



TUG HILL
OPERATING

Well: Knob Creek S-14HU (slot N)
Site: Knob Creek
Project: Marshall County, West Virginia.
Design: rev5

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=737+33 @ 770.00usft (Nabors X08)
Surface location
Northing 14443145.32 Easting 1723197.98 Latitude 39.77007229 Longitude -80.70539221

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.84°



Azimuths to Grid North
True North: -0.19°
Magnetic North: -8.85°

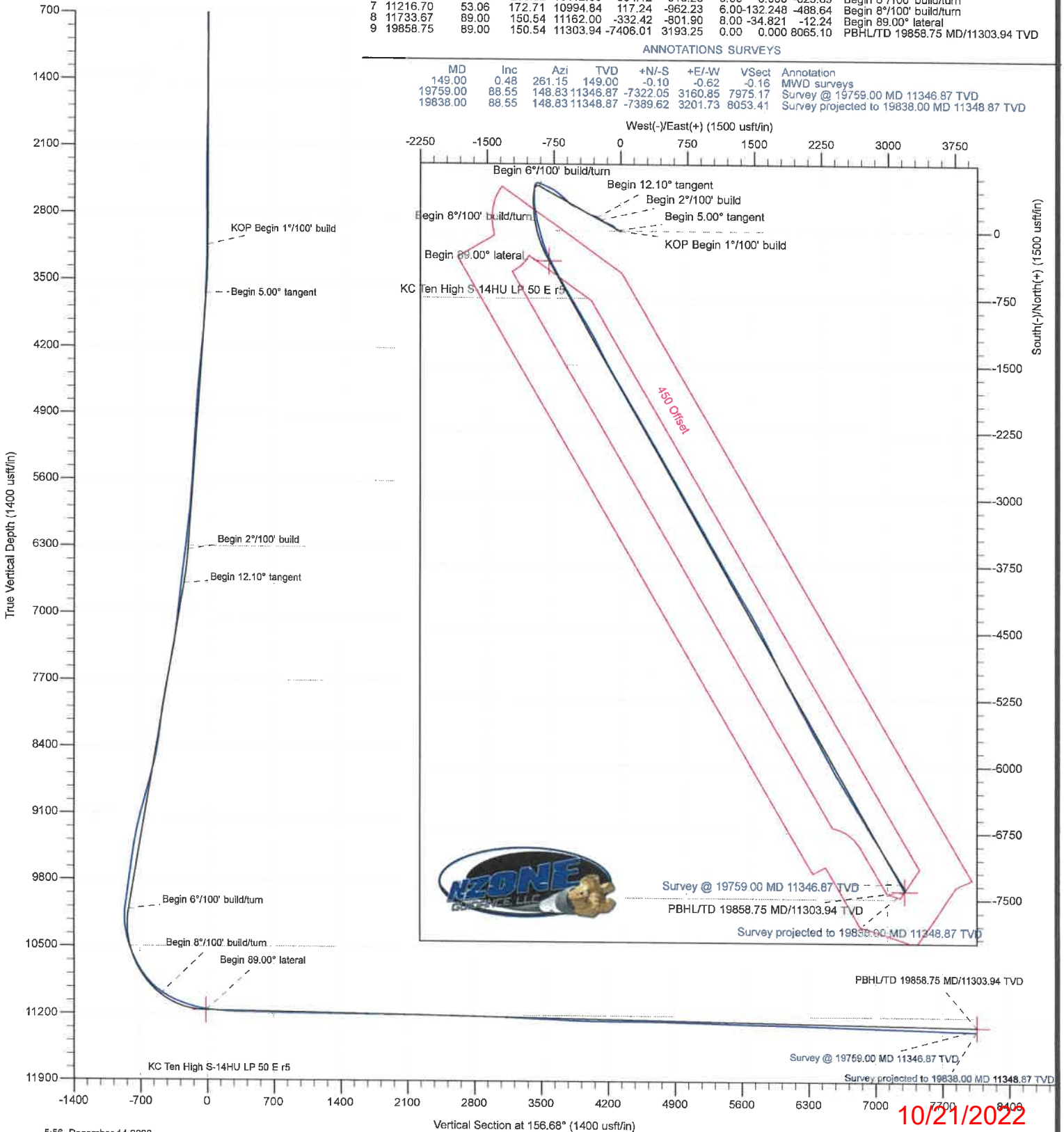
Magnetic Field
Strength: 51803.5snT
Dip Angle: 66.58°
Date: 11/14/2020
Model: IGRF2020

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSec	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	3133.00	0.00	0.00	3133.00	0.00	0.00	0.00	0.00	0.00	KOP Begin 1°/100' build
3	3633.00	5.00	298.82	3632.37	10.51	-19.10	1.00	298.820	-17.21	Begin 5.00° tangent
4	6343.95	5.00	298.82	6333.00	124.41	-226.11	0.00	0.000	-203.77	Begin 2°/100' build
5	6698.95	12.10	298.82	6683.83	149.84	-272.32	2.00	0.000	-245.41	Begin 12.10° tangent
6	10205.01	12.10	298.82	10112.00	504.12	-916.23	0.00	0.000	-825.69	Begin 6°/100' build/turn
7	11216.70	53.06	172.71	10994.84	117.24	-962.23	6.00	-132.248	-488.64	Begin 8°/100' build/turn
8	11733.67	89.00	150.54	11162.00	-332.42	-801.90	8.00	-34.821	-12.24	Begin 89.00° lateral
9	19858.75	89.00	150.54	11303.94	-7406.01	3193.25	0.00	0.000	8065.10	PBHL/TD 19858.75 MD/11303.94 TVD

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSec	Annotation
149.00	0.48	261.15	149.00	-0.10	-0.62	-0.16	MWD surveys
19759.00	88.55	148.83	11348.87	-7322.05	3160.85	7975.17	Survey @ 19759.00 MD 11346.87 TVD
19838.00	88.55	148.83	11348.87	-7389.62	3201.73	8053.41	Survey projected to 19838.00 MD 11348.87 TVD



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	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	Knob Creek				
Site Position:		Northing:	14,443,053.74 usft	Latitude:	39.76982148
From:	Lat/Long	Easting:	1,723,120.29 usft	Longitude:	-80.70566975
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.188 °

Well	Knob Creek S-14HU (slot N)					
Well Position	+N/-S	0.00 usft	Northing:	14,443,145.32 usft	Latitude:	39.77007229
	+E/-W	0.00 usft	Easting:	1,723,197.98 usft	Longitude:	-80.70539221
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	737.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	11/14/2020	-8.658	66.583	51,803.48828829

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	156.68	

Survey Program	Date	12/14/2020			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
149.00	511.00	MWD surf (Original Hole)	MWD	MWD - Standard	
609.00	2,394.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,489.00	7,300.00	MWD int2 (Original Hole)	MWD	MWD - Standard	
7,384.00	19,759.00	MWD lat (Original Hole)	MWD	MWD - Standard	
19,838.00	19,838.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
149.00	0.48	261.15	149.00	-0.10	-0.62	-0.16	0.32	0.32	0.00	
MWD surveys										
180.00	0.48	293.23	180.00	-0.06	-0.86	-0.28	0.86	0.00	103.48	
211.00	0.44	302.19	211.00	0.05	-1.08	-0.48	0.27	-0.13	28.90	
241.00	0.44	277.17	241.00	0.13	-1.30	-0.63	0.64	0.00	-83.40	
272.00	0.62	275.30	271.99	0.16	-1.58	-0.77	0.58	0.58	-6.03	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
303.00	0.57	278.90	302.99	0.20	-1.90	-0.93	0.20	-0.16	11.61
333.00	0.62	269.41	332.99	0.22	-2.21	-1.07	0.37	0.17	-31.63
364.00	0.48	299.73	363.99	0.28	-2.49	-1.24	1.03	-0.45	97.81
395.00	0.44	308.52	394.99	0.42	-2.70	-1.45	0.26	-0.13	28.35
425.00	0.44	286.11	424.99	0.52	-2.90	-1.63	0.57	0.00	-74.70
456.00	0.40	300.88	455.99	0.61	-3.10	-1.79	0.37	-0.13	47.65
511.00	0.26	291.03	510.99	0.75	-3.39	-2.03	0.27	-0.25	-17.91
609.00	0.66	226.17	608.98	0.44	-4.00	-1.99	0.61	0.41	-66.18
700.00	0.40	232.06	699.98	-0.12	-4.63	-1.73	0.29	-0.29	6.47
794.00	0.83	233.20	793.97	-0.73	-5.43	-1.48	0.46	0.46	1.21
888.00	0.04	191.10	887.97	-1.17	-5.98	-1.30	0.85	-0.84	-44.79
983.00	0.17	81.15	982.97	-1.18	-5.85	-1.24	0.20	0.14	-115.74
1,077.00	0.17	116.48	1,076.97	-1.22	-5.59	-1.09	0.11	0.00	37.59
1,170.00	0.39	185.04	1,169.97	-1.59	-5.49	-0.71	0.39	0.24	73.72
1,264.00	0.39	156.82	1,263.97	-2.21	-5.40	-0.11	0.20	0.00	-30.02
1,358.00	1.05	64.36	1,357.96	-2.13	-4.49	0.18	1.21	0.70	-98.36
1,452.00	1.58	48.80	1,451.94	-0.90	-2.74	-0.26	0.67	0.56	-16.55
1,546.00	1.23	40.72	1,545.91	0.72	-1.11	-1.10	0.43	-0.37	-8.60
1,640.00	1.19	41.07	1,639.89	2.22	0.19	-1.96	0.04	-0.04	0.37
1,735.00	1.98	44.85	1,734.85	4.12	2.00	-3.00	0.84	0.83	3.98
1,830.00	1.93	46.70	1,829.79	6.38	4.32	-4.15	0.08	-0.05	1.95
1,924.00	1.10	26.48	1,923.76	8.28	5.87	-5.28	1.04	-0.88	-21.51
2,018.00	0.83	19.01	2,017.75	9.73	6.50	-6.36	0.32	-0.29	-7.95
2,113.00	0.83	331.37	2,112.74	10.98	6.39	-7.56	0.71	0.00	-50.15
2,206.00	1.09	326.45	2,205.73	12.31	5.58	-9.10	0.29	0.28	-5.29
2,301.00	0.83	328.74	2,300.71	13.65	4.72	-10.67	0.28	-0.27	2.41
2,394.00	0.79	280.66	2,393.70	14.35	3.74	-11.69	0.71	-0.04	-51.70
2,489.00	0.79	235.22	2,488.70	14.10	2.56	-11.93	0.64	0.00	-47.83
2,583.00	1.27	219.58	2,582.68	12.92	1.37	-11.33	0.59	0.51	-16.64
2,677.00	1.36	223.88	2,676.66	11.32	-0.07	-10.42	0.14	0.10	4.57
2,772.00	1.93	214.74	2,771.62	9.19	-1.76	-9.14	0.66	0.60	-9.62
2,866.00	1.10	211.84	2,865.58	7.12	-3.14	-7.78	0.89	-0.88	-3.09
2,960.00	0.44	178.71	2,959.57	5.99	-3.61	-6.93	0.82	-0.70	-35.24
3,053.00	0.66	200.42	3,052.57	5.14	-3.79	-6.22	0.32	0.24	23.34
3,148.00	1.01	275.74	3,147.56	4.71	-4.81	-6.23	1.11	0.37	79.28
3,241.00	2.64	288.40	3,240.51	5.46	-7.66	-8.05	1.79	1.75	13.61
3,335.00	3.38	287.87	3,334.38	7.00	-12.35	-11.32	0.79	0.79	-0.56
3,429.00	3.69	288.75	3,428.20	8.82	-17.85	-15.17	0.33	0.33	0.94
3,524.00	3.91	285.41	3,522.99	10.66	-23.87	-19.24	0.33	0.23	-3.52
3,621.00	3.82	282.68	3,619.77	12.25	-30.21	-23.21	0.21	-0.09	-2.81
3,715.00	3.91	288.75	3,713.56	13.97	-36.30	-27.20	0.45	0.10	6.46
3,809.00	4.22	307.03	3,807.33	17.08	-42.10	-32.35	1.41	0.33	19.45
3,902.00	3.34	311.07	3,900.12	20.92	-46.87	-37.77	0.99	-0.95	4.34
3,995.00	4.13	309.84	3,992.93	24.85	-51.49	-43.20	0.85	0.85	-1.32

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,089.00	5.27	314.06	4,086.61	30.02	-57.19	-50.21	1.27	1.21	4.49
4,183.00	6.19	318.91	4,180.14	36.84	-63.62	-59.02	1.11	0.98	5.16
4,277.00	6.37	317.66	4,273.57	44.52	-70.46	-68.77	0.24	0.19	-1.33
4,371.00	6.11	312.57	4,367.02	51.75	-77.66	-78.27	0.65	-0.28	-5.41
4,465.00	6.77	307.29	4,460.43	58.49	-85.75	-87.66	0.94	0.70	-5.62
4,560.00	6.46	299.56	4,554.79	64.52	-94.86	-96.80	0.99	-0.33	-8.14
4,654.00	5.62	293.05	4,648.27	68.93	-103.69	-104.35	1.15	-0.89	-6.93
4,749.00	5.01	291.65	4,742.86	72.29	-111.83	-110.65	0.66	-0.64	-1.47
4,843.00	4.26	292.09	4,836.56	75.11	-118.88	-116.04	0.80	-0.80	0.47
4,938.00	4.48	292.79	4,931.28	77.88	-125.57	-121.22	0.24	0.23	0.74
5,032.00	5.58	292.09	5,024.92	81.02	-133.19	-127.12	1.17	1.17	-0.74
5,127.00	4.79	294.55	5,119.53	84.40	-141.07	-133.36	0.86	-0.83	2.59
5,221.00	4.44	296.75	5,213.22	87.67	-147.89	-139.06	0.42	-0.37	2.34
5,316.00	4.35	298.68	5,307.94	91.06	-154.34	-144.71	0.18	-0.09	2.03
5,410.00	4.66	294.20	5,401.65	94.33	-160.95	-150.34	0.50	0.33	-4.77
5,504.00	4.88	290.86	5,495.33	97.32	-168.17	-155.94	0.38	0.23	-3.55
5,597.00	4.00	288.74	5,588.05	99.77	-174.94	-160.87	0.96	-0.95	-2.28
5,691.00	4.61	298.15	5,681.78	102.61	-181.37	-166.02	0.99	0.65	10.01
5,785.00	5.63	304.92	5,775.41	107.03	-188.48	-172.90	1.26	1.09	7.20
5,879.00	6.33	303.07	5,868.90	112.50	-196.61	-181.14	0.77	0.74	-1.97
5,973.00	7.47	304.57	5,962.21	118.79	-205.98	-190.63	1.23	1.21	1.60
6,066.00	8.09	305.18	6,054.36	125.99	-216.31	-201.33	0.67	0.67	0.66
6,161.00	7.73	305.01	6,148.45	133.51	-227.00	-212.47	0.38	-0.38	-0.18
6,259.00	6.81	306.68	6,245.66	140.76	-237.06	-223.11	0.96	-0.94	1.70
6,352.00	7.29	304.66	6,337.96	147.41	-246.34	-232.88	0.58	0.52	-2.17
6,447.00	8.48	302.28	6,432.06	154.58	-257.22	-243.78	1.30	1.25	-2.51
6,539.00	9.54	298.06	6,522.93	161.79	-269.68	-255.33	1.36	1.15	-4.59
6,633.00	9.44	293.67	6,615.64	168.55	-283.62	-267.05	0.78	-0.11	-4.67
6,727.00	9.98	289.19	6,708.29	174.32	-298.37	-278.19	0.99	0.57	-4.77
6,822.00	10.81	286.46	6,801.74	179.55	-314.69	-289.46	1.02	0.87	-2.87
6,915.00	9.54	284.44	6,893.27	183.94	-330.51	-299.76	1.42	-1.37	-2.17
7,009.00	8.04	291.30	6,986.17	188.27	-344.18	-309.14	1.94	-1.60	7.30
7,102.00	8.13	293.41	7,078.24	193.25	-356.28	-318.50	0.33	0.10	2.27
7,196.00	8.92	297.89	7,171.20	199.30	-368.82	-329.02	1.10	0.84	4.77
7,300.00	10.99	302.72	7,273.63	208.43	-384.29	-343.53	2.14	1.99	4.64
7,384.00	11.78	302.90	7,355.98	217.42	-398.22	-357.30	0.94	0.94	0.21
7,477.00	12.52	301.84	7,446.90	227.89	-414.76	-373.46	0.83	0.80	-1.14
7,571.00	13.23	302.11	7,538.53	238.98	-432.52	-390.68	0.76	0.76	0.29
7,665.00	13.27	299.47	7,630.03	250.01	-451.03	-408.13	0.65	0.04	-2.81
7,759.00	13.49	296.39	7,721.48	260.19	-470.24	-425.09	0.79	0.23	-3.28
7,853.00	14.24	294.81	7,812.74	269.91	-490.56	-442.06	0.89	0.80	-1.68
7,947.00	13.36	291.12	7,904.03	278.68	-511.18	-458.27	1.32	-0.94	-3.93
8,041.00	11.56	291.03	7,995.81	285.97	-530.11	-472.46	1.92	-1.91	-0.10

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
8,136.00	9.10	293.85	8,089.27	292.43	-545.87	-484.63	2.64	-2.59	2.97
8,229.00	7.38	302.90	8,181.31	298.65	-557.61	-494.99	2.31	-1.85	9.73
8,324.00	8.75	310.02	8,275.37	306.61	-568.27	-506.52	1.78	1.44	7.49
8,418.00	10.33	312.04	8,368.06	316.85	-580.00	-520.57	1.72	1.68	2.15
8,513.00	11.29	312.83	8,461.38	328.87	-593.15	-536.82	1.02	1.01	0.83
8,606.00	13.54	314.59	8,552.20	342.71	-607.58	-555.23	2.45	2.42	1.89
8,701.00	15.56	314.85	8,644.15	359.50	-624.53	-577.37	2.13	2.13	0.27
8,795.00	16.22	312.65	8,734.55	377.29	-643.13	-601.06	0.95	0.70	-2.34
8,889.00	16.83	311.16	8,824.67	395.14	-663.03	-625.33	0.79	0.65	-1.59
8,983.00	17.31	308.70	8,914.53	412.84	-684.19	-649.96	0.92	0.51	-2.62
9,078.00	17.45	306.85	9,005.19	430.22	-706.62	-674.80	0.60	0.15	-1.95
9,172.00	17.14	304.22	9,094.95	446.46	-729.35	-698.72	0.89	-0.33	-2.80
9,267.00	16.44	302.37	9,185.90	461.53	-752.28	-721.63	0.93	-0.74	-1.95
9,360.00	15.29	297.80	9,275.36	474.30	-774.24	-742.05	1.82	-1.24	-4.91
9,453.00	13.36	295.25	9,365.46	484.60	-794.81	-759.65	2.18	-2.08	-2.74
9,546.00	11.16	294.20	9,456.33	492.88	-812.74	-774.35	2.38	-2.37	-1.13
9,640.00	10.63	293.49	9,548.64	500.06	-828.99	-787.38	0.58	-0.56	-0.76
9,734.00	11.11	295.25	9,640.95	507.38	-845.13	-800.49	0.62	0.51	1.87
9,827.00	10.55	292.97	9,732.30	514.52	-861.07	-813.36	0.76	-0.60	-2.45
9,921.00	10.02	290.15	9,824.79	520.70	-876.67	-825.21	0.78	-0.56	-3.00
10,014.00	10.59	292.35	9,916.29	526.74	-892.17	-836.89	0.74	0.61	2.37
10,079.00	10.81	294.20	9,980.16	531.51	-903.26	-845.66	0.63	0.34	2.85
10,130.00	11.96	296.83	10,030.15	535.85	-912.34	-853.24	2.47	2.25	5.16
10,177.00	11.96	289.10	10,076.14	539.64	-921.28	-860.26	3.41	0.00	-16.45
10,224.00	11.34	274.16	10,122.18	541.57	-930.50	-865.68	6.53	-1.32	-31.79
10,271.00	11.17	251.48	10,168.30	540.46	-939.43	-868.20	9.37	-0.36	-48.26
10,318.00	10.99	235.49	10,214.43	536.48	-947.44	-867.71	6.53	-0.38	-34.02
10,365.00	10.46	215.62	10,260.63	530.47	-953.62	-864.64	7.91	-1.13	-42.28
10,412.00	10.82	201.56	10,306.83	522.90	-957.72	-859.31	5.56	0.77	-29.91
10,459.00	12.49	195.06	10,352.86	513.88	-960.66	-852.20	4.51	3.55	-13.83
10,506.00	15.48	190.66	10,398.46	502.81	-963.15	-843.01	6.75	6.36	-9.36
10,553.00	18.20	187.15	10,443.44	489.36	-965.22	-831.48	6.18	5.79	-7.47
10,600.00	20.40	185.74	10,487.80	473.92	-966.95	-817.99	4.78	4.68	-3.00
10,647.00	22.42	185.04	10,531.55	456.84	-968.56	-802.94	4.33	4.30	-1.49
10,695.00	24.80	183.63	10,575.53	437.68	-970.00	-785.91	5.10	4.96	-2.94
10,742.00	27.35	183.10	10,617.74	417.06	-971.21	-767.45	5.45	5.43	-1.13
10,789.00	29.02	181.35	10,659.17	394.88	-972.06	-747.42	3.96	3.55	-3.72
10,836.00	31.57	180.82	10,699.75	371.17	-972.51	-725.83	5.46	5.43	-1.13
10,884.00	34.03	178.01	10,740.10	345.18	-972.22	-701.85	6.03	5.13	-5.85
10,931.00	36.67	175.19	10,778.43	318.05	-970.59	-676.29	6.60	5.62	-6.00
10,978.00	40.19	173.26	10,815.24	288.99	-967.63	-648.43	7.91	7.49	-4.11
11,025.00	42.47	171.85	10,850.53	258.22	-963.60	-618.58	5.24	4.85	-3.00
11,072.00	45.55	171.15	10,884.33	225.93	-958.77	-587.01	6.63	6.55	-1.49

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
11,119.00	50.12	170.10	10,915.88	191.57	-953.08	-553.21	9.86	9.72	-2.23
11,165.00	53.11	168.51	10,944.44	156.14	-946.38	-518.03	7.04	6.50	-3.46
11,212.00	56.01	167.46	10,971.69	118.70	-938.41	-480.48	6.43	6.17	-2.23
11,259.00	58.56	166.23	10,997.09	80.20	-929.40	-441.56	5.86	5.43	-2.62
11,306.00	61.29	165.70	11,020.64	40.74	-919.54	-401.43	5.89	5.81	-1.13
11,352.00	64.02	165.53	11,041.77	1.17	-909.38	-361.07	5.94	5.93	-0.37
11,399.00	67.36	165.35	11,061.11	-40.28	-898.62	-318.74	7.11	7.11	-0.38
11,446.00	69.82	164.65	11,078.27	-82.54	-887.29	-275.45	5.41	5.23	-1.49
11,493.00	71.31	162.19	11,093.91	-125.02	-874.64	-231.44	5.87	3.17	-5.23
11,540.00	72.55	158.85	11,108.49	-167.13	-859.74	-186.86	7.25	2.64	-7.11
11,587.00	73.78	155.86	11,122.11	-208.64	-842.42	-141.89	6.63	2.62	-6.36
11,634.00	76.50	155.51	11,134.16	-250.04	-823.71	-96.47	5.83	5.79	-0.74
11,681.00	78.96	155.15	11,144.15	-291.77	-804.55	-50.56	5.29	5.23	-0.77
11,729.00	81.43	154.80	11,152.32	-334.62	-784.54	-3.29	5.20	5.15	-0.73
11,776.00	83.19	153.40	11,158.61	-376.52	-764.19	43.24	4.77	3.74	-2.98
11,823.00	84.59	151.29	11,163.61	-417.91	-742.50	89.84	5.37	2.98	-4.49
11,918.00	87.76	150.41	11,169.95	-500.68	-696.34	184.12	3.46	3.34	-0.93
12,012.00	88.72	149.70	11,172.84	-582.09	-649.44	277.45	1.27	1.02	-0.76
12,106.00	88.90	149.70	11,174.79	-663.23	-602.02	370.73	0.19	0.19	0.00
12,205.00	88.81	149.88	11,176.77	-748.77	-552.22	469.00	0.20	-0.09	0.18
12,299.00	88.99	149.88	11,178.57	-830.06	-505.06	562.32	0.19	0.19	0.00
12,393.00	88.90	149.70	11,180.30	-911.28	-457.77	655.62	0.21	-0.10	-0.19
12,488.00	88.99	149.70	11,182.05	-993.29	-409.85	749.90	0.09	0.09	0.00
12,582.00	88.99	149.35	11,183.71	-1,074.29	-362.18	843.16	0.37	0.00	-0.37
12,676.00	88.90	150.76	11,185.44	-1,155.73	-315.27	936.51	1.50	-0.10	1.50
12,769.00	89.52	153.04	11,186.72	-1,237.75	-271.47	1,029.17	2.54	0.67	2.45
12,863.00	89.60	152.87	11,187.44	-1,321.47	-228.73	1,122.97	0.20	0.09	-0.18
12,957.00	89.52	152.87	11,188.16	-1,405.13	-185.87	1,216.76	0.09	-0.09	0.00
13,051.00	89.52	152.69	11,188.95	-1,488.71	-142.87	1,310.54	0.19	0.00	-0.19
13,145.00	89.43	150.06	11,189.81	-1,571.21	-97.84	1,404.12	2.80	-0.10	-2.80
13,240.00	89.43	150.06	11,190.76	-1,653.53	-50.43	1,498.49	0.00	0.00	0.00
13,333.00	89.43	150.23	11,191.68	-1,734.18	-4.14	1,590.88	0.18	0.00	0.18
13,427.00	89.52	150.06	11,192.54	-1,815.71	42.65	1,684.26	0.20	0.10	-0.18
13,522.00	89.52	150.06	11,193.34	-1,898.03	90.06	1,778.63	0.00	0.00	0.00
13,616.00	88.99	149.70	11,194.56	-1,979.33	137.23	1,871.96	0.68	-0.56	-0.38
13,710.00	88.90	149.70	11,196.29	-2,060.47	184.65	1,965.24	0.10	-0.10	0.00
13,803.00	88.99	150.58	11,198.01	-2,141.11	230.94	2,057.62	0.95	0.10	0.95
13,898.00	88.99	150.76	11,199.68	-2,223.92	277.47	2,152.08	0.19	0.00	0.19
13,991.00	88.90	150.58	11,201.39	-2,304.98	323.02	2,244.56	0.22	-0.10	-0.19
14,086.00	88.99	150.06	11,203.14	-2,387.51	370.05	2,338.96	0.56	0.09	-0.55
14,180.00	88.99	150.41	11,204.80	-2,469.09	416.71	2,432.35	0.37	0.00	0.37
14,273.00	88.99	150.06	11,206.44	-2,549.81	462.87	2,524.75	0.38	0.00	-0.38
14,367.00	89.08	150.23	11,208.02	-2,631.32	509.66	2,618.12	0.20	0.10	0.18
14,462.00	89.16	150.76	11,209.48	-2,713.99	556.44	2,712.56	0.56	0.08	0.56

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
14,556.00	88.72	149.53	11,211.22	-2,795.50	603.22	2,805.93	1.39	-0.47	-1.31
14,650.00	88.55	150.41	11,213.46	-2,876.86	650.25	2,899.26	0.95	-0.18	0.94
14,744.00	89.25	150.76	11,215.26	-2,958.73	696.41	2,992.71	0.83	0.74	0.37
14,838.00	88.20	149.70	11,217.35	-3,040.30	743.07	3,086.09	1.59	-1.12	-1.13
14,932.00	87.93	150.58	11,220.53	-3,121.77	789.84	3,179.42	0.98	-0.29	0.94
15,026.00	87.93	150.41	11,223.92	-3,203.53	836.11	3,272.81	0.18	0.00	-0.18
15,119.00	87.85	150.06	11,227.35	-3,284.20	882.25	3,365.16	0.39	-0.09	-0.38
15,214.00	87.58	150.23	11,231.14	-3,366.53	929.50	3,459.47	0.34	-0.28	0.18
15,308.00	87.14	150.41	11,235.47	-3,448.11	975.99	3,552.79	0.51	-0.47	0.19
15,403.00	87.14	150.41	11,240.21	-3,530.62	1,022.85	3,647.11	0.00	0.00	0.00
15,497.00	87.05	150.58	11,244.97	-3,612.32	1,069.08	3,740.44	0.20	-0.10	0.18
15,591.00	87.49	150.41	11,249.45	-3,694.04	1,115.32	3,833.79	0.50	0.47	-0.18
15,685.00	88.99	151.29	11,252.33	-3,776.09	1,161.09	3,927.25	1.85	1.60	0.94
15,780.00	88.64	149.00	11,254.30	-3,858.46	1,208.37	4,021.61	2.44	-0.37	-2.41
15,875.00	88.90	149.00	11,256.34	-3,939.87	1,257.28	4,115.73	0.27	0.27	0.00
15,969.00	90.31	149.88	11,256.99	-4,020.81	1,305.07	4,208.98	1.77	1.50	0.94
16,064.00	90.40	149.35	11,256.40	-4,102.76	1,353.12	4,303.26	0.57	0.09	-0.56
16,158.00	90.40	149.18	11,255.74	-4,183.56	1,401.16	4,396.47	0.18	0.00	-0.18
16,252.00	89.69	150.76	11,255.67	-4,264.93	1,448.20	4,489.82	1.84	-0.76	1.68
16,308.00	89.69	151.64	11,255.97	-4,314.01	1,475.18	4,545.56	1.57	0.00	1.57
16,403.00	89.43	150.41	11,256.70	-4,397.11	1,521.20	4,640.10	1.32	-0.27	-1.29
16,497.00	88.46	150.76	11,258.43	-4,478.98	1,567.36	4,733.55	1.10	-1.03	0.37
16,591.00	88.37	153.57	11,261.03	-4,562.06	1,611.23	4,827.21	2.99	-0.10	2.99
16,685.00	88.37	153.92	11,263.70	-4,646.33	1,652.79	4,921.05	0.37	0.00	0.37
16,779.00	88.64	154.28	11,266.16	-4,730.86	1,693.84	5,014.92	0.48	0.29	0.38
16,873.00	88.55	154.10	11,268.46	-4,815.46	1,734.75	5,108.80	0.21	-0.10	-0.19
16,967.00	88.90	152.69	11,270.55	-4,899.48	1,776.84	5,202.62	1.55	0.37	-1.50
17,061.00	88.29	151.46	11,272.86	-4,982.51	1,820.85	5,296.29	1.46	-0.65	-1.31
17,155.00	88.29	151.99	11,275.66	-5,065.26	1,865.35	5,389.90	0.56	0.00	0.56
17,249.00	88.37	151.81	11,278.40	-5,148.14	1,909.61	5,483.53	0.21	0.09	-0.19
17,343.00	88.64	151.64	11,280.86	-5,230.90	1,954.12	5,577.15	0.34	0.29	-0.18
17,436.00	88.55	151.81	11,283.14	-5,312.78	1,998.16	5,669.77	0.21	-0.10	0.18
17,531.00	88.37	151.81	11,285.69	-5,396.48	2,043.03	5,764.39	0.19	-0.19	0.00
17,625.00	88.90	151.99	11,287.93	-5,479.37	2,087.29	5,858.04	0.60	0.56	0.19
17,719.00	89.16	151.29	11,289.52	-5,562.08	2,131.93	5,951.66	0.79	0.28	-0.74
17,812.00	89.43	151.46	11,290.66	-5,643.71	2,176.48	6,044.26	0.34	0.29	0.18
17,905.00	88.99	151.46	11,291.95	-5,725.40	2,220.91	6,136.86	0.47	-0.47	0.00
17,998.00	87.85	151.46	11,294.51	-5,807.06	2,265.33	6,229.44	1.23	-1.23	0.00
18,092.00	88.02	151.99	11,297.90	-5,889.79	2,309.83	6,323.03	0.59	0.18	0.56
18,185.00	88.11	152.34	11,301.04	-5,971.99	2,353.23	6,415.69	0.39	0.10	0.38
18,279.00	88.72	150.76	11,303.64	-6,054.60	2,397.99	6,509.27	1.80	0.65	-1.68
18,372.00	88.20	149.35	11,306.14	-6,135.15	2,444.39	6,601.61	1.62	-0.56	-1.52
18,467.00	88.29	149.18	11,309.05	-6,216.77	2,492.92	6,695.77	0.20	0.09	-0.18



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
18,561.00	88.11	148.65	11,312.00	-6,297.23	2,541.43	6,788.87	0.60	-0.19	-0.56
18,655.00	88.11	148.83	11,315.10	-6,377.54	2,590.18	6,881.91	0.19	0.00	0.19
18,749.00	87.93	148.83	11,318.35	-6,457.92	2,638.81	6,974.98	0.19	-0.19	0.00
18,843.00	88.72	148.83	11,321.09	-6,538.32	2,687.44	7,068.06	0.84	0.84	0.00
18,937.00	88.64	148.65	11,323.26	-6,618.65	2,736.20	7,161.13	0.21	-0.09	-0.19
19,031.00	88.64	148.47	11,325.49	-6,698.83	2,785.22	7,254.16	0.19	0.00	-0.19
19,125.00	88.55	148.65	11,327.80	-6,779.00	2,834.24	7,347.19	0.21	-0.10	0.19
19,220.00	88.11	148.83	11,330.56	-6,860.18	2,883.51	7,441.24	0.50	-0.46	0.19
19,314.00	88.11	149.18	11,333.66	-6,940.71	2,931.89	7,534.35	0.37	0.00	0.37
19,407.00	88.02	149.35	11,336.81	-7,020.60	2,979.39	7,626.52	0.21	-0.10	0.18
19,501.00	88.02	149.00	11,340.05	-7,101.27	3,027.53	7,719.66	0.37	0.00	-0.37
19,595.00	88.64	149.18	11,342.79	-7,181.89	3,075.80	7,812.79	0.69	0.66	0.19
19,689.00	88.55	148.47	11,345.10	-7,262.29	3,124.44	7,905.88	0.76	-0.10	-0.76
19,759.00	88.55	148.83	11,346.87	-7,322.05	3,160.85	7,975.17	0.51	0.00	0.51
Survey @ 19759.00 MD 11346.87 TVD									
19,838.00	88.55	148.83	11,348.87	-7,389.62	3,201.73	8,053.41	0.00	0.00	0.00
Survey projected to 19838.00 MD 11348.87 TVD									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
149.00	149.00	-0.10	-0.62	MWD surveys
19,759.00	11,346.87	-7,322.05	3,160.85	Survey @ 19759.00 MD 11346.87 TVD
19,838.00	11,348.87	-7,389.62	3,201.73	Survey projected to 19838.00 MD 11348.87 TVD

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	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	Knob Creek				
Site Position:		Northing:	14,443,053.74 usft	Latitude:	39.76982148
From:	Lat/Long	Easting:	1,723,120.29 usft	Longitude:	-80.70566975
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.188 °

Well	Knob Creek S-14HU (slot N)					
Well Position	+N/-S	0.00 usft	Northing:	14,443,145.32 usft	Latitude:	39.77007229
	+E/-W	0.00 usft	Easting:	1,723,197.98 usft	Longitude:	-80.70539221
Position Uncertainty	0.00 usft		Wellhead Elevation:	usft	Ground Level:	737.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	11/14/2020	-8.658	66.583	51,803.48828829

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	156.68	

Survey Program	Date	12/14/2020			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
149.00	511.00	MWD surf (Original Hole)	MWD	MWD - Standard	
609.00	2,394.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,489.00	7,300.00	MWD int2 (Original Hole)	MWD	MWD - Standard	
7,384.00	19,759.00	MWD lat (Original Hole)	MWD	MWD - Standard	
19,838.00	19,838.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.00	0.00	0.00	0.00	14,443,145.32	1,723,197.98	39.77007229	-80.70539221	
149.00	0.48	261.15	149.00	-0.10	-0.62	14,443,145.22	1,723,197.36	39.77007203	-80.70539441	
MWD surveys										
180.00	0.48	293.23	180.00	-0.06	-0.86	14,443,145.25	1,723,197.12	39.77007212	-80.70539529	
211.00	0.44	302.19	211.00	0.05	-1.08	14,443,145.37	1,723,196.90	39.77007244	-80.70539607	
241.00	0.44	277.17	241.00	0.13	-1.30	14,443,145.44	1,723,196.68	39.77007265	-80.70539682	
272.00	0.62	275.30	271.99	0.16	-1.58	14,443,145.48	1,723,196.40	39.77007273	-80.70539784	
303.00	0.57	278.90	302.99	0.20	-1.90	14,443,145.51	1,723,196.08	39.77007285	-80.70539897	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
333.00	0.62	269.41	332.99	0.22	-2.21	14,443,145.54	1,723,195.77	39.77007291	-80.70540007	
364.00	0.48	299.73	363.99	0.28	-2.49	14,443,145.60	1,723,195.49	39.77007308	-80.70540107	
395.00	0.44	308.52	394.99	0.42	-2.70	14,443,145.74	1,723,195.28	39.77007346	-80.70540180	
425.00	0.44	286.11	424.99	0.52	-2.90	14,443,145.84	1,723,195.08	39.77007375	-80.70540252	
456.00	0.40	300.88	455.99	0.61	-3.10	14,443,145.93	1,723,194.88	39.77007400	-80.70540325	
511.00	0.26	291.03	510.99	0.75	-3.39	14,443,146.07	1,723,194.59	39.77007439	-80.70540425	
609.00	0.66	226.17	608.98	0.44	-4.00	14,443,145.76	1,723,193.98	39.77007354	-80.70540644	
700.00	0.40	232.06	699.98	-0.12	-4.63	14,443,145.20	1,723,193.35	39.77007202	-80.70540869	
794.00	0.83	233.20	793.97	-0.73	-5.43	14,443,144.59	1,723,192.55	39.77007035	-80.70541155	
888.00	0.04	191.10	887.97	-1.17	-5.98	14,443,144.15	1,723,192.00	39.77006915	-80.70541352	
983.00	0.17	81.15	982.97	-1.18	-5.85	14,443,144.14	1,723,192.13	39.77006911	-80.70541305	
1,077.00	0.17	116.48	1,076.97	-1.22	-5.59	14,443,144.10	1,723,192.39	39.77006900	-80.70541212	
1,170.00	0.39	185.04	1,169.97	-1.59	-5.49	14,443,143.73	1,723,192.49	39.77006796	-80.70541178	
1,264.00	0.39	156.82	1,263.97	-2.21	-5.40	14,443,143.11	1,723,192.58	39.77006628	-80.70541144	
1,358.00	1.05	64.36	1,357.96	-2.13	-4.49	14,443,143.19	1,723,193.49	39.77006649	-80.70540823	
1,452.00	1.58	48.80	1,451.94	-0.90	-2.74	14,443,144.42	1,723,195.24	39.77006984	-80.70540198	
1,546.00	1.23	40.72	1,545.91	0.72	-1.11	14,443,146.04	1,723,196.87	39.77007427	-80.70539615	
1,640.00	1.19	41.07	1,639.89	2.22	0.19	14,443,147.54	1,723,198.17	39.77007838	-80.70539151	
1,735.00	1.98	44.85	1,734.85	4.12	2.00	14,443,149.44	1,723,199.98	39.77008360	-80.70538506	
1,830.00	1.93	46.70	1,829.79	6.38	4.32	14,443,151.70	1,723,202.30	39.77008979	-80.70537677	
1,924.00	1.10	26.48	1,923.76	8.28	5.87	14,443,153.60	1,723,203.85	39.77009497	-80.70537121	
2,018.00	0.83	19.01	2,017.75	9.73	6.50	14,443,155.05	1,723,204.48	39.77009895	-80.70536898	
2,113.00	0.83	331.37	2,112.74	10.98	6.39	14,443,156.30	1,723,204.37	39.77010240	-80.70536934	
2,206.00	1.09	326.45	2,205.73	12.31	5.58	14,443,157.63	1,723,203.56	39.77010605	-80.70537221	
2,301.00	0.83	328.74	2,300.71	13.65	4.72	14,443,158.97	1,723,202.70	39.77010975	-80.70537524	
2,394.00	0.79	280.66	2,393.70	14.35	3.74	14,443,159.67	1,723,201.72	39.77011166	-80.70537872	
2,489.00	0.79	235.22	2,488.70	14.10	2.56	14,443,159.41	1,723,200.54	39.77011098	-80.70538293	
2,583.00	1.27	219.58	2,582.68	12.92	1.37	14,443,158.24	1,723,199.35	39.77010777	-80.70538720	
2,677.00	1.36	223.88	2,676.66	11.32	-0.07	14,443,156.64	1,723,197.91	39.77010337	-80.70539233	
2,772.00	1.93	214.74	2,771.62	9.19	-1.76	14,443,154.51	1,723,196.22	39.77009754	-80.70539838	
2,866.00	1.10	211.84	2,865.58	7.12	-3.14	14,443,152.44	1,723,194.84	39.77009188	-80.70540331	
2,960.00	0.44	178.71	2,959.57	5.99	-3.61	14,443,151.31	1,723,194.37	39.77008879	-80.70540499	
3,053.00	0.66	200.42	3,052.57	5.14	-3.79	14,443,150.45	1,723,194.19	39.77008643	-80.70540563	
3,148.00	1.01	275.74	3,147.56	4.71	-4.81	14,443,150.03	1,723,193.17	39.77008526	-80.70540928	
3,241.00	2.64	288.40	3,240.51	5.46	-7.66	14,443,150.78	1,723,190.32	39.77008737	-80.70541941	
3,335.00	3.38	287.87	3,334.38	7.00	-12.35	14,443,152.32	1,723,185.63	39.77009162	-80.70543609	
3,429.00	3.69	288.75	3,428.20	8.82	-17.85	14,443,154.14	1,723,180.13	39.77009668	-80.70545565	
3,524.00	3.91	285.41	3,522.99	10.66	-23.87	14,443,155.98	1,723,174.11	39.77010179	-80.70547704	
3,621.00	3.82	282.68	3,619.77	12.25	-30.21	14,443,157.57	1,723,167.77	39.77010621	-80.70549959	
3,715.00	3.91	288.75	3,713.56	13.97	-36.30	14,443,159.29	1,723,161.68	39.77011098	-80.70552124	
3,809.00	4.22	307.03	3,807.33	17.08	-42.10	14,443,162.40	1,723,155.88	39.77011959	-80.70554183	
3,902.00	3.34	311.07	3,900.12	20.92	-46.87	14,443,166.24	1,723,151.11	39.77013018	-80.70555878	
3,995.00	4.13	309.84	3,992.93	24.85	-51.49	14,443,170.17	1,723,146.49	39.77014100	-80.70557515	
4,089.00	5.27	314.06	4,086.61	30.02	-57.19	14,443,175.34	1,723,140.79	39.77015525	-80.70559538	
4,183.00	6.19	318.91	4,180.14	36.84	-63.62	14,443,182.16	1,723,134.36	39.77017404	-80.70561819	
4,277.00	6.37	317.66	4,273.57	44.52	-70.46	14,443,189.83	1,723,127.52	39.77019518	-80.70564246	
4,371.00	6.11	312.57	4,367.02	51.75	-77.66	14,443,197.07	1,723,120.32	39.77021512	-80.70566798	
4,465.00	6.77	307.29	4,460.43	58.49	-85.75	14,443,203.81	1,723,112.23	39.77023371	-80.70569670	
4,560.00	6.46	299.56	4,554.79	64.52	-94.86	14,443,209.84	1,723,103.12	39.77025035	-80.70572903	
4,654.00	5.62	293.05	4,648.27	68.93	-103.69	14,443,214.25	1,723,094.29	39.77026254	-80.70576042	
4,749.00	5.01	291.65	4,742.86	72.29	-111.83	14,443,217.61	1,723,086.15	39.77027182	-80.70578934	
4,843.00	4.26	292.09	4,836.56	75.11	-118.88	14,443,220.43	1,723,079.10	39.77027965	-80.70581440	
4,938.00	4.48	292.79	4,931.28	77.88	-125.57	14,443,223.20	1,723,072.41	39.77028730	-80.70583817	
5,032.00	5.58	292.09	5,024.92	81.02	-133.19	14,443,226.34	1,723,064.79	39.77029599	-80.70586525	
5,127.00	4.79	294.55	5,119.53	84.40	-141.07	14,443,229.72	1,723,056.91	39.77030536	-80.70589328	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
5,221.00	4.44	296.75	5,213.22	87.67	-147.89	14,443,232.99	1,723,050.09	39.77031440	-80.70591751	
5,316.00	4.35	298.68	5,307.94	91.06	-154.34	14,443,236.38	1,723,043.64	39.77032375	-80.70594041	
5,410.00	4.66	294.20	5,401.65	94.33	-160.95	14,443,239.65	1,723,037.03	39.77033281	-80.70596390	
5,504.00	4.88	290.86	5,495.33	97.32	-168.17	14,443,242.64	1,723,029.81	39.77034108	-80.70598955	
5,597.00	4.00	288.74	5,588.05	99.77	-174.94	14,443,245.09	1,723,023.04	39.77034787	-80.70601361	
5,691.00	4.61	298.15	5,681.78	102.61	-181.37	14,443,247.93	1,723,016.61	39.77035572	-80.70603648	
5,785.00	5.63	304.92	5,775.41	107.03	-188.48	14,443,252.35	1,723,009.50	39.77036792	-80.70606174	
5,879.00	6.33	303.07	5,868.90	112.50	-196.61	14,443,257.82	1,723,001.37	39.77038301	-80.70609058	
5,973.00	7.47	304.57	5,962.21	118.79	-205.98	14,443,264.11	1,722,992.00	39.77040038	-80.70612387	
6,066.00	8.09	305.18	6,054.36	125.99	-216.31	14,443,271.31	1,722,981.67	39.77042025	-80.70616054	
6,161.00	7.73	305.01	6,148.45	133.51	-227.00	14,443,278.83	1,722,970.98	39.77044099	-80.70619852	
6,259.00	6.81	306.68	6,245.66	140.76	-237.06	14,443,286.08	1,722,960.92	39.77046100	-80.70623423	
6,352.00	7.29	304.66	6,337.96	147.41	-246.34	14,443,292.73	1,722,951.64	39.77047934	-80.70626716	
6,447.00	8.48	302.28	6,432.06	154.58	-257.22	14,443,299.90	1,722,940.76	39.77049913	-80.70630580	
6,539.00	9.54	298.06	6,522.93	161.79	-269.68	14,443,307.11	1,722,928.30	39.77051904	-80.70635007	
6,633.00	9.44	293.67	6,615.64	168.55	-283.62	14,443,313.87	1,722,914.37	39.77053773	-80.70639958	
6,727.00	9.98	289.19	6,708.29	174.32	-298.37	14,443,319.64	1,722,899.61	39.77055371	-80.70645202	
6,822.00	10.81	286.46	6,801.74	179.55	-314.69	14,443,324.87	1,722,883.29	39.77056822	-80.70651003	
6,915.00	9.54	284.44	6,893.27	183.94	-330.51	14,443,329.26	1,722,867.47	39.77058043	-80.70656631	
7,009.00	8.04	291.30	6,986.17	188.27	-344.18	14,443,333.59	1,722,853.80	39.77059244	-80.70661491	
7,102.00	8.13	293.41	7,078.24	193.25	-356.28	14,443,338.57	1,722,841.70	39.77060622	-80.70665789	
7,196.00	8.92	297.89	7,171.20	199.30	-368.82	14,443,344.62	1,722,829.16	39.77062294	-80.70670245	
7,300.00	10.99	302.72	7,273.63	208.43	-384.29	14,443,353.75	1,722,813.69	39.77064816	-80.70675739	
7,384.00	11.78	302.90	7,355.98	217.42	-398.22	14,443,362.73	1,722,799.76	39.77067296	-80.70680688	
7,477.00	12.52	301.84	7,446.90	227.89	-414.76	14,443,373.21	1,722,783.22	39.77070188	-80.70686561	
7,571.00	13.23	302.11	7,538.53	238.98	-432.52	14,443,384.30	1,722,765.46	39.77073250	-80.70692871	
7,665.00	13.27	299.47	7,630.03	250.01	-451.03	14,443,395.33	1,722,746.95	39.77076294	-80.70699443	
7,759.00	13.49	296.39	7,721.48	260.19	-470.24	14,443,405.51	1,722,727.74	39.77079108	-80.70706269	
7,853.00	14.24	294.81	7,812.74	269.91	-490.56	14,443,415.23	1,722,707.42	39.77081796	-80.70713488	
7,947.00	13.36	291.12	7,904.03	278.68	-511.18	14,443,424.00	1,722,686.80	39.77084222	-80.70720818	
8,041.00	11.56	291.03	7,995.81	285.97	-530.11	14,443,431.29	1,722,667.87	39.77086242	-80.70727544	
8,136.00	9.10	293.85	8,089.27	292.43	-545.87	14,443,437.75	1,722,652.11	39.77088029	-80.70733145	
8,229.00	7.38	302.90	8,181.31	298.65	-557.61	14,443,443.96	1,722,640.37	39.77089747	-80.70737317	
8,324.00	8.75	310.02	8,275.37	306.61	-568.27	14,443,451.93	1,722,629.71	39.77091943	-80.70741100	
8,418.00	10.33	312.04	8,368.06	316.85	-580.00	14,443,462.17	1,722,617.98	39.77094766	-80.70745265	
8,513.00	11.29	312.83	8,461.38	328.87	-593.15	14,443,474.19	1,722,604.83	39.77098081	-80.70749929	
8,606.00	13.54	314.59	8,552.20	342.71	-607.58	14,443,488.03	1,722,590.40	39.77101893	-80.70755049	
8,701.00	15.56	314.85	8,644.15	359.50	-624.53	14,443,504.82	1,722,573.45	39.77106520	-80.70761064	
8,795.00	16.22	312.65	8,734.55	377.29	-643.13	14,443,522.61	1,722,554.85	39.77111422	-80.70767661	
8,889.00	16.83	311.16	8,824.67	395.14	-663.03	14,443,540.46	1,722,534.95	39.77116342	-80.70774723	
8,983.00	17.31	308.70	8,914.53	412.84	-684.19	14,443,558.16	1,722,513.79	39.77121222	-80.70782232	
9,078.00	17.45	306.85	9,005.19	430.22	-706.62	14,443,575.54	1,722,491.36	39.77126015	-80.70790194	
9,172.00	17.14	304.22	9,094.95	446.46	-729.35	14,443,591.78	1,722,468.63	39.77130496	-80.70798265	
9,267.00	16.44	302.37	9,185.90	461.53	-752.28	14,443,608.85	1,722,445.70	39.77134655	-80.70806408	
9,360.00	15.29	297.80	9,275.36	474.30	-774.24	14,443,619.62	1,722,423.74	39.77138180	-80.70814210	
9,453.00	13.36	295.25	9,365.46	484.60	-794.81	14,443,629.92	1,722,403.17	39.77141028	-80.70821518	
9,546.00	11.16	294.20	9,456.33	492.88	-812.74	14,443,638.19	1,722,385.24	39.77143317	-80.70827889	
9,640.00	10.63	293.49	9,548.64	500.06	-828.99	14,443,645.38	1,722,368.99	39.77145304	-80.70833664	
9,734.00	11.11	295.25	9,640.95	507.38	-845.13	14,443,652.70	1,722,352.85	39.77147329	-80.70839400	
9,827.00	10.55	292.97	9,732.30	514.52	-861.07	14,443,659.84	1,722,336.91	39.77149305	-80.70845066	
9,921.00	10.02	290.15	9,824.79	520.70	-876.67	14,443,666.02	1,722,321.31	39.77151015	-80.70850611	
10,014.00	10.59	292.35	9,916.29	526.74	-892.17	14,443,672.06	1,722,305.81	39.77152687	-80.70856120	
10,079.00	10.81	294.20	9,980.16	531.51	-903.26	14,443,676.83	1,722,294.72	39.77154006	-80.70860059	
10,130.00	11.96	296.83	10,030.15	535.85	-912.34	14,443,681.17	1,722,285.64	39.77155208	-80.70863285	
10,177.00	11.96	289.10	10,076.14	539.64	-921.28	14,443,684.96	1,722,276.70	39.77156257	-80.70868465	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
10,224.00	11.34	274.16	10,122.18	541.57	-930.50	14,443,686.89	1,722,267.48	39.77156795	-80.70869742
10,271.00	11.17	251.48	10,168.30	540.46	-939.43	14,443,685.78	1,722,258.55	39.77156498	-80.70872921
10,318.00	10.99	235.49	10,214.43	536.48	-947.44	14,443,681.80	1,722,250.54	39.77155411	-80.70875776
10,365.00	10.46	215.62	10,260.63	530.47	-953.62	14,443,675.79	1,722,244.37	39.77153766	-80.70877982
10,412.00	10.82	201.56	10,306.83	522.90	-957.72	14,443,668.22	1,722,240.26	39.77151690	-80.70879452
10,459.00	12.49	195.06	10,352.86	513.88	-960.66	14,443,659.20	1,722,237.32	39.77149218	-80.70880510
10,506.00	15.48	190.66	10,398.46	502.81	-963.15	14,443,648.13	1,722,234.84	39.77146179	-80.70881406
10,553.00	18.20	187.15	10,443.44	489.36	-965.22	14,443,634.68	1,722,232.76	39.77142487	-80.70882159
10,600.00	20.40	185.74	10,487.80	473.92	-966.95	14,443,619.24	1,722,231.03	39.77138250	-80.70882794
10,647.00	22.42	185.04	10,531.55	456.84	-968.56	14,443,602.16	1,722,229.42	39.77133561	-80.70883386
10,695.00	24.80	183.63	10,575.53	437.68	-970.00	14,443,583.00	1,722,227.98	39.77128298	-80.70883921
10,742.00	27.35	183.10	10,617.74	417.06	-971.21	14,443,562.37	1,722,226.77	39.77122636	-80.70884375
10,789.00	29.02	181.35	10,659.17	394.88	-972.06	14,443,540.20	1,722,225.92	39.77116546	-80.70884704
10,836.00	31.57	180.82	10,699.75	371.17	-972.51	14,443,516.49	1,722,225.47	39.77110037	-80.70884890
10,884.00	34.03	178.01	10,740.10	345.18	-972.22	14,443,490.50	1,722,225.76	39.77102898	-80.70884818
10,931.00	36.67	175.19	10,778.43	318.05	-970.59	14,443,463.37	1,722,227.39	39.77095445	-80.70884268
10,978.00	40.19	173.26	10,815.24	288.99	-967.63	14,443,434.31	1,722,230.35	39.77087463	-80.70883249
11,025.00	42.47	171.85	10,850.53	258.22	-963.60	14,443,403.54	1,722,234.38	39.77079008	-80.70881850
11,072.00	45.55	171.15	10,884.33	225.93	-958.77	14,443,371.25	1,722,239.21	39.77070136	-80.70880168
11,119.00	50.12	170.10	10,915.88	191.57	-953.08	14,443,336.89	1,722,244.90	39.77060695	-80.70878185
11,165.00	53.11	168.51	10,944.44	156.14	-946.38	14,443,301.46	1,722,251.60	39.77050961	-80.70875841
11,212.00	56.01	167.46	10,971.69	118.70	-938.41	14,443,264.02	1,722,259.58	39.77040670	-80.70873046
11,259.00	58.56	166.23	10,997.09	80.20	-929.40	14,443,225.52	1,722,268.58	39.77030088	-80.70869886
11,306.00	61.29	165.70	11,020.64	40.74	-919.54	14,443,186.06	1,722,278.45	39.77019244	-80.70866420
11,352.00	64.02	165.53	11,041.77	1.17	-909.38	14,443,146.49	1,722,288.60	39.77008367	-80.70862854
11,399.00	67.36	165.35	11,061.11	-40.28	-898.62	14,443,105.04	1,722,299.36	39.76996974	-80.70859070
11,446.00	69.82	164.65	11,078.27	-82.54	-887.29	14,443,062.78	1,722,310.69	39.76985358	-80.70855088
11,493.00	71.31	162.19	11,093.91	-125.02	-874.64	14,443,020.30	1,722,323.34	39.76973682	-80.70850635
11,540.00	72.55	158.85	11,108.49	-167.13	-859.74	14,442,978.19	1,722,338.24	39.76962103	-80.70845381
11,587.00	73.78	155.86	11,122.11	-208.64	-842.42	14,442,936.68	1,722,355.56	39.76950688	-80.70839265
11,634.00	76.50	155.51	11,134.16	-250.04	-823.71	14,442,895.28	1,722,374.27	39.76939303	-80.70832656
11,681.00	78.96	155.15	11,144.15	-291.77	-804.55	14,442,853.55	1,722,393.44	39.76927826	-80.70825883
11,729.00	81.43	154.80	11,152.32	-334.62	-784.54	14,442,810.70	1,722,413.44	39.76916038	-80.70818812
11,776.00	83.19	153.40	11,158.61	-376.52	-764.19	14,442,768.80	1,722,433.79	39.76904515	-80.70811621
11,823.00	84.59	151.29	11,163.61	-417.91	-742.50	14,442,727.41	1,722,455.48	39.76893128	-80.70803950
11,918.00	87.76	150.41	11,169.95	-500.68	-696.34	14,442,644.64	1,722,501.64	39.76870356	-80.70787616
12,012.00	88.72	149.70	11,172.84	-582.09	-649.44	14,442,563.23	1,722,548.54	39.76847956	-80.70771021
12,106.00	88.90	149.70	11,174.79	-663.23	-602.02	14,442,482.09	1,722,595.96	39.76825630	-80.70754241
12,205.00	88.81	149.88	11,176.77	-748.77	-552.22	14,442,396.55	1,722,645.76	39.76802094	-80.70736617
12,299.00	88.99	149.88	11,178.57	-830.06	-505.06	14,442,315.26	1,722,692.92	39.76779727	-80.70719928
12,393.00	88.90	149.70	11,180.30	-911.28	-457.77	14,442,234.04	1,722,740.21	39.76757379	-80.70703193
12,488.00	88.99	149.70	11,182.05	-993.29	-409.85	14,442,152.03	1,722,788.14	39.76734814	-80.70686235
12,582.00	88.99	149.35	11,183.71	-1,074.29	-362.18	14,442,071.03	1,722,835.80	39.76712526	-80.70669366
12,676.00	88.90	150.76	11,185.44	-1,155.73	-315.27	14,441,989.59	1,722,882.71	39.76690120	-80.70652767
12,769.00	89.52	153.04	11,186.72	-1,237.75	-271.47	14,441,907.57	1,722,926.51	39.76667554	-80.70637277
12,863.00	89.60	152.87	11,187.44	-1,321.47	-228.73	14,441,823.85	1,722,969.25	39.76644524	-80.70622165
12,957.00	89.52	152.87	11,188.16	-1,405.13	-185.87	14,441,740.19	1,723,012.11	39.76621512	-80.70607009
13,051.00	89.52	152.69	11,188.95	-1,488.71	-142.87	14,441,656.61	1,723,055.11	39.76598518	-80.70591806
13,145.00	89.43	150.06	11,189.81	-1,571.21	-97.84	14,441,574.11	1,723,100.14	39.76575821	-80.70575879
13,240.00	89.43	150.06	11,190.76	-1,653.53	-50.43	14,441,491.79	1,723,147.55	39.76553171	-80.70559104
13,333.00	89.43	150.23	11,191.68	-1,734.18	-4.14	14,441,411.14	1,723,193.84	39.76530980	-80.70542724
13,427.00	89.52	150.06	11,192.54	-1,815.71	42.65	14,441,329.61	1,723,240.63	39.76508549	-80.70526168
13,522.00	89.52	150.06	11,193.34	-1,898.03	90.06	14,441,247.29	1,723,288.04	39.76485899	-80.70509393
13,616.00	88.99	149.70	11,194.56	-1,979.33	137.23	14,441,165.99	1,723,335.21	39.76463529	-80.70492704
13,710.00	88.90	149.70	11,196.29	-2,060.47	184.65	14,441,084.85	1,723,382.63	39.76441202	-80.70475925

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
13,803.00	88.99	150.58	11,198.01	-2,141.11	230.94	14,441,004.21	1,723,428.92	39.76419014	-80.70459546
13,898.00	88.99	150.76	11,199.68	-2,223.92	277.47	14,440,921.40	1,723,475.45	39.76396230	-80.70443086
13,991.00	88.90	150.58	11,201.39	-2,304.98	323.02	14,440,840.33	1,723,521.00	39.76373926	-80.70426973
14,086.00	88.99	150.06	11,203.14	-2,387.51	370.05	14,440,757.81	1,723,568.03	39.76351221	-80.70410334
14,180.00	88.99	150.41	11,204.80	-2,469.09	416.71	14,440,676.23	1,723,614.69	39.76328773	-80.70393827
14,273.00	88.99	150.06	11,206.44	-2,549.81	462.87	14,440,595.51	1,723,660.85	39.76306564	-80.70377495
14,367.00	89.08	150.23	11,208.02	-2,631.32	509.66	14,440,514.00	1,723,707.64	39.76284136	-80.70360942
14,462.00	89.16	150.76	11,209.48	-2,713.99	556.44	14,440,431.33	1,723,754.42	39.76261390	-80.70344392
14,556.00	88.72	149.53	11,211.22	-2,795.50	603.22	14,440,349.82	1,723,801.20	39.76238963	-80.70327840
14,650.00	88.55	150.41	11,213.46	-2,876.86	650.25	14,440,268.46	1,723,848.23	39.76216577	-80.70311201
14,744.00	89.25	150.76	11,215.26	-2,958.73	696.41	14,440,186.59	1,723,894.39	39.76194052	-80.70294873
14,838.00	88.20	149.70	11,217.35	-3,040.30	743.07	14,440,105.02	1,723,941.05	39.76171608	-80.70278366
14,932.00	87.93	150.58	11,220.53	-3,121.77	789.84	14,440,023.55	1,723,987.82	39.76149190	-80.70261818
15,026.00	87.93	150.41	11,223.92	-3,203.53	836.11	14,439,941.79	1,724,034.09	39.76126696	-80.70245452
15,119.00	87.85	150.06	11,227.35	-3,284.20	882.25	14,439,861.12	1,724,080.23	39.76104498	-80.70229130
15,214.00	87.58	150.23	11,231.14	-3,366.53	929.50	14,439,778.79	1,724,127.48	39.76081845	-80.70212413
15,308.00	87.14	150.41	11,235.47	-3,448.11	975.99	14,439,697.21	1,724,173.98	39.76059399	-80.70195965
15,403.00	87.14	150.41	11,240.21	-3,530.62	1,022.85	14,439,614.70	1,724,220.83	39.76036697	-80.70179391
15,497.00	87.05	150.58	11,244.97	-3,612.32	1,069.08	14,439,533.00	1,724,267.06	39.76014217	-80.70163036
15,591.00	87.49	150.41	11,249.45	-3,694.04	1,115.32	14,439,451.28	1,724,313.30	39.75991733	-80.70146678
15,685.00	88.99	151.29	11,252.33	-3,776.09	1,161.09	14,439,369.23	1,724,359.07	39.75969157	-80.70130492
15,780.00	88.64	149.00	11,254.30	-3,858.46	1,208.37	14,439,286.86	1,724,406.35	39.75946493	-80.70113766
15,875.00	88.90	149.00	11,256.34	-3,939.87	1,257.28	14,439,205.45	1,724,455.26	39.75924090	-80.70096457
15,969.00	90.31	149.88	11,256.99	-4,020.81	1,305.07	14,439,124.51	1,724,503.05	39.75901818	-80.70079548
16,064.00	90.40	149.35	11,256.40	-4,102.76	1,353.12	14,439,042.56	1,724,551.11	39.75879269	-80.70062548
16,158.00	90.40	149.18	11,255.74	-4,183.56	1,401.16	14,438,961.76	1,724,599.14	39.75857036	-80.70045550
16,252.00	89.69	150.76	11,255.67	-4,264.93	1,448.20	14,438,880.38	1,724,646.19	39.75834644	-80.70028909
16,308.00	89.69	151.64	11,255.97	-4,314.01	1,475.18	14,438,831.31	1,724,673.16	39.75821143	-80.70019368
16,403.00	89.43	150.41	11,256.70	-4,397.11	1,521.20	14,438,748.21	1,724,719.18	39.75798278	-80.70003093
16,497.00	88.46	150.76	11,258.43	-4,478.98	1,567.36	14,438,666.34	1,724,765.34	39.75775753	-80.69986767
16,591.00	88.37	153.57	11,261.03	-4,562.06	1,611.23	14,438,583.26	1,724,809.21	39.75752895	-80.69971256
16,685.00	88.37	153.92	11,263.70	-4,646.33	1,652.79	14,438,498.99	1,724,850.77	39.75729715	-80.69956567
16,779.00	88.64	154.28	11,266.16	-4,730.86	1,693.84	14,438,414.46	1,724,891.82	39.75706463	-80.69942063
16,873.00	88.55	154.10	11,268.46	-4,815.46	1,734.75	14,438,329.86	1,724,932.73	39.75683192	-80.69927606
16,967.00	88.90	152.69	11,270.55	-4,899.48	1,776.84	14,438,245.84	1,724,974.82	39.75660078	-80.69912732
17,061.00	88.29	151.46	11,272.86	-4,982.51	1,820.85	14,438,162.81	1,725,018.83	39.75637236	-80.69897173
17,155.00	88.29	151.99	11,275.66	-5,065.26	1,865.35	14,438,080.06	1,725,063.33	39.75614470	-80.69881436
17,249.00	88.37	151.81	11,278.40	-5,148.14	1,909.61	14,437,997.18	1,725,107.59	39.75591667	-80.69865788
17,343.00	88.64	151.64	11,280.86	-5,230.90	1,954.12	14,437,914.42	1,725,152.10	39.75568899	-80.69850049
17,436.00	88.55	151.81	11,283.14	-5,312.78	1,998.16	14,437,832.54	1,725,196.15	39.75546372	-80.69834477
17,531.00	88.37	151.81	11,285.69	-5,396.48	2,043.03	14,437,748.84	1,725,241.01	39.75523344	-80.69818615
17,625.00	88.90	151.99	11,287.93	-5,479.37	2,087.29	14,437,665.95	1,725,285.27	39.75500537	-80.69802966
17,719.00	89.16	151.29	11,289.52	-5,562.08	2,131.93	14,437,583.24	1,725,329.91	39.75477783	-80.69787180
17,812.00	89.43	151.46	11,290.66	-5,643.71	2,176.48	14,437,501.61	1,725,374.46	39.75455325	-80.69771427
17,905.00	88.99	151.46	11,291.95	-5,725.40	2,220.91	14,437,419.92	1,725,418.89	39.75432849	-80.69755717
17,998.00	87.85	151.46	11,294.51	-5,807.06	2,265.33	14,437,338.26	1,725,463.31	39.75410380	-80.69740013
18,092.00	88.02	151.99	11,297.90	-5,889.79	2,309.83	14,437,255.53	1,725,507.81	39.75387618	-80.69724279
18,185.00	88.11	152.34	11,301.04	-5,971.99	2,353.23	14,437,173.33	1,725,551.21	39.75365006	-80.69708937
18,279.00	88.72	150.76	11,303.64	-6,054.60	2,397.99	14,437,090.72	1,725,595.97	39.75342277	-80.69693110
18,372.00	88.20	149.35	11,306.14	-6,135.15	2,444.39	14,437,010.17	1,725,642.37	39.75320111	-80.69676696
18,467.00	88.29	149.18	11,309.05	-6,216.77	2,492.92	14,436,928.55	1,725,690.90	39.75297652	-80.69660286
18,561.00	88.11	148.65	11,312.00	-6,297.23	2,541.43	14,436,848.09	1,725,739.41	39.75275509	-80.69643866
18,655.00	88.11	148.83	11,315.10	-6,377.54	2,590.18	14,436,767.78	1,725,788.16	39.75253409	-80.69627446
18,749.00	87.93	148.83	11,318.35	-6,457.92	2,638.81	14,436,687.40	1,725,836.79	39.75231289	-80.69611026
18,843.00	88.72	148.83	11,321.09	-6,538.32	2,687.44	14,436,607.00	1,725,885.42	39.75209165	-80.69594606

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-14HU (slot N)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Site:	Knob Creek	MD Reference:	RKB=737+33 @ 770.00usft (Nabors X08)
Well:	Knob Creek S-14HU (slot N)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
18,937.00	88.64	148.65	11,323.26	-6,618.65	2,736.20	14,436,526.67	1,725,934.18	39.75187058	-80.69573456
19,031.00	88.64	148.47	11,325.49	-6,698.83	2,785.22	14,436,446.49	1,725,983.20	39.75164993	-80.69556113
19,125.00	88.55	148.65	11,327.80	-6,779.00	2,834.24	14,436,366.32	1,726,032.22	39.75142929	-80.69538771
19,220.00	88.11	148.83	11,330.56	-6,860.18	2,883.51	14,436,285.14	1,726,081.49	39.75120591	-80.69521337
19,314.00	88.11	149.18	11,333.66	-6,940.71	2,931.89	14,436,204.61	1,726,129.87	39.75098429	-80.69504222
19,407.00	88.02	149.35	11,336.81	-7,020.60	2,979.39	14,436,124.72	1,726,177.37	39.75076444	-80.69487418
19,501.00	88.02	149.00	11,340.05	-7,101.27	3,027.53	14,436,044.05	1,726,225.51	39.75054244	-80.69470389
19,595.00	88.64	149.18	11,342.79	-7,181.89	3,075.80	14,435,963.43	1,726,273.78	39.75032060	-80.69453314
19,689.00	88.55	148.47	11,345.10	-7,262.29	3,124.44	14,435,883.03	1,726,322.42	39.75009934	-80.69436105
19,759.00	88.55	148.83	11,346.87	-7,322.05	3,160.85	14,435,823.27	1,726,358.83	39.74993488	-80.69423225
Survey @ 19759.00 MD 11346.87 TVD									
19,838.00	88.55	148.83	11,348.87	-7,389.62	3,201.73	14,435,755.69	1,726,399.71	39.74974892	-80.69408764
Survey projected to 19838.00 MD 11348.87 TVD									

Measured Depth (usft)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Comment
149.00	149.00	-0.10	-0.62	MWD surveys
19,759.00	11,346.87	-7,322.05	3,160.85	Survey @ 19759.00 MD 11346.87 TVD
19,838.00	11,348.87	-7,389.62	3,201.73	Survey projected to 19838.00 MD 11348.87 TVD