17,241.00	88.92	150.320	7,052.11	-7,529.66	-1,029.06	14,447,019.396	1,740,146.302	39.780542699	-80.645021721
17,336.00	89.49	150.320	7,053.42	-7,612.18	-982.02	14,446,936.868	1,740,193.337	39.780315545	-80.644855472
17,431.00	89.49	149.880	7,054.27	-7,694.54	-934.67	14,446,854.517	1,740,240.691	39.780088872	-80.644688086
17,525.00	89.41	150.050	7,055.17	-7,775.91	-887.62	14,446,773.143	1,740,287.739	39.779864887	-80.644521779
17,619.00	89.41	149.970	7,056.14	-7,857.32	-840.64	14,446,691.733	1,740,334.722	39.779640802	-80.644355702
17,713.00	89.49	149.880	7,057.04	-7,938.66	-793.53	14,446,610.392	1,740,381.826	39.779416907	-80.644189194
17,808.00	89.54	149.970	7,057.85	-8,020.87	-745.93	14,446,528.185	1,740,429.432	39.779190626	-80.644020915
17,902.00	89.41	149.880	7,058.71	-8,102.21	-698.82	14,446,446.844	1,740,476.536	39.778966729	-80.643854409
17,996.00	89.45	149.790	7,059.64	-8,183.48	-651.59	14,446,365.577	1,740,523.768	39.778743035	-80.643687449
18,091.00	89.45	150.230	7,060.55	-8,265.75	-604.11	14,446,283.301	1,740,571.252	39.778516565	-80.643519611
18,186.00	89.58	149.970	7,061.36	-8,348.11	-556.75	14,446,200.949	1,740,618.606	39.778289888	-80.643352232
18,280.00	89.49	149.530	7,062.12	-8,429.30	-509.40	14,446,119.751	1,740,665.959	39.778066382	-80.643184844
18,375.00	89.14	149.350	7,063.26	-8,511.10	-461.10	14,446,037.953	1,740,714.257	39.777841216	-80.643014101
18,470.00	88.88	149.700	7,064.90	-8,592.96	-412.93	14,445,956.090	1,740,762.430	39.777615872	-80.642843805
18,564.00	88.57	149.090	7,066.99	-8,673.85	-365.08	14,445,875.205	1,740,810.275	39.777393218	-80.642674666
18,658.00	88.57	149.880	7,069.34	-8,754.80	-317.37	14,445,794.250	1,740,857.989	39.777170373	-80.642505992
18,752.00	89.10	149.700	7,071.25	-8,836.02	-270.08	14,445,713.034	1,740,905.277	39.776946815	-80.642338840
18,851.00	88.75	149.530	7,073.10	-8,921.41	-220.02	14,445,627.648	1,740,955.343	39.776711773	-80.642161862
Survey @ 18851.00 MD 7073.10 TVD									
18,905.00	88.75	149.530	7,074.28	-8,967.94	-192.64	14,445,581.116	1,740,982.719	39.776583687	-80.642065088
Survey Proj. to 18905.00 MD 7074.28 TVD									

Measured Depth (ft)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Comment
152.09	152.09	-0.05	0.03	MWD surveys
18,851.00	7,073.10	-8,921.41	-220.02	Survey @ 18851.00 MD 7073.10 TVD
18,905.00	7,074.28	-8,967.94	-192.64	Survey Proj. to 18905.00 MD 7074.28 TVD

Checked By: _____ Approved By: _____ Date: _____