



Well: Hillrock 1S-13 HU (E)  
 Site: Hillrock/Simms  
 Project: Marshall County, West Virginia  
 Design: rev5  
 Rig: Nabors B28

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Annotation
1	10248.00	9.80	316.050	10167.93	382.42	-622.27	0.00	0.000	-644.88	Survey @ 10248.00 MD 10167.93 TVD
2	10350.00	9.80	316.050	10268.45	394.92	-634.32	0.00	0.000	-661.76	KOP Begin 6.35°/100' build/turn
3	11303.79	50.79	132.288	11120.77	184.81	-394.56	6.35	176.654	-359.16	Begin 6.35°/100' build/turn
4	11378.66	50.00	126.200	11168.53	148.33	-349.93	6.35	101.448	-305.11	Begin 8°/100' build/turn
5	11867.41	89.10	126.200	11336.00	-116.92	12.49	8.00	0.000	107.14	Begin 3.75°/100' turn
6	12501.75	89.10	149.991	11346.12	-585.59	433.07	3.75	90.194	724.26	Begin 89.10° lateral
7	23103.96	89.10	149.991	11513.00	-9765.37	5735.00	0.00	0.000	1324.87	PBHLTD 23103.96 MD/11513.00 TVD

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSec	Departure	Annotation
181.00	0.00	0.000	181.00	0.00	0.00	0.00	0.00	MWD surveys
23039.00	88.79	151.080	11538.62	-9728.94	5692.08	11271.72	12929.53	Survey @ 23039.00 MD 11538.62 TVD
23081.00	88.79	151.080	11539.51	-9765.70	5712.39	11313.70	12971.52	Survey projected to 23081.00 MD 11539.51 TVD

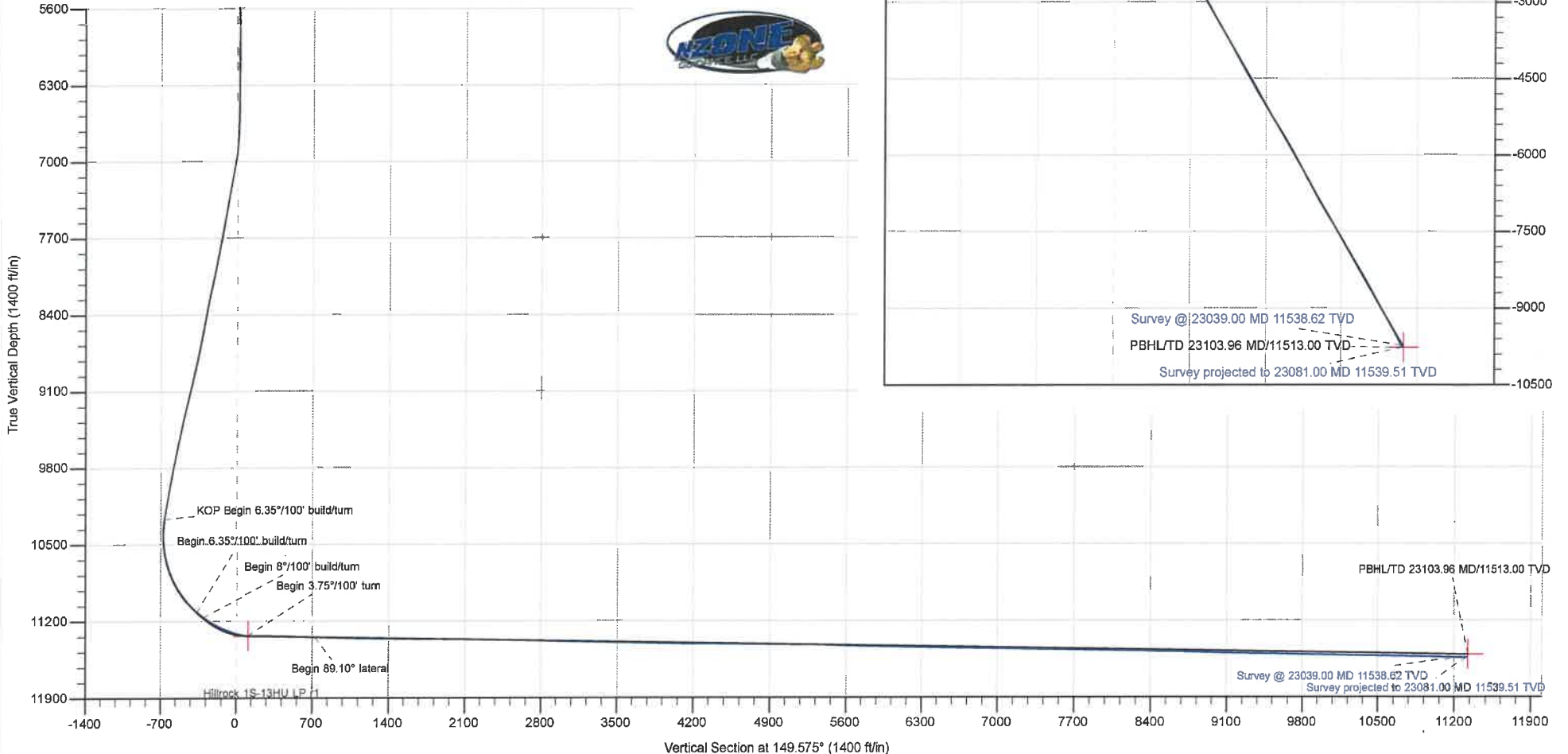
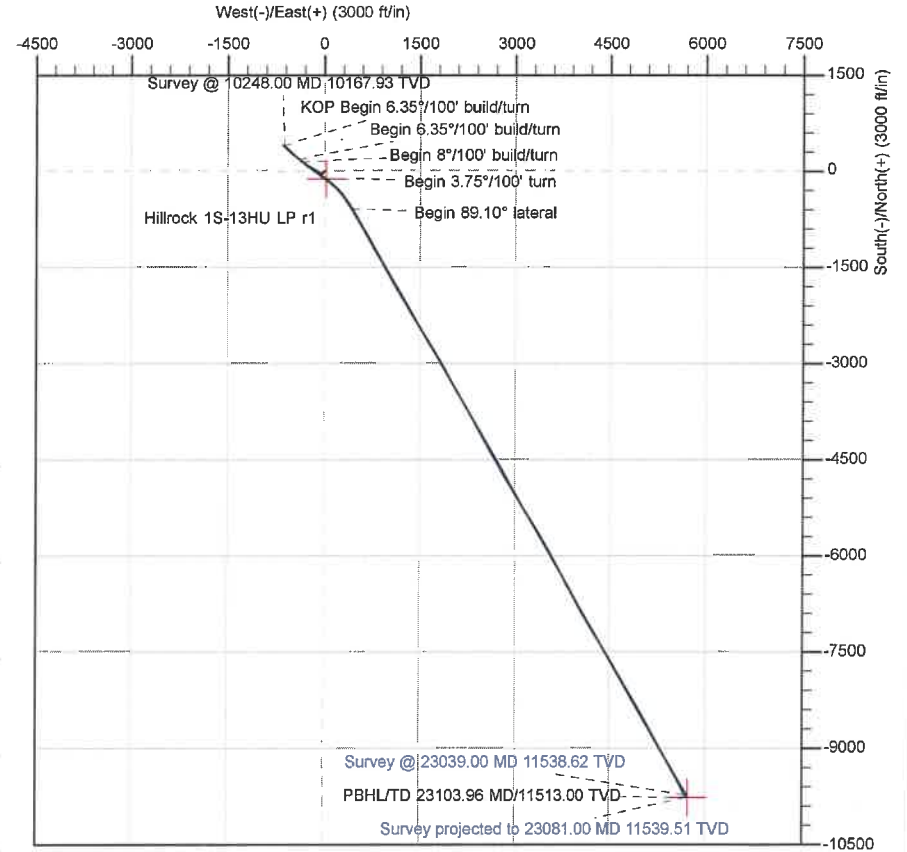


Azimuths to Grid North  
 True North: -0.15°  
 Magnetic North: -8.88°

Magnetic Field  
 Strength: 51798.7snT  
 Dip Angle: 66.67°  
 Date: 8/4/2020  
 Model: IGRF2015

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+26 @ 1245.00ft (Nabors B28)  
 Northing: 14434239.85 Easting: 1704993.07 Latitude: 39.74576170 Longitude: -80.77026180

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.883°



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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

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

<b>Well</b>	Hillrock 1S-13 HU (E)					
<b>Well Position</b>	<b>+N/-S</b>	0.00 ft	<b>Northing:</b>	14,434,239.85 usft	<b>Latitude:</b>	39.74576170
	<b>+E/-W</b>	0.00 ft	<b>Easting:</b>	1,704,993.07 usft	<b>Longitude:</b>	-80.77026180
<b>Position Uncertainty</b>		0.00 ft	<b>Wellhead Elevation:</b>	ft	<b>Ground Level:</b>	1,219.00 ft

<b>Wellbore</b>	Original Hole				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2015	8/4/2020	-8.736	66.670	51,798.68910141

<b>Design</b>	Surveys Original Hole				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (°)</b>	
	0.00	0.00	0.00	149.575	

<b>Survey Program</b>	Date 8/18/2020			
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
181.00	913.00	MWD surf (Original Hole)	MWD	MWD - Standard
1,067.00	2,676.00	MWD int (Original Hole)	MWD	MWD - Standard
2,780.00	10,248.00	MWD (Original Hole)	MWD	MWD - Standard
10,287.00	23,039.00	MWD lat (Original Hole)	MWD	MWD - Standard
23,081.00	23,081.00	Projection (Original Hole)	MWD	MWD - Standard

<b>Survey</b>										
<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Vertical Section (ft)</b>	<b>Dogleg Rate (°/100ft)</b>	<b>Build Rate (°/100ft)</b>	<b>Turn Rate (°/100ft)</b>	
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
181.00	0.00	0.000	181.00	0.00	0.00	0.00	0.00	0.00	0.00	
<b>MWD surveys</b>										
241.00	0.17	355.160	241.00	0.09	-0.01	-0.08	0.28	0.28	0.00	
333.00	0.26	230.450	333.00	0.09	-0.18	-0.17	0.42	0.10	-135.55	
425.00	0.04	349.450	425.00	-0.01	-0.35	-0.17	0.31	-0.24	129.35	
515.00	0.48	277.820	515.00	0.07	-0.73	-0.43	0.52	0.49	-79.59	

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	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)	
606.00	0.13	179.120	606.00	0.02	-1.10	-0.58	0.57	-0.38	-108.46	
697.00	0.04	261.120	697.00	-0.09	-1.13	-0.50	0.14	-0.10	90.11	
788.00	0.22	2.280	788.00	0.08	-1.16	-0.66	0.25	0.20	111.16	
883.00	0.31	309.110	883.00	0.43	-1.35	-1.05	0.26	0.09	-55.97	
913.00	0.35	261.120	913.00	0.46	-1.50	-1.16	0.90	0.13	-159.97	
1,067.00	0.04	177.180	1,066.99	0.34	-1.96	-1.29	0.23	-0.20	-54.51	
1,161.00	0.66	171.740	1,160.99	-0.23	-1.88	-0.76	0.66	0.66	-5.79	
1,256.00	0.31	192.740	1,255.99	-1.02	-1.86	-0.06	0.41	-0.37	22.11	
1,351.00	0.70	217.970	1,350.99	-1.73	-2.28	0.34	0.46	0.41	26.56	
1,446.00	0.96	232.820	1,445.98	-2.67	-3.27	0.65	0.35	0.27	15.63	
1,540.00	2.37	238.880	1,539.93	-4.15	-5.56	0.76	1.51	1.50	6.45	
1,635.00	3.47	238.360	1,634.81	-6.67	-9.69	0.85	1.16	1.16	-0.55	
1,730.00	3.16	235.980	1,729.65	-9.65	-14.31	1.07	0.36	-0.33	-2.51	
1,824.00	2.59	228.340	1,823.53	-12.51	-18.04	1.65	0.73	-0.61	-8.13	
1,919.00	2.59	217.520	1,918.43	-15.64	-20.95	2.87	0.51	0.00	-11.39	
2,013.00	3.16	222.800	2,012.32	-19.22	-24.01	4.42	0.67	0.61	5.62	
2,108.00	2.77	225.700	2,107.19	-22.75	-27.43	5.73	0.44	-0.41	3.05	
2,202.00	3.12	222.980	2,201.06	-26.20	-30.80	7.00	0.40	0.37	-2.89	
2,297.00	2.46	229.220	2,295.95	-29.43	-34.10	8.11	0.76	-0.69	6.57	
2,392.00	2.11	261.120	2,390.88	-31.03	-37.37	7.83	1.37	-0.37	33.58	
2,486.00	2.94	269.290	2,484.79	-31.33	-41.50	6.00	0.96	0.88	8.69	
2,581.00	2.81	262.530	2,579.67	-31.66	-46.24	3.88	0.38	-0.14	-7.12	
2,676.00	2.81	247.410	2,674.56	-32.86	-50.70	2.66	0.78	0.00	-15.92	
2,780.00	2.94	238.000	2,778.43	-35.25	-55.31	2.38	0.47	0.13	-9.05	
2,874.00	3.12	227.370	2,872.29	-38.26	-59.24	2.99	0.63	0.19	-11.31	
2,969.00	2.46	218.850	2,967.18	-41.60	-62.42	4.26	0.82	-0.69	-8.97	
3,063.00	1.76	187.560	3,061.12	-44.60	-63.88	6.11	1.41	-0.74	-33.29	
3,158.00	1.14	194.760	3,156.09	-46.96	-64.31	7.93	0.68	-0.65	7.58	
3,253.00	0.88	163.650	3,251.08	-48.57	-64.35	9.30	0.63	-0.27	-32.75	
3,347.00	1.54	111.180	3,345.06	-49.72	-62.96	10.99	1.30	0.70	-55.82	
3,442.00	2.54	151.520	3,440.00	-52.03	-60.77	14.09	1.78	1.05	42.46	
3,535.00	2.68	135.170	3,532.90	-55.39	-58.25	18.26	0.81	0.15	-17.58	
3,630.00	2.28	93.770	3,627.82	-57.09	-54.80	21.47	1.89	-0.42	-43.58	
3,725.00	1.05	83.230	3,722.78	-57.11	-52.05	22.88	1.33	-1.29	-11.09	
3,819.00	0.35	15.030	3,816.77	-56.73	-51.12	23.03	1.04	-0.74	-72.55	
3,913.00	0.66	358.590	3,910.77	-55.91	-51.06	22.35	0.36	0.33	-17.49	
4,010.00	0.79	30.140	4,007.76	-54.78	-50.74	21.54	0.43	0.13	32.53	
4,104.00	0.66	20.830	4,101.76	-53.71	-50.22	20.88	0.19	-0.14	-9.90	
4,199.00	1.40	12.390	4,196.74	-52.06	-49.78	19.69	0.79	0.78	-8.88	
4,293.00	1.45	348.750	4,290.71	-49.78	-49.76	17.72	0.62	0.05	-25.15	
4,387.00	0.62	341.100	4,384.70	-48.13	-50.16	16.10	0.89	-0.88	-8.14	
4,482.00	1.53	327.390	4,479.68	-46.57	-51.01	14.33	0.99	0.96	-14.43	
4,576.00	0.92	337.230	4,573.66	-44.82	-51.98	12.33	0.68	-0.65	10.47	
4,669.00	1.41	338.730	4,666.64	-43.07	-52.68	10.46	0.53	0.53	1.61	

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<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	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)	
4,764.00	1.45	353.490	4,761.61	-40.78	-53.24	8.20	0.39	0.04	15.54	
4,858.00	0.70	35.600	4,855.59	-39.13	-53.04	6.88	1.11	-0.80	44.80	
4,952.00	0.66	42.100	4,949.58	-38.27	-52.35	6.49	0.09	-0.04	6.91	
5,047.00	1.41	100.280	5,044.57	-38.07	-50.83	7.08	1.26	0.79	61.24	
5,141.00	1.14	73.470	5,138.55	-38.01	-48.80	8.06	0.69	-0.29	-28.52	
5,235.00	0.92	134.380	5,232.54	-38.27	-47.36	9.02	1.13	-0.23	64.80	
5,330.00	1.80	97.990	5,327.51	-39.01	-45.34	10.68	1.25	0.93	-38.31	
5,423.00	2.77	129.110	5,420.44	-40.63	-42.15	13.69	1.66	1.04	33.46	
5,518.00	2.72	146.420	5,515.33	-43.96	-39.12	18.09	0.87	-0.05	18.22	
5,611.00	2.28	167.340	5,608.24	-47.60	-37.49	22.06	1.08	-0.47	22.49	
5,706.00	0.92	183.430	5,703.20	-50.21	-37.12	24.49	1.49	-1.43	16.94	
5,801.00	1.31	222.620	5,798.19	-51.77	-37.91	25.44	0.88	0.41	41.25	
5,896.00	1.54	204.430	5,893.16	-53.73	-39.17	26.49	0.53	0.24	-19.15	
5,990.00	0.70	213.310	5,987.14	-55.36	-40.01	27.48	0.91	-0.89	9.45	
6,084.00	0.70	281.860	6,081.13	-55.72	-40.88	27.34	0.84	0.00	72.93	
6,179.00	1.41	298.470	6,176.12	-55.04	-42.48	25.95	0.81	0.75	17.48	
6,274.00	0.79	311.570	6,271.10	-54.05	-44.00	24.33	0.70	-0.65	13.79	
6,369.00	0.48	319.570	6,366.09	-53.31	-44.74	23.31	0.34	-0.33	8.42	
6,559.00	0.40	346.020	6,556.09	-52.06	-45.42	21.89	0.11	-0.04	13.92	
6,653.00	1.01	325.370	6,650.08	-51.06	-45.97	20.75	0.69	0.65	-21.97	
6,748.00	2.64	316.230	6,745.03	-48.80	-47.96	17.79	1.74	1.72	-9.62	
6,843.00	5.49	310.780	6,839.78	-44.25	-52.92	11.36	3.02	3.00	-5.74	
6,937.00	8.48	310.160	6,933.07	-36.84	-61.62	0.56	3.18	3.18	-0.66	
7,032.00	10.99	308.840	7,026.70	-26.64	-74.03	-14.52	2.65	2.64	-1.39	
7,126.00	11.34	306.380	7,118.92	-15.54	-88.45	-31.39	0.63	0.37	-2.62	
7,221.00	11.69	305.590	7,212.01	-4.40	-103.79	-48.77	0.40	0.37	-0.83	
7,315.00	11.56	303.040	7,304.08	6.28	-119.43	-65.90	0.56	-0.14	-2.71	
7,410.00	11.07	300.760	7,397.23	16.13	-135.25	-82.40	0.70	-0.52	-2.40	
7,504.00	11.07	300.060	7,489.48	25.27	-150.82	-98.16	0.14	0.00	-0.74	
7,597.00	11.95	299.000	7,580.61	34.41	-166.96	-114.22	0.97	0.95	-1.14	
7,692.00	12.22	296.980	7,673.51	43.74	-184.53	-131.16	0.53	0.28	-2.13	
7,787.00	13.23	294.780	7,766.17	52.86	-203.36	-148.56	1.18	1.06	-2.32	
7,882.00	13.18	297.860	7,858.66	62.48	-222.80	-166.70	0.74	-0.05	3.24	
7,976.00	12.39	304.270	7,950.34	73.16	-240.61	-184.94	1.73	-0.84	6.82	
8,071.00	13.01	306.300	8,043.01	85.23	-257.65	-203.97	0.80	0.65	2.14	
8,165.00	13.27	303.750	8,134.55	97.49	-275.15	-223.40	0.68	0.28	-2.71	
8,260.00	12.44	305.420	8,227.17	109.48	-292.56	-242.55	0.96	-0.87	1.76	
8,354.00	12.17	307.700	8,319.01	121.41	-308.65	-260.99	0.59	-0.29	2.43	
8,449.00	10.94	308.230	8,412.08	133.11	-323.65	-278.68	1.30	-1.29	0.56	
8,544.00	10.85	309.020	8,505.37	144.32	-337.68	-295.45	0.18	-0.09	0.83	
8,638.00	11.21	310.430	8,597.64	155.81	-351.51	-312.36	0.48	0.38	1.50	
8,733.00	11.91	309.720	8,690.71	168.06	-366.08	-330.31	0.75	0.74	-0.75	
8,827.00	13.32	309.280	8,782.44	181.12	-381.92	-349.59	1.50	1.50	-0.47	



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<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	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)	
8,922.00	13.67	308.760	8,874.81	195.08	-399.14	-370.34	0.39	0.37	-0.55	
9,017.00	14.24	308.410	8,967.01	209.36	-417.05	-391.73	0.61	0.60	-0.37	
9,112.00	14.06	306.910	9,059.13	223.55	-435.44	-413.28	0.43	-0.19	-1.58	
9,210.00	14.81	307.790	9,154.03	238.38	-454.85	-435.89	0.80	0.77	0.90	
9,305.00	14.06	306.410	9,246.03	252.67	-473.74	-457.78	0.87	-0.79	-1.45	
9,399.00	12.96	309.020	9,337.43	266.08	-491.11	-478.14	1.34	-1.17	2.78	
9,493.00	13.54	310.600	9,428.93	279.88	-507.66	-498.42	0.73	0.62	1.68	
9,589.00	13.49	311.570	9,522.27	294.62	-524.57	-519.70	0.24	-0.05	1.01	
9,683.00	12.96	310.510	9,613.78	308.74	-540.79	-540.09	0.62	-0.56	-1.13	
9,778.00	12.00	309.720	9,706.53	321.97	-556.48	-559.44	1.03	-1.01	-0.83	
9,871.00	11.25	310.250	9,797.62	334.01	-570.84	-577.10	0.81	-0.81	0.57	
9,965.00	11.25	312.710	9,889.82	346.16	-584.58	-594.53	0.51	0.00	2.62	
10,059.00	10.94	312.980	9,982.06	358.46	-597.84	-611.85	0.33	-0.33	0.29	
10,153.00	10.50	314.470	10,074.42	370.54	-610.48	-628.67	0.55	-0.47	1.59	
10,248.00	9.80	316.050	10,167.93	382.42	-622.27	-644.88	0.79	-0.74	1.66	
10,287.00	9.76	316.670	10,206.37	387.22	-626.84	-651.33	0.29	-0.10	1.59	
10,358.00	7.69	317.280	10,276.54	395.09	-634.19	-661.84	2.92	-2.92	0.86	
10,405.00	3.91	338.290	10,323.30	398.89	-636.92	-666.50	9.10	-8.04	44.70	
10,453.00	3.03	349.630	10,371.21	401.66	-637.75	-669.31	2.32	-1.83	23.63	
10,500.00	1.76	21.270	10,418.17	403.55	-637.72	-670.92	3.80	-2.70	67.32	
10,548.00	3.43	106.960	10,466.13	403.82	-636.07	-670.32	7.78	3.48	178.52	
10,595.00	6.42	120.140	10,512.95	402.09	-632.46	-667.00	6.76	6.36	28.04	
10,643.00	9.89	122.160	10,560.46	398.55	-626.64	-661.00	7.25	7.23	4.21	
10,690.00	12.57	126.380	10,606.56	393.36	-619.11	-652.72	5.96	5.70	8.98	
10,738.00	14.90	131.220	10,653.18	386.20	-610.26	-642.06	5.41	4.85	10.08	
10,785.00	17.27	132.890	10,698.34	377.47	-600.60	-629.64	5.14	5.04	3.55	
10,832.00	19.74	133.330	10,742.91	367.27	-589.71	-615.33	5.26	5.26	0.94	
10,879.00	23.12	132.360	10,786.65	355.60	-577.12	-598.89	7.23	7.19	-2.06	
10,927.00	26.81	133.680	10,830.16	341.77	-562.32	-579.47	7.77	7.69	2.75	
10,974.00	29.27	134.820	10,871.64	326.35	-546.50	-558.16	5.36	5.23	2.43	
11,022.00	32.09	133.850	10,912.92	309.24	-528.98	-534.54	5.96	5.88	-2.02	
11,069.00	36.22	134.120	10,951.80	290.92	-510.00	-509.13	8.79	8.79	0.57	
11,116.00	40.57	134.560	10,988.63	270.52	-489.13	-480.97	9.27	9.26	0.94	
11,163.00	42.77	133.940	11,023.74	248.72	-466.75	-450.83	4.76	4.68	-1.32	
11,210.00	45.71	132.800	11,057.41	226.21	-442.91	-419.35	6.48	6.26	-2.43	
11,257.00	48.31	130.780	11,089.45	203.31	-417.27	-386.63	6.36	5.53	-4.30	
11,304.00	50.37	129.550	11,120.08	180.32	-390.03	-353.01	4.81	4.38	-2.62	
11,351.00	52.48	127.880	11,149.38	157.35	-361.35	-318.68	5.28	4.49	-3.55	
11,397.00	55.16	127.090	11,176.53	134.76	-331.89	-284.28	5.99	5.83	-1.72	
11,444.00	59.47	127.440	11,201.91	110.81	-300.42	-247.69	9.19	9.17	0.74	
11,492.00	62.20	127.440	11,225.30	85.33	-267.14	-208.87	5.69	5.69	0.00	
11,539.00	64.84	127.610	11,246.25	59.71	-233.78	-169.88	5.63	5.62	0.36	
11,586.00	67.87	127.170	11,265.10	33.57	-199.58	-130.02	6.50	6.45	-0.94	

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	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)
11,633.00	69.98	126.470	11,282.00	7.29	-164.47	-89.58	4.70	4.49	-1.49
11,681.00	71.65	125.680	11,297.77	-19.40	-127.83	-48.01	3.81	3.48	-1.65
11,728.00	74.95	125.940	11,311.28	-45.74	-91.33	-6.81	7.04	7.02	0.55
11,776.00	79.43	126.650	11,321.92	-73.44	-53.61	36.17	9.44	9.33	1.48
11,823.00	83.78	127.000	11,328.78	-101.30	-16.41	79.04	9.28	9.26	0.74
11,870.00	86.77	127.880	11,332.65	-129.77	20.78	122.43	6.63	6.36	1.87
11,917.00	90.20	129.110	11,333.89	-159.01	57.55	166.26	7.75	7.30	2.62
11,964.00	90.37	130.780	11,333.66	-189.19	93.58	210.52	3.57	0.36	3.55
12,011.00	89.58	131.130	11,333.68	-219.99	129.07	255.06	1.84	-1.68	0.74
12,058.00	89.45	133.500	11,334.08	-251.63	163.82	299.94	5.05	-0.28	5.04
12,105.00	88.35	136.140	11,334.98	-284.75	197.15	345.38	6.08	-2.34	5.62
12,153.00	88.92	138.860	11,336.12	-320.13	229.57	392.30	5.79	1.19	5.67
12,200.00	89.32	141.240	11,336.85	-356.15	259.74	438.64	5.13	0.85	5.06
12,247.00	88.13	141.410	11,337.89	-392.83	289.10	485.14	2.56	-2.53	0.36
12,294.00	88.75	141.760	11,339.17	-429.65	318.30	531.67	1.51	1.32	0.74
12,342.00	87.03	144.490	11,340.94	-468.01	347.08	579.33	6.72	-3.58	5.69
12,389.00	85.89	146.950	11,343.84	-506.77	373.50	626.13	5.76	-2.43	5.23
12,436.00	89.01	147.920	11,345.93	-546.34	398.77	673.04	6.95	6.64	2.06
12,530.00	88.48	148.090	11,347.99	-626.04	448.56	766.98	0.59	-0.56	0.18
12,625.00	88.62	150.200	11,350.39	-707.56	497.26	861.94	2.23	0.15	2.22
12,718.00	88.35	150.030	11,352.85	-788.17	543.59	954.91	0.34	-0.29	-0.18
12,826.00	88.75	149.760	11,355.59	-881.57	597.74	1,062.87	0.45	0.37	-0.25
12,921.00	88.84	150.200	11,357.58	-963.81	645.26	1,157.85	0.47	0.09	0.46
13,015.00	89.32	149.850	11,359.09	-1,045.22	692.22	1,251.83	0.63	0.51	-0.37
13,110.00	89.45	150.380	11,360.11	-1,127.58	739.55	1,346.82	0.57	0.14	0.56
13,204.00	89.23	150.290	11,361.20	-1,209.26	786.07	1,440.81	0.25	-0.23	-0.10
13,299.00	89.71	150.290	11,362.07	-1,291.77	833.15	1,535.80	0.51	0.51	0.00
13,392.00	89.76	150.290	11,362.50	-1,372.54	879.24	1,628.79	0.05	0.05	0.00
13,487.00	89.45	150.380	11,363.16	-1,455.09	926.26	1,723.78	0.34	-0.33	0.09
13,581.00	89.32	150.380	11,364.17	-1,536.80	972.71	1,817.76	0.14	-0.14	0.00
13,676.00	89.41	150.990	11,365.22	-1,619.63	1,019.22	1,912.74	0.65	0.09	0.64
13,771.00	89.27	150.030	11,366.32	-1,702.31	1,065.99	2,007.72	1.02	-0.15	-1.01
13,866.00	89.36	150.910	11,367.45	-1,784.97	1,112.80	2,102.70	0.93	0.09	0.93
13,960.00	88.75	150.640	11,369.00	-1,866.99	1,158.69	2,196.66	0.71	-0.65	-0.29
14,055.00	88.88	150.470	11,370.97	-1,949.70	1,205.38	2,291.63	0.23	0.14	-0.18
14,150.00	88.84	150.910	11,372.86	-2,032.52	1,251.88	2,386.59	0.46	-0.04	0.46
14,245.00	89.14	149.500	11,374.53	-2,114.95	1,299.08	2,481.57	1.52	0.32	-1.48
14,339.00	88.79	147.920	11,376.23	-2,195.26	1,347.89	2,575.54	1.72	-0.37	-1.68
14,434.00	88.79	148.180	11,378.24	-2,275.85	1,398.15	2,670.49	0.27	0.00	0.27
14,529.00	88.97	148.440	11,380.09	-2,356.67	1,448.05	2,765.45	0.33	0.19	0.27
14,623.00	88.92	148.620	11,381.82	-2,436.83	1,497.11	2,859.41	0.20	-0.05	0.19
14,718.00	88.97	148.440	11,383.57	-2,517.84	1,546.70	2,954.38	0.20	0.05	-0.19
14,813.00	88.84	148.440	11,385.39	-2,598.78	1,596.41	3,049.35	0.14	-0.14	0.00
14,907.00	88.75	148.090	11,387.36	-2,678.71	1,645.84	3,143.30	0.38	-0.10	-0.37

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	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)
15,002.00	88.75	148.440	11,389.44	-2,759.48	1,695.80	3,238.25	0.37	0.00	0.37
15,097.00	88.84	148.180	11,391.43	-2,840.30	1,745.69	3,333.21	0.29	0.09	-0.27
15,192.00	88.75	148.270	11,393.43	-2,921.05	1,795.71	3,428.16	0.13	-0.09	0.09
15,286.00	88.70	150.030	11,395.52	-3,001.72	1,843.90	3,522.13	1.87	-0.05	1.87
15,381.00	88.75	150.990	11,397.64	-3,084.39	1,890.65	3,617.09	1.01	0.05	1.01
15,476.00	88.75	151.080	11,399.71	-3,167.49	1,936.65	3,712.04	0.09	0.00	0.09
15,571.00	88.88	151.170	11,401.68	-3,250.66	1,982.51	3,806.99	0.17	0.14	0.09
15,665.00	88.88	151.170	11,403.51	-3,332.99	2,027.83	3,900.93	0.00	0.00	0.00
15,760.00	89.01	150.910	11,405.26	-3,416.10	2,073.82	3,995.88	0.31	0.14	-0.27
15,855.00	89.41	150.730	11,406.57	-3,499.04	2,120.13	4,090.85	0.46	0.42	-0.19
15,950.00	89.41	150.640	11,407.55	-3,581.87	2,166.65	4,185.83	0.09	0.00	-0.09
16,044.00	89.27	150.730	11,408.63	-3,663.82	2,212.67	4,279.81	0.18	-0.15	0.10
16,139.00	89.41	150.820	11,409.73	-3,746.73	2,259.05	4,374.78	0.18	0.15	0.09
16,234.00	89.36	150.550	11,410.75	-3,829.56	2,305.56	4,469.75	0.29	-0.05	-0.28
16,329.00	89.54	150.640	11,411.66	-3,912.31	2,352.20	4,564.74	0.21	0.19	0.09
16,423.00	89.85	150.550	11,412.16	-3,994.20	2,398.35	4,658.72	0.34	0.33	-0.10
16,517.00	89.36	150.470	11,412.81	-4,076.02	2,444.62	4,752.70	0.53	-0.52	-0.09
16,612.00	89.36	150.730	11,413.87	-4,158.78	2,491.25	4,847.68	0.27	0.00	0.27
16,707.00	89.36	151.700	11,414.93	-4,242.04	2,536.99	4,942.64	1.02	0.00	1.02
16,801.00	89.45	152.310	11,415.91	-4,325.03	2,581.11	5,036.55	0.66	0.10	0.65
16,895.00	89.05	150.910	11,417.14	-4,407.72	2,625.80	5,130.48	1.55	-0.43	-1.49
16,990.00	89.76	150.640	11,418.12	-4,490.62	2,672.18	5,225.45	0.80	0.75	-0.28
17,085.00	88.79	148.440	11,419.32	-4,572.50	2,720.34	5,320.44	2.53	-1.02	-2.32
17,180.00	87.96	148.880	11,422.02	-4,653.60	2,769.73	5,415.38	0.99	-0.87	0.46
17,274.00	87.96	148.530	11,425.36	-4,733.87	2,818.52	5,509.31	0.37	0.00	-0.37
17,369.00	88.35	149.320	11,428.42	-4,815.20	2,867.53	5,604.26	0.93	0.41	0.83
17,464.00	88.40	148.360	11,431.12	-4,896.46	2,916.67	5,699.21	1.01	0.05	-1.01
17,558.00	88.92	149.320	11,433.32	-4,976.87	2,965.29	5,793.18	1.16	0.55	1.02
17,653.00	88.97	149.240	11,435.06	-5,058.53	3,013.81	5,888.16	0.10	0.05	-0.08
17,748.00	88.75	149.410	11,436.95	-5,140.22	3,062.27	5,983.14	0.29	-0.23	0.18
17,843.00	88.79	148.270	11,438.99	-5,221.49	3,111.41	6,078.11	1.20	0.04	-1.20
17,937.00	88.97	148.710	11,440.83	-5,301.62	3,160.53	6,172.07	0.51	0.19	0.47
18,032.00	88.79	149.320	11,442.69	-5,383.04	3,209.43	6,267.05	0.67	-0.19	0.64
18,127.00	89.14	148.800	11,444.40	-5,464.51	3,258.27	6,362.03	0.66	0.37	-0.55
18,222.00	88.70	149.060	11,446.20	-5,545.87	3,307.28	6,457.01	0.54	-0.46	0.27
18,316.00	88.92	149.060	11,448.15	-5,626.48	3,355.60	6,550.98	0.23	0.23	0.00
18,411.00	88.75	149.150	11,450.08	-5,707.98	3,404.37	6,645.96	0.20	-0.18	0.09
18,506.00	88.97	149.060	11,451.97	-5,789.48	3,453.14	6,740.94	0.25	0.23	-0.09
18,600.00	88.66	150.380	11,453.91	-5,870.64	3,500.53	6,834.91	1.44	-0.33	1.40
18,694.00	89.41	151.520	11,455.50	-5,952.80	3,546.16	6,928.87	1.45	0.80	1.21
18,789.00	89.49	151.260	11,456.41	-6,036.20	3,591.65	7,023.82	0.29	0.08	-0.27
18,884.00	89.49	151.610	11,457.25	-6,119.63	3,637.08	7,118.77	0.37	0.00	0.37
18,978.00	89.49	151.260	11,458.09	-6,202.19	3,682.02	7,212.71	0.37	0.00	-0.37

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	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)
	19,072.00	89.49	151.260	11,458.93	-6,284.60	3,727.22	7,306.67	0.00	0.00	0.00
	19,166.00	89.05	151.340	11,460.12	-6,367.05	3,772.35	7,400.62	0.48	-0.47	0.09
	19,261.00	88.92	151.520	11,461.81	-6,450.47	3,817.78	7,495.55	0.23	-0.14	0.19
	19,356.00	89.01	151.700	11,463.52	-6,534.03	3,862.94	7,590.48	0.21	0.09	0.19
	19,450.00	88.92	151.520	11,465.22	-6,616.71	3,907.63	7,684.40	0.21	-0.10	-0.19
	19,545.00	88.84	151.340	11,467.08	-6,700.12	3,953.05	7,779.33	0.21	-0.08	-0.19
	19,640.00	89.36	151.260	11,468.57	-6,783.44	3,998.67	7,874.28	0.55	0.55	-0.08
	19,735.00	88.97	149.320	11,469.96	-6,865.94	4,045.74	7,969.26	2.08	-0.41	-2.04
	19,830.00	88.84	149.060	11,471.77	-6,947.52	4,094.39	8,064.24	0.31	-0.14	-0.27
	19,925.00	88.75	149.150	11,473.77	-7,029.02	4,143.16	8,159.21	0.13	-0.09	0.09
	20,019.00	89.10	148.800	11,475.53	-7,109.56	4,191.60	8,253.19	0.53	0.37	-0.37
	20,114.00	88.48	148.270	11,477.54	-7,190.57	4,241.18	8,348.15	0.86	-0.65	-0.56
	20,209.00	88.48	149.320	11,480.06	-7,271.80	4,290.38	8,443.11	1.10	0.00	1.11
	20,303.00	88.26	148.880	11,482.73	-7,352.42	4,338.63	8,537.07	0.52	-0.23	-0.47
	20,398.00	88.53	149.240	11,485.39	-7,433.87	4,387.46	8,632.03	0.47	0.28	0.38
	20,493.00	88.70	148.880	11,487.89	-7,515.33	4,436.29	8,727.00	0.42	0.18	-0.38
	20,587.00	88.31	149.060	11,490.14	-7,595.85	4,484.72	8,820.96	0.46	-0.41	0.19
	20,681.00	88.35	148.880	11,492.88	-7,676.37	4,533.16	8,914.91	0.20	0.04	-0.19
	20,776.00	88.26	148.880	11,495.69	-7,757.66	4,582.24	9,009.86	0.09	-0.09	0.00
	20,871.00	89.05	149.060	11,497.92	-7,839.04	4,631.19	9,104.83	0.85	0.83	0.19
	20,965.00	89.10	149.940	11,499.44	-7,920.02	4,678.90	9,198.82	0.94	0.05	0.94
	21,059.00	88.97	149.410	11,501.02	-8,001.15	4,726.35	9,292.80	0.58	-0.14	-0.56
	21,153.00	89.93	150.380	11,501.92	-8,082.46	4,773.50	9,386.80	1.45	1.02	1.03
	21,247.00	88.75	148.620	11,503.01	-8,163.45	4,821.20	9,480.79	2.25	-1.26	-1.87
	21,342.00	88.70	148.530	11,505.12	-8,244.49	4,870.72	9,575.75	0.11	-0.05	-0.09
	21,436.00	88.35	148.970	11,507.54	-8,324.83	4,919.47	9,669.71	0.60	-0.37	0.47
	21,531.00	88.26	150.730	11,510.35	-8,406.94	4,967.16	9,764.66	1.85	-0.09	1.85
	21,626.00	88.88	151.430	11,512.72	-8,490.06	5,013.08	9,859.60	0.98	0.65	0.74
	21,721.00	88.84	151.430	11,514.61	-8,573.48	5,058.51	9,954.53	0.04	-0.04	0.00
	21,815.00	88.92	151.700	11,516.45	-8,656.12	5,103.26	10,048.45	0.30	0.09	0.29
	21,909.00	89.10	151.260	11,518.07	-8,738.70	5,148.13	10,142.39	0.51	0.19	-0.47
	22,004.00	89.41	151.430	11,519.31	-8,822.06	5,193.69	10,237.33	0.37	0.33	0.18
	22,098.00	88.88	151.340	11,520.71	-8,904.57	5,238.70	10,331.28	0.57	-0.56	-0.10
	22,192.00	89.05	151.170	11,522.41	-8,986.97	5,283.90	10,425.22	0.26	0.18	-0.18
	22,285.00	89.01	151.430	11,523.98	-9,068.53	5,328.55	10,518.16	0.28	-0.04	0.28
	22,380.00	88.97	151.520	11,525.66	-9,151.99	5,373.91	10,613.10	0.10	-0.04	0.09
	22,475.00	88.79	151.080	11,527.51	-9,235.30	5,419.52	10,708.04	0.50	-0.19	-0.46
	22,570.00	88.84	151.430	11,529.48	-9,318.58	5,465.20	10,802.97	0.37	0.05	0.37
	22,663.00	88.84	150.640	11,531.36	-9,399.93	5,510.23	10,895.92	0.85	0.00	-0.85
	22,758.00	89.05	151.080	11,533.11	-9,482.89	5,556.48	10,990.88	0.51	0.22	0.46
	22,852.00	88.79	151.080	11,534.88	-9,565.15	5,601.93	11,084.83	0.28	-0.28	0.00
	22,946.00	88.92	151.260	11,536.76	-9,647.48	5,647.25	11,178.78	0.24	0.14	0.19
	23,039.00	88.79	151.080	11,538.62	-9,728.94	5,692.08	11,271.72	0.24	-0.14	-0.19



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	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)	
<b>Survey @ 23039.00 MD 11538.62 TVD</b>										
23,081.00	88.79	151.080	11,539.51	-9,765.70	5,712.39	11,313.70	0.00	0.00	0.00	
<b>Survey projected to 23081.00 MD 11539.51 TVD</b>										

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
181.00	181.00	0.00	0.00	MWD surveys	
23,039.00	11,538.62	-9,728.94	5,692.08	Survey @ 23039.00 MD 11538.62 TVD	

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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

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

<b>Well</b>	Hillrock 1S-13 HU (E)					
<b>Well Position</b>	<b>+N/-S</b>	0.00 ft	<b>Northing:</b>	14,434,239.85 usft	<b>Latitude:</b>	39.74576170
	<b>+E/-W</b>	0.00 ft	<b>Easting:</b>	1,704,993.07 usft	<b>Longitude:</b>	-80.77026180
<b>Position Uncertainty</b>	0.00 ft	<b>Wellhead Elevation:</b>	ft	<b>Ground Level:</b>	1,219.00 ft	

<b>Wellbore</b>	Original Hole				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (")</b>	<b>Dip Angle (")</b>	<b>Field Strength (nT)</b>
	IGRF2015	8/4/2020	-8.736	66.670	51,798.68910141

<b>Design</b>	Surveys Original Hole				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (")</b>	
	0.00	0.00	0.00	149.575	

<b>Survey Program</b>	Date 8/18/2020			
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
181.00	913.00	MWD surf (Original Hole)	MWD	MWD - Standard
1,067.00	2,676.00	MWD int (Original Hole)	MWD	MWD - Standard
2,780.00	10,248.00	MWD (Original Hole)	MWD	MWD - Standard
10,287.00	23,039.00	MWD lat (Original Hole)	MWD	MWD - Standard
23,081.00	23,081.00	Projection (Original Hole)	MWD	MWD - Standard

<b>Survey</b>										
<b>Measured Depth (ft)</b>	<b>Inclination (")</b>	<b>Azimuth (")</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Map Northing (usft)</b>	<b>Map Easting (usft)</b>	<b>Latitude</b>	<b>Longitude</b>	
0.00	0.00	0.000	0.00	0.00	0.00	14,434,239.85	1,704,993.07	39.74576170	-80.77026180	
181.00	0.00	0.000	181.00	0.00	0.00	14,434,239.85	1,704,993.07	39.74576170	-80.77026180	
<b>MWD surveys</b>										
241.00	0.17	355.160	241.00	0.09	-0.01	14,434,239.94	1,704,993.06	39.74576195	-80.77026183	
333.00	0.26	230.450	333.00	0.09	-0.18	14,434,239.94	1,704,992.89	39.74576195	-80.77026244	
425.00	0.04	349.450	425.00	-0.01	-0.35	14,434,239.84	1,704,992.72	39.74576168	-80.77026303	
515.00	0.48	277.820	515.00	0.07	-0.73	14,434,239.93	1,704,992.34	39.74576191	-80.77026438	
606.00	0.13	179.120	606.00	0.02	-1.10	14,434,239.87	1,704,991.97	39.74576177	-80.77026572	

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	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	
697.00	0.04	261.120	697.00	-0.09	-1.13	14,434,239.77	1,704,991.94	39.74576147	-80.77026583	
788.00	0.22	2.280	788.00	0.08	-1.16	14,434,239.94	1,704,991.91	39.74576194	-80.77026591	
883.00	0.31	309.110	883.00	0.43	-1.35	14,434,240.28	1,704,991.72	39.74576288	-80.77026659	
913.00	0.35	261.120	913.00	0.46	-1.50	14,434,240.32	1,704,991.57	39.74576299	-80.77026714	
1,067.00	0.04	177.180	1,066.99	0.34	-1.96	14,434,240.19	1,704,991.11	39.74576264	-80.77026879	
1,161.00	0.66	171.740	1,160.99	-0.23	-1.88	14,434,239.62	1,704,991.19	39.74576108	-80.77026851	
1,256.00	0.31	192.740	1,255.99	-1.02	-1.86	14,434,238.83	1,704,991.21	39.74575891	-80.77026844	
1,351.00	0.70	217.970	1,350.99	-1.73	-2.28	14,434,238.12	1,704,990.79	39.74575696	-80.77026992	
1,446.00	0.96	232.820	1,445.98	-2.67	-3.27	14,434,237.18	1,704,989.80	39.74575439	-80.77027345	
1,540.00	2.37	238.880	1,539.93	-4.15	-5.56	14,434,235.70	1,704,987.51	39.74575034	-80.77028162	
1,635.00	3.47	238.360	1,634.81	-6.67	-9.69	14,434,233.18	1,704,983.38	39.74574344	-80.77029633	
1,730.00	3.16	235.980	1,729.65	-9.65	-14.31	14,434,230.21	1,704,978.76	39.74573531	-80.77031278	
1,824.00	2.59	228.340	1,823.53	-12.51	-18.04	14,434,227.35	1,704,975.03	39.74572748	-80.77032610	
1,919.00	2.59	217.520	1,918.43	-15.64	-20.95	14,434,224.22	1,704,972.12	39.74571891	-80.77033648	
2,013.00	3.16	222.800	2,012.32	-19.22	-24.01	14,434,220.63	1,704,969.06	39.74570908	-80.77034738	
2,108.00	2.77	225.700	2,107.19	-22.75	-27.43	14,434,217.11	1,704,965.64	39.74569943	-80.77035958	
2,202.00	3.12	222.980	2,201.06	-26.20	-30.80	14,434,213.65	1,704,962.27	39.74568995	-80.77037160	
2,297.00	2.46	229.220	2,295.95	-29.43	-34.10	14,434,210.42	1,704,958.97	39.74568112	-80.77038339	
2,392.00	2.11	261.120	2,390.88	-31.03	-37.37	14,434,208.82	1,704,955.70	39.74567675	-80.77039505	
2,486.00	2.94	269.290	2,484.79	-31.33	-41.50	14,434,208.53	1,704,951.57	39.74567596	-80.77040971	
2,581.00	2.81	262.530	2,579.67	-31.66	-46.24	14,434,208.19	1,704,946.83	39.74567508	-80.77042659	
2,676.00	2.81	247.410	2,674.56	-32.86	-50.70	14,434,207.00	1,704,942.37	39.74567182	-80.77044247	
2,780.00	2.94	238.000	2,778.43	-35.25	-55.31	14,434,204.60	1,704,937.76	39.74566529	-80.77045891	
2,874.00	3.12	227.370	2,872.29	-38.26	-59.24	14,434,201.59	1,704,933.83	39.74565705	-80.77047290	
2,969.00	2.46	218.850	2,967.18	-41.60	-62.42	14,434,198.25	1,704,930.65	39.74564790	-80.77048425	
3,063.00	1.76	187.560	3,061.12	-44.60	-63.88	14,434,195.25	1,704,929.19	39.74563967	-80.77048946	
3,158.00	1.14	194.760	3,156.09	-46.96	-64.31	14,434,192.89	1,704,928.76	39.74563319	-80.77049102	
3,253.00	0.88	163.650	3,251.08	-48.57	-64.35	14,434,191.28	1,704,928.72	39.74562876	-80.77049116	
3,347.00	1.54	111.180	3,345.06	-49.72	-62.96	14,434,190.13	1,704,930.11	39.74562559	-80.77048626	
3,442.00	2.54	151.520	3,440.00	-52.03	-60.77	14,434,187.82	1,704,932.30	39.74561923	-80.77047847	
3,535.00	2.68	135.170	3,532.90	-55.39	-58.25	14,434,184.46	1,704,934.82	39.74561000	-80.77046955	
3,630.00	2.28	93.770	3,627.82	-57.09	-54.80	14,434,182.77	1,704,938.27	39.74560531	-80.77045729	
3,725.00	1.05	83.230	3,722.78	-57.11	-52.05	14,434,182.74	1,704,941.02	39.74560523	-80.77044750	
3,819.00	0.35	15.030	3,816.77	-56.73	-51.12	14,434,183.12	1,704,941.95	39.74560626	-80.77044419	
3,913.00	0.66	358.590	3,910.77	-55.91	-51.06	14,434,183.94	1,704,942.01	39.74560851	-80.77044397	
4,010.00	0.79	30.140	4,007.76	-54.78	-50.74	14,434,185.08	1,704,942.33	39.74561163	-80.77044281	
4,104.00	0.66	20.830	4,101.76	-53.71	-50.22	14,434,186.14	1,704,942.85	39.74561456	-80.77044096	
4,199.00	1.40	12.390	4,196.74	-52.06	-49.78	14,434,187.79	1,704,943.29	39.74561907	-80.77043937	
4,293.00	1.45	348.750	4,290.71	-49.78	-49.76	14,434,190.08	1,704,943.31	39.74562535	-80.77043930	
4,387.00	0.62	341.100	4,384.70	-48.13	-50.16	14,434,191.72	1,704,942.91	39.74562988	-80.77044069	
4,482.00	1.53	327.390	4,479.68	-46.57	-51.01	14,434,193.28	1,704,942.06	39.74563416	-80.77044370	
4,576.00	0.92	337.230	4,573.66	-44.82	-51.98	14,434,195.03	1,704,941.09	39.74563898	-80.77044713	
4,669.00	1.41	338.730	4,666.64	-43.07	-52.68	14,434,196.79	1,704,940.39	39.74564380	-80.77044962	
4,764.00	1.45	353.490	4,761.61	-40.78	-53.24	14,434,199.07	1,704,939.83	39.74565008	-80.77045159	
4,858.00	0.70	35.600	4,855.59	-39.13	-53.04	14,434,200.72	1,704,940.03	39.74565460	-80.77045087	
4,952.00	0.66	42.100	4,949.58	-38.27	-52.35	14,434,201.59	1,704,940.72	39.74565698	-80.77044838	
5,047.00	1.41	100.280	5,044.57	-38.07	-50.83	14,434,201.78	1,704,942.24	39.74565751	-80.77044298	
5,141.00	1.14	73.470	5,138.55	-38.01	-48.80	14,434,201.84	1,704,944.27	39.74565766	-80.77043574	
5,235.00	0.92	134.380	5,232.54	-38.27	-47.36	14,434,201.58	1,704,945.71	39.74565693	-80.77043064	
5,330.00	1.80	97.990	5,327.51	-39.01	-45.34	14,434,200.84	1,704,947.73	39.74565489	-80.77042345	
5,423.00	2.77	129.110	5,420.44	-40.63	-42.15	14,434,199.22	1,704,950.92	39.74565041	-80.77041211	
5,518.00	2.72	146.420	5,515.33	-43.96	-39.12	14,434,195.90	1,704,953.95	39.74564126	-80.77040137	
5,611.00	2.28	167.340	5,608.24	-47.60	-37.49	14,434,192.25	1,704,955.58	39.74563124	-80.77039562	
5,706.00	0.92	183.430	5,703.20	-50.21	-37.12	14,434,189.65	1,704,955.95	39.74562408	-80.77039433	
5,801.00	1.31	222.620	5,798.19	-51.77	-37.91	14,434,188.09	1,704,955.16	39.74561980	-80.77039712	



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	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
5,896.00	1.54	204.430	5,893.16	-53.73	-39.17	14,434,186.12	1,704,953.90	39.74561442	-80.77040164
5,990.00	0.70	213.310	5,987.14	-55.36	-40.01	14,434,184.49	1,704,953.06	39.74560995	-80.77040463
6,084.00	0.70	281.860	6,081.13	-55.72	-40.88	14,434,184.13	1,704,952.19	39.74560897	-80.77040776
6,179.00	1.41	298.470	6,176.12	-55.04	-42.48	14,434,184.81	1,704,950.59	39.74561084	-80.77041343
6,274.00	0.79	311.570	6,271.10	-54.05	-44.00	14,434,185.80	1,704,949.07	39.74561357	-80.77041882
6,369.00	0.48	319.570	6,366.09	-53.31	-44.74	14,434,186.54	1,704,948.33	39.74561560	-80.77042147
6,559.00	0.40	346.020	6,556.09	-52.06	-45.42	14,434,187.79	1,704,947.65	39.74561904	-80.77042386
6,653.00	1.01	325.370	6,650.08	-51.06	-45.97	14,434,188.79	1,704,947.10	39.74562179	-80.77042581
6,748.00	2.64	316.230	6,745.03	-48.80	-47.96	14,434,191.06	1,704,945.11	39.74562803	-80.77043287
6,843.00	5.49	310.780	6,839.78	-44.25	-52.92	14,434,195.61	1,704,940.15	39.74564056	-80.77045046
6,937.00	8.48	310.160	6,933.07	-36.84	-61.62	14,434,203.01	1,704,931.45	39.74566097	-80.77048135
7,032.00	10.99	308.840	7,026.70	-26.64	-74.03	14,434,213.21	1,704,919.04	39.74568906	-80.77052541
7,126.00	11.34	306.380	7,118.92	-15.54	-88.45	14,434,224.31	1,704,904.62	39.74571965	-80.77057660
7,221.00	11.69	305.590	7,212.01	-4.40	-103.79	14,434,235.45	1,704,889.28	39.74575035	-80.77063110
7,315.00	11.56	303.040	7,304.08	6.28	-119.43	14,434,246.13	1,704,873.64	39.74577979	-80.77068664
7,410.00	11.07	300.760	7,397.23	16.13	-135.25	14,434,255.99	1,704,857.82	39.74580696	-80.77074282
7,504.00	11.07	300.060	7,489.48	25.27	-150.82	14,434,265.12	1,704,842.25	39.74583216	-80.77079811
7,597.00	11.95	299.000	7,580.61	34.41	-166.96	14,434,274.26	1,704,826.11	39.74585738	-80.77085548
7,692.00	12.22	296.980	7,673.51	43.74	-184.53	14,434,283.59	1,704,808.54	39.74588312	-80.77091787
7,787.00	13.23	294.780	7,766.17	52.86	-203.36	14,434,292.71	1,704,789.71	39.74590829	-80.77098478
7,882.00	13.18	297.860	7,858.66	62.48	-222.80	14,434,302.33	1,704,770.27	39.74593484	-80.77105387
7,976.00	12.39	304.270	7,950.34	73.16	-240.61	14,434,313.02	1,704,752.46	39.74596432	-80.77111713
8,071.00	13.01	306.300	8,043.01	85.23	-257.65	14,434,325.08	1,704,735.42	39.74599758	-80.77117765
8,165.00	13.27	303.750	8,134.55	97.49	-275.15	14,434,337.34	1,704,717.92	39.74603137	-80.77123979
8,260.00	12.44	305.420	8,227.17	109.48	-292.56	14,434,349.33	1,704,700.52	39.74606441	-80.77130160
8,354.00	12.17	307.700	8,319.01	121.41	-308.65	14,434,361.26	1,704,684.42	39.74609728	-80.77135873
8,449.00	10.94	308.230	8,412.08	133.11	-323.65	14,434,372.96	1,704,669.42	39.74612953	-80.77141201
8,544.00	10.85	309.020	8,505.37	144.32	-337.68	14,434,384.17	1,704,655.39	39.74616040	-80.77146181
8,638.00	11.21	310.430	8,597.64	155.81	-351.51	14,434,395.66	1,704,641.56	39.74619207	-80.77151090
8,733.00	11.91	309.720	8,690.71	168.06	-366.08	14,434,407.92	1,704,626.99	39.74622582	-80.77156263
8,827.00	13.32	309.280	8,782.44	181.12	-381.92	14,434,420.97	1,704,611.15	39.74626179	-80.77161887
8,922.00	13.67	308.760	8,874.81	195.08	-399.14	14,434,434.93	1,704,593.93	39.74630024	-80.77168002
9,017.00	14.24	308.410	8,967.01	209.36	-417.05	14,434,449.21	1,704,576.02	39.74633960	-80.77174361
9,112.00	14.06	306.910	9,059.13	223.55	-435.44	14,434,463.40	1,704,557.63	39.74637869	-80.77180888
9,210.00	14.81	307.790	9,154.03	238.38	-454.85	14,434,478.23	1,704,538.22	39.74641954	-80.77187782
9,305.00	14.06	306.410	9,246.03	252.67	-473.74	14,434,492.52	1,704,519.34	39.74645892	-80.77194487
9,399.00	12.96	309.020	9,337.43	266.08	-491.11	14,434,505.93	1,704,501.96	39.74649588	-80.77200657
9,493.00	13.54	310.600	9,428.93	279.88	-507.66	14,434,519.73	1,704,485.41	39.74653389	-80.77206531
9,589.00	13.49	311.570	9,522.27	294.62	-524.57	14,434,534.47	1,704,468.50	39.74657449	-80.77212533
9,683.00	12.96	310.510	9,613.78	308.74	-540.79	14,434,548.60	1,704,452.29	39.74661339	-80.77218290
9,778.00	12.00	309.720	9,706.53	321.97	-556.48	14,434,561.83	1,704,436.59	39.74664984	-80.77223862
9,871.00	11.25	310.250	9,797.62	334.01	-570.84	14,434,573.87	1,704,422.23	39.74668300	-80.77228960
9,965.00	11.25	312.710	9,889.82	346.16	-584.58	14,434,586.01	1,704,408.49	39.74671645	-80.77233836
10,059.00	10.94	312.980	9,982.06	358.46	-597.84	14,434,598.31	1,704,395.23	39.74675032	-80.77238543
10,153.00	10.50	314.470	10,074.42	370.54	-610.48	14,434,610.39	1,704,382.59	39.74678359	-80.77243028
10,248.00	9.80	316.050	10,167.93	382.42	-622.27	14,434,622.28	1,704,370.80	39.74681631	-80.77247211
10,287.00	9.76	316.670	10,206.37	387.22	-626.84	14,434,627.07	1,704,366.23	39.74682951	-80.77248834
10,358.00	7.69	317.280	10,276.54	395.09	-634.19	14,434,634.94	1,704,358.88	39.74685117	-80.77251442
10,405.00	3.91	338.290	10,323.30	398.89	-636.92	14,434,638.74	1,704,356.15	39.74686162	-80.77252409
10,453.00	3.03	349.630	10,371.21	401.66	-637.75	14,434,641.51	1,704,355.32	39.74686923	-80.77252703
10,500.00	1.76	21.270	10,418.17	403.55	-637.72	14,434,643.40	1,704,355.36	39.74687444	-80.77252688
10,548.00	3.43	106.960	10,466.13	403.82	-636.07	14,434,643.67	1,704,357.00	39.74687516	-80.77252104
10,595.00	6.42	120.140	10,512.95	402.09	-632.46	14,434,641.94	1,704,360.62	39.74687038	-80.77250818
10,643.00	9.89	122.160	10,560.46	398.55	-626.64	14,434,638.40	1,704,366.43	39.74686061	-80.77248754
10,690.00	12.57	126.380	10,606.56	393.36	-619.11	14,434,633.22	1,704,373.96	39.74684633	-80.77246077



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	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
10,738.00	14.90	131.220	10,653.18	386.20	-610.26	14,434,626.05	1,704,382.81	39.74682659	-80.77242936
10,785.00	17.27	132.890	10,698.34	377.47	-600.60	14,434,617.32	1,704,392.47	39.74680254	-80.77239508
10,832.00	19.74	133.330	10,742.91	367.27	-589.71	14,434,607.12	1,704,403.36	39.74677446	-80.77235644
10,879.00	23.12	132.360	10,786.65	355.60	-577.12	14,434,595.45	1,704,415.95	39.74674233	-80.77231173
10,927.00	26.81	133.680	10,830.16	341.77	-562.32	14,434,581.62	1,704,430.75	39.74670425	-80.77225921
10,974.00	29.27	134.820	10,871.64	326.35	-546.50	14,434,566.20	1,704,446.57	39.74666179	-80.77220308
11,022.00	32.09	133.850	10,912.92	309.24	-528.98	14,434,549.10	1,704,464.09	39.74661468	-80.77214090
11,069.00	36.22	134.120	10,951.80	290.92	-510.00	14,434,530.77	1,704,483.07	39.74656423	-80.77207354
11,116.00	40.57	134.560	10,988.63	270.52	-489.13	14,434,510.37	1,704,503.94	39.74650805	-80.77199948
11,163.00	42.77	133.940	11,023.74	248.72	-466.75	14,434,488.57	1,704,526.32	39.74644803	-80.77192005
11,210.00	45.71	132.800	11,057.41	226.21	-442.91	14,434,466.06	1,704,550.16	39.74638605	-80.77183544
11,257.00	48.31	130.780	11,089.45	203.31	-417.27	14,434,443.17	1,704,575.80	39.74632299	-80.77174444
11,304.00	50.37	129.550	11,120.08	180.32	-390.03	14,434,420.18	1,704,603.04	39.74625966	-80.77164772
11,351.00	52.48	127.880	11,149.38	157.35	-361.35	14,434,397.20	1,704,631.72	39.74619637	-80.77154592
11,397.00	55.16	127.090	11,176.53	134.76	-331.89	14,434,374.61	1,704,661.18	39.74613413	-80.77144131
11,444.00	59.47	127.440	11,201.91	110.81	-300.42	14,434,350.67	1,704,692.65	39.74606814	-80.77132956
11,492.00	62.20	127.440	11,225.30	85.33	-267.14	14,434,325.19	1,704,725.93	39.74599793	-80.77121141
11,539.00	64.84	127.610	11,246.25	59.71	-233.78	14,434,299.56	1,704,759.29	39.74592733	-80.77109296
11,586.00	67.87	127.170	11,265.10	33.57	-199.58	14,434,273.42	1,704,793.49	39.74585530	-80.77097151
11,633.00	69.98	126.470	11,282.00	7.29	-164.47	14,434,247.14	1,704,828.60	39.74578288	-80.77084685
11,681.00	71.65	125.680	11,297.77	-19.40	-127.83	14,434,220.45	1,704,865.24	39.74570932	-80.77071674
11,728.00	74.95	125.940	11,311.28	-45.74	-91.33	14,434,194.12	1,704,901.74	39.74563674	-80.77058712
11,776.00	79.43	126.650	11,321.92	-73.44	-53.61	14,434,166.42	1,704,939.46	39.74556040	-80.77045321
11,823.00	83.78	127.000	11,328.78	-101.30	-16.41	14,434,138.55	1,704,976.66	39.74548362	-80.77032109
11,870.00	86.77	127.880	11,332.65	-129.77	20.78	14,434,110.08	1,705,013.85	39.74540516	-80.77018906
11,917.00	90.20	129.110	11,333.89	-159.01	57.55	14,434,080.84	1,705,050.62	39.74532460	-80.77005853
11,964.00	90.37	130.780	11,333.66	-189.19	93.58	14,434,050.66	1,705,086.65	39.74524148	-80.76993062
12,011.00	89.58	131.130	11,333.68	-219.99	129.07	14,434,019.86	1,705,122.14	39.74515662	-80.76980462
12,058.00	89.45	133.500	11,334.08	-251.63	163.82	14,433,988.22	1,705,156.89	39.74506949	-80.76968129
12,105.00	88.35	136.140	11,334.98	-284.75	197.15	14,433,955.10	1,705,190.22	39.74497830	-80.76956302
12,153.00	88.92	138.860	11,336.12	-320.13	229.57	14,433,919.73	1,705,222.64	39.74488092	-80.76944802
12,200.00	89.32	141.240	11,336.85	-356.15	259.74	14,433,883.70	1,705,252.81	39.74478178	-80.76934101
12,247.00	88.13	141.410	11,337.89	-392.83	289.10	14,433,847.02	1,705,282.17	39.74468083	-80.76923689
12,294.00	88.75	141.760	11,339.17	-429.65	318.30	14,433,810.21	1,705,311.37	39.74457952	-80.76913337
12,342.00	87.03	144.490	11,340.94	-468.01	347.08	14,433,771.84	1,705,340.15	39.74447395	-80.76903134
12,389.00	85.89	146.950	11,343.84	-506.77	373.50	14,433,733.08	1,705,366.57	39.74436733	-80.76893770
12,436.00	89.01	147.920	11,345.93	-546.34	398.77	14,433,693.52	1,705,391.84	39.74425849	-80.76884817
12,530.00	88.48	148.090	11,347.99	-626.04	448.56	14,433,613.82	1,705,441.63	39.74403925	-80.76867176
12,625.00	88.62	150.200	11,350.39	-707.56	497.26	14,433,532.29	1,705,490.33	39.74381502	-80.76849925
12,718.00	88.35	150.030	11,352.85	-788.17	543.59	14,433,451.69	1,705,536.65	39.74359333	-80.76833520
12,826.00	88.75	149.760	11,355.59	-881.57	597.74	14,433,358.29	1,705,590.81	39.74333643	-80.76814341
12,921.00	88.84	150.200	11,357.58	-963.81	645.26	14,433,276.05	1,705,638.33	39.74311025	-80.76797512
13,015.00	89.32	149.850	11,359.09	-1,045.22	692.22	14,433,194.63	1,705,685.28	39.74288632	-80.76780882
13,110.00	89.45	150.380	11,360.11	-1,127.58	739.55	14,433,112.27	1,705,732.62	39.74265979	-80.76764120
13,204.00	89.23	150.290	11,361.20	-1,209.26	786.07	14,433,030.60	1,705,779.14	39.74243516	-80.76747646
13,299.00	89.71	150.290	11,362.07	-1,291.77	833.15	14,432,948.09	1,705,826.22	39.74220824	-80.76730974
13,392.00	89.76	150.290	11,362.50	-1,372.54	879.24	14,432,867.31	1,705,872.31	39.74198608	-80.76714652
13,487.00	89.45	150.380	11,363.16	-1,455.09	926.26	14,432,784.77	1,705,919.32	39.74175905	-80.76698003
13,581.00	89.32	150.380	11,364.17	-1,536.80	972.71	14,432,703.06	1,705,965.78	39.74153431	-80.76681552
13,676.00	89.41	150.990	11,365.22	-1,619.63	1,019.22	14,432,620.23	1,706,012.29	39.74130651	-80.76665083
13,771.00	89.27	150.030	11,366.32	-1,702.31	1,065.99	14,432,537.54	1,706,059.05	39.74107909	-80.76648525
13,866.00	89.36	150.910	11,367.45	-1,784.97	1,112.80	14,432,454.89	1,706,105.87	39.74085177	-80.76631946
13,960.00	88.75	150.640	11,369.00	-1,866.99	1,158.69	14,432,372.87	1,706,151.76	39.74062618	-80.76615699
14,055.00	88.88	150.470	11,370.97	-1,949.70	1,205.38	14,432,290.16	1,706,198.45	39.74039870	-80.76599166
14,150.00	88.84	150.910	11,372.86	-2,032.52	1,251.88	14,432,207.33	1,706,244.95	39.74017091	-80.76582703

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	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	
14,245.00	89.14	149.500	11,374.53	-2,114.95	1,299.08	14,432,124.91	1,706,292.14	39.73994421	-80.76565990	
14,339.00	88.79	147.920	11,376.23	-2,195.26	1,347.89	14,432,044.60	1,706,340.96	39.73972330	-80.76548701	
14,434.00	88.79	148.180	11,378.24	-2,275.85	1,398.15	14,431,964.01	1,706,391.22	39.73950161	-80.76530897	
14,529.00	88.97	148.440	11,380.09	-2,356.67	1,448.05	14,431,883.19	1,706,441.11	39.73927930	-80.76513223	
14,623.00	88.92	148.620	11,381.82	-2,436.83	1,497.11	14,431,803.03	1,706,490.18	39.73905880	-80.76495845	
14,718.00	88.97	148.440	11,383.57	-2,517.84	1,546.70	14,431,722.01	1,706,539.76	39.73883596	-80.76478281	
14,813.00	88.84	148.440	11,385.39	-2,598.78	1,596.41	14,431,641.08	1,706,589.48	39.73861333	-80.76460673	
14,907.00	88.75	148.090	11,387.36	-2,678.71	1,645.84	14,431,561.15	1,706,638.91	39.73839347	-80.76443163	
15,002.00	88.75	148.440	11,389.44	-2,759.48	1,695.80	14,431,480.37	1,706,688.87	39.73817127	-80.76425468	
15,097.00	88.84	148.180	11,391.43	-2,840.30	1,745.69	14,431,399.56	1,706,738.76	39.73794896	-80.76407795	
15,192.00	88.75	148.270	11,393.43	-2,921.05	1,795.71	14,431,318.81	1,706,788.77	39.73772685	-80.76390080	
15,286.00	88.70	150.030	11,395.52	-3,001.72	1,843.90	14,431,238.14	1,706,836.96	39.73750494	-80.76373014	
15,381.00	88.75	150.990	11,397.64	-3,084.39	1,890.65	14,431,155.47	1,706,883.72	39.73727757	-80.76356461	
15,476.00	88.75	151.080	11,399.71	-3,167.49	1,936.65	14,431,072.37	1,706,929.71	39.73704902	-80.76340177	
15,571.00	88.88	151.170	11,401.68	-3,250.66	1,982.51	14,430,989.20	1,706,975.58	39.73682028	-80.76323941	
15,665.00	88.88	151.170	11,403.51	-3,332.99	2,027.83	14,430,906.86	1,707,020.90	39.73659384	-80.76307897	
15,760.00	89.01	150.910	11,405.26	-3,416.10	2,073.82	14,430,823.76	1,707,066.89	39.73636527	-80.76291616	
15,855.00	89.41	150.730	11,406.57	-3,499.04	2,120.13	14,430,740.82	1,707,113.20	39.73613717	-80.76275220	
15,950.00	89.41	150.640	11,407.55	-3,581.87	2,166.65	14,430,657.99	1,707,159.71	39.73590935	-80.76258754	
16,044.00	89.27	150.730	11,408.63	-3,663.82	2,212.67	14,430,576.04	1,707,205.73	39.73568394	-80.76242461	
16,139.00	89.41	150.820	11,409.73	-3,746.73	2,259.05	14,430,493.13	1,707,252.11	39.73545593	-80.76226042	
16,234.00	89.36	150.550	11,410.75	-3,829.56	2,305.56	14,430,410.30	1,707,298.62	39.73522812	-80.76209576	
16,329.00	89.54	150.640	11,411.66	-3,912.31	2,352.20	14,430,327.55	1,707,345.26	39.73500050	-80.76193064	
16,423.00	89.85	150.550	11,412.16	-3,994.20	2,398.35	14,430,245.66	1,707,391.41	39.73477527	-80.76176725	
16,517.00	89.36	150.470	11,412.81	-4,076.02	2,444.62	14,430,163.84	1,707,437.68	39.73455024	-80.76160344	
16,612.00	89.36	150.730	11,413.87	-4,158.78	2,491.25	14,430,081.08	1,707,484.32	39.73432261	-80.76143835	
16,707.00	89.36	151.700	11,414.93	-4,242.04	2,536.99	14,429,997.82	1,707,530.06	39.73409364	-80.76127643	
16,801.00	89.45	152.310	11,415.91	-4,325.03	2,581.11	14,429,914.83	1,707,574.18	39.73386538	-80.76112028	
16,895.00	89.05	150.910	11,417.14	-4,407.72	2,625.80	14,429,832.14	1,707,618.87	39.73363798	-80.76096211	
16,990.00	89.76	150.640	11,418.12	-4,490.62	2,672.18	14,429,749.24	1,707,665.25	39.73340996	-80.76079793	
17,085.00	88.79	148.440	11,419.32	-4,572.50	2,720.34	14,429,667.37	1,707,713.40	39.73318476	-80.76062743	
17,180.00	87.96	148.880	11,422.02	-4,653.60	2,769.73	14,429,586.26	1,707,762.79	39.73296165	-80.76045252	
17,274.00	87.96	148.530	11,425.36	-4,733.87	2,818.52	14,429,505.99	1,707,811.59	39.73274084	-80.76027972	
17,369.00	88.35	149.320	11,428.42	-4,815.20	2,867.53	14,429,424.66	1,707,860.60	39.73251715	-80.76010617	
17,464.00	88.40	148.360	11,431.12	-4,896.46	2,916.67	14,429,343.40	1,707,909.73	39.73229362	-80.75993218	
17,558.00	88.92	149.320	11,433.32	-4,976.87	2,965.29	14,429,262.99	1,707,958.36	39.73207242	-80.75975999	
17,653.00	88.97	149.240	11,435.06	-5,058.53	3,013.81	14,429,181.33	1,708,006.88	39.73184781	-80.75958818	
17,748.00	88.75	149.410	11,436.95	-5,140.22	3,062.27	14,429,099.64	1,708,055.33	39.73162311	-80.75941661	
17,843.00	88.79	148.270	11,438.99	-5,221.49	3,111.41	14,429,018.37	1,708,104.48	39.73139954	-80.75924259	
17,937.00	88.97	148.710	11,440.83	-5,301.62	3,160.53	14,428,938.25	1,708,153.60	39.73117914	-80.75906865	
18,032.00	88.79	149.320	11,442.69	-5,383.04	3,209.43	14,428,856.82	1,708,202.49	39.73095515	-80.75889551	
18,127.00	89.14	148.800	11,444.40	-5,464.51	3,258.27	14,428,775.35	1,708,251.33	39.73073106	-80.75872259	
18,222.00	88.70	149.060	11,446.20	-5,545.87	3,307.28	14,428,693.99	1,708,300.35	39.73050727	-80.75854902	
18,316.00	88.92	149.060	11,448.15	-5,626.48	3,356.60	14,428,613.39	1,708,348.67	39.73028554	-80.75837793	
18,411.00	88.75	149.150	11,450.08	-5,707.98	3,404.37	14,428,531.88	1,708,397.44	39.73006134	-80.75820525	
18,506.00	88.97	149.060	11,451.97	-5,789.48	3,453.14	14,428,450.38	1,708,446.21	39.72983715	-80.75803257	
18,600.00	88.66	150.380	11,453.91	-5,870.64	3,500.53	14,428,369.22	1,708,493.59	39.72961392	-80.75786481	
18,694.00	89.41	151.520	11,455.50	-5,952.80	3,546.16	14,428,287.06	1,708,539.23	39.72938794	-80.75770328	
18,789.00	89.49	151.260	11,456.41	-6,036.20	3,591.65	14,428,203.67	1,708,584.72	39.72915857	-80.75754229	
18,884.00	89.49	151.610	11,457.25	-6,119.63	3,637.08	14,428,120.23	1,708,630.14	39.72892910	-80.75738154	
18,978.00	89.49	151.260	11,458.09	-6,202.19	3,682.02	14,428,037.68	1,708,675.08	39.72870205	-80.75722248	
19,072.00	89.49	151.260	11,458.93	-6,284.60	3,727.22	14,427,955.26	1,708,720.28	39.72847537	-80.75706252	
19,166.00	89.05	151.340	11,460.12	-6,367.05	3,772.35	14,427,872.82	1,708,765.42	39.72824862	-80.75690278	
19,261.00	88.92	151.520	11,461.81	-6,450.47	3,817.78	14,427,789.40	1,708,810.84	39.72801919	-80.75674202	
19,356.00	89.01	151.700	11,463.52	-6,534.03	3,862.94	14,427,705.84	1,708,856.00	39.72778937	-80.75658220	



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	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
19,450.00	88.92	151.520	11,465.22	-6,616.71	3,907.63	14,427,623.16	1,708,900.69	39.72756197	-80.75642406
19,545.00	88.84	151.340	11,467.08	-6,700.12	3,953.05	14,427,539.74	1,708,946.11	39.72733255	-80.75626332
19,640.00	89.36	151.260	11,468.57	-6,783.44	3,998.67	14,427,456.42	1,708,991.73	39.72710339	-80.75610188
19,735.00	88.97	149.320	11,469.96	-6,865.94	4,045.74	14,427,373.92	1,709,038.80	39.72687647	-80.75593525
19,830.00	88.84	149.060	11,471.77	-6,947.52	4,094.39	14,427,292.35	1,709,087.45	39.72665207	-80.75576302
19,925.00	88.75	149.150	11,473.77	-7,029.02	4,143.16	14,427,210.84	1,709,136.22	39.72642788	-80.75559036
20,019.00	89.10	148.800	11,475.53	-7,109.56	4,191.60	14,427,130.31	1,709,184.66	39.72620633	-80.75541886
20,114.00	88.48	148.270	11,477.54	-7,190.57	4,241.18	14,427,049.29	1,709,234.24	39.72598348	-80.75524332
20,209.00	88.48	149.320	11,480.06	-7,271.80	4,290.38	14,426,968.07	1,709,283.44	39.72576004	-80.75506912
20,303.00	88.26	148.880	11,482.73	-7,352.42	4,338.63	14,426,887.44	1,709,331.69	39.72553825	-80.75489829
20,398.00	88.53	149.240	11,485.39	-7,433.87	4,387.46	14,426,805.99	1,709,380.52	39.72531420	-80.75472544
20,493.00	88.70	148.880	11,487.69	-7,515.33	4,436.29	14,426,724.54	1,709,429.35	39.72509013	-80.75455257
20,587.00	88.31	149.060	11,490.14	-7,595.85	4,484.72	14,426,644.02	1,709,477.79	39.72486863	-80.75438108
20,681.00	88.35	148.880	11,492.88	-7,676.37	4,533.16	14,426,563.50	1,709,526.22	39.72464715	-80.75420961
20,776.00	88.26	148.880	11,495.69	-7,757.66	4,582.24	14,426,482.21	1,709,575.30	39.72442353	-80.75403586
20,871.00	89.05	149.060	11,497.92	-7,839.04	4,631.19	14,426,400.83	1,709,624.26	39.72419966	-80.75386253
20,965.00	89.10	149.940	11,499.44	-7,920.02	4,678.90	14,426,319.85	1,709,671.96	39.72397690	-80.75369368
21,059.00	88.97	149.410	11,501.02	-8,001.15	4,726.35	14,426,238.72	1,709,719.41	39.72375374	-80.75352570
21,153.00	89.93	150.380	11,501.92	-8,082.46	4,773.50	14,426,157.41	1,709,766.56	39.72353007	-80.75335882
21,247.00	88.75	148.620	11,503.01	-8,163.45	4,821.20	14,426,076.42	1,709,814.26	39.72330731	-80.75318997
21,342.00	88.70	148.530	11,505.12	-8,244.49	4,870.72	14,425,995.38	1,709,863.78	39.72308436	-80.75301465
21,436.00	88.35	148.970	11,507.54	-8,324.83	4,919.47	14,425,915.04	1,709,912.53	39.72286337	-80.75284207
21,531.00	88.26	150.730	11,510.35	-8,406.94	4,967.16	14,425,832.93	1,709,960.22	39.72263751	-80.75267326
21,626.00	88.88	151.430	11,512.72	-8,490.06	5,013.08	14,425,749.81	1,710,006.14	39.72240887	-80.75251074
21,721.00	88.84	151.430	11,514.61	-8,573.48	5,058.51	14,425,666.39	1,710,051.57	39.72217945	-80.75235002
21,815.00	88.92	151.700	11,516.45	-8,656.12	5,103.26	14,425,583.75	1,710,096.32	39.72195214	-80.75219168
21,909.00	89.10	151.260	11,518.07	-8,738.70	5,148.13	14,425,501.17	1,710,141.19	39.72172501	-80.75203291
22,004.00	89.41	151.430	11,519.31	-8,822.06	5,193.69	14,425,417.81	1,710,186.74	39.72149574	-80.75187173
22,098.00	88.88	151.340	11,520.71	-8,904.57	5,238.70	14,425,335.30	1,710,231.76	39.72126880	-80.75171246
22,192.00	89.05	151.170	11,522.41	-8,986.97	5,283.90	14,425,252.90	1,710,276.96	39.72104216	-80.75155253
22,285.00	89.01	151.430	11,523.98	-9,068.53	5,328.55	14,425,171.34	1,710,321.61	39.72081782	-80.75139453
22,380.00	88.97	151.520	11,525.66	-9,151.99	5,373.91	14,425,087.88	1,710,366.97	39.72058829	-80.75123404
22,475.00	88.79	151.080	11,527.51	-9,235.30	5,419.52	14,425,004.57	1,710,412.58	39.72035914	-80.75107265
22,570.00	88.84	151.430	11,529.48	-9,318.58	5,465.20	14,424,921.29	1,710,458.26	39.72013009	-80.75091104
22,663.00	88.84	150.640	11,531.36	-9,399.93	5,510.23	14,424,839.94	1,710,503.29	39.71990634	-80.75075171
22,758.00	89.05	151.080	11,533.11	-9,482.89	5,556.48	14,424,756.98	1,710,549.54	39.71967815	-80.75058805
22,852.00	88.79	151.080	11,534.88	-9,565.15	5,601.93	14,424,674.72	1,710,594.99	39.71945188	-80.75042723
22,946.00	88.92	151.260	11,536.76	-9,647.48	5,647.25	14,424,592.39	1,710,640.31	39.71922542	-80.75026689
23,039.00	88.79	151.080	11,538.62	-9,728.94	5,692.08	14,424,510.93	1,710,685.14	39.71900138	-80.75010824
<b>Survey @ 23039.00 MD 11538.62 TVD</b>									
23,081.00	88.79	151.080	11,539.51	-9,765.70	5,712.39	14,424,474.18	1,710,705.45	39.71890028	-80.75003640
<b>Survey projected to 23081.00 MD 11539.51 TVD</b>									

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
181.00	181.00	0.00	0.00	MWD surveys	
23,039.00	11,538.62	-9,728.94	5,692.08	Survey @ 23039.00 MD 11538.62 TVD	
23,081.00	11,539.51	-9,765.70	5,712.39	Survey projected to 23081.00 MD 11539.51 TVD	

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Hillrock 1S-13 HU (E)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Site:</b>	Hillrock/Simms	<b>MD Reference:</b>	RKB=1219+26 @ 1245.00ft (Nabors B28)
<b>Well:</b>	Hillrock 1S-13 HU (E)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14