



Well: Hillrock 1S-15 HU (G)
Site: Hillrock/Simms
Project: Marshall County, West Virginia
Design: rev8
Rig: Nabors B28

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 Easting Longitude
 14434263.85 1704992.79 39.74582760 -80.77026260

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.887°

SECTION DETAILS

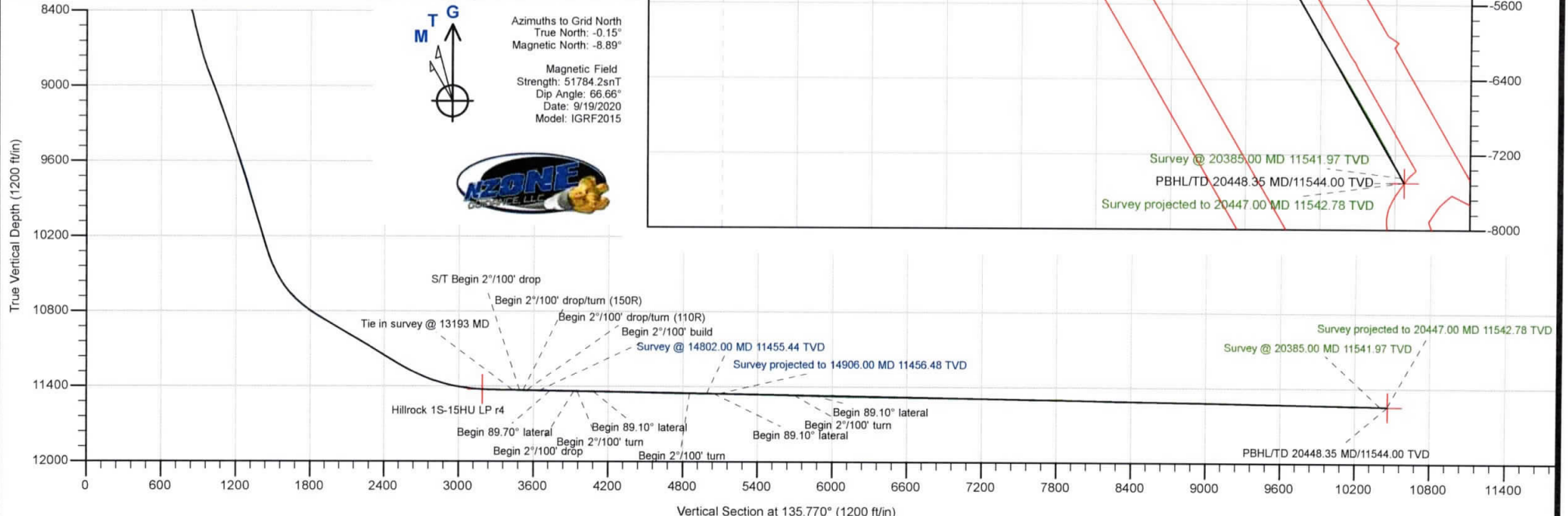
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
1	13193.00	88.99	152.480	11430.69	-1220.42	3671.75	0.00	0.000	3435.68	Tie in survey @ 13193 MD
2	13251.00	89.63	151.296	11431.39	-1271.57	3699.07	2.32	-61.613	3491.39	S/T Begin 2°/100' drop
3	13281.00	89.03	151.296	11431.74	-1297.88	3713.48	2.00	180.000	3520.29	Begin 2°/100' drop/turn (150R)
4	13311.00	88.51	151.596	11432.39	-1324.23	3727.82	2.00	150.000	3549.17	Begin 2°/100' drop/turn (110R)
5	13411.00	87.83	153.477	11435.58	-1412.91	3773.91	2.00	110.000	3644.87	Begin 2°/100' build
6	13504.64	89.70	153.477	11437.60	-1496.67	3815.71	2.00	0.000	3734.04	Begin 89.70° lateral
7	13704.64	89.70	153.477	11438.65	-1675.61	3905.02	0.00	0.000	3924.56	Begin 2°/100' drop
8	13734.64	89.10	153.477	11438.96	-1702.46	3918.42	2.00	180.000	3953.14	Begin 2°/100' turn
9	13869.64	89.10	150.777	11441.08	-1821.77	3981.52	2.00	-90.000	4082.65	Begin 89.10° lateral
10	14669.64	89.10	150.777	11453.65	-2519.86	4372.04	0.00	0.000	4855.27	Begin 2°/100' turn
11	14869.64	89.10	146.777	11456.79	-2690.84	4475.68	2.00	-90.000	5050.07	Begin 89.10° lateral
12	15529.64	89.10	146.777	11467.16	-3242.89	4837.25	0.00	0.000	5697.85	Begin 2°/100' turn
13	15690.84	89.10	150.001	11469.68	-3380.13	4921.72	2.00	89.937	5855.12	Begin 89.10° lateral
14	20448.35	89.10	150.001	11544.00	-7499.81	7300.10	0.00	0.000	10466.07	PBHLTD

ANNOTATIONS SURVEYS ORIGINAL HOLE

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSect	Annotation
210.00	0.09	198.280	210.00	-0.16	-0.05	0.08	MWD surveys
14802.00	89.43	150.190	11455.44	-2617.45	4469.25	4993.00	Survey @ 14802.00 MD 11455.44 TVD
14906.00	89.43	150.190	11456.48	-2707.68	4520.95	5093.72	Survey projected to 14906.00 MD 11456.48 TVD

ANNOTATIONS SURVEYS SIDETRACK 01

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSect	Annotation
13193.00	88.99	152.480	11430.69	-1220.42	3671.75	3435.68	Tie into original hole @ 13193 MD
20385.00	89.25	150.540	11541.97	-7444.03	7268.86	10404.31	Survey @ 20385.00 MD 11541.97 TVD
20447.00	89.25	150.540	11542.78	-7498.01	7299.35	10464.25	Survey projected to 20447.00 MD 11542.78 TVD



Compass Rose: True North, Magnetic North, Azimuths to Grid North.

Azimuths to Grid North
 True North: -0.15°
 Magnetic North: -8.89°

Magnetic Field
 Strength: 51784.2snT
 Dip Angle: 66.66°
 Date: 9/19/2020
 Model: IGRF2015



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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

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

Well	Hillrock 1S-15 HU (G)					
Well Position	+N-S	0.00 ft	Northing:	14,434,263.85 usft	Latitude:	39.74582760
	+E-W	0.00 ft	Easting:	1,704,992.78 usft	Longitude:	-80.77026260
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,219.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	9/9/2020	-8.740	66.662	51,787.39081238

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	135.770	

Survey Program	Date	9/28/2020			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
210.00	924.00	MWD surf (Original Hole)	MWD	MWD - Standard	
975.00	2,585.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,678.00	10,344.00	MWD (Original Hole)	MWD	MWD - Standard	
10,470.00	14,802.00	MWD lat (Original Hole)	MWD	MWD - Standard	
14,860.00	14,906.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
210.00	0.09	198.280	210.00	-0.16	-0.05	0.08	0.04	0.04	0.00	
MWD surveys										
240.00	0.18	261.130	240.00	-0.19	-0.11	0.06	0.53	0.30	209.50	
287.00	0.35	188.880	287.00	-0.34	-0.20	0.10	0.73	0.36	-153.72	
331.00	0.44	201.630	331.00	-0.63	-0.28	0.25	0.28	0.20	28.98	
362.00	0.26	193.010	362.00	-0.81	-0.34	0.34	0.60	-0.58	-27.81	

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Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
392.00	0.31	181.940	392.00	-0.96	-0.36	0.43	0.25	0.17	-36.90	
422.00	0.31	184.490	422.00	-1.12	-0.37	0.54	0.05	0.00	8.50	
469.00	0.35	197.590	469.00	-1.38	-0.42	0.69	0.18	0.09	27.87	
512.00	0.35	220.260	512.00	-1.61	-0.55	0.77	0.32	0.00	52.72	
559.00	0.40	185.980	558.99	-1.88	-0.66	0.89	0.48	0.11	-72.94	
603.00	0.35	211.820	602.99	-2.15	-0.75	1.02	0.40	-0.11	58.73	
648.00	0.40	204.530	647.99	-2.41	-0.88	1.11	0.15	0.11	-16.20	
695.00	0.44	215.600	694.99	-2.70	-1.06	1.20	0.19	0.09	23.55	
742.00	0.44	192.490	741.99	-3.03	-1.20	1.33	0.38	0.00	-49.17	
787.00	0.57	212.000	786.99	-3.38	-1.36	1.48	0.48	0.29	43.36	
834.00	0.44	199.990	833.99	-3.75	-1.54	1.61	0.36	-0.28	-25.55	
881.00	0.31	204.700	880.99	-4.04	-1.66	1.74	0.28	-0.28	10.02	
924.00	0.48	207.870	923.98	-4.30	-1.79	1.83	0.40	0.40	7.37	
975.00	0.66	215.760	974.98	-4.73	-2.06	1.95	0.38	0.35	15.47	
1,070.00	0.62	169.280	1,069.98	-5.68	-2.29	2.47	0.53	-0.04	-48.93	
1,165.00	1.19	121.650	1,164.97	-6.70	-1.35	3.86	0.95	0.60	-50.14	
1,260.00	1.93	89.740	1,259.93	-7.21	1.09	5.93	1.17	0.78	-33.59	
1,354.00	3.34	92.470	1,353.83	-7.32	5.41	9.02	1.51	1.50	2.90	
1,449.00	4.57	96.690	1,448.60	-7.88	11.93	13.97	1.33	1.29	4.44	
1,496.00	5.36	101.260	1,495.43	-8.53	15.95	17.23	1.88	1.68	9.72	
1,543.00	5.41	103.630	1,542.22	-9.48	20.25	20.92	0.49	0.11	5.04	
1,590.00	5.36	105.040	1,589.01	-10.57	24.52	24.68	0.30	-0.11	3.00	
1,637.00	5.67	104.680	1,635.79	-11.73	28.89	28.56	0.66	0.66	-0.77	
1,732.00	5.84	104.070	1,730.31	-14.09	38.12	36.69	0.19	0.18	-0.64	
1,827.00	6.15	104.860	1,824.79	-16.57	47.73	45.17	0.34	0.33	0.83	
1,922.00	6.50	105.740	1,919.22	-19.34	57.82	54.19	0.38	0.37	0.93	
2,017.00	6.37	102.930	2,013.62	-21.98	68.13	63.27	0.36	-0.14	-2.96	
2,112.00	5.41	105.210	2,108.12	-24.33	77.59	71.56	1.04	-1.01	2.40	
2,160.00	4.92	102.840	2,155.92	-25.38	81.78	75.23	1.11	-1.02	-4.94	
2,206.00	4.61	100.820	2,201.76	-26.17	85.52	78.40	0.77	-0.67	-4.39	
2,300.00	4.00	95.720	2,295.50	-27.20	92.49	84.01	0.77	-0.65	-5.43	
2,395.00	4.04	94.050	2,390.26	-27.77	99.13	89.04	0.13	0.04	-1.76	
2,490.00	3.96	92.380	2,485.03	-28.14	105.74	93.92	0.15	-0.08	-1.76	
2,585.00	3.78	93.080	2,579.81	-28.45	112.15	98.61	0.20	-0.19	0.74	
2,678.00	4.00	101.960	2,672.60	-29.28	118.38	103.56	0.69	0.24	9.55	
2,780.00	4.44	105.560	2,774.32	-31.08	125.67	109.93	0.50	0.43	3.53	
2,827.00	5.19	105.740	2,821.16	-32.14	129.46	113.34	1.60	1.60	0.38	
2,875.00	5.98	105.480	2,868.93	-33.40	133.96	117.38	1.65	1.65	-0.54	
2,970.00	6.55	106.620	2,963.36	-36.27	143.92	126.38	0.61	0.60	1.20	
3,064.00	4.75	100.730	3,056.90	-38.53	152.89	134.25	2.01	-1.91	-6.27	
3,157.00	4.79	98.270	3,149.58	-39.80	160.51	140.49	0.22	0.04	-2.65	
3,252.00	5.36	97.390	3,244.21	-40.95	168.84	147.11	0.61	0.60	-0.93	
3,350.00	4.66	98.880	3,341.83	-42.15	177.31	153.88	0.73	-0.71	1.52	
3,445.00	4.22	100.290	3,436.55	-43.37	184.56	159.82	0.48	-0.46	1.48	

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Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
3,539.00	4.92	103.630	3,530.25	-44.94	191.88	166.04	0.80	0.74	3.55
3,633.00	5.54	104.250	3,623.86	-47.00	200.20	173.33	0.66	0.66	0.66
3,728.00	5.84	106.530	3,718.39	-49.51	209.28	181.45	0.40	0.32	2.40
3,823.00	6.20	108.460	3,812.86	-52.51	218.78	190.23	0.43	0.38	2.03
3,917.00	5.71	107.060	3,906.36	-55.49	228.06	198.84	0.54	-0.52	-1.49
4,012.00	4.44	101.700	4,000.98	-57.62	236.18	206.03	1.43	-1.34	-5.64
4,106.00	4.04	93.170	4,094.73	-58.54	243.05	211.48	0.79	-0.43	-9.07
4,201.00	4.22	90.090	4,189.48	-58.73	249.89	216.39	0.30	0.19	-3.24
4,295.00	4.31	84.820	4,283.22	-58.42	256.86	221.03	0.43	0.10	-5.61
4,390.00	3.91	87.020	4,377.98	-57.93	263.65	225.41	0.45	-0.42	2.32
4,485.00	4.17	96.860	4,472.74	-58.17	270.32	230.24	0.78	0.27	10.36
4,580.00	5.36	106.000	4,567.41	-59.81	278.01	236.78	1.48	1.25	9.62
4,675.00	6.46	108.990	4,661.91	-62.77	287.33	245.40	1.20	1.16	3.15
4,770.00	6.02	107.500	4,756.34	-66.00	297.13	254.56	0.49	-0.46	-1.57
4,864.00	4.97	100.990	4,849.91	-68.26	305.83	262.24	1.30	-1.12	-6.93
4,958.00	5.01	96.250	4,943.55	-69.49	313.91	268.75	0.44	0.04	-5.04
5,053.00	5.36	97.650	5,038.17	-70.53	322.43	275.45	0.39	0.37	1.47
5,148.00	5.80	103.980	5,132.72	-72.28	331.49	283.02	0.80	0.46	6.66
5,243.00	6.68	107.500	5,227.15	-75.10	341.42	291.96	1.01	0.93	3.71
5,337.00	6.68	107.320	5,320.51	-78.37	351.85	301.59	0.02	0.00	-0.19
5,431.00	5.80	105.560	5,413.96	-81.27	361.64	310.50	0.96	-0.94	-1.87
5,525.00	4.61	99.500	5,507.57	-83.17	369.95	317.65	1.39	-1.27	-6.45
5,618.00	4.83	94.400	5,600.25	-84.09	377.54	323.60	0.51	0.24	-5.48
5,713.00	6.28	93.430	5,694.80	-84.71	386.71	330.44	1.53	1.53	-1.02
5,807.00	6.24	94.490	5,788.24	-85.41	396.93	338.08	0.13	-0.04	1.13
5,902.00	5.32	99.760	5,882.76	-86.56	406.42	345.52	1.12	-0.97	5.55
5,949.00	4.70	102.400	5,929.58	-87.35	410.45	348.89	1.41	-1.32	5.62
5,997.00	4.17	104.160	5,977.44	-88.20	414.06	352.02	1.14	-1.10	3.67
6,091.00	4.79	99.850	6,071.15	-89.70	421.24	358.11	0.75	0.66	-4.59
6,185.00	4.53	105.560	6,164.84	-91.37	428.69	364.50	0.57	-0.28	6.07
6,279.00	4.53	117.080	6,258.55	-94.06	435.57	371.22	0.97	0.00	12.26
6,374.00	5.63	114.880	6,353.17	-97.73	443.14	379.13	1.18	1.16	-2.32
6,560.00	6.02	113.390	6,538.21	-105.44	460.37	396.67	0.22	0.21	-0.80
6,654.00	6.99	107.060	6,631.61	-109.07	470.36	406.25	1.28	1.03	-6.73
6,749.00	8.44	100.640	6,725.75	-112.05	482.74	417.02	1.77	1.53	-6.76
6,844.00	9.84	95.540	6,819.54	-114.12	497.67	428.92	1.70	1.47	-5.37
6,939.00	11.65	94.230	6,912.87	-115.62	515.32	442.30	1.92	1.91	-1.38
7,033.00	13.27	95.280	7,004.65	-117.31	535.53	457.61	1.74	1.72	1.12
7,128.00	14.99	98.180	7,096.78	-120.06	558.55	475.64	1.96	1.81	3.05
7,222.00	16.22	99.850	7,187.31	-124.04	583.51	495.90	1.39	1.31	1.78
7,317.00	17.40	102.310	7,278.25	-129.33	610.47	518.50	1.45	1.24	2.59
7,411.00	17.40	102.930	7,367.95	-135.48	637.90	542.03	0.20	0.00	0.66
7,506.00	16.39	101.700	7,458.85	-141.37	664.87	565.07	1.13	-1.06	-1.29

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Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
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7,599.00	17.97	101.700	7,547.70	-146.94	691.76	587.82	1.70	1.70	0.00
7,693.00	19.12	101.780	7,636.81	-153.03	721.03	612.60	1.22	1.22	0.09
7,788.00	19.25	100.990	7,726.54	-159.19	751.64	638.36	0.31	0.14	-0.83
7,883.00	20.57	101.520	7,815.86	-165.51	783.37	665.02	1.40	1.39	0.56
7,978.00	20.92	102.840	7,904.70	-172.61	816.26	693.05	0.61	0.37	1.39
8,072.00	20.43	101.080	7,992.64	-179.49	848.72	720.63	0.84	-0.52	-1.87
8,166.00	20.43	100.200	8,080.73	-185.55	880.97	747.46	0.33	0.00	-0.94
8,261.00	20.79	100.640	8,169.65	-191.60	913.85	774.74	0.41	0.38	0.46
8,356.00	20.43	100.550	8,258.57	-197.75	946.72	802.07	0.38	-0.38	-0.09
8,451.00	19.73	100.290	8,347.80	-203.65	978.80	828.68	0.74	-0.74	-0.27
8,545.00	16.44	100.030	8,437.14	-208.80	1,007.52	852.40	3.50	-3.50	-0.28
8,640.00	15.95	102.050	8,528.37	-213.87	1,033.52	874.17	0.79	-0.52	2.13
8,734.00	16.57	106.880	8,618.62	-220.46	1,058.98	896.65	1.58	0.66	5.14
8,828.00	17.58	104.770	8,708.47	-227.97	1,085.54	920.55	1.26	1.07	-2.24
8,923.00	21.05	105.650	8,798.11	-236.23	1,115.85	947.62	3.67	3.65	0.93
9,018.00	23.00	107.670	8,886.17	-246.47	1,149.96	978.75	2.20	2.05	2.13
9,117.00	24.13	109.340	8,976.92	-259.04	1,187.49	1,013.93	1.33	1.14	1.69
9,212.00	23.55	105.120	9,063.82	-270.42	1,224.13	1,047.65	1.90	-0.61	-4.44
9,307.00	23.55	100.730	9,150.91	-278.91	1,261.11	1,079.52	1.85	0.00	-4.62
9,401.00	23.33	99.150	9,237.16	-285.36	1,297.93	1,109.84	0.71	-0.23	-1.68
9,496.00	23.25	99.240	9,324.42	-291.36	1,335.01	1,140.00	0.09	-0.08	0.09
9,591.00	23.77	99.850	9,411.53	-297.65	1,372.38	1,170.57	0.60	0.55	0.64
9,685.00	23.12	100.550	9,497.77	-304.27	1,409.19	1,200.99	0.75	-0.69	0.74
9,780.00	22.59	100.290	9,585.31	-310.94	1,445.48	1,231.09	0.57	-0.56	-0.27
9,873.00	21.14	100.290	9,671.62	-317.13	1,479.56	1,259.29	1.56	-1.56	0.00
9,967.00	20.52	100.030	9,759.47	-323.03	1,512.46	1,286.47	0.67	-0.66	-0.28
10,061.00	20.26	99.670	9,847.58	-328.63	1,544.73	1,312.99	0.31	-0.28	-0.38
10,155.00	20.04	100.640	9,935.83	-334.34	1,576.60	1,339.31	0.43	-0.23	1.03
10,250.00	19.47	102.140	10,025.24	-340.67	1,608.08	1,365.81	0.80	-0.60	1.58
10,344.00	18.94	103.370	10,114.01	-347.50	1,638.23	1,391.73	0.71	-0.56	1.31
10,470.00	19.17	106.420	10,233.11	-358.07	1,677.97	1,427.03	0.81	0.18	2.42
10,551.00	21.02	105.370	10,309.17	-365.68	1,704.74	1,451.15	2.33	2.28	-1.30
10,598.00	22.42	102.910	10,352.84	-369.92	1,721.60	1,465.95	3.55	2.98	-5.23
10,646.00	25.68	104.310	10,396.66	-374.54	1,740.61	1,482.52	6.89	6.79	2.92
10,693.00	27.44	105.190	10,438.70	-379.89	1,760.93	1,500.53	3.84	3.74	1.87
10,741.00	30.51	106.070	10,480.69	-386.16	1,783.32	1,520.64	6.46	6.40	1.83
10,788.00	33.24	106.770	10,520.60	-393.19	1,807.12	1,542.27	5.86	5.81	1.49
10,835.00	36.40	106.420	10,559.18	-400.85	1,832.84	1,565.70	6.74	6.72	-0.74
10,882.00	39.48	105.900	10,596.24	-408.88	1,860.59	1,590.82	6.59	6.55	-1.11
10,930.00	43.62	104.490	10,632.16	-417.21	1,891.31	1,618.21	8.84	8.63	-2.94
10,977.00	47.84	103.080	10,664.96	-425.21	1,923.99	1,646.74	9.23	8.98	-3.00
11,024.00	50.91	101.500	10,695.56	-432.79	1,958.84	1,676.49	7.01	6.53	-3.36
11,071.00	53.99	101.150	10,724.20	-440.11	1,995.37	1,707.21	6.58	6.55	-0.74



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,119.00	57.07	100.800	10,751.36	-447.64	2,034.22	1,739.70	6.44	6.42	-0.73
11,166.00	59.18	100.450	10,776.18	-455.00	2,073.44	1,772.34	4.53	4.49	-0.74
11,212.00	60.67	100.450	10,799.23	-462.22	2,112.59	1,804.81	3.24	3.24	0.00
11,259.00	62.61	99.920	10,821.55	-469.53	2,153.29	1,838.45	4.25	4.13	-1.13
11,306.00	64.19	99.570	10,842.60	-476.64	2,194.71	1,872.43	3.43	3.36	-0.74
11,353.00	64.72	99.570	10,862.87	-483.69	2,236.53	1,906.65	1.13	1.13	0.00
11,400.00	65.51	99.570	10,882.64	-490.78	2,278.57	1,941.06	1.68	1.68	0.00
11,447.00	66.21	99.570	10,901.86	-497.91	2,320.86	1,975.67	1.49	1.49	0.00
11,494.00	64.89	98.860	10,921.32	-504.76	2,363.09	2,010.04	3.13	-2.81	-1.51
11,541.00	65.42	99.040	10,941.07	-511.40	2,405.22	2,044.18	1.18	1.13	0.38
11,589.00	66.13	99.220	10,960.76	-518.34	2,448.44	2,079.30	1.52	1.48	0.38
11,636.00	66.04	99.390	10,979.81	-525.29	2,490.84	2,113.86	0.38	-0.19	0.36
11,683.00	64.54	99.920	10,999.46	-532.45	2,532.93	2,148.35	3.35	-3.19	1.13
11,730.00	64.72	100.090	11,019.60	-539.83	2,574.75	2,182.81	0.50	0.38	0.36
11,778.00	63.93	100.090	11,040.39	-547.41	2,617.35	2,217.95	1.65	-1.65	0.00
11,825.00	64.54	100.450	11,060.82	-554.95	2,658.99	2,252.40	1.47	1.30	0.77
11,873.00	63.84	100.970	11,081.72	-562.98	2,701.45	2,287.77	1.75	-1.46	1.08
11,920.00	64.37	100.620	11,102.25	-570.90	2,742.99	2,322.42	1.31	1.13	-0.74
11,967.00	63.05	100.450	11,123.07	-578.61	2,784.41	2,356.84	2.83	-2.81	-0.36
12,014.00	63.49	99.920	11,144.21	-586.03	2,825.73	2,390.98	1.38	0.94	-1.13
12,061.00	63.66	100.090	11,165.12	-593.34	2,867.18	2,425.13	0.49	0.36	0.36
12,108.00	64.19	99.570	11,185.78	-600.55	2,908.77	2,459.31	1.50	1.13	-1.11
12,156.00	64.37	99.740	11,206.61	-607.80	2,951.41	2,494.24	0.49	0.38	0.35
12,203.00	64.98	99.220	11,226.72	-614.80	2,993.31	2,528.48	1.64	1.30	-1.11
12,250.00	65.77	101.320	11,246.30	-622.42	3,035.35	2,563.27	4.40	1.68	4.47
12,297.00	65.86	103.430	11,265.56	-631.60	3,077.22	2,599.06	4.10	0.19	4.49
12,344.00	66.21	106.250	11,284.65	-642.60	3,118.73	2,635.90	5.53	0.74	6.00
12,391.00	66.83	108.180	11,303.38	-655.36	3,159.90	2,673.76	3.99	1.32	4.11
12,439.00	68.41	112.400	11,321.66	-670.76	3,201.52	2,713.82	8.77	3.29	8.79
12,486.00	70.35	117.150	11,338.22	-689.19	3,241.44	2,754.87	10.32	4.13	10.11
12,533.00	72.19	120.490	11,353.32	-710.65	3,280.42	2,797.44	7.79	3.91	7.11
12,580.00	73.51	124.880	11,367.18	-734.90	3,318.21	2,841.18	9.36	2.81	9.34
12,628.00	74.92	128.920	11,380.24	-762.63	3,355.13	2,886.80	8.62	2.94	8.42
12,675.00	76.59	132.970	11,391.81	-792.48	3,389.53	2,932.18	9.08	3.55	8.62
12,720.00	79.58	136.310	11,401.11	-823.42	3,420.84	2,976.19	9.84	6.64	7.42
12,767.00	81.16	138.940	11,408.97	-857.65	3,452.07	3,022.50	6.46	3.36	5.60
12,815.00	83.27	142.810	11,415.47	-894.54	3,482.07	3,069.86	9.12	4.40	8.06
12,862.00	84.24	145.620	11,420.59	-932.43	3,509.38	3,116.07	6.29	2.06	5.98
12,910.00	86.26	148.790	11,424.56	-972.64	3,535.29	3,162.94	7.81	4.21	6.60
12,957.00	88.37	150.190	11,426.76	-1,013.08	3,559.12	3,208.55	5.39	4.49	2.98
13,005.00	89.16	150.900	11,427.80	-1,054.87	3,582.72	3,254.95	2.21	1.65	1.48
13,099.00	89.16	151.770	11,429.18	-1,137.34	3,627.80	3,345.49	0.93	0.00	0.93
13,193.00	88.99	152.480	11,430.69	-1,220.42	3,671.75	3,435.68	0.78	-0.18	0.76
13,288.00	90.04	150.540	11,431.50	-1,303.91	3,717.06	3,527.10	2.32	1.11	-2.04

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
13,382.00	89.78	150.720	11,431.65	-1,385.82	3,763.16	3,617.96	0.34	-0.28	0.19
13,476.00	89.69	151.250	11,432.08	-1,468.03	3,808.75	3,708.66	0.57	-0.10	0.56
13,571.00	89.34	150.190	11,432.88	-1,550.88	3,855.21	3,800.44	1.18	-0.37	-1.12
13,665.00	89.16	150.720	11,434.12	-1,632.65	3,901.56	3,891.37	0.60	-0.19	0.56
13,760.00	88.64	149.310	11,435.94	-1,714.92	3,949.03	3,983.42	1.58	-0.55	-1.48
13,855.00	88.55	150.900	11,438.27	-1,797.25	3,996.36	4,075.44	1.68	-0.09	1.67
13,949.00	89.08	149.140	11,440.21	-1,878.65	4,043.32	4,166.52	1.96	0.56	-1.87
14,044.00	88.72	148.960	11,442.04	-1,960.11	4,092.17	4,258.96	0.42	-0.38	-0.19
14,139.00	88.37	148.790	11,444.45	-2,041.41	4,141.26	4,351.46	0.41	-0.37	-0.18
14,234.00	89.78	149.840	11,445.98	-2,123.10	4,189.73	4,443.80	1.85	1.48	1.11
14,328.00	89.25	150.190	11,446.78	-2,204.51	4,236.71	4,534.91	0.68	-0.56	0.37
14,423.00	88.90	150.540	11,448.31	-2,287.07	4,283.68	4,626.83	0.52	-0.37	0.37
14,518.00	88.37	150.720	11,450.57	-2,369.84	4,330.26	4,718.63	0.59	-0.56	0.19
14,612.00	89.25	150.370	11,452.53	-2,451.67	4,376.47	4,809.50	1.01	0.94	-0.37
14,707.00	88.90	151.250	11,454.06	-2,534.59	4,422.79	4,901.23	1.00	-0.37	0.93
14,802.00	89.43	150.190	11,455.44	-2,617.45	4,469.25	4,993.00	1.25	0.56	-1.12
Survey @ 14802.00 MD 11455.44 TVD									
14,906.00	89.43	150.190	11,456.48	-2,707.68	4,520.95	5,093.72	0.00	0.00	0.00
Survey projected to 14906.00 MD 11456.48 TVD									

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
210.00	210.00	-0.16	-0.05	MWD surveys
14,802.00	11,455.44	-2,617.45	4,469.25	Survey @ 14802.00 MD 11455.44 TVD
14,906.00	11,456.48	-2,707.68	4,520.95	Survey projected to 14906.00 MD 11456.48 TVD

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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

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

Well	Hillrock 1S-15 HU (G)					
Well Position	+N-S	0.00 ft	Northing:	14,434,263.85 usft	Latitude:	39.74582760
	+E-W	0.00 ft	Easting:	1,704,992.78 usft	Longitude:	-80.77026260
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,219.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	9/9/2020	-8.740	66.662	51,787.39081238

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	135.770	

Survey Program	Date	9/28/2020			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
210.00	924.00	MWD surf (Original Hole)	MWD	MWD - Standard	
975.00	2,585.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,678.00	10,344.00	MWD (Original Hole)	MWD	MWD - Standard	
10,470.00	14,802.00	MWD lat (Original Hole)	MWD	MWD - Standard	
14,860.00	14,906.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.000	0.00	0.00	0.00	14,434,263.85	1,704,992.78	39.74582760	-80.77026260	
210.00	0.09	198.280	210.00	-0.16	-0.05	14,434,263.69	1,704,992.73	39.74582717	-80.77026279	
MWD surveys										
240.00	0.18	261.130	240.00	-0.19	-0.11	14,434,263.66	1,704,992.68	39.74582709	-80.77026298	
287.00	0.35	188.880	287.00	-0.34	-0.20	14,434,263.51	1,704,992.58	39.74582667	-80.77026332	
331.00	0.44	201.630	331.00	-0.63	-0.28	14,434,263.22	1,704,992.50	39.74582588	-80.77026362	
362.00	0.26	193.010	362.00	-0.81	-0.34	14,434,263.04	1,704,992.44	39.74582538	-80.77026383	
392.00	0.31	181.940	392.00	-0.96	-0.36	14,434,262.89	1,704,992.42	39.74582498	-80.77026390	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
422.00	0.31	184.490	422.00	-1.12	-0.37	14,434,262.73	1,704,992.41	39.74582453	-80.77026393	
469.00	0.35	197.590	469.00	-1.38	-0.42	14,434,262.47	1,704,992.36	39.74582381	-80.77026412	
512.00	0.35	220.260	512.00	-1.61	-0.55	14,434,262.24	1,704,992.23	39.74582319	-80.77026457	
559.00	0.40	185.980	558.99	-1.88	-0.66	14,434,261.97	1,704,992.13	39.74582244	-80.77026496	
603.00	0.35	211.820	602.99	-2.15	-0.75	14,434,261.70	1,704,992.04	39.74582171	-80.77026527	
648.00	0.40	204.530	647.99	-2.41	-0.88	14,434,261.44	1,704,991.90	39.74582100	-80.77026576	
695.00	0.44	215.600	694.99	-2.70	-1.06	14,434,261.15	1,704,991.73	39.74582019	-80.77026638	
742.00	0.44	192.490	741.99	-3.03	-1.20	14,434,260.82	1,704,991.58	39.74581930	-80.77026690	
787.00	0.57	212.000	786.99	-3.38	-1.36	14,434,260.46	1,704,991.43	39.74581832	-80.77026746	
834.00	0.44	199.990	833.99	-3.75	-1.54	14,434,260.10	1,704,991.24	39.74581731	-80.77026812	
881.00	0.31	204.700	880.99	-4.04	-1.66	14,434,259.81	1,704,991.13	39.74581653	-80.77026853	
924.00	0.48	207.870	923.98	-4.30	-1.79	14,434,259.55	1,704,990.99	39.74581580	-80.77026901	
975.00	0.66	215.760	974.98	-4.73	-2.06	14,434,259.12	1,704,990.72	39.74581463	-80.77026998	
1,070.00	0.62	169.280	1,069.98	-5.68	-2.29	14,434,258.17	1,704,990.50	39.74581202	-80.77027078	
1,165.00	1.19	121.650	1,164.97	-6.70	-1.35	14,434,257.15	1,704,991.43	39.74580921	-80.77026746	
1,260.00	1.93	89.740	1,259.93	-7.21	1.09	14,434,256.64	1,704,993.87	39.74580779	-80.77025879	
1,354.00	3.34	92.470	1,353.83	-7.32	5.41	14,434,256.53	1,704,998.19	39.74580746	-80.77024343	
1,449.00	4.57	96.690	1,448.60	-7.88	11.93	14,434,255.97	1,705,004.72	39.74580587	-80.77022022	
1,496.00	5.36	101.260	1,495.43	-8.53	15.95	14,434,255.32	1,705,008.73	39.74580407	-80.77020595	
1,543.00	5.41	103.630	1,542.22	-9.48	20.25	14,434,254.37	1,705,013.03	39.74580143	-80.77019064	
1,590.00	5.36	105.040	1,589.01	-10.57	24.52	14,434,253.28	1,705,017.31	39.74579840	-80.77017545	
1,637.00	5.67	104.680	1,635.79	-11.73	28.89	14,434,252.12	1,705,021.67	39.74579519	-80.77015993	
1,732.00	5.84	104.070	1,730.31	-14.09	38.12	14,434,249.75	1,705,030.90	39.74578863	-80.77012712	
1,827.00	6.15	104.860	1,824.79	-16.57	47.73	14,434,247.27	1,705,040.51	39.74578175	-80.77009296	
1,922.00	6.50	105.740	1,919.22	-19.34	57.82	14,434,244.51	1,705,050.60	39.74577409	-80.77005708	
2,017.00	6.37	102.930	2,013.62	-21.98	68.13	14,434,241.87	1,705,060.91	39.74576677	-80.77002042	
2,112.00	5.41	105.210	2,108.12	-24.33	77.59	14,434,239.52	1,705,070.37	39.74576024	-80.76998679	
2,160.00	4.92	102.840	2,155.92	-25.38	81.78	14,434,238.47	1,705,074.56	39.74575732	-80.76997189	
2,206.00	4.61	100.820	2,201.76	-26.17	85.52	14,434,237.68	1,705,078.30	39.74575514	-80.76995860	
2,300.00	4.00	95.720	2,295.50	-27.20	92.49	14,434,236.65	1,705,085.28	39.74575225	-80.76993380	
2,395.00	4.04	94.050	2,390.26	-27.77	99.13	14,434,236.08	1,705,091.91	39.74575064	-80.76991020	
2,490.00	3.96	92.380	2,485.03	-28.14	105.74	14,434,235.71	1,705,098.53	39.74574957	-80.76988667	
2,585.00	3.78	93.080	2,579.81	-28.45	112.15	14,434,235.40	1,705,104.93	39.74574869	-80.76986389	
2,678.00	4.00	101.960	2,672.60	-29.28	118.38	14,434,234.57	1,705,111.16	39.74574635	-80.76984172	
2,780.00	4.44	105.560	2,774.32	-31.08	125.67	14,434,232.77	1,705,118.45	39.74574136	-80.76981582	
2,827.00	5.19	105.740	2,821.16	-32.14	129.46	14,434,231.70	1,705,122.25	39.74573841	-80.76980231	
2,875.00	5.98	105.480	2,868.93	-33.40	133.96	14,434,230.45	1,705,126.75	39.74573493	-80.76978632	
2,970.00	6.55	106.620	2,963.36	-36.27	143.92	14,434,227.58	1,705,136.71	39.74572698	-80.76975091	
3,064.00	4.75	100.730	3,056.90	-38.53	152.89	14,434,225.32	1,705,145.67	39.74572071	-80.76971905	
3,157.00	4.79	98.270	3,149.58	-39.80	160.51	14,434,224.04	1,705,153.30	39.74571716	-80.76969193	
3,252.00	5.36	97.390	3,244.21	-40.95	168.84	14,434,222.90	1,705,161.62	39.74571396	-80.76966232	
3,350.00	4.66	98.880	3,341.83	-42.15	177.31	14,434,221.70	1,705,170.09	39.74571060	-80.76963219	
3,445.00	4.22	100.290	3,436.55	-43.37	184.56	14,434,220.48	1,705,177.35	39.74570720	-80.76960640	
3,539.00	4.92	103.630	3,530.25	-44.94	191.88	14,434,218.91	1,705,184.67	39.74570284	-80.76958037	
3,633.00	5.54	104.250	3,623.86	-47.00	200.20	14,434,216.84	1,705,192.98	39.74569711	-80.76955081	
3,728.00	5.84	106.530	3,718.39	-49.51	209.28	14,434,214.34	1,705,202.06	39.74569107	-80.76951854	
3,823.00	6.20	108.460	3,812.86	-52.51	218.78	14,434,211.34	1,705,211.56	39.74568186	-80.76948477	
3,917.00	5.71	107.060	3,906.36	-55.49	228.06	14,434,208.36	1,705,220.84	39.74567361	-80.76945176	
4,012.00	4.44	101.700	4,000.98	-57.62	236.18	14,434,206.23	1,705,228.96	39.74566770	-80.76942290	
4,106.00	4.04	93.170	4,094.73	-58.54	243.05	14,434,205.31	1,705,235.83	39.74566512	-80.76939847	
4,201.00	4.22	90.090	4,189.48	-58.73	249.89	14,434,205.12	1,705,242.67	39.74566455	-80.76937415	
4,295.00	4.31	84.820	4,283.22	-58.42	256.86	14,434,205.43	1,705,249.65	39.74566536	-80.76934933	
4,390.00	3.91	87.020	4,377.98	-57.93	263.65	14,434,205.92	1,705,256.44	39.74566666	-80.76932517	
4,485.00	4.17	96.860	4,472.74	-58.17	270.32	14,434,205.68	1,705,263.10	39.74566594	-80.76930146	
4,580.00	5.36	106.000	4,567.41	-59.81	278.01	14,434,204.04	1,705,270.79	39.74566140	-80.76927410	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
4,675.00	6.46	108.990	4,661.91	-62.77	287.33	14,434,201.08	1,705,280.11	39.74565320	-80.76924097	
4,770.00	6.02	107.500	4,756.34	-66.00	297.13	14,434,197.84	1,705,289.92	39.74564424	-80.76920612	
4,864.00	4.97	100.990	4,849.91	-68.26	305.83	14,434,195.59	1,705,298.62	39.74563797	-80.76917520	
4,958.00	5.01	96.250	4,943.55	-69.49	313.91	14,434,194.36	1,705,306.69	39.74563456	-80.76914647	
5,053.00	5.36	97.650	5,038.17	-70.53	322.43	14,434,193.32	1,705,315.21	39.74563164	-80.76911617	
5,148.00	5.80	103.980	5,132.72	-72.28	331.49	14,434,191.57	1,705,324.27	39.74562676	-80.76908397	
5,243.00	6.68	107.500	5,227.15	-75.10	341.42	14,434,188.75	1,705,334.20	39.74561895	-80.76904868	
5,337.00	6.68	107.320	5,320.51	-78.37	351.85	14,434,185.48	1,705,344.63	39.74560989	-80.76901159	
5,431.00	5.80	105.560	5,413.96	-81.27	361.64	14,434,182.57	1,705,354.43	39.74560185	-80.76897677	
5,525.00	4.61	99.500	5,507.57	-83.17	369.95	14,434,180.68	1,705,362.73	39.74559658	-80.76894725	
5,618.00	4.83	94.400	5,600.25	-84.09	377.54	14,434,179.76	1,705,370.32	39.74559401	-80.76892026	
5,713.00	6.28	93.430	5,694.80	-84.71	386.71	14,434,179.14	1,705,379.49	39.74559224	-80.76888762	
5,807.00	6.24	94.490	5,788.24	-85.41	396.93	14,434,178.43	1,705,389.72	39.74559023	-80.76885125	
5,902.00	5.32	99.760	5,882.76	-86.56	406.42	14,434,177.28	1,705,399.21	39.74558700	-80.76881751	
5,949.00	4.70	102.400	5,929.58	-87.35	410.45	14,434,176.50	1,705,403.23	39.74558482	-80.76880319	
5,997.00	4.17	104.160	5,977.44	-88.20	414.06	14,434,175.65	1,705,406.85	39.74558246	-80.76879034	
6,091.00	4.79	99.850	6,071.15	-89.70	421.24	14,434,174.14	1,705,414.03	39.74557827	-80.76876481	
6,185.00	4.53	105.560	6,164.84	-91.37	428.69	14,434,172.48	1,705,421.47	39.74557364	-80.76873835	
6,279.00	4.53	117.080	6,258.55	-94.06	435.57	14,434,169.79	1,705,428.35	39.74556622	-80.76871389	
6,374.00	5.63	114.880	6,353.17	-97.73	443.14	14,434,166.12	1,705,435.92	39.74555609	-80.76868700	
6,560.00	6.02	113.390	6,538.21	-105.44	460.37	14,434,158.41	1,705,453.15	39.74553479	-80.76862578	
6,654.00	6.99	107.060	6,631.61	-109.07	470.36	14,434,154.78	1,705,463.14	39.74552474	-80.76859026	
6,749.00	8.44	100.640	6,725.75	-112.05	482.74	14,434,151.79	1,705,475.52	39.74551646	-80.76854625	
6,844.00	9.84	95.540	6,819.54	-114.12	497.67	14,434,149.72	1,705,490.45	39.74551066	-80.76849315	
6,939.00	11.65	94.230	6,912.87	-115.62	515.32	14,434,148.23	1,705,508.10	39.74550644	-80.76843038	
7,033.00	13.27	95.280	7,004.65	-117.31	535.53	14,434,146.54	1,705,528.31	39.74550165	-80.76835850	
7,128.00	14.99	98.180	7,096.78	-120.06	558.55	14,434,143.79	1,705,551.33	39.74549393	-80.76827663	
7,222.00	16.22	99.850	7,187.31	-124.04	583.51	14,434,139.81	1,705,576.30	39.74548283	-80.76818784	
7,317.00	17.40	102.310	7,278.25	-129.33	610.47	14,434,134.51	1,705,603.25	39.74546809	-80.76809201	
7,411.00	17.40	102.930	7,367.95	-135.48	637.90	14,434,128.37	1,705,630.68	39.74545103	-80.76799448	
7,506.00	16.39	101.700	7,458.85	-141.37	664.87	14,434,122.48	1,705,657.65	39.74543465	-80.76789859	
7,599.00	17.97	101.700	7,547.70	-146.94	691.76	14,434,116.90	1,705,684.55	39.74541916	-80.76780294	
7,693.00	19.12	101.780	7,636.81	-153.03	721.03	14,434,110.82	1,705,713.82	39.74540224	-80.76769887	
7,788.00	19.25	100.990	7,726.54	-159.19	751.64	14,434,104.66	1,705,744.42	39.74538510	-80.76759005	
7,883.00	20.57	101.520	7,815.86	-165.51	783.37	14,434,098.34	1,705,776.15	39.74536752	-80.76747724	
7,978.00	20.92	102.840	7,904.70	-172.61	816.26	14,434,091.24	1,705,809.04	39.74534778	-80.76736029	
8,072.00	20.43	101.080	7,992.64	-179.49	848.72	14,434,084.36	1,705,841.50	39.74532865	-80.76724487	
8,166.00	20.43	100.200	8,080.73	-185.55	880.97	14,434,078.30	1,705,873.75	39.74531178	-80.76713020	
8,261.00	20.79	100.640	8,169.65	-191.60	913.85	14,434,072.25	1,705,906.64	39.74529494	-80.76701326	
8,356.00	20.43	100.550	8,258.57	-197.75	946.72	14,434,066.10	1,705,939.51	39.74527781	-80.76689638	
8,451.00	19.73	100.290	8,347.80	-203.65	978.80	14,434,060.20	1,705,971.58	39.74526138	-80.76678231	
8,545.00	16.44	100.030	8,437.14	-208.80	1,007.52	14,434,055.05	1,706,000.30	39.74524703	-80.76668019	
8,640.00	15.95	102.050	8,528.37	-213.87	1,033.52	14,434,049.98	1,706,026.30	39.74523293	-80.76658773	
8,734.00	16.57	106.880	8,618.62	-220.46	1,058.98	14,434,043.39	1,706,051.76	39.74521465	-80.76649722	
8,828.00	17.58	104.770	8,708.47	-227.97	1,085.54	14,434,035.88	1,706,078.32	39.74519383	-80.76640283	
8,923.00	21.05	105.650	8,798.11	-236.23	1,115.85	14,434,027.62	1,706,108.63	39.74517092	-80.76629507	
9,018.00	23.00	107.670	8,886.17	-246.47	1,149.96	14,434,017.38	1,706,142.74	39.74514256	-80.76617379	
9,117.00	24.13	109.340	8,976.92	-259.04	1,187.49	14,434,004.81	1,706,180.27	39.74510777	-80.76604042	
9,212.00	23.55	105.120	9,063.82	-270.42	1,224.13	14,433,993.43	1,706,216.92	39.74507625	-80.76591015	
9,307.00	23.55	100.730	9,150.91	-278.91	1,261.11	14,433,984.94	1,706,253.89	39.74505268	-80.76577870	
9,401.00	23.33	99.150	9,237.16	-285.36	1,297.93	14,433,978.49	1,706,290.71	39.74503468	-80.76564775	
9,496.00	23.25	99.240	9,324.42	-291.36	1,335.01	14,433,972.48	1,706,327.79	39.74501793	-80.76551589	
9,591.00	23.77	99.850	9,411.53	-297.65	1,372.38	14,433,966.20	1,706,365.16	39.74500040	-80.76538300	
9,685.00	23.12	100.550	9,497.77	-304.27	1,409.19	14,433,959.58	1,706,401.97	39.74498196	-80.76525212	
9,780.00	22.59	100.290	9,585.31	-310.94	1,445.48	14,433,952.90	1,706,438.26	39.74496337	-80.76512308	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
12,815.00	83.27	142.810	11,415.47	-894.54	3,482.07	14,433,369.31	1,708,474.84	39.74334578	-80.75788345	
12,862.00	84.24	145.620	11,420.59	-932.43	3,509.38	14,433,331.42	1,708,502.16	39.74324150	-80.75778664	
12,910.00	86.26	148.790	11,424.56	-972.64	3,535.29	14,433,291.21	1,708,528.06	39.74313089	-80.75769487	
12,957.00	88.37	150.190	11,426.76	-1,013.08	3,559.12	14,433,250.77	1,708,551.90	39.74301964	-80.75761048	
13,005.00	89.16	150.900	11,427.80	-1,054.87	3,582.72	14,433,208.98	1,708,575.49	39.74290471	-80.75752694	
13,099.00	89.16	151.770	11,429.18	-1,137.34	3,627.80	14,433,126.51	1,708,620.58	39.74267789	-80.75736734	
13,193.00	88.99	152.480	11,430.69	-1,220.42	3,671.75	14,433,043.43	1,708,664.52	39.74244940	-80.75721182	
13,288.00	90.04	150.540	11,431.50	-1,303.91	3,717.06	14,432,959.94	1,708,709.83	39.74221978	-80.75705143	
13,382.00	89.78	150.720	11,431.65	-1,385.82	3,763.16	14,432,878.03	1,708,755.93	39.74199447	-80.75688822	
13,476.00	89.69	151.250	11,432.08	-1,468.03	3,808.75	14,432,795.83	1,708,801.53	39.74176838	-80.75672682	
13,571.00	89.34	150.190	11,432.88	-1,550.88	3,855.21	14,432,712.97	1,708,847.99	39.74154048	-80.75656235	
13,665.00	89.16	150.720	11,434.12	-1,632.65	3,901.56	14,432,631.20	1,708,894.33	39.74131557	-80.75639826	
13,760.00	88.64	149.310	11,435.94	-1,714.92	3,949.03	14,432,548.93	1,708,941.80	39.74108929	-80.75623020	
13,855.00	88.55	150.900	11,438.27	-1,797.25	3,996.36	14,432,466.60	1,708,989.14	39.74086283	-80.75606261	
13,949.00	89.08	149.140	11,440.21	-1,878.65	4,043.32	14,432,385.20	1,709,036.10	39.74063892	-80.75589635	
14,044.00	88.72	148.960	11,442.04	-1,960.11	4,092.17	14,432,303.74	1,709,084.94	39.74041485	-80.75572337	
14,139.00	88.37	148.790	11,444.45	-2,041.41	4,141.26	14,432,222.44	1,709,134.03	39.74019121	-80.75554953	
14,234.00	89.78	149.840	11,445.98	-2,123.10	4,189.73	14,432,140.76	1,709,182.51	39.73996652	-80.75537789	
14,328.00	89.25	150.190	11,446.78	-2,204.51	4,236.71	14,432,059.34	1,709,229.48	39.73974258	-80.75521158	
14,423.00	88.90	150.540	11,448.31	-2,287.07	4,283.68	14,431,976.78	1,709,276.45	39.73951549	-80.75504530	
14,518.00	88.37	150.720	11,450.57	-2,369.84	4,330.26	14,431,894.01	1,709,323.03	39.73928784	-80.75488041	
14,612.00	89.25	150.370	11,452.53	-2,451.67	4,376.47	14,431,812.18	1,709,369.24	39.73906276	-80.75471682	
14,707.00	88.90	151.250	11,454.06	-2,534.59	4,422.79	14,431,729.26	1,709,415.57	39.73883468	-80.75455283	
14,802.00	89.43	150.190	11,455.44	-2,617.45	4,469.25	14,431,646.41	1,709,462.03	39.73860679	-80.75438838	
Survey @ 14802.00 MD 11455.44 TVD										
14,906.00	89.43	150.190	11,456.48	-2,707.68	4,520.95	14,431,556.17	1,709,513.72	39.73835859	-80.75420536	
Survey projected to 14906.00 MD 11456.48 TVD										

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
210.00	210.00	-0.16	-0.05	MWD surveys	
14,802.00	11,455.44	-2,617.45	4,469.25	Survey @ 14802.00 MD 11455.44 TVD	
14,906.00	11,456.48	-2,707.68	4,520.95	Survey projected to 14906.00 MD 11456.48 TVD	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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

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

Well	Hillrock 1S-15 HU (G)					
Well Position	+N-S	0.00 ft	Northing:	14,434,263.85 usft	Latitude:	39.74582760
	+E-W	0.00 ft	Easting:	1,704,992.78 usft	Longitude:	-80.77026260
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,219.00 ft

Wellbore	Sidetrack 01				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	9/19/2020	-8.740	66.659	51,784.24409503

Design	Surveys Sidetrack 01				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	13,193.00
Vertical Section:	Depth From (TVD) (ft)	+N-S (ft)	+E-W (ft)	Direction (°)	
	0.00	0.00	0.00	135.770	

Survey Program	Date	9/26/2020			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
210.00	924.00	MWD surf (Original Hole)	MWD	MWD - Standard	
975.00	2,585.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,678.00	10,344.00	MWD (Original Hole)	MWD	MWD - Standard	
10,470.00	13,193.00	MWD lat (Original Hole)	MWD	MWD - Standard	
13,251.00	20,385.00	MWD ST1 (Sidetrack 01)	MWD	MWD - Standard	
20,447.00	20,447.00	Projection (Sidetrack 01)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
210.00	0.09	198.280	210.00	-0.16	-0.05	0.08	0.04	0.04	0.00	0.00
240.00	0.18	261.130	240.00	-0.19	-0.11	0.06	0.53	0.30	209.50	
287.00	0.35	188.880	287.00	-0.34	-0.20	0.10	0.73	0.36	-153.72	
331.00	0.44	201.630	331.00	-0.63	-0.28	0.25	0.28	0.20	28.98	
362.00	0.26	193.010	362.00	-0.81	-0.34	0.34	0.60	-0.58	-27.81	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
392.00	0.31	181.940	392.00	-0.96	-0.36	0.43	0.25	0.17	-36.90
422.00	0.31	184.490	422.00	-1.12	-0.37	0.54	0.05	0.00	8.50
469.00	0.35	197.590	469.00	-1.38	-0.42	0.69	0.18	0.09	27.87
512.00	0.35	220.260	512.00	-1.61	-0.55	0.77	0.32	0.00	52.72
558.00	0.40	185.980	558.99	-1.88	-0.66	0.89	0.48	0.11	-72.94
603.00	0.35	211.820	602.99	-2.15	-0.75	1.02	0.40	-0.11	58.73
648.00	0.40	204.530	647.99	-2.41	-0.88	1.11	0.15	0.11	-16.20
695.00	0.44	215.600	694.99	-2.70	-1.06	1.20	0.19	0.09	23.55
742.00	0.44	192.490	741.99	-3.03	-1.20	1.33	0.38	0.00	-49.17
787.00	0.57	212.000	786.99	-3.38	-1.36	1.48	0.48	0.29	43.36
834.00	0.44	199.990	833.99	-3.75	-1.54	1.61	0.36	-0.28	-25.55
881.00	0.31	204.700	880.99	-4.04	-1.66	1.74	0.28	-0.28	10.02
924.00	0.48	207.870	923.98	-4.30	-1.79	1.83	0.40	0.40	7.37
975.00	0.66	215.760	974.98	-4.73	-2.06	1.95	0.38	0.35	15.47
1,070.00	0.62	169.280	1,069.98	-5.68	-2.29	2.47	0.53	-0.04	-48.93
1,165.00	1.19	121.650	1,164.97	-6.70	-1.35	3.86	0.95	0.60	-50.14
1,260.00	1.93	89.740	1,259.93	-7.21	1.09	5.93	1.17	0.78	-33.59
1,354.00	3.34	92.470	1,353.83	-7.32	5.41	9.02	1.51	1.50	2.90
1,449.00	4.57	96.690	1,448.60	-7.88	11.93	13.97	1.33	1.29	4.44
1,496.00	5.36	101.260	1,495.43	-8.53	15.95	17.23	1.88	1.68	9.72
1,543.00	5.41	103.630	1,542.22	-9.48	20.25	20.92	0.49	0.11	5.04
1,590.00	5.36	105.040	1,589.01	-10.57	24.52	24.68	0.30	-0.11	3.00
1,637.00	5.67	104.680	1,635.79	-11.73	28.89	28.56	0.66	0.66	-0.77
1,732.00	5.84	104.070	1,730.31	-14.09	38.12	36.69	0.19	0.18	-0.64
1,827.00	6.15	104.860	1,824.79	-16.57	47.73	45.17	0.34	0.33	0.83
1,922.00	6.50	105.740	1,919.22	-19.34	57.82	54.19	0.38	0.37	0.93
2,017.00	6.37	102.930	2,013.62	-21.98	68.13	63.27	0.36	-0.14	-2.96
2,112.00	5.41	105.210	2,108.12	-24.33	77.59	71.56	1.04	-1.01	2.40
2,160.00	4.92	102.840	2,155.92	-25.38	81.78	75.23	1.11	-1.02	-4.94
2,206.00	4.61	100.820	2,201.76	-26.17	85.52	78.40	0.77	-0.67	-4.39
2,300.00	4.00	95.720	2,295.50	-27.20	92.49	84.01	0.77	-0.65	-5.43
2,395.00	4.04	94.050	2,390.26	-27.77	99.13	89.04	0.13	0.04	-1.76
2,490.00	3.96	92.380	2,485.03	-28.14	105.74	93.92	0.15	-0.08	-1.76
2,585.00	3.78	93.080	2,579.81	-28.45	112.15	98.61	0.20	-0.19	0.74
2,678.00	4.00	101.960	2,672.60	-29.28	118.38	103.56	0.69	0.24	9.55
2,780.00	4.44	105.560	2,774.32	-31.08	125.67	109.93	0.50	0.43	3.53
2,827.00	5.19	105.740	2,821.16	-32.14	129.46	113.34	1.60	1.60	0.38
2,875.00	5.98	105.480	2,868.93	-33.40	133.96	117.38	1.65	1.65	-0.54
2,970.00	6.55	106.620	2,963.36	-36.27	143.92	126.38	0.61	0.60	1.20
3,064.00	4.75	100.730	3,056.90	-38.53	152.89	134.25	2.01	-1.91	-6.27
3,157.00	4.79	98.270	3,149.58	-39.80	160.51	140.49	0.22	0.04	-2.65
3,252.00	5.36	97.390	3,244.21	-40.95	168.84	147.11	0.61	0.60	-0.93
3,350.00	4.66	98.880	3,341.83	-42.15	177.31	153.88	0.73	-0.71	1.52
3,445.00	4.22	100.290	3,436.55	-43.37	184.56	159.82	0.48	-0.46	1.48

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
3,539.00	4.92	103.630	3,530.25	-44.94	191.88	166.04	0.80	0.74	3.55
3,633.00	5.54	104.250	3,623.86	-47.00	200.20	173.33	0.66	0.66	0.66
3,728.00	5.84	106.530	3,718.39	-49.51	209.28	181.45	0.40	0.32	2.40
3,823.00	6.20	108.460	3,812.86	-52.51	218.78	190.23	0.43	0.38	2.03
3,917.00	5.71	107.060	3,906.36	-55.49	228.06	198.84	0.54	-0.52	-1.49
4,012.00	4.44	101.700	4,000.98	-57.62	236.18	206.03	1.43	-1.34	-5.64
4,106.00	4.04	93.170	4,094.73	-58.54	243.05	211.48	0.79	-0.43	-9.07
4,201.00	4.22	90.090	4,189.48	-58.73	249.89	216.39	0.30	0.19	-3.24
4,295.00	4.31	84.820	4,283.22	-58.42	256.86	221.03	0.43	0.10	-5.61
4,390.00	3.91	87.020	4,377.98	-57.93	263.65	225.41	0.45	-0.42	2.32
4,485.00	4.17	96.860	4,472.74	-58.17	270.32	230.24	0.78	0.27	10.36
4,580.00	5.36	106.000	4,567.41	-59.81	278.01	236.78	1.48	1.25	9.62
4,675.00	6.46	108.990	4,661.91	-62.77	287.33	245.40	1.20	1.16	3.15
4,770.00	6.02	107.500	4,756.34	-66.00	297.13	254.56	0.49	-0.46	-1.57
4,864.00	4.97	100.990	4,849.91	-68.26	305.83	262.24	1.30	-1.12	-6.93
4,958.00	5.01	96.250	4,943.55	-69.49	313.91	268.75	0.44	0.04	-5.04
5,053.00	5.36	97.650	5,038.17	-70.53	322.43	275.45	0.39	0.37	1.47
5,148.00	5.80	103.980	5,132.72	-72.28	331.49	283.02	0.80	0.46	6.66
5,243.00	6.68	107.500	5,227.15	-75.10	341.42	291.96	1.01	0.93	3.71
5,337.00	6.68	107.320	5,320.51	-78.37	351.85	301.59	0.02	0.00	-0.19
5,431.00	5.80	105.560	5,413.96	-81.27	361.64	310.50	0.96	-0.94	-1.87
5,525.00	4.61	99.500	5,507.57	-83.17	369.95	317.65	1.39	-1.27	-6.45
5,618.00	4.83	94.400	5,600.25	-84.09	377.54	323.60	0.51	0.24	-5.48
5,713.00	6.28	93.430	5,694.80	-84.71	386.71	330.44	1.53	1.53	-1.02
5,807.00	6.24	94.490	5,788.24	-85.41	396.93	338.08	0.13	-0.04	1.13
5,902.00	5.32	99.760	5,882.76	-86.56	406.42	345.52	1.12	-0.97	5.55
5,949.00	4.70	102.400	5,929.58	-87.35	410.45	348.89	1.41	-1.32	5.62
5,997.00	4.17	104.160	5,977.44	-88.20	414.06	352.02	1.14	-1.10	3.67
6,091.00	4.79	99.850	6,071.15	-89.70	421.24	358.11	0.75	0.66	-4.59
6,185.00	4.53	105.560	6,164.84	-91.37	428.69	364.50	0.57	-0.28	6.07
6,279.00	4.53	117.080	6,258.55	-94.06	435.57	371.22	0.97	0.00	12.26
6,374.00	5.63	114.880	6,353.17	-97.73	443.14	379.13	1.18	1.16	-2.32
6,560.00	6.02	113.390	6,538.21	-105.44	460.37	396.67	0.22	0.21	-0.80
6,654.00	6.99	107.060	6,631.61	-109.07	470.36	406.25	1.28	1.03	-6.73
6,749.00	8.44	100.640	6,725.75	-112.05	482.74	417.02	1.77	1.53	-6.76
6,844.00	9.84	95.540	6,819.54	-114.12	497.67	428.92	1.70	1.47	-5.37
6,939.00	11.65	94.230	6,912.87	-115.62	515.32	442.30	1.92	1.91	-1.38
7,033.00	13.27	95.280	7,004.65	-117.31	535.53	457.61	1.74	1.72	1.12
7,128.00	14.99	98.180	7,096.78	-120.06	558.55	475.64	1.96	1.81	3.05
7,222.00	16.22	99.850	7,187.31	-124.04	583.51	495.90	1.39	1.31	1.78
7,317.00	17.40	102.310	7,278.25	-129.33	610.47	518.50	1.45	1.24	2.59
7,411.00	17.40	102.930	7,367.95	-135.48	637.90	542.03	0.20	0.00	0.66
7,506.00	16.39	101.700	7,458.85	-141.37	664.87	565.07	1.13	-1.06	-1.29

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
7,599.00	17.97	101.700	7,547.70	-146.94	691.76	587.82	1.70	1.70	0.00
7,693.00	19.12	101.780	7,636.81	-153.03	721.03	612.60	1.22	1.22	0.09
7,788.00	19.25	100.990	7,726.54	-159.19	751.64	638.36	0.31	0.14	-0.83
7,883.00	20.57	101.520	7,815.86	-165.51	783.37	665.02	1.40	1.39	0.56
7,978.00	20.92	102.840	7,904.70	-172.61	816.26	693.05	0.61	0.37	1.39
8,072.00	20.43	101.080	7,992.64	-179.49	848.72	720.63	0.84	-0.52	-1.87
8,166.00	20.43	100.200	8,080.73	-185.55	880.97	747.46	0.33	0.00	-0.94
8,261.00	20.79	100.640	8,169.65	-191.60	913.85	774.74	0.41	0.38	0.46
8,356.00	20.43	100.550	8,258.57	-197.75	946.72	802.07	0.38	-0.38	-0.09
8,451.00	19.73	100.290	8,347.80	-203.65	978.80	828.68	0.74	-0.74	-0.27
8,545.00	16.44	100.030	8,437.14	-208.80	1,007.52	852.40	3.50	-3.50	-0.28
8,640.00	15.95	102.050	8,528.37	-213.87	1,033.52	874.17	0.79	-0.52	2.13
8,734.00	16.57	106.880	8,618.62	-220.46	1,058.98	896.65	1.58	0.66	5.14
8,828.00	17.58	104.770	8,708.47	-227.97	1,085.54	920.55	1.26	1.07	-2.24
8,923.00	21.05	105.650	8,798.11	-236.23	1,115.85	947.62	3.67	3.65	0.93
9,018.00	23.00	107.670	8,886.17	-246.47	1,149.96	978.75	2.20	2.05	2.13
9,117.00	24.13	109.340	8,976.92	-259.04	1,187.49	1,013.93	1.33	1.14	1.69
9,212.00	23.55	105.120	9,063.82	-270.42	1,224.13	1,047.65	1.90	-0.61	-4.44
9,307.00	23.55	100.730	9,150.91	-278.91	1,261.11	1,079.52	1.85	0.00	-4.62
9,401.00	23.33	99.150	9,237.16	-285.36	1,297.93	1,109.84	0.71	-0.23	-1.68
9,496.00	23.25	99.240	9,324.42	-291.36	1,335.01	1,140.00	0.09	-0.08	0.09
9,591.00	23.77	99.850	9,411.53	-297.65	1,372.38	1,170.57	0.60	0.55	0.64
9,685.00	23.12	100.550	9,497.77	-304.27	1,409.19	1,200.99	0.75	-0.69	0.74
9,780.00	22.59	100.290	9,585.31	-310.94	1,445.48	1,231.09	0.57	-0.56	-0.27
9,873.00	21.14	100.290	9,671.62	-317.13	1,479.56	1,259.29	1.56	-1.56	0.00
9,967.00	20.52	100.030	9,759.47	-323.03	1,512.46	1,286.47	0.67	-0.66	-0.28
10,061.00	20.26	99.670	9,847.58	-328.63	1,544.73	1,312.99	0.31	-0.28	-0.38
10,155.00	20.04	100.640	9,935.83	-334.34	1,576.60	1,339.31	0.43	-0.23	1.03
10,250.00	19.47	102.140	10,025.24	-340.67	1,608.08	1,365.81	0.80	-0.60	1.58
10,344.00	18.94	103.370	10,114.01	-347.50	1,638.23	1,391.73	0.71	-0.56	1.31
10,470.00	19.17	106.420	10,233.11	-358.07	1,677.97	1,427.03	0.81	0.18	2.42
10,551.00	21.02	105.370	10,309.17	-365.68	1,704.74	1,451.15	2.33	2.28	-1.30
10,598.00	22.42	102.910	10,352.84	-369.92	1,721.60	1,465.95	3.55	2.98	-5.23
10,646.00	25.68	104.310	10,396.66	-374.54	1,740.61	1,482.52	6.89	6.79	2.92
10,693.00	27.44	105.190	10,438.70	-379.89	1,760.93	1,500.53	3.84	3.74	1.87
10,741.00	30.51	106.070	10,480.69	-386.16	1,783.32	1,520.64	6.46	6.40	1.83
10,788.00	33.24	106.770	10,520.60	-393.19	1,807.12	1,542.27	5.86	5.81	1.49
10,835.00	36.40	106.420	10,559.18	-400.85	1,832.84	1,565.70	6.74	6.72	-0.74
10,882.00	39.48	105.900	10,596.24	-408.88	1,860.59	1,590.82	6.59	6.55	-1.11
10,930.00	43.62	104.490	10,632.16	-417.21	1,891.31	1,618.21	8.84	8.63	-2.94
10,977.00	47.84	103.080	10,664.96	-425.21	1,923.99	1,646.74	9.23	8.98	-3.00
11,024.00	50.91	101.500	10,695.56	-432.79	1,958.84	1,676.49	7.01	6.53	-3.36
11,071.00	53.99	101.150	10,724.20	-440.11	1,995.37	1,707.21	6.58	6.55	-0.74

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,119.00	57.07	100.800	10,751.36	-447.64	2,034.22	1,739.70	6.44	6.42	-0.73
11,166.00	59.18	100.450	10,776.18	-455.00	2,073.44	1,772.34	4.53	4.49	-0.74
11,212.00	60.67	100.450	10,799.23	-462.22	2,112.59	1,804.81	3.24	3.24	0.00
11,259.00	62.61	99.920	10,821.55	-469.53	2,153.29	1,838.45	4.25	4.13	-1.13
11,306.00	64.19	99.570	10,842.60	-476.64	2,194.71	1,872.43	3.43	3.36	-0.74
11,353.00	64.72	99.570	10,862.87	-483.69	2,236.53	1,906.65	1.13	1.13	0.00
11,400.00	65.51	99.570	10,882.64	-490.78	2,278.57	1,941.06	1.68	1.68	0.00
11,447.00	66.21	99.570	10,901.86	-497.91	2,320.86	1,975.67	1.49	1.49	0.00
11,494.00	64.89	98.860	10,921.32	-504.76	2,363.09	2,010.04	3.13	-2.81	-1.51
11,541.00	65.42	99.040	10,941.07	-511.40	2,405.22	2,044.18	1.18	1.13	0.38
11,589.00	66.13	99.220	10,960.76	-518.34	2,448.44	2,079.30	1.52	1.48	0.38
11,636.00	66.04	99.390	10,979.81	-525.29	2,490.84	2,113.86	0.38	-0.19	0.36
11,683.00	64.54	99.920	10,999.46	-532.45	2,532.93	2,148.35	3.35	-3.19	1.13
11,730.00	64.72	100.090	11,019.60	-539.83	2,574.75	2,182.81	0.50	0.38	0.36
11,778.00	63.93	100.090	11,040.39	-547.41	2,617.35	2,217.95	1.65	-1.65	0.00
11,825.00	64.54	100.450	11,060.82	-554.95	2,658.99	2,252.40	1.47	1.30	0.77
11,873.00	63.84	100.970	11,081.72	-562.98	2,701.45	2,287.77	1.75	-1.46	1.08
11,920.00	64.37	100.620	11,102.25	-570.90	2,742.99	2,322.42	1.31	1.13	-0.74
11,967.00	63.05	100.450	11,123.07	-578.61	2,784.41	2,356.84	2.83	-2.81	-0.36
12,014.00	63.49	99.920	11,144.21	-586.03	2,825.73	2,390.98	1.38	0.94	-1.13
12,061.00	63.66	100.090	11,165.12	-593.34	2,867.18	2,425.13	0.49	0.36	0.36
12,108.00	64.19	99.570	11,185.78	-600.55	2,908.77	2,459.31	1.50	1.13	-1.11
12,156.00	64.37	99.740	11,206.61	-607.80	2,951.41	2,494.24	0.49	0.38	0.35
12,203.00	64.98	99.220	11,226.72	-614.80	2,993.31	2,528.48	1.64	1.30	-1.11
12,250.00	65.77	101.320	11,246.30	-622.42	3,035.35	2,563.27	4.40	1.68	4.47
12,297.00	65.86	103.430	11,265.56	-631.60	3,077.22	2,599.06	4.10	0.19	4.49
12,344.00	66.21	106.250	11,284.65	-642.60	3,118.73	2,635.90	5.53	0.74	6.00
12,391.00	66.83	108.180	11,303.38	-655.36	3,159.90	2,673.76	3.99	1.32	4.11
12,439.00	68.41	112.400	11,321.66	-670.76	3,201.52	2,713.82	8.77	3.29	8.79
12,486.00	70.35	117.150	11,338.22	-689.19	3,241.44	2,754.87	10.32	4.13	10.11
12,533.00	72.19	120.490	11,353.32	-710.65	3,280.42	2,797.44	7.79	3.91	7.11
12,580.00	73.51	124.880	11,367.18	-734.90	3,318.21	2,841.18	9.36	2.81	9.34
12,628.00	74.92	128.920	11,380.24	-762.63	3,355.13	2,886.80	8.62	2.94	8.42
12,675.00	76.59	132.970	11,391.81	-792.48	3,389.53	2,932.18	9.08	3.55	8.62
12,720.00	79.58	136.310	11,401.11	-823.42	3,420.84	2,976.19	9.84	6.64	7.42
12,767.00	81.16	138.940	11,408.97	-857.65	3,452.07	3,022.50	6.46	3.36	5.60
12,815.00	83.27	142.810	11,415.47	-894.54	3,482.07	3,069.86	9.12	4.40	8.06
12,862.00	84.24	145.620	11,420.59	-932.43	3,509.38	3,116.07	6.29	2.06	5.98
12,910.00	86.26	148.790	11,424.56	-972.64	3,535.29	3,162.94	7.81	4.21	6.60
12,957.00	88.37	150.190	11,426.76	-1,013.08	3,559.12	3,208.55	5.39	4.49	2.98
13,005.00	89.16	150.900	11,427.80	-1,054.87	3,582.72	3,254.95	2.21	1.65	1.48
13,099.00	89.16	151.770	11,429.18	-1,137.34	3,627.80	3,345.49	0.93	0.00	0.93
13,193.00	88.99	152.480	11,430.69	-1,220.42	3,671.75	3,435.68	0.78	-0.18	0.76

Tie into original hole @ 13193 MD

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
13,251.00	87.85	153.000	11,432.29	-1,271.96	3,698.30	3,491.13	2.16	-1.97	0.90
13,277.00	87.67	154.410	11,433.31	-1,295.25	3,709.81	3,515.85	5.46	-0.69	5.42
13,311.00	89.08	157.570	11,434.27	-1,326.29	3,723.64	3,547.73	10.17	4.15	9.29
13,405.00	89.43	156.340	11,435.50	-1,412.78	3,760.43	3,635.37	1.36	0.37	-1.31
13,500.00	89.52	153.360	11,436.37	-1,498.76	3,800.80	3,725.14	3.14	0.09	-3.14
13,594.00	89.16	153.180	11,437.45	-1,582.71	3,843.07	3,814.78	0.43	-0.38	-0.19
13,689.00	89.16	150.900	11,438.84	-1,666.60	3,887.61	3,905.96	2.40	0.00	-2.40
13,784.00	89.08	150.370	11,440.30	-1,749.39	3,934.19	3,997.77	0.56	-0.08	-0.56
13,878.00	88.72	151.070	11,442.11	-1,831.36	3,980.15	4,088.57	0.84	-0.38	0.74
13,973.00	89.08	150.020	11,443.93	-1,914.07	4,026.86	4,180.41	1.17	0.38	-1.11
14,068.00	88.99	149.490	11,445.53	-1,996.12	4,074.70	4,272.58	0.57	-0.09	-0.56
14,163.00	88.99	149.310	11,447.20	-2,077.88	4,123.05	4,364.89	0.19	0.00	-0.19
14,257.00	89.08	149.310	11,448.79	-2,158.70	4,171.02	4,456.27	0.10	0.10	0.00
14,352.00	89.25	149.140	11,450.17	-2,240.32	4,219.63	4,548.65	0.25	0.18	-0.18
14,447.00	88.90	148.430	11,451.71	-2,321.55	4,268.85	4,641.20	0.83	-0.37	-0.75
14,541.00	88.99	149.140	11,453.44	-2,401.93	4,317.56	4,732.76	0.76	0.10	0.76
14,636.00	89.60	148.960	11,454.61	-2,483.40	4,366.41	4,825.22	0.67	0.64	-0.19
14,731.00	89.34	149.140	11,455.48	-2,564.87	4,415.27	4,917.67	0.33	-0.27	0.19
14,825.00	89.25	149.310	11,456.64	-2,645.62	4,463.36	5,009.09	0.20	-0.10	0.18
14,920.00	89.34	149.840	11,457.81	-2,727.54	4,511.47	5,101.33	0.57	0.09	0.56
15,015.00	89.25	150.020	11,458.98	-2,809.74	4,559.06	5,193.44	0.21	-0.09	0.19
15,109.00	89.16	148.080	11,460.28	-2,890.35	4,607.40	5,284.91	2.07	-0.10	-2.06
15,204.00	89.25	147.560	11,461.60	-2,970.75	4,657.99	5,377.81	0.56	0.09	-0.55
15,299.00	88.64	147.380	11,463.35	-3,050.83	4,709.07	5,470.82	0.67	-0.64	-0.19
15,394.00	88.55	147.200	11,465.68	-3,130.74	4,760.39	5,563.88	0.21	-0.09	-0.19
15,489.00	88.72	147.380	11,467.94	-3,210.65	4,811.71	5,656.94	0.26	0.18	0.19
15,583.00	88.72	147.200	11,470.04	-3,289.72	4,862.49	5,749.02	0.19	0.00	-0.19
15,678.00	88.29	148.260	11,472.52	-3,370.02	4,913.20	5,841.93	1.20	-0.45	1.12
15,773.00	89.08	149.310	11,474.70	-3,451.24	4,962.42	5,934.46	1.38	0.83	1.11
15,867.00	89.16	149.840	11,476.14	-3,532.29	5,010.01	6,025.73	0.57	0.09	0.56
15,962.00	89.25	150.190	11,477.46	-3,614.57	5,057.49	6,117.80	0.38	0.09	0.37
16,057.00	89.34	150.190	11,478.63	-3,696.99	5,104.71	6,209.80	0.09	0.09	0.00
16,152.00	89.43	150.020	11,479.65	-3,779.35	5,152.06	6,301.84	0.20	0.09	-0.18
16,247.00	89.43	149.840	11,480.60	-3,861.56	5,199.66	6,393.95	0.19	0.00	-0.19
16,342.00	89.52	149.660	11,481.47	-3,943.62	5,247.51	6,486.13	0.21	0.09	-0.19
16,436.00	89.34	149.310	11,482.40	-4,024.59	5,295.24	6,577.45	0.42	-0.19	-0.37
16,530.00	89.16	148.790	11,483.63	-4,105.20	5,343.58	6,668.93	0.59	-0.19	-0.55
16,625.00	89.16	148.260	11,485.03	-4,186.21	5,393.17	6,761.57	0.56	0.00	-0.56
16,720.00	89.25	148.960	11,486.34	-4,267.30	5,442.65	6,854.19	0.74	0.09	0.74
16,814.00	89.25	148.790	11,487.57	-4,347.76	5,491.24	6,945.73	0.18	0.00	-0.18
16,908.00	88.99	150.540	11,489.02	-4,428.88	5,538.70	7,036.96	1.88	-0.28	1.86
17,003.00	89.16	150.020	11,490.55	-4,511.37	5,585.80	7,128.92	0.58	0.18	-0.55
17,098.00	89.60	149.840	11,491.58	-4,593.58	5,633.39	7,221.03	0.50	0.46	-0.19

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
17,192.00	89.16	151.250	11,492.60	-4,675.43	5,679.61	7,311.91	1.57	-0.47	1.50
17,287.00	89.25	151.070	11,493.91	-4,758.63	5,725.43	7,403.50	0.21	0.09	-0.19
17,382.00	89.25	150.900	11,495.16	-4,841.70	5,771.51	7,495.16	0.18	0.00	-0.18
17,477.00	89.25	150.900	11,496.40	-4,924.71	5,817.71	7,586.86	0.00	0.00	0.00
17,571.00	89.34	150.540	11,497.56	-5,006.69	5,863.68	7,677.67	0.39	0.10	-0.38
17,666.00	89.16	150.370	11,498.80	-5,089.33	5,910.52	7,769.56	0.26	-0.19	-0.18
17,761.00	89.43	150.900	11,499.97	-5,172.12	5,957.10	7,861.37	0.63	0.28	0.56
17,855.00	88.20	149.840	11,501.91	-5,253.80	6,003.56	7,952.32	1.73	-1.31	-1.13
17,950.00	88.29	150.020	11,504.82	-5,335.98	6,051.14	8,044.39	0.21	0.09	0.19
18,045.00	88.37	150.190	11,507.59	-5,418.30	6,098.47	8,136.39	0.20	0.08	0.18
18,139.00	89.25	150.370	11,509.54	-5,499.92	6,145.06	8,227.37	0.96	0.94	0.19
18,234.00	89.34	149.840	11,510.71	-5,582.27	6,192.40	8,319.40	0.57	0.09	-0.56
18,329.00	89.34	149.840	11,511.81	-5,664.41	6,240.13	8,411.55	0.00	0.00	0.00
18,424.00	89.34	150.020	11,512.90	-5,746.62	6,287.73	8,503.66	0.19	0.00	0.19
18,518.00	89.43	150.370	11,513.91	-5,828.18	6,334.45	8,594.69	0.38	0.10	0.37
18,613.00	89.60	150.540	11,514.72	-5,910.82	6,381.29	8,686.58	0.25	0.18	0.18
18,707.00	89.43	150.540	11,515.51	-5,992.66	6,427.52	8,777.47	0.18	-0.18	0.00
18,802.00	88.81	148.610	11,516.97	-6,074.57	6,475.62	8,869.71	2.13	-0.65	-2.03
18,897.00	89.16	149.490	11,518.65	-6,156.03	6,524.47	8,962.16	1.00	0.37	0.93
18,991.00	89.69	150.190	11,519.60	-6,237.30	6,571.69	9,053.33	0.93	0.56	0.74
19,085.00	89.16	149.140	11,520.54	-6,318.42	6,619.17	9,144.57	1.25	-0.56	-1.12
19,179.00	88.90	148.260	11,522.13	-6,398.73	6,667.99	9,236.18	0.98	-0.28	-0.94
19,274.00	88.72	148.430	11,524.10	-6,479.58	6,717.84	9,328.88	0.26	-0.19	0.18
19,368.00	88.90	148.430	11,526.06	-6,559.65	6,767.04	9,420.57	0.19	0.19	0.00
19,463.00	88.81	150.020	11,527.95	-6,641.25	6,815.64	9,512.94	1.68	-0.09	1.67
19,558.00	88.99	150.370	11,529.78	-6,723.67	6,862.85	9,604.93	0.41	0.19	0.37
19,653.00	88.99	150.370	11,531.45	-6,806.24	6,909.81	9,696.85	0.00	0.00	0.00
19,748.00	88.99	150.190	11,533.13	-6,888.73	6,956.90	9,788.80	0.19	0.00	-0.19
19,842.00	88.99	150.540	11,534.78	-6,970.42	7,003.37	9,879.76	0.37	0.00	0.37
19,938.00	88.99	150.540	11,536.48	-7,053.99	7,050.58	9,972.57	0.00	0.00	0.00
20,032.00	89.16	150.540	11,537.99	-7,135.83	7,096.80	10,063.45	0.18	0.18	0.00
20,127.00	89.34	150.900	11,539.24	-7,218.68	7,143.26	10,155.23	0.42	0.19	0.38
20,222.00	89.52	151.250	11,540.18	-7,301.83	7,189.21	10,246.85	0.41	0.19	0.37
20,316.00	89.34	150.540	11,541.12	-7,383.95	7,234.93	10,337.59	0.78	-0.19	-0.76
20,385.00	89.25	150.540	11,541.97	-7,444.03	7,268.86	10,404.31	0.13	-0.13	0.00
Survey @ 20385.00 MD 11541.97 TVD									
20,447.00	89.25	150.540	11,542.78	-7,498.01	7,299.35	10,464.25	0.00	0.00	0.00
Survey projected to 20447.00 MD 11542.78 TVD									



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Design Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
13,193.00	11,430.69	-1,220.42	3,671.75	Tie into original hole @ 13193 MD
20,385.00	11,541.97	-7,444.03	7,268.86	Survey @ 20385.00 MD 11541.97 TVD

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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

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

Well	Hillrock 1S-15 HU (G)					
Well Position	+N-S	0.00 ft	Northing:	14,434,263.85 usft	Latitude:	39.74582760
	+E-W	0.00 ft	Easting:	1,704,992.78 usft	Longitude:	-80.77026260
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,219.00 ft

Wellbore	Sidetrack 01				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	9/19/2020	-8.740	66.659	51,784.24409503

Design	Surveys Sidetrack 01				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	13,193.00
Vertical Section:	Depth From (TVD) (ft)	+N-S (ft)	+E-W (ft)	Direction (°)	
	0.00	0.00	0.00	135.770	

Survey Program	Date	9/26/2020		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
210.00	924.00	MWD surf (Original Hole)	MWD	MWD - Standard
975.00	2,585.00	MWD int (Original Hole)	MWD	MWD - Standard
2,678.00	10,344.00	MWD (Original Hole)	MWD	MWD - Standard
10,470.00	13,193.00	MWD lat (Original Hole)	MWD	MWD - Standard
13,251.00	20,385.00	MWD ST1 (Sidetrack 01)	MWD	MWD - Standard
20,447.00	20,447.00	Projection (Sidetrack 01)	MWD	MWD - Standard

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.000	0.00	0.00	0.00	14,434,263.85	1,704,992.78	39.74582760	-80.77026260	
210.00	0.09	198.280	210.00	-0.16	-0.05	14,434,263.69	1,704,992.73	39.74582717	-80.77026279	
240.00	0.18	261.130	240.00	-0.19	-0.11	14,434,263.66	1,704,992.68	39.74582709	-80.77026298	
287.00	0.35	188.880	287.00	-0.34	-0.20	14,434,263.51	1,704,992.58	39.74582667	-80.77026332	
331.00	0.44	201.630	331.00	-0.63	-0.28	14,434,263.22	1,704,992.50	39.74582588	-80.77026362	
362.00	0.26	193.010	362.00	-0.81	-0.34	14,434,263.04	1,704,992.44	39.74582538	-80.77026383	
392.00	0.31	181.940	392.00	-0.96	-0.36	14,434,262.89	1,704,992.42	39.74582498	-80.77026390	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hillrock 1S-15 HU (G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Site:	Hillrock/Simms	MD Reference:	RKB=1219+26 @ 1245.00ft (Nabors B28)
Well:	Hillrock 1S-15 HU (G)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
17,571.00	89.34	150.540	11,497.56	-5,006.69	5,863.68	14,429,257.17	1,710,856.45	39.73203464	-80.74945188	
17,666.00	89.16	150.370	11,498.80	-5,089.33	5,910.52	14,429,174.53	1,710,903.29	39.73180733	-80.74928609	
17,761.00	89.43	150.900	11,499.97	-5,172.12	5,957.10	14,429,091.74	1,710,949.87	39.73157962	-80.74912123	
17,855.00	88.20	149.840	11,501.91	-5,253.80	6,003.56	14,429,010.05	1,710,996.33	39.73135492	-80.74895679	
17,950.00	88.29	150.020	11,504.82	-5,335.98	6,051.14	14,428,927.88	1,711,043.91	39.73112887	-80.74878838	
18,045.00	88.37	150.190	11,507.59	-5,418.30	6,098.47	14,428,845.55	1,711,091.24	39.73090242	-80.74862086	
18,139.00	89.25	150.370	11,509.54	-5,499.92	6,145.06	14,428,763.94	1,711,137.83	39.73067792	-80.74845596	
18,234.00	89.34	149.840	11,510.71	-5,582.27	6,192.40	14,428,681.59	1,711,185.17	39.73045139	-80.74828838	
18,329.00	89.34	149.840	11,511.81	-5,664.41	6,240.13	14,428,599.45	1,711,232.90	39.73022546	-80.74811945	
18,424.00	89.34	150.020	11,512.90	-5,746.62	6,287.73	14,428,517.24	1,711,280.50	39.72999932	-80.74795098	
18,518.00	89.43	150.370	11,513.91	-5,828.18	6,334.45	14,428,435.68	1,711,327.22	39.72977497	-80.74778563	
18,613.00	89.60	150.540	11,514.72	-5,910.82	6,381.29	14,428,353.04	1,711,374.06	39.72954765	-80.74761984	
18,707.00	89.43	150.540	11,515.51	-5,992.66	6,427.52	14,428,271.20	1,711,420.29	39.72932252	-80.74745624	
18,802.00	88.81	148.610	11,516.97	-6,074.57	6,475.62	14,428,189.29	1,711,468.39	39.72909722	-80.74728598	
18,897.00	89.16	149.490	11,518.65	-6,156.03	6,524.47	14,428,107.83	1,711,517.24	39.72887313	-80.74711305	
18,991.00	89.69	150.190	11,519.60	-6,237.30	6,571.69	14,428,026.56	1,711,564.46	39.72864957	-80.74694590	
19,085.00	89.16	149.140	11,520.54	-6,318.42	6,619.17	14,427,945.44	1,711,611.94	39.72842641	-80.74677788	
19,179.00	88.90	148.260	11,522.13	-6,398.73	6,667.99	14,427,865.13	1,711,660.76	39.72820549	-80.74660502	
19,274.00	88.72	148.430	11,524.10	-6,479.58	6,717.84	14,427,784.28	1,711,710.61	39.72798307	-80.74642855	
19,368.00	88.90	148.430	11,526.06	-6,559.65	6,767.04	14,427,704.21	1,711,759.81	39.72776279	-80.74625436	
19,463.00	88.81	150.020	11,527.95	-6,641.25	6,815.64	14,427,622.61	1,711,808.41	39.72753830	-80.74608234	
19,558.00	88.99	150.370	11,529.78	-6,723.67	6,862.85	14,427,540.19	1,711,855.62	39.72731159	-80.74591526	
19,653.00	88.99	150.370	11,531.45	-6,806.24	6,909.81	14,427,457.63	1,711,902.58	39.72708448	-80.74574907	
19,748.00	88.99	150.190	11,533.13	-6,888.73	6,956.90	14,427,375.14	1,711,949.67	39.72685757	-80.74558242	
19,842.00	88.99	150.540	11,534.78	-6,970.42	7,003.37	14,427,293.44	1,711,996.14	39.72663286	-80.74541796	
19,938.00	88.99	150.540	11,536.48	-7,053.99	7,050.58	14,427,209.87	1,712,043.35	39.72640297	-80.74525091	
20,032.00	89.16	150.540	11,537.99	-7,135.83	7,096.80	14,427,128.04	1,712,089.57	39.72617787	-80.74508733	
20,127.00	89.34	150.900	11,539.24	-7,218.68	7,143.26	14,427,045.18	1,712,136.03	39.72594996	-80.74492294	
20,222.00	89.52	151.250	11,540.18	-7,301.83	7,189.21	14,426,962.04	1,712,181.98	39.72572126	-80.74476037	
20,316.00	89.34	150.540	11,541.12	-7,383.95	7,234.93	14,426,879.91	1,712,227.70	39.72549536	-80.74459860	
20,385.00	89.25	150.540	11,541.97	-7,444.03	7,268.86	14,426,819.84	1,712,261.63	39.72533011	-80.74447853	
Survey @ 20385.00 MD 11541.97 TVD										
20,447.00	89.25	150.540	11,542.78	-7,498.01	7,299.35	14,426,765.86	1,712,292.12	39.72518163	-80.74437063	
Survey projected to 20447.00 MD 11542.78 TVD										

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
13,193.00	11,430.69	-1,220.42	3,671.75	Tie into original hole @ 13193 MD	
20,385.00	11,541.97	-7,444.03	7,268.86	Survey @ 20385.00 MD 11541.97 TVD	
20,447.00	11,542.78	-7,498.01	7,299.35	Survey projected to 20447.00 MD 11542.78 TVD	