



Well: Knob Creek S-16HU (slot P)
 Site: Knob Creek
 Project: Marshall County, West Virginia.
 Design: rev6
 Rig: Nabors X08

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 14443164.07 Easting 1723212.94 Latitude 39.77012366 Longitude -80.70533874

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.846°
 SECTION DETAILS



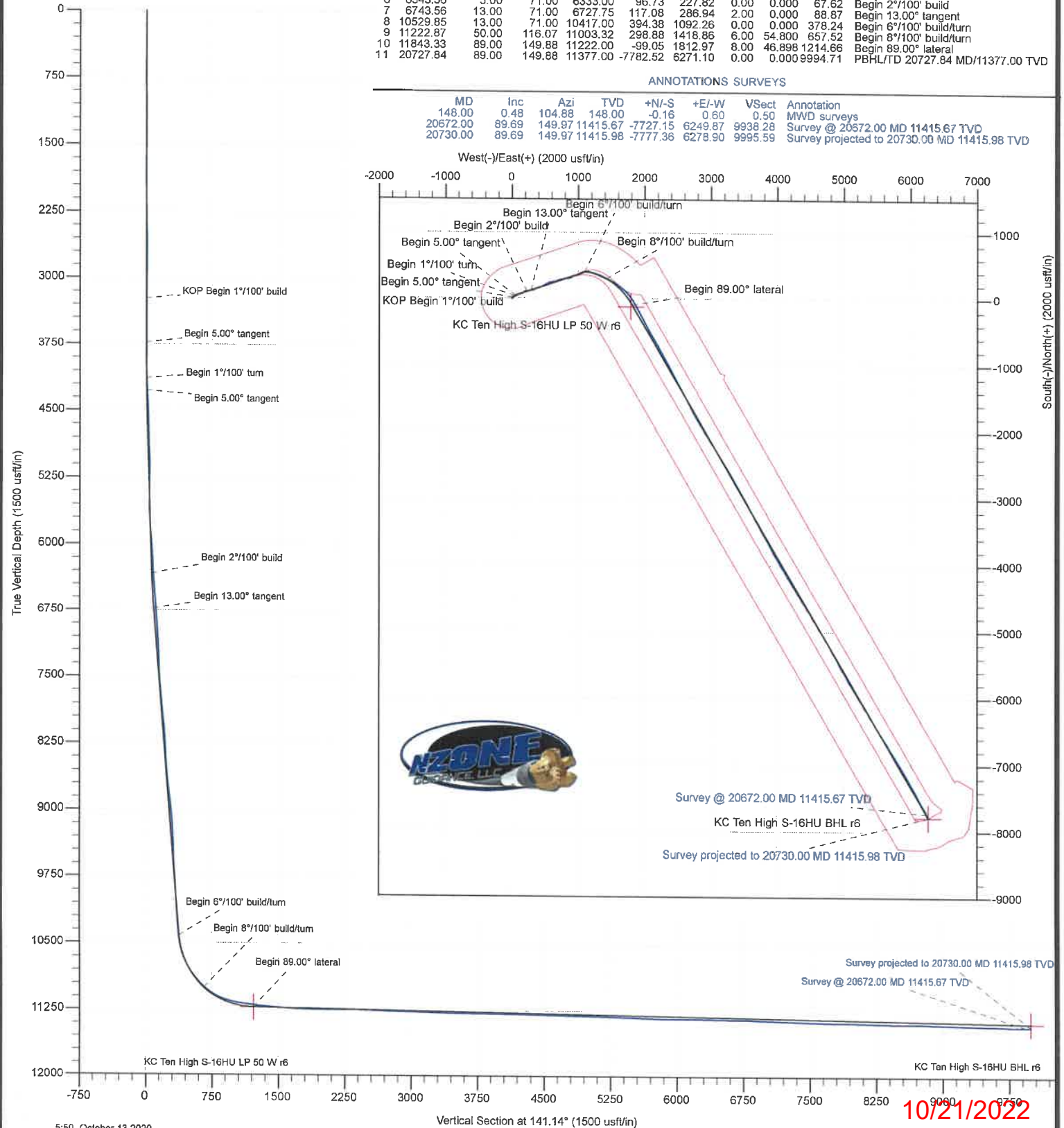
Azimuths to Grid North
 True North: -0.19°
 Magnetic North: -8.85°

Magnetic Field
 Strength: 51823.7nT
 Dip Angle: 66.60°
 Date: 9/4/2020
 Model: IGRF2020

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	0.000	0.00	
2	3233.00	0.00	0.00	3233.00	0.00	0.00	0.00	0.000	0.00	KOP Begin 1°/100' build
3	3733.00	5.00	55.00	3732.37	12.51	17.86	1.00	55.000	1.47	Begin 5.00° tangent
4	4133.00	5.00	55.00	4130.84	32.50	46.42	0.00	0.000	3.82	Begin 1°/100' turn
5	4272.00	5.00	71.00	4269.32	37.95	57.11	1.00	97.970	6.28	Begin 5.00° tangent
6	6343.56	5.00	71.00	6333.00	96.73	227.82	0.00	0.000	67.62	Begin 2°/100' build
7	6743.56	13.00	71.00	6727.75	117.08	286.94	2.00	0.000	88.87	Begin 13.00° tangent
8	10529.85	13.00	71.00	10417.00	394.38	1092.26	0.00	0.000	378.24	Begin 6°/100' build/turn
9	11222.87	50.00	116.07	11003.32	298.88	1418.86	6.00	54.800	657.52	Begin 8°/100' build/turn
10	11843.33	89.00	149.88	11222.00	-99.05	1812.97	8.00	46.898	1214.66	Begin 89.00° lateral
11	20727.84	89.00	149.88	11377.00	-7782.52	6271.10	0.00	0.000	9994.71	PBHL/ID 20727.84 MD/11377.00 TVD

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSec	Annotation
148.00	0.48	104.88	148.00	-0.16	0.60	0.50	MWD surveys
20672.00	89.69	149.97	11415.67	-7727.15	6249.87	9938.28	Survey @ 20672.00 MD 11415.67 TVD
20730.00	89.69	149.97	11415.98	-7777.36	6278.90	9995.59	Survey projected to 20730.00 MD 11415.98 TVD



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	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-16HU (slot P)					
Well Position	+N/-S	0.00 usft	Northing:	14,443,164.07 usft	Latitude:	39.77012366
	+E/-W	0.00 usft	Easting:	1,723,212.94 usft	Longitude:	-80.70533874
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	9/4/2020	-8.657	66.602	51,823.72537905

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	141.14	

Survey Program	Date	10/13/2020			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
148.00	2,199.00	MWD surf (Original Hole)	MWD	MWD - Standard	
2,296.00	10,105.00	MWD int (Original Hole)	MWD	MWD - Standard	
10,184.00	20,672.00	MWD (Original Hole)	MWD	MWD - Standard	
20,730.00	20,730.00	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	
148.00	0.48	104.88	148.00	-0.16	0.60	0.50	0.32	0.32	0.00	
MWD surveys										
178.00	0.66	152.78	178.00	-0.35	0.80	0.77	1.64	0.60	159.67	
209.00	0.62	151.81	209.00	-0.65	0.96	1.11	0.13	-0.13	-3.13	
240.00	0.62	191.63	239.99	-0.96	1.01	1.38	1.36	0.00	128.45	
270.00	0.88	175.90	269.99	-1.35	0.99	1.67	1.10	0.87	-52.43	
301.00	0.92	179.15	300.99	-1.84	1.01	2.07	0.21	0.13	10.48	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	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)
332.00	0.66	193.56	331.98	-2.26	0.97	2.37	1.05	-0.84	46.48
362.00	0.97	171.15	361.98	-2.68	0.97	2.70	1.46	1.03	-74.70
393.00	0.66	186.53	392.98	-3.12	0.99	3.05	1.22	-1.00	49.61
424.00	0.97	191.72	423.97	-3.55	0.92	3.34	1.03	1.00	16.74
454.00	0.53	189.69	453.97	-3.94	0.84	3.59	1.47	-1.47	-6.77
485.00	0.88	191.45	484.97	-4.31	0.77	3.84	1.13	1.13	5.68
505.00	0.92	194.00	504.97	-4.62	0.70	4.04	0.28	0.20	12.75
602.00	2.02	302.81	601.95	-4.45	-0.92	2.88	2.55	1.13	112.18
633.00	2.37	302.90	632.92	-3.80	-1.92	1.76	1.13	1.13	0.29
664.00	2.02	309.49	663.90	-3.11	-2.88	0.61	1.39	-1.13	21.26
694.00	1.41	309.93	693.89	-2.53	-3.57	-0.27	2.03	-2.03	1.47
726.00	0.70	345.17	725.88	-2.09	-3.92	-0.83	2.91	-2.22	110.13
757.00	0.88	85.63	756.88	-1.89	-3.74	-0.87	3.93	0.58	324.06
788.00	1.93	91.26	787.87	-1.88	-2.98	-0.40	3.41	3.39	18.16
819.00	2.72	85.81	818.84	-1.84	-1.72	0.35	2.64	2.55	-17.58
851.00	3.16	91.70	850.80	-1.81	-0.08	1.36	1.67	1.38	18.41
882.00	2.99	94.69	881.76	-1.90	1.58	2.47	0.75	-0.55	9.65
913.00	2.59	89.06	912.72	-1.96	3.08	3.46	1.56	-1.29	-18.16
945.00	1.85	83.79	944.70	-1.89	4.32	4.18	2.40	-2.31	-16.47
976.00	1.36	77.01	975.68	-1.75	5.18	4.61	1.69	-1.58	-21.87
1,007.00	0.75	65.68	1,006.68	-1.59	5.72	4.83	2.07	-1.97	-36.55
1,038.00	0.92	75.00	1,037.68	-1.44	6.15	4.98	0.70	0.55	30.06
1,069.00	0.83	63.40	1,068.67	-1.28	6.59	5.13	0.64	-0.29	-37.42
1,100.00	1.01	50.21	1,099.67	-1.00	7.00	5.17	0.89	0.58	-42.55
1,132.00	1.41	57.68	1,131.66	-0.61	7.55	5.21	1.34	1.25	23.34
1,163.00	1.36	64.80	1,162.65	-0.25	8.20	5.34	0.58	-0.16	22.97
1,257.00	0.75	86.86	1,256.64	0.26	9.83	5.96	0.77	-0.65	23.47
1,350.00	0.44	293.49	1,349.63	0.44	10.11	6.00	1.25	-0.33	-164.91
1,444.00	0.66	282.33	1,443.63	0.70	9.25	5.26	0.26	0.23	-11.87
1,539.00	1.58	288.04	1,538.61	1.22	7.47	3.74	0.97	0.97	6.01
1,633.00	1.71	292.88	1,632.57	2.16	4.94	1.41	0.20	0.14	5.15
1,727.00	0.97	297.62	1,726.55	3.08	2.94	-0.55	0.80	-0.79	5.04
1,821.00	1.58	103.21	1,820.54	3.15	3.50	-0.26	2.69	0.65	176.16
1,915.00	2.11	114.64	1,914.49	2.13	6.34	2.31	0.68	0.56	12.16
2,010.00	0.97	176.86	2,009.46	0.60	7.97	4.53	1.97	-1.20	65.49
2,104.00	1.80	227.75	2,103.43	-1.19	6.92	5.26	1.50	0.88	54.14
2,199.00	1.05	201.30	2,198.40	-3.00	5.50	5.79	1.03	-0.79	-27.84
2,296.00	0.53	268.44	2,295.39	-3.84	4.73	5.96	1.01	-0.54	69.22
2,390.00	0.92	167.55	2,389.39	-4.59	4.46	6.37	1.22	0.41	-107.33
2,484.00	1.10	171.06	2,483.37	-6.22	4.76	7.83	0.20	0.19	3.73
2,579.00	0.48	130.46	2,578.37	-7.38	5.20	9.01	0.84	-0.65	-42.74
2,673.00	0.48	129.31	2,672.36	-7.88	5.81	9.78	0.01	0.00	-1.22
2,768.00	0.70	70.95	2,767.36	-7.94	6.66	10.37	0.64	0.23	-61.43

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	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)
2,861.00	0.79	43.44	2,860.35	-7.29	7.64	10.47	0.39	0.10	-29.58
2,955.00	0.62	46.17	2,954.34	-6.47	8.45	10.34	0.18	-0.18	2.90
3,049.00	0.88	32.19	3,048.34	-5.51	9.21	10.06	0.34	0.28	-14.87
3,142.00	0.97	27.80	3,141.32	-4.21	9.95	9.52	0.12	0.10	-4.72
3,236.00	1.98	33.60	3,235.29	-2.15	11.22	8.72	1.08	1.07	6.17
3,330.00	3.16	43.88	3,329.20	1.07	13.92	7.90	1.34	1.26	10.94
3,424.00	3.38	50.21	3,423.04	4.71	17.84	7.53	0.45	0.23	6.73
3,519.00	3.96	48.81	3,517.85	8.66	22.46	7.35	0.62	0.61	-1.47
3,617.00	3.69	52.50	3,615.63	12.81	27.51	7.28	0.37	-0.28	3.77
3,710.00	3.69	47.66	3,708.44	16.65	32.10	7.17	0.33	0.00	-5.20
3,804.00	3.87	49.51	3,802.23	20.75	36.75	6.90	0.23	0.19	1.97
3,897.00	5.84	48.54	3,894.89	25.92	42.68	6.60	2.12	2.12	-1.04
3,991.00	5.98	55.49	3,988.40	31.86	50.30	6.75	0.78	0.15	7.39
4,085.00	6.06	65.77	4,081.88	36.67	58.86	8.38	1.15	0.09	10.94
4,179.00	6.42	72.88	4,175.32	40.25	68.41	11.58	0.91	0.38	7.56
4,273.00	6.98	76.40	4,268.68	43.14	78.98	15.96	0.74	0.60	3.74
4,366.00	6.30	78.60	4,361.06	45.48	89.47	20.72	0.78	-0.73	2.37
4,460.00	5.14	73.15	4,454.59	47.72	98.56	24.68	1.36	-1.23	-5.80
4,554.00	4.13	68.14	4,548.28	50.20	105.73	27.25	1.16	-1.07	-5.33
4,648.00	4.04	70.87	4,642.04	52.55	112.00	29.36	0.23	-0.10	2.90
4,741.00	4.74	72.53	4,734.77	54.77	118.76	31.86	0.76	0.75	1.78
4,834.00	6.24	73.41	4,827.34	57.37	127.27	35.18	1.62	1.61	0.95
4,929.00	5.36	74.90	4,921.85	60.00	136.50	38.92	0.94	-0.93	1.57
5,023.00	4.39	75.88	5,015.51	62.02	144.23	42.20	1.04	-1.03	1.04
5,117.00	2.81	53.99	5,109.33	64.25	149.59	43.82	2.20	-1.68	-23.29
5,211.00	3.08	32.90	5,203.21	67.73	152.82	43.14	1.18	0.29	-22.44
5,305.00	4.66	33.95	5,296.99	73.02	156.33	41.22	1.68	1.68	1.12
5,400.00	6.28	44.94	5,391.55	79.90	162.15	39.52	2.02	1.71	11.57
5,494.00	7.51	53.64	5,484.88	87.18	170.73	39.24	1.71	1.31	9.26
5,588.00	7.87	61.55	5,578.03	93.89	181.34	40.67	1.19	0.38	8.41
5,682.00	8.17	71.04	5,671.12	99.12	193.31	44.10	1.44	0.32	10.10
5,776.00	9.14	73.94	5,764.05	103.36	206.80	49.27	1.13	1.03	3.09
5,870.00	8.96	80.18	5,856.88	106.67	221.19	55.72	1.06	-0.19	6.64
5,964.00	7.82	87.83	5,949.87	108.16	234.80	63.09	1.69	-1.21	8.14
6,059.00	6.37	84.31	6,044.14	108.93	246.50	69.84	1.59	-1.53	-3.71
6,090.00	6.06	83.26	6,074.96	109.29	249.83	71.65	1.07	-1.00	-3.39
6,184.00	6.11	76.32	6,168.43	111.06	259.62	76.41	0.78	0.05	-7.38
6,230.00	5.58	77.28	6,214.19	112.13	264.18	78.44	1.17	-1.15	2.09
6,256.00	5.45	78.60	6,240.07	112.65	266.63	79.57	0.70	-0.50	5.08
6,350.00	7.20	76.49	6,333.50	114.91	276.73	84.15	1.88	1.86	-2.24
6,444.00	9.84	75.70	6,426.45	118.27	290.24	90.01	2.81	2.81	-0.84
6,538.00	12.35	74.73	6,518.69	122.90	307.73	97.37	2.68	2.67	-1.03
6,633.00	13.58	71.22	6,611.27	129.17	328.09	105.27	1.54	1.29	-3.69
6,728.00	12.52	71.75	6,703.81	135.99	348.43	112.72	1.12	-1.12	0.56

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	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)	
6,822.00	15.21	66.30	6,795.07	144.13	369.40	119.53	3.18	2.86	-5.80	
6,916.00	14.68	68.65	6,885.89	153.43	391.78	126.34	0.86	-0.56	2.50	
7,010.00	14.02	68.14	6,976.96	162.00	413.45	133.25	0.71	-0.70	-0.54	
7,103.00	13.57	65.59	7,067.27	170.71	433.84	139.27	0.81	-0.48	-2.74	
7,197.00	13.18	60.76	7,158.73	180.50	453.23	143.81	1.26	-0.41	-5.14	
7,385.00	15.07	57.24	7,341.04	204.20	492.49	149.99	1.10	1.01	-1.87	
7,478.00	14.94	57.24	7,430.87	217.23	512.74	152.55	0.14	-0.14	0.00	
7,572.00	14.77	64.98	7,521.73	228.85	533.79	156.71	2.12	-0.18	8.23	
7,667.00	13.32	72.89	7,613.90	237.19	555.22	163.66	2.53	-1.53	8.33	
7,761.00	12.04	76.84	7,705.61	242.61	575.12	171.92	1.64	-1.36	4.20	
7,856.00	12.04	79.74	7,798.52	246.63	594.52	180.96	0.64	0.00	3.05	
7,951.00	12.70	79.04	7,891.31	250.38	614.52	190.59	0.71	0.69	-0.74	
8,044.00	12.35	79.13	7,982.10	254.20	634.32	200.04	0.38	-0.38	0.10	
8,139.00	11.12	78.86	8,075.11	257.89	653.29	209.07	1.30	-1.29	-0.28	
8,233.00	9.93	71.39	8,167.53	262.23	669.87	216.10	1.92	-1.27	-7.95	
8,327.00	9.27	66.91	8,260.22	267.78	684.51	220.96	1.06	-0.70	-4.77	
8,422.00	10.46	67.09	8,353.81	274.14	699.49	225.41	1.25	1.25	0.19	
8,516.00	10.06	70.60	8,446.31	280.19	715.10	230.49	0.79	-0.43	3.73	
8,610.00	11.38	75.44	8,538.67	285.25	731.82	237.04	1.70	1.40	5.15	
8,703.00	12.39	77.46	8,629.67	289.72	750.44	245.24	1.17	1.09	2.17	
8,797.00	12.79	81.15	8,721.42	293.51	770.56	254.92	0.96	0.43	3.93	
8,891.00	12.22	84.67	8,813.19	296.04	790.75	265.62	1.01	-0.61	3.74	
8,985.00	11.78	85.63	8,905.13	297.69	810.22	276.54	0.51	-0.47	1.02	
9,081.00	10.90	86.60	8,999.26	298.98	829.06	287.36	0.94	-0.92	1.01	
9,175.00	10.63	81.41	9,091.60	300.80	846.50	296.89	1.07	-0.29	-5.52	
9,269.00	8.79	73.42	9,184.26	304.14	861.96	303.98	2.42	-1.96	-8.50	
9,363.00	8.88	66.12	9,277.15	309.13	875.48	308.58	1.20	0.10	-7.77	
9,457.00	10.24	63.13	9,369.84	315.84	889.57	312.19	1.54	1.45	-3.18	
9,551.00	11.65	61.11	9,462.13	324.21	905.33	315.57	1.55	1.50	-2.15	
9,645.00	12.48	60.50	9,554.05	333.79	922.48	318.86	0.89	0.88	-0.65	
9,739.00	13.71	65.77	9,645.61	343.37	941.48	323.33	1.82	1.31	5.61	
9,833.00	13.84	69.28	9,736.91	351.92	962.15	329.64	0.90	0.14	3.73	
9,927.00	13.23	67.61	9,828.29	359.99	982.61	336.19	0.77	-0.65	-1.78	
10,021.00	12.17	64.27	9,919.99	368.39	1,001.49	341.49	1.37	-1.13	-3.55	
10,105.00	12.17	64.19	10,002.11	376.09	1,017.43	345.50	0.02	0.00	-0.10	
10,184.00	12.68	67.61	10,079.26	383.02	1,032.95	349.84	1.13	0.65	4.33	
10,278.00	11.95	65.94	10,171.09	390.91	1,051.37	355.25	0.86	-0.78	-1.78	
10,372.00	11.87	74.56	10,263.08	397.46	1,069.58	361.58	1.89	-0.09	9.17	
10,466.00	11.34	72.36	10,355.16	402.83	1,087.70	368.77	0.73	-0.56	-2.34	
10,513.00	11.82	77.19	10,401.20	405.30	1,096.80	372.56	2.30	1.02	10.28	
10,560.00	14.11	84.14	10,447.00	406.95	1,107.20	377.79	5.89	4.87	14.79	
10,607.00	15.78	85.98	10,492.41	407.98	1,119.27	384.56	3.69	3.55	3.91	
10,654.00	17.40	92.75	10,537.46	408.09	1,132.67	392.88	5.36	3.45	14.40	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	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)
10,701.00	20.21	99.08	10,581.95	406.48	1,147.71	403.58	7.38	5.98	13.47
10,749.00	22.32	104.18	10,626.68	402.93	1,164.74	417.02	5.84	4.40	10.63
10,796.00	25.93	106.99	10,669.57	397.74	1,183.22	432.66	8.06	7.68	5.98
10,843.00	29.49	106.46	10,711.17	391.46	1,204.15	450.69	7.59	7.57	-1.13
10,890.00	32.30	106.73	10,751.50	384.57	1,227.28	470.56	5.99	5.98	0.57
10,938.00	35.02	108.31	10,791.45	376.55	1,252.64	492.72	5.95	5.67	3.29
10,985.00	37.84	109.54	10,829.26	367.49	1,279.03	516.34	6.20	6.00	2.62
11,032.00	40.69	110.15	10,865.65	357.38	1,307.01	541.75	6.12	6.06	1.30
11,079.00	43.68	111.38	10,900.47	346.19	1,336.51	568.99	6.60	6.36	2.62
11,126.00	46.14	113.14	10,933.76	333.61	1,367.21	598.04	5.86	5.23	3.74
11,173.00	48.21	115.69	10,965.71	319.35	1,398.59	628.83	5.94	4.40	5.43
11,219.00	51.20	118.42	10,995.45	303.38	1,429.82	660.86	7.92	6.50	5.93
11,266.00	52.69	118.33	11,024.43	285.79	1,462.38	694.98	3.17	3.17	-0.19
11,313.00	55.68	120.53	11,051.93	267.06	1,495.56	730.39	7.41	6.36	4.68
11,360.00	60.91	121.32	11,076.62	246.51	1,529.85	767.90	11.22	11.13	1.68
11,406.00	65.08	122.46	11,097.50	224.86	1,564.63	806.59	9.33	9.07	2.48
11,453.00	68.16	124.83	11,116.15	200.95	1,600.53	847.73	8.02	6.55	5.04
11,500.00	70.75	127.91	11,132.65	174.85	1,635.96	890.28	8.25	5.51	6.55
11,547.00	73.74	130.63	11,146.98	146.52	1,670.59	934.07	8.42	6.36	5.79
11,594.00	76.20	133.01	11,159.17	116.25	1,704.41	978.86	7.16	5.23	5.06
11,641.00	79.54	137.22	11,169.05	83.70	1,736.82	1,024.54	11.28	7.11	8.96
11,688.00	81.34	141.62	11,176.86	48.51	1,766.96	1,070.85	9.99	3.83	9.36
11,719.00	82.05	146.01	11,181.34	23.75	1,785.06	1,101.49	14.20	2.29	14.16
11,751.00	82.18	147.33	11,185.73	-2.73	1,802.48	1,133.03	4.11	0.41	4.13
11,782.00	82.27	147.68	11,189.92	-28.63	1,818.98	1,163.56	1.16	0.29	1.13
11,814.00	82.22	147.24	11,194.24	-55.36	1,836.03	1,195.08	1.37	-0.16	-1.38
11,877.00	82.88	148.91	11,202.41	-108.38	1,869.07	1,257.08	2.83	1.05	2.65
11,909.00	84.07	152.25	11,206.05	-136.07	1,884.68	1,288.44	11.02	3.72	10.44
11,971.00	84.20	152.25	11,212.38	-190.65	1,913.40	1,348.96	0.21	0.21	0.00
12,066.00	86.26	151.46	11,220.28	-274.12	1,958.05	1,441.97	2.32	2.17	-0.83
12,160.00	86.04	152.08	11,226.60	-356.76	2,002.41	1,534.15	0.70	-0.23	0.66
12,254.00	86.00	151.99	11,233.12	-439.58	2,046.39	1,626.24	0.10	-0.04	-0.10
12,348.00	88.11	150.85	11,237.95	-522.01	2,091.29	1,718.60	2.55	2.24	-1.21
12,443.00	88.55	150.67	11,240.72	-604.87	2,137.68	1,812.22	0.50	0.46	-0.19
12,537.00	88.46	149.71	11,243.17	-686.40	2,184.39	1,905.02	1.03	-0.10	-1.02
12,632.00	89.65	151.55	11,244.74	-769.18	2,230.97	1,998.70	2.31	1.25	1.94
12,725.00	89.91	151.20	11,245.09	-850.81	2,275.53	2,090.22	0.47	0.28	-0.38
12,819.00	90.44	150.76	11,244.81	-933.01	2,321.13	2,182.84	0.73	0.56	-0.47
12,913.00	89.65	150.32	11,244.73	-1,014.85	2,367.36	2,275.57	0.96	-0.84	-0.47
13,007.00	89.08	151.81	11,245.78	-1,097.11	2,412.83	2,368.16	1.70	-0.61	1.59
13,101.00	88.07	152.25	11,248.11	-1,180.10	2,456.91	2,460.43	1.17	-1.07	0.47
13,195.00	88.20	152.69	11,251.17	-1,263.41	2,500.33	2,552.55	0.49	0.14	0.47
13,289.00	88.42	152.61	11,253.94	-1,346.87	2,543.50	2,644.62	0.25	0.23	-0.09

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	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)
13,383.00	88.20	152.34	11,256.72	-1,430.19	2,586.92	2,736.75	0.37	-0.23	-0.29
13,477.00	88.29	151.90	11,259.60	-1,513.24	2,630.86	2,828.99	0.48	0.10	-0.47
13,571.00	88.77	152.25	11,262.01	-1,596.27	2,674.86	2,921.25	0.63	0.51	0.37
13,665.00	89.25	152.25	11,263.63	-1,679.45	2,718.62	3,013.47	0.51	0.51	0.00
13,759.00	88.24	151.29	11,265.69	-1,762.24	2,763.07	3,105.83	1.48	-1.07	-1.02
13,853.00	87.89	149.44	11,268.86	-1,843.90	2,809.53	3,198.56	2.00	-0.37	-1.97
13,947.00	87.98	148.47	11,272.25	-1,924.38	2,857.97	3,291.63	1.04	0.10	-1.03
14,041.00	87.89	148.47	11,275.64	-2,004.45	2,907.10	3,384.80	0.10	-0.10	0.00
14,135.00	89.03	148.56	11,278.16	-2,084.58	2,956.17	3,477.99	1.22	1.21	0.10
14,229.00	88.81	148.04	11,279.94	-2,164.54	3,005.56	3,571.24	0.60	-0.23	-0.55
14,323.00	90.09	148.74	11,280.84	-2,244.59	3,054.82	3,664.48	1.55	1.36	0.74
14,417.00	89.82	148.21	11,280.91	-2,324.72	3,103.97	3,757.71	0.63	-0.29	-0.56
14,511.00	89.74	148.04	11,281.27	-2,404.54	3,153.61	3,851.01	0.20	-0.09	-0.18
14,606.00	88.46	149.09	11,282.77	-2,485.59	3,203.15	3,945.20	1.74	-1.35	1.11
14,700.00	88.68	147.60	11,285.11	-2,565.57	3,252.46	4,038.42	1.60	0.23	-1.59
14,794.00	89.21	149.53	11,286.84	-2,645.76	3,301.47	4,131.61	2.13	0.56	2.05
14,887.00	88.64	149.79	11,288.59	-2,726.01	3,348.44	4,223.57	0.67	-0.61	0.28
14,982.00	88.90	149.88	11,290.63	-2,808.13	3,396.17	4,317.46	0.29	0.27	0.09
15,075.00	88.73	151.64	11,292.55	-2,889.26	3,441.59	4,409.13	1.90	-0.18	1.89
15,169.00	89.21	150.41	11,294.24	-2,971.47	3,487.11	4,501.71	1.40	0.51	-1.31
15,263.00	88.55	151.38	11,296.08	-3,053.59	3,532.83	4,594.34	1.25	-0.70	1.03
15,357.00	88.73	151.46	11,298.31	-3,136.11	3,577.78	4,686.80	0.21	0.19	0.09
15,452.00	89.12	151.55	11,300.09	-3,219.59	3,623.10	4,780.23	0.42	0.41	0.09
15,547.00	87.63	151.29	11,302.78	-3,302.98	3,668.52	4,873.67	1.59	-1.57	-0.27
15,641.00	87.80	151.20	11,306.53	-3,385.32	3,713.71	4,966.14	0.20	0.18	-0.10
15,735.00	88.20	151.29	11,309.81	-3,467.68	3,758.90	5,058.62	0.44	0.43	0.10
15,830.00	88.51	151.38	11,312.54	-3,551.00	3,804.45	5,152.08	0.34	0.33	0.09
15,924.00	88.77	151.20	11,314.77	-3,633.42	3,849.59	5,244.59	0.34	0.28	-0.19
16,019.00	89.03	151.38	11,316.59	-3,716.72	3,895.22	5,338.08	0.33	0.27	0.19
16,113.00	89.34	151.81	11,317.93	-3,799.40	3,939.93	5,430.51	0.56	0.33	0.46
16,208.00	87.63	150.85	11,320.44	-3,882.72	3,985.49	5,523.98	2.06	-1.80	-1.01
16,301.00	87.71	150.50	11,324.22	-3,963.73	4,031.00	5,615.62	0.39	0.09	-0.38
16,395.00	87.32	149.18	11,328.30	-4,044.93	4,078.18	5,708.44	1.46	-0.41	-1.40
16,490.00	87.85	147.60	11,332.30	-4,125.76	4,127.93	5,802.60	1.75	0.56	-1.66
16,584.00	89.60	149.71	11,334.40	-4,206.01	4,176.81	5,895.76	2.92	1.86	2.24
16,678.00	89.96	149.00	11,334.76	-4,286.89	4,224.72	5,988.79	0.85	0.38	-0.76
16,772.00	90.35	148.65	11,334.50	-4,367.31	4,273.38	6,081.95	0.56	0.41	-0.37
16,866.00	89.78	149.18	11,334.40	-4,447.81	4,321.92	6,175.08	0.83	-0.61	0.56
16,960.00	88.86	148.83	11,335.51	-4,528.38	4,370.32	6,268.19	1.05	-0.98	-0.37
17,054.00	88.95	149.09	11,337.31	-4,608.91	4,418.78	6,361.30	0.29	0.10	0.28
17,148.00	89.38	148.30	11,338.68	-4,689.21	4,467.62	6,454.47	0.96	0.46	-0.84
17,242.00	89.38	148.21	11,339.69	-4,769.15	4,517.07	6,547.74	0.10	0.00	-0.10
17,336.00	90.00	148.39	11,340.20	-4,849.12	4,566.46	6,641.01	0.69	0.66	0.19
17,430.00	89.25	148.56	11,340.82	-4,929.25	4,615.61	6,734.24	0.82	-0.80	0.18

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	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)
17,523.00	87.67	150.50	11,343.32	-5,009.37	4,662.75	6,826.20	2.69	-1.70	2.09
17,618.00	87.98	151.02	11,346.92	-5,092.20	4,709.12	6,919.80	0.64	0.33	0.55
17,712.00	88.15	150.67	11,350.10	-5,174.24	4,754.89	7,012.40	0.41	0.18	-0.37
17,806.00	88.59	151.38	11,352.77	-5,256.44	4,800.41	7,104.96	0.89	0.47	0.76
17,899.00	87.93	151.38	11,355.59	-5,338.04	4,844.93	7,196.44	0.71	-0.71	0.00
17,992.00	88.20	151.29	11,358.73	-5,419.60	4,889.52	7,287.92	0.31	0.29	-0.10
18,085.00	88.68	150.85	11,361.27	-5,500.96	4,934.49	7,379.49	0.70	0.52	-0.47
18,179.00	88.07	150.50	11,363.93	-5,582.88	4,980.51	7,472.16	0.75	-0.65	-0.37
18,272.00	87.85	150.58	11,367.24	-5,663.81	5,026.22	7,563.85	0.25	-0.24	0.09
18,366.00	88.42	150.06	11,370.30	-5,745.43	5,072.74	7,656.59	0.82	0.61	-0.55
18,459.00	88.73	149.18	11,372.61	-5,825.64	5,119.76	7,748.55	1.00	0.33	-0.95
18,554.00	89.17	148.83	11,374.36	-5,907.06	5,168.67	7,842.64	0.59	0.46	-0.37
18,648.00	89.47	149.00	11,375.47	-5,987.55	5,217.20	7,935.77	0.37	0.32	0.18
18,742.00	89.91	148.65	11,375.98	-6,067.98	5,265.86	8,028.92	0.60	0.47	-0.37
18,836.00	89.03	149.18	11,376.85	-6,148.47	5,314.39	8,122.05	1.09	-0.94	0.56
18,930.00	87.85	149.09	11,379.41	-6,229.13	5,362.59	8,215.10	1.26	-1.26	-0.10
19,024.00	88.20	148.83	11,382.65	-6,309.62	5,411.03	8,308.17	0.46	0.37	-0.28
19,118.00	88.77	148.30	11,385.13	-6,389.80	5,460.04	8,401.35	0.83	0.61	-0.56
19,212.00	89.21	147.77	11,386.79	-6,469.53	5,509.79	8,494.66	0.73	0.47	-0.56
19,307.00	89.38	148.83	11,387.96	-6,550.35	5,559.71	8,588.91	1.13	0.18	1.12
19,401.00	89.96	148.39	11,388.50	-6,630.59	5,608.67	8,682.11	0.77	0.62	-0.47
19,494.00	89.65	148.83	11,388.82	-6,709.98	5,657.11	8,774.32	0.58	-0.33	0.47
19,588.00	88.59	148.83	11,390.26	-6,790.40	5,705.76	8,867.46	1.13	-1.13	0.00
19,682.00	89.21	147.24	11,392.07	-6,870.13	5,755.51	8,960.76	1.82	0.66	-1.69
19,776.00	88.02	147.16	11,394.34	-6,949.12	5,806.41	9,054.21	1.27	-1.27	-0.09
19,870.00	88.46	147.95	11,397.22	-7,028.41	5,856.82	9,147.57	0.96	0.47	0.84
19,964.00	88.90	150.06	11,399.39	-7,108.96	5,905.21	9,240.66	2.29	0.47	2.24
20,057.00	88.02	151.64	11,401.89	-7,190.15	5,950.49	9,332.29	1.94	-0.95	1.70
20,152.00	88.59	151.46	11,404.70	-7,273.64	5,995.73	9,425.68	0.63	0.60	-0.19
20,245.00	89.17	150.50	11,406.52	-7,354.94	6,040.84	9,517.30	1.21	0.62	-1.03
20,338.00	88.07	151.02	11,408.76	-7,436.07	6,086.25	9,608.96	1.31	-1.18	0.56
20,432.00	88.42	150.94	11,411.64	-7,518.23	6,131.83	9,701.53	0.38	0.37	-0.09
20,526.00	88.90	150.58	11,413.83	-7,600.23	6,177.73	9,794.19	0.64	0.51	-0.38
20,620.00	89.38	150.41	11,415.24	-7,682.03	6,224.02	9,886.92	0.54	0.51	-0.18
20,672.00	89.69	149.97	11,415.67	-7,727.15	6,249.87	9,938.28	1.04	0.60	-0.85
Survey @ 20672.00 MD 11415.67 TVD									
20,730.00	89.69	149.97	11,415.98	-7,777.36	6,278.90	9,995.59	0.00	0.00	0.00
Survey projected to 20730.00 MD 11415.98 TVD									



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
148.00	148.00	-0.16	0.60	MWD surveys
20,672.00	11,415.67	-7,727.15	6,249.87	Survey @ 20672.00 MD 11415.67 TVD
20,730.00	11,415.98	-7,777.36	6,278.90	Survey projected to 20730.00 MD 11415.98 TVD

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	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-16HU (slot P)					
Well Position	+N/-S	0.00 usft	Northing:	14,443,164.07 usft	Latitude:	39.77012366
	+E/-W	0.00 usft	Easting:	1,723,212.94 usft	Longitude:	-80.70533874
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	9/4/2020	-8.657	66.602	51,823.72537905

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	141.14

Survey Program	Date 10/13/2020				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
148.00	2,199.00	MWD surf (Original Hole)	MWD	MWD - Standard	
2,296.00	10,105.00	MWD int (Original Hole)	MWD	MWD - Standard	
10,184.00	20,672.00	MWD (Original Hole)	MWD	MWD - Standard	
20,730.00	20,730.00	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	14,443,164.07	1,723,212.94	39.77012366	-80.70533874	
148.00	0.48	104.88	148.00	-0.16	0.60	14,443,163.91	1,723,213.54	39.77012322	-80.70533661	
MWD surveys										
178.00	0.66	152.78	178.00	-0.35	0.80	14,443,163.73	1,723,213.74	39.77012271	-80.70533590	
209.00	0.62	151.81	209.00	-0.65	0.96	14,443,163.42	1,723,213.90	39.77012186	-80.70533533	
240.00	0.62	191.63	239.99	-0.96	1.01	14,443,163.11	1,723,213.95	39.77012101	-80.70533517	
270.00	0.88	175.90	269.99	-1.35	0.99	14,443,162.72	1,723,213.93	39.77011994	-80.70533523	
301.00	0.92	179.15	300.99	-1.84	1.01	14,443,162.23	1,723,213.95	39.77011860	-80.70533517	
332.00	0.66	193.56	331.98	-2.26	0.97	14,443,161.81	1,723,213.92	39.77011744	-80.70533531	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	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
362.00	0.97	171.15	361.98	-2.68	0.97	14,443,161.39	1,723,213.91	39.77011629	-80.70533532
393.00	0.66	186.53	392.98	-3.12	0.99	14,443,160.96	1,723,213.93	39.77011509	-80.70533525
424.00	0.97	191.72	423.97	-3.55	0.92	14,443,160.52	1,723,213.86	39.77011390	-80.70533552
454.00	0.53	189.69	453.97	-3.94	0.84	14,443,160.14	1,723,213.79	39.77011284	-80.70533579
485.00	0.88	191.45	484.97	-4.31	0.77	14,443,159.76	1,723,213.71	39.77011182	-80.70533605
505.00	0.92	194.00	504.97	-4.62	0.70	14,443,159.46	1,723,213.64	39.77011097	-80.70533630
602.00	2.02	302.81	601.95	-4.45	-0.92	14,443,159.63	1,723,212.02	39.77011146	-80.70534208
633.00	2.37	302.90	632.92	-3.80	-1.92	14,443,160.27	1,723,211.02	39.77011324	-80.70534562
664.00	2.02	309.49	663.90	-3.11	-2.88	14,443,160.97	1,723,210.06	39.77011516	-80.70534903
694.00	1.41	309.93	693.89	-2.53	-3.57	14,443,161.54	1,723,209.37	39.77011674	-80.70535148
726.00	0.70	345.17	725.88	-2.09	-3.92	14,443,161.98	1,723,209.02	39.77011795	-80.70535273
757.00	0.88	85.63	756.88	-1.89	-3.74	14,443,162.18	1,723,209.21	39.77011850	-80.70535206
788.00	1.93	91.26	787.87	-1.88	-2.98	14,443,162.19	1,723,209.97	39.77011851	-80.70534935
819.00	2.72	85.81	818.84	-1.84	-1.72	14,443,162.23	1,723,211.22	39.77011862	-80.70534488
851.00	3.16	91.70	850.80	-1.81	-0.08	14,443,162.26	1,723,212.86	39.77011868	-80.70533905
882.00	2.99	94.69	881.76	-1.90	1.58	14,443,162.17	1,723,214.52	39.77011842	-80.70533315
913.00	2.59	89.06	912.72	-1.96	3.08	14,443,162.12	1,723,216.03	39.77011825	-80.70532779
945.00	1.85	83.79	944.70	-1.89	4.32	14,443,162.18	1,723,217.26	39.77011843	-80.70532339
976.00	1.36	77.01	975.68	-1.75	5.18	14,443,162.32	1,723,218.12	39.77011880	-80.70532034
1,007.00	0.75	65.68	1,006.68	-1.59	5.72	14,443,162.49	1,723,218.66	39.77011925	-80.70531840
1,038.00	0.92	75.00	1,037.68	-1.44	6.15	14,443,162.63	1,723,219.09	39.77011965	-80.70531689
1,069.00	0.83	63.40	1,068.67	-1.28	6.59	14,443,162.80	1,723,219.53	39.77012010	-80.70531531
1,100.00	1.01	50.21	1,099.67	-1.00	7.00	14,443,163.07	1,723,219.94	39.77012085	-80.70531385
1,132.00	1.41	57.68	1,131.66	-0.61	7.55	14,443,163.47	1,723,220.49	39.77012192	-80.70531189
1,163.00	1.36	64.80	1,162.65	-0.25	8.20	14,443,163.83	1,723,221.15	39.77012291	-80.70530955
1,257.00	0.75	86.86	1,256.64	0.26	9.83	14,443,164.33	1,723,222.77	39.77012429	-80.70530377
1,350.00	0.44	293.49	1,349.63	0.44	10.11	14,443,164.51	1,723,223.05	39.77012477	-80.70530277
1,444.00	0.66	282.33	1,443.63	0.70	9.25	14,443,164.77	1,723,222.19	39.77012549	-80.70530583
1,539.00	1.58	288.04	1,538.61	1.22	7.47	14,443,165.29	1,723,220.41	39.77012694	-80.70531216
1,633.00	1.71	292.88	1,632.57	2.16	4.94	14,443,166.24	1,723,217.89	39.77012956	-80.70532113
1,727.00	0.97	297.62	1,726.55	3.08	2.94	14,443,167.15	1,723,215.89	39.77013209	-80.70532823
1,821.00	1.58	103.21	1,820.54	3.15	3.50	14,443,167.23	1,723,216.44	39.77013229	-80.70532624
1,915.00	2.11	114.64	1,914.49	2.13	6.34	14,443,166.21	1,723,219.28	39.77012947	-80.70531617
2,010.00	0.97	176.86	2,009.46	0.60	7.97	14,443,164.68	1,723,220.91	39.77012524	-80.70531037
2,104.00	1.80	227.75	2,103.43	-1.19	6.92	14,443,162.89	1,723,219.86	39.77012034	-80.70531413
2,199.00	1.05	201.30	2,198.40	-3.00	5.50	14,443,161.07	1,723,218.44	39.77011537	-80.70531920
2,296.00	0.53	268.44	2,295.39	-3.84	4.73	14,443,160.23	1,723,217.67	39.77011307	-80.70532196
2,390.00	0.92	167.55	2,389.39	-4.59	4.46	14,443,159.49	1,723,217.40	39.77011102	-80.70532293
2,484.00	1.10	171.06	2,483.37	-6.22	4.76	14,443,157.86	1,723,217.70	39.77010655	-80.70532188
2,579.00	0.48	130.46	2,578.37	-7.38	5.20	14,443,156.70	1,723,218.15	39.77010336	-80.70532031
2,673.00	0.48	129.31	2,672.36	-7.88	5.81	14,443,156.19	1,723,218.75	39.77010197	-80.70531816
2,768.00	0.70	70.95	2,767.36	-7.94	6.66	14,443,156.13	1,723,219.61	39.77010179	-80.70531512
2,861.00	0.79	43.44	2,860.35	-7.29	7.64	14,443,156.78	1,723,220.59	39.77010357	-80.70531163
2,955.00	0.62	46.17	2,954.34	-6.47	8.45	14,443,157.60	1,723,221.40	39.77010582	-80.70530873
3,049.00	0.88	32.19	3,048.34	-5.51	9.21	14,443,158.57	1,723,222.15	39.77010846	-80.70530604
3,142.00	0.97	27.80	3,141.32	-4.21	9.95	14,443,159.87	1,723,222.90	39.77011202	-80.70530337
3,236.00	1.98	33.60	3,235.29	-2.15	11.22	14,443,161.92	1,723,224.17	39.77011766	-80.70529882
3,330.00	3.16	43.88	3,329.20	1.07	13.92	14,443,165.14	1,723,226.86	39.77012648	-80.70528920
3,424.00	3.38	50.21	3,423.04	4.71	17.84	14,443,168.79	1,723,230.79	39.77013644	-80.70527518
3,519.00	3.96	48.81	3,517.85	8.66	22.46	14,443,172.74	1,723,235.41	39.77014725	-80.70525869
3,617.00	3.69	52.50	3,615.63	12.81	27.51	14,443,176.89	1,723,240.46	39.77015860	-80.70524068
3,710.00	3.69	47.66	3,708.44	16.65	32.10	14,443,180.72	1,723,245.04	39.77016910	-80.70522431
3,804.00	3.87	49.51	3,802.23	20.75	36.75	14,443,184.82	1,723,249.69	39.77018031	-80.70520772
3,897.00	5.84	48.54	3,894.89	25.92	42.68	14,443,189.99	1,723,255.62	39.77019445	-80.70518655
3,991.00	5.98	55.49	3,988.40	31.86	50.30	14,443,195.93	1,723,263.24	39.77021070	-80.70515936

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	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
4,085.00	6.06	65.77	4,081.88	36.67	58.86	14,443,200.74	1,723,271.80	39.77022383	-80.70512884
4,179.00	6.42	72.88	4,175.32	40.25	68.41	14,443,204.33	1,723,281.35	39.77023359	-80.70509482
4,273.00	6.98	76.40	4,268.88	43.14	78.98	14,443,207.22	1,723,291.92	39.77024143	-80.70505716
4,366.00	6.30	78.60	4,361.06	45.48	89.47	14,443,209.55	1,723,302.42	39.77024775	-80.70501978
4,460.00	5.14	73.15	4,454.59	47.72	98.56	14,443,211.79	1,723,311.50	39.77025382	-80.70498742
4,554.00	4.13	68.14	4,548.28	50.20	105.73	14,443,214.27	1,723,318.68	39.77026057	-80.70496187
4,648.00	4.04	70.87	4,642.04	52.55	112.00	14,443,216.62	1,723,324.95	39.77026696	-80.70493953
4,741.00	4.74	72.53	4,734.77	54.77	118.76	14,443,218.85	1,723,331.71	39.77027301	-80.70491544
4,834.00	6.24	73.41	4,827.34	57.37	127.27	14,443,221.44	1,723,340.22	39.77028007	-80.70488513
4,929.00	5.36	74.90	4,921.85	60.00	136.50	14,443,224.07	1,723,349.45	39.77028720	-80.70485224
5,023.00	4.39	75.88	5,015.51	62.02	144.23	14,443,226.10	1,723,357.18	39.77029269	-80.70482471
5,117.00	2.81	53.99	5,109.33	64.25	149.59	14,443,228.33	1,723,362.53	39.77029877	-80.70480564
5,211.00	3.08	32.90	5,203.21	67.73	152.82	14,443,231.80	1,723,365.76	39.77030828	-80.70479408
5,305.00	4.66	33.95	5,296.99	73.02	156.33	14,443,237.09	1,723,369.27	39.77032277	-80.70478155
5,400.00	6.28	44.94	5,391.55	79.90	162.15	14,443,243.97	1,723,375.10	39.77034161	-80.70476073
5,494.00	7.51	53.64	5,484.88	87.18	170.73	14,443,251.25	1,723,383.67	39.77036153	-80.70473012
5,588.00	7.87	61.55	5,578.03	93.89	181.34	14,443,257.96	1,723,394.28	39.77037986	-80.70469229
5,682.00	8.17	71.04	5,671.12	99.12	193.31	14,443,263.20	1,723,406.26	39.77039413	-80.70466496
5,776.00	9.14	73.94	5,764.05	103.36	206.80	14,443,267.43	1,723,419.75	39.77040564	-80.70460155
5,870.00	8.96	80.18	5,856.88	106.67	221.19	14,443,270.75	1,723,434.13	39.77041461	-80.70455031
5,964.00	7.82	87.83	5,949.87	108.16	234.80	14,443,272.24	1,723,447.74	39.77041858	-80.70450188
6,059.00	6.37	84.31	6,044.14	108.93	246.50	14,443,273.00	1,723,459.44	39.77042058	-80.70446022
6,090.00	6.06	83.26	6,074.96	109.29	249.83	14,443,273.37	1,723,462.78	39.77042155	-80.70444834
6,184.00	6.11	76.32	6,168.43	111.06	259.62	14,443,275.13	1,723,472.57	39.77042631	-80.70441348
6,230.00	5.58	77.28	6,214.19	112.13	264.18	14,443,276.20	1,723,477.13	39.77042921	-80.70439724
6,256.00	5.45	78.60	6,240.07	112.65	266.63	14,443,276.73	1,723,479.57	39.77043062	-80.70438854
6,350.00	7.20	76.49	6,333.50	114.91	276.73	14,443,278.98	1,723,489.67	39.77043673	-80.70435255
6,444.00	9.84	75.70	6,426.45	118.27	290.24	14,443,282.35	1,723,503.19	39.77044584	-80.70430442
6,538.00	12.35	74.73	6,518.69	122.90	307.73	14,443,286.98	1,723,520.67	39.77045840	-80.70424215
6,633.00	13.58	71.22	6,611.27	129.17	328.09	14,443,293.24	1,723,541.03	39.77047543	-80.70416961
6,728.00	12.52	71.75	6,703.81	135.99	348.43	14,443,300.06	1,723,561.37	39.77049396	-80.70409715
6,822.00	15.21	66.30	6,795.07	144.13	369.40	14,443,308.21	1,723,582.34	39.77051615	-80.70402242
6,916.00	14.68	68.65	6,885.89	153.43	391.78	14,443,317.50	1,723,604.73	39.77054147	-80.70394264
7,010.00	14.02	68.14	6,976.96	162.00	413.45	14,443,326.08	1,723,626.39	39.77056482	-80.70386545
7,103.00	13.57	65.59	7,067.27	170.71	433.84	14,443,334.78	1,723,646.78	39.77058854	-80.70379278
7,197.00	13.18	60.76	7,158.73	180.50	453.23	14,443,344.57	1,723,666.17	39.77061525	-80.70372365
7,385.00	15.07	57.24	7,341.04	204.20	492.49	14,443,368.27	1,723,705.43	39.77067998	-80.70358365
7,478.00	14.94	57.24	7,430.87	217.23	512.74	14,443,381.30	1,723,725.68	39.77071557	-80.70351144
7,572.00	14.77	64.98	7,521.73	228.85	533.79	14,443,392.92	1,723,746.73	39.77074731	-80.70343639
7,667.00	13.32	72.89	7,613.90	237.19	555.22	14,443,401.27	1,723,768.17	39.77077002	-80.70336001
7,761.00	12.04	76.84	7,705.61	242.61	575.12	14,443,406.69	1,723,788.06	39.77078472	-80.70328913
7,856.00	12.04	79.74	7,798.52	246.63	594.52	14,443,410.71	1,723,807.46	39.77079559	-80.70322005
7,951.00	12.70	79.04	7,891.31	250.38	614.52	14,443,414.46	1,723,827.46	39.77080571	-80.70314882
8,044.00	12.35	79.13	7,982.10	254.20	634.32	14,443,418.28	1,723,847.27	39.77081601	-80.70307830
8,139.00	11.12	78.86	8,075.11	257.89	653.29	14,443,421.96	1,723,866.23	39.77082596	-80.70301075
8,233.00	9.93	71.39	8,167.53	262.23	669.87	14,443,426.30	1,723,882.81	39.77083773	-80.70295171
8,327.00	9.27	66.91	8,260.22	267.78	684.51	14,443,431.86	1,723,897.45	39.77085285	-80.70289952
8,422.00	10.46	67.09	8,353.81	274.14	699.49	14,443,438.21	1,723,912.44	39.77087018	-80.70284613
8,516.00	10.06	70.60	8,446.31	280.19	715.10	14,443,444.26	1,723,928.04	39.77088664	-80.70279052
8,610.00	11.38	75.44	8,538.67	285.25	731.82	14,443,449.32	1,723,944.76	39.77090038	-80.70273096
8,703.00	12.39	77.46	8,629.67	289.72	750.44	14,443,453.79	1,723,963.38	39.77091250	-80.70266464
8,797.00	12.79	81.15	8,721.42	293.51	770.56	14,443,457.58	1,723,983.51	39.77092273	-80.70259297
8,891.00	12.22	84.67	8,813.19	296.04	790.75	14,443,460.11	1,724,003.69	39.77092948	-80.70252110
8,985.00	11.78	85.63	8,905.13	297.69	810.22	14,443,461.76	1,724,023.17	39.77093384	-80.70245178
9,081.00	10.90	86.60	8,999.26	298.98	829.06	14,443,463.05	1,724,042.00	39.77093720	-80.70238474

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	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
9,175.00	10.63	81.41	9,091.60	300.80	846.50	14,443,464.87	1,724,059.44	39.77094205	-80.70232263
9,269.00	8.79	73.42	9,184.26	304.14	861.96	14,443,468.22	1,724,074.90	39.77095109	-80.70226758
9,363.00	8.88	66.12	9,277.15	309.13	875.48	14,443,473.20	1,724,088.42	39.77096466	-80.70219411
9,457.00	10.24	63.13	9,369.84	315.84	889.57	14,443,479.92	1,724,102.51	39.77098297	-80.70216920
9,551.00	11.65	61.11	9,462.13	324.21	905.33	14,443,488.28	1,724,118.27	39.77100579	-80.70211300
9,645.00	12.48	60.50	9,554.05	333.79	922.48	14,443,497.87	1,724,135.42	39.77103196	-80.70205185
9,739.00	13.71	65.77	9,645.61	343.37	941.48	14,443,507.44	1,724,154.42	39.77105808	-80.70198412
9,833.00	13.84	69.28	9,736.91	351.92	962.15	14,443,515.99	1,724,175.10	39.77108137	-80.70191044
9,927.00	13.23	67.61	9,828.29	359.99	982.61	14,443,524.06	1,724,195.56	39.77110336	-80.70183752
10,021.00	12.17	64.27	9,919.99	368.39	1,001.49	14,443,532.46	1,724,214.43	39.77112625	-80.70177026
10,105.00	12.17	64.19	10,002.11	376.09	1,017.43	14,443,540.16	1,724,230.38	39.77114725	-80.70171342
10,184.00	12.68	67.61	10,079.26	383.02	1,032.95	14,443,547.09	1,724,245.89	39.77116614	-80.70165812
10,278.00	11.95	65.94	10,171.09	390.91	1,051.37	14,443,554.99	1,724,264.32	39.77118766	-80.70159246
10,372.00	11.87	74.56	10,263.08	397.46	1,069.58	14,443,561.53	1,724,282.52	39.77120545	-80.70152758
10,466.00	11.34	72.36	10,355.16	402.83	1,087.70	14,443,566.90	1,724,300.65	39.77122005	-80.70146301
10,513.00	11.82	77.19	10,401.20	405.30	1,096.80	14,443,569.37	1,724,309.75	39.77122674	-80.70143060
10,560.00	14.11	84.14	10,447.00	406.95	1,107.20	14,443,571.02	1,724,320.14	39.77123118	-80.70139359
10,607.00	15.78	85.98	10,492.41	407.98	1,119.27	14,443,572.06	1,724,332.22	39.77123391	-80.70135061
10,654.00	17.40	92.75	10,537.46	408.09	1,132.67	14,443,572.17	1,724,345.61	39.77123409	-80.70130293
10,701.00	20.21	99.08	10,581.95	406.48	1,147.71	14,443,570.55	1,724,360.65	39.77122951	-80.70124942
10,749.00	22.32	104.18	10,626.68	402.93	1,164.74	14,443,567.01	1,724,377.68	39.77121963	-80.70118886
10,796.00	25.93	106.99	10,669.57	397.74	1,183.22	14,443,561.82	1,724,396.17	39.77120520	-80.70112313
10,843.00	29.49	106.46	10,711.17	391.46	1,204.15	14,443,555.53	1,724,417.10	39.77118776	-80.70104872
10,890.00	32.30	106.73	10,751.50	384.57	1,227.28	14,443,548.64	1,724,440.22	39.77116861	-80.70096651
10,938.00	35.02	108.31	10,791.45	376.55	1,252.64	14,443,540.62	1,724,465.58	39.77114635	-80.70087634
10,985.00	37.84	109.54	10,829.26	367.49	1,279.03	14,443,531.56	1,724,491.98	39.77112123	-80.70078251
11,032.00	40.69	110.15	10,865.65	357.38	1,307.01	14,443,521.46	1,724,519.95	39.77109323	-80.70068307
11,079.00	43.68	111.38	10,900.47	346.19	1,336.51	14,443,510.26	1,724,549.46	39.77106221	-80.70057821
11,126.00	46.14	113.14	10,933.76	333.61	1,367.21	14,443,497.68	1,724,580.16	39.77102739	-80.70046910
11,173.00	48.21	115.69	10,965.71	319.35	1,398.59	14,443,483.43	1,724,611.53	39.77098794	-80.70035760
11,219.00	51.20	118.42	10,995.45	303.38	1,429.82	14,443,467.46	1,724,642.76	39.77094380	-80.70024665
11,266.00	52.69	118.33	11,024.43	285.79	1,462.38	14,443,449.87	1,724,675.32	39.77089520	-80.70013098
11,313.00	55.68	120.53	11,051.93	267.06	1,495.56	14,443,431.13	1,724,708.50	39.77084344	-80.70001312
11,360.00	60.91	121.32	11,076.62	246.51	1,529.85	14,443,410.58	1,724,742.79	39.77078669	-80.69989135
11,406.00	65.08	122.46	11,097.50	224.86	1,564.63	14,443,388.93	1,724,777.57	39.77072691	-80.69976781
11,453.00	68.16	124.83	11,116.15	200.95	1,600.53	14,443,365.03	1,724,813.48	39.77066093	-80.69964033
11,500.00	70.75	127.91	11,132.65	174.85	1,635.96	14,443,338.93	1,724,848.90	39.77058892	-80.69951457
11,547.00	73.74	130.63	11,146.98	146.52	1,670.59	14,443,310.59	1,724,883.54	39.77051079	-80.69939163
11,594.00	76.20	133.01	11,159.17	116.25	1,704.41	14,443,280.33	1,724,917.36	39.77042736	-80.69927164
11,641.00	79.54	137.22	11,169.05	83.70	1,736.82	14,443,247.77	1,724,949.76	39.77033767	-80.69915670
11,688.00	81.34	141.62	11,176.86	48.51	1,766.96	14,443,212.58	1,724,979.90	39.77024074	-80.69904987
11,719.00	82.05	146.01	11,181.34	23.75	1,785.06	14,443,187.83	1,724,998.01	39.77017260	-80.69898573
11,751.00	82.18	147.33	11,185.73	-2.73	1,802.48	14,443,161.35	1,725,015.42	39.77009971	-80.69892407
11,782.00	82.27	147.68	11,189.92	-28.63	1,818.98	14,443,135.44	1,725,031.92	39.77002841	-80.69886565
11,814.00	82.22	147.24	11,194.24	-55.36	1,836.03	14,443,108.71	1,725,048.98	39.76995484	-80.69880528
11,877.00	82.88	148.91	11,202.41	-108.38	1,869.07	14,443,055.69	1,725,082.01	39.76980894	-80.69868836
11,909.00	84.07	152.25	11,206.05	-136.07	1,884.68	14,443,028.00	1,725,097.62	39.76973275	-80.69863313
11,971.00	84.20	152.25	11,212.38	-190.65	1,913.40	14,442,973.42	1,725,126.34	39.76958259	-80.69853158
12,066.00	86.26	151.46	11,220.28	-274.12	1,958.05	14,442,889.95	1,725,170.99	39.76935294	-80.69837367
12,160.00	86.04	152.08	11,226.60	-356.76	2,002.41	14,442,807.32	1,725,215.36	39.76912561	-80.69821678
12,254.00	86.00	151.99	11,233.12	-439.58	2,046.39	14,442,724.49	1,725,259.33	39.76889774	-80.69806128
12,348.00	88.11	150.85	11,237.95	-522.01	2,091.29	14,442,642.06	1,725,304.24	39.76867095	-80.69790246
12,443.00	88.55	150.67	11,240.72	-604.87	2,137.68	14,442,559.20	1,725,350.62	39.76844297	-80.69773838
12,537.00	88.46	149.71	11,243.17	-686.40	2,184.39	14,442,477.67	1,725,397.33	39.76821862	-80.69757312
12,632.00	89.65	151.55	11,244.74	-769.18	2,230.97	14,442,394.90	1,725,443.92	39.76799087	-80.69740834

Company: Tug Hill Operating LLC	Local Co-ordinate Reference: Well Knob Creek S-16HU (slot P)
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-16HU (slot P)	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
12,725.00	89.91	151.20	11,245.09	-850.81	2,275.53	14,442,313.27	1,725,488.47	39.76776627	-80.69725077
12,819.00	90.44	150.76	11,244.81	-933.01	2,321.13	14,442,231.07	1,725,534.07	39.76754011	-80.69708948
12,913.00	89.65	150.32	11,244.73	-1,014.85	2,367.36	14,442,149.22	1,725,580.30	39.76731492	-80.69692595
13,007.00	89.08	151.81	11,245.78	-1,097.11	2,412.83	14,442,066.96	1,725,625.78	39.76708859	-80.69676511
13,101.00	88.07	152.25	11,248.11	-1,180.10	2,456.91	14,441,983.97	1,725,669.85	39.76686026	-80.69666092
13,195.00	88.20	152.69	11,251.17	-1,263.41	2,500.33	14,441,900.66	1,725,713.27	39.76663106	-80.69645574
13,289.00	88.42	152.61	11,253.94	-1,346.87	2,543.50	14,441,817.20	1,725,756.44	39.76640147	-80.69630313
13,383.00	88.20	152.34	11,256.72	-1,430.19	2,586.92	14,441,733.88	1,725,799.86	39.76617223	-80.69614961
13,477.00	88.29	151.90	11,259.60	-1,513.24	2,630.86	14,441,650.83	1,725,843.80	39.76594374	-80.69599427
13,571.00	88.77	152.25	11,262.01	-1,596.27	2,674.86	14,441,567.80	1,725,887.81	39.76571532	-80.69583867
13,665.00	89.25	152.25	11,263.63	-1,679.45	2,718.62	14,441,484.63	1,725,931.57	39.76548649	-80.69568395
13,759.00	88.24	151.29	11,265.69	-1,762.24	2,763.07	14,441,401.83	1,725,976.02	39.76525869	-80.69552676
13,853.00	87.89	149.44	11,268.86	-1,843.90	2,809.53	14,441,320.18	1,726,022.47	39.76503401	-80.69536245
13,947.00	87.98	148.47	11,272.25	-1,924.38	2,857.97	14,441,239.69	1,726,070.91	39.76481253	-80.69519103
14,041.00	87.89	148.47	11,275.64	-2,004.45	2,907.10	14,441,159.62	1,726,120.04	39.76459218	-80.69501719
14,135.00	89.03	148.56	11,278.16	-2,084.58	2,956.17	14,441,079.49	1,726,169.11	39.76437166	-80.69484352
14,229.00	88.81	148.04	11,279.94	-2,164.54	3,005.56	14,440,999.53	1,726,218.50	39.76415160	-80.69466875
14,323.00	90.09	148.74	11,280.84	-2,244.59	3,054.82	14,440,919.48	1,726,267.76	39.76393131	-80.69449441
14,417.00	89.82	148.21	11,280.91	-2,324.72	3,103.97	14,440,839.36	1,726,316.91	39.76371080	-80.69432049
14,511.00	89.74	148.04	11,281.27	-2,404.54	3,153.61	14,440,759.53	1,726,366.55	39.76349111	-80.69414482
14,606.00	88.46	149.09	11,282.77	-2,485.59	3,203.15	14,440,678.49	1,726,416.09	39.76326808	-80.69396953
14,700.00	88.68	147.60	11,285.11	-2,565.57	3,252.46	14,440,598.50	1,726,465.40	39.76304795	-80.69379502
14,794.00	89.21	149.53	11,286.84	-2,645.76	3,301.47	14,440,518.31	1,726,514.42	39.76282728	-80.69362158
14,887.00	88.64	149.79	11,288.59	-2,726.01	3,348.44	14,440,438.06	1,726,561.39	39.76260645	-80.69345542
14,982.00	88.90	149.88	11,290.63	-2,808.13	3,396.17	14,440,355.95	1,726,609.11	39.76238049	-80.69328659
15,075.00	88.73	151.64	11,292.55	-2,889.26	3,441.59	14,440,274.82	1,726,654.53	39.76215726	-80.69312597
15,169.00	89.21	150.41	11,294.24	-2,971.47	3,487.11	14,440,192.60	1,726,700.06	39.76193104	-80.69296497
15,263.00	88.55	151.38	11,296.08	-3,053.59	3,532.83	14,440,110.49	1,726,745.77	39.76170510	-80.69280331
15,357.00	88.73	151.46	11,298.31	-3,136.11	3,577.78	14,440,027.96	1,726,790.73	39.76147805	-80.69264434
15,452.00	89.12	151.55	11,300.09	-3,219.59	3,623.10	14,439,944.49	1,726,836.04	39.76124837	-80.69248412
15,547.00	87.63	151.29	11,302.78	-3,302.98	3,668.52	14,439,861.10	1,726,881.47	39.76101894	-80.69232349
15,641.00	87.80	151.20	11,306.53	-3,385.32	3,713.71	14,439,778.76	1,726,926.65	39.76079237	-80.69216372
15,735.00	88.20	151.29	11,309.81	-3,467.68	3,758.90	14,439,696.40	1,726,971.84	39.76056577	-80.69200391
15,830.00	88.51	151.38	11,312.54	-3,551.00	3,804.45	14,439,613.08	1,727,017.39	39.76033652	-80.69184285
15,924.00	88.77	151.20	11,314.77	-3,633.42	3,849.59	14,439,530.65	1,727,062.54	39.76010974	-80.69168322
16,019.00	89.03	151.38	11,316.59	-3,716.72	3,895.22	14,439,447.35	1,727,108.16	39.75988053	-80.69152189
16,113.00	89.34	151.81	11,317.93	-3,799.40	3,939.93	14,439,364.67	1,727,152.88	39.75965306	-80.69136381
16,208.00	87.63	150.85	11,320.44	-3,882.72	3,985.49	14,439,281.36	1,727,198.44	39.75942381	-80.69120272
16,301.00	87.71	150.50	11,324.22	-3,963.73	4,031.00	14,439,200.34	1,727,243.95	39.75920089	-80.69104177
16,395.00	87.32	149.18	11,328.30	-4,044.93	4,078.18	14,439,119.14	1,727,291.13	39.75897746	-80.69087488
16,490.00	87.85	147.60	11,332.30	-4,125.76	4,127.93	14,439,038.31	1,727,340.87	39.75875500	-80.69069887
16,584.00	89.60	149.71	11,334.40	-4,206.01	4,176.81	14,438,958.06	1,727,389.75	39.75853414	-80.69052592
16,678.00	89.96	149.00	11,334.76	-4,286.89	4,224.72	14,438,877.19	1,727,437.67	39.75831159	-80.69035643
16,772.00	90.35	148.65	11,334.50	-4,367.31	4,273.38	14,438,796.76	1,727,486.33	39.75809026	-80.69018428
16,866.00	89.78	149.18	11,334.40	-4,447.81	4,321.92	14,438,716.26	1,727,534.86	39.75786872	-80.69001259
16,960.00	88.86	148.83	11,335.51	-4,528.38	4,370.32	14,438,635.69	1,727,583.26	39.75764699	-80.68984135
17,054.00	88.95	149.09	11,337.31	-4,608.91	4,418.78	14,438,555.17	1,727,631.72	39.75742539	-80.68966991
17,148.00	89.38	148.30	11,338.88	-4,689.21	4,467.62	14,438,474.86	1,727,680.56	39.75720438	-80.68949714
17,242.00	89.38	148.21	11,339.69	-4,769.15	4,517.07	14,438,394.93	1,727,730.01	39.75698440	-80.68932216
17,336.00	90.00	148.39	11,340.20	-4,849.12	4,566.46	14,438,314.95	1,727,779.41	39.75676429	-80.68914740
17,430.00	89.25	148.56	11,340.82	-4,929.25	4,615.61	14,438,234.83	1,727,828.55	39.75654378	-80.68897351
17,523.00	87.67	150.50	11,343.32	-5,009.37	4,662.75	14,438,154.71	1,727,877.69	39.75632330	-80.68880677
17,618.00	87.98	151.02	11,346.92	-5,092.20	4,709.12	14,438,071.87	1,727,922.06	39.75609537	-80.68864280
17,712.00	88.15	150.67	11,350.10	-5,174.24	4,754.89	14,437,989.83	1,727,967.83	39.75586962	-80.68848097
17,806.00	88.59	151.38	11,352.77	-5,256.44	4,800.41	14,437,907.63	1,728,013.35	39.75564344	-80.68832003

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Kneb Creek S-16HU (slot P)
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-16HU (slot P)	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
17,899.00	87.93	151.38	11,355.59	-5,338.04	4,844.93	14,437,826.03	1,728,057.88	39.75541892	-80.68816262
17,992.00	88.20	151.29	11,358.73	-5,419.60	4,889.52	14,437,744.47	1,728,102.46	39.75519452	-80.68800499
18,085.00	88.68	150.85	11,361.27	-5,500.96	4,934.49	14,437,663.11	1,728,147.43	39.75497065	-80.68784599
18,179.00	88.07	150.50	11,363.93	-5,582.88	4,980.51	14,437,581.19	1,728,193.45	39.75474523	-80.68768327
18,272.00	87.85	150.58	11,367.24	-5,663.81	5,026.22	14,437,500.27	1,728,239.16	39.75452255	-80.68752164
18,366.00	88.42	150.06	11,370.30	-5,745.43	5,072.74	14,437,418.64	1,728,285.68	39.75429795	-80.68735713
18,459.00	88.73	149.18	11,372.61	-5,825.64	5,119.76	14,437,338.44	1,728,332.70	39.75407723	-80.68719084
18,554.00	89.17	148.83	11,374.36	-5,907.06	5,168.67	14,437,257.02	1,728,381.61	39.75385316	-80.68701782
18,648.00	89.47	149.00	11,375.47	-5,987.55	5,217.20	14,437,176.52	1,728,430.14	39.75363163	-80.68684615
18,742.00	89.91	148.65	11,375.98	-6,067.98	5,265.86	14,437,096.10	1,728,478.80	39.75341030	-80.68667403
18,836.00	89.03	149.18	11,376.85	-6,148.47	5,314.39	14,437,015.60	1,728,527.33	39.75318876	-80.68650236
18,930.00	87.85	149.09	11,379.41	-6,229.13	5,362.59	14,436,934.94	1,728,575.54	39.75296680	-80.68633185
19,024.00	88.20	148.83	11,382.65	-6,309.62	5,411.03	14,436,854.45	1,728,623.98	39.75274528	-80.68616051
19,118.00	88.77	148.30	11,385.13	-6,389.80	5,460.04	14,436,774.28	1,728,672.98	39.75252462	-80.68598714
19,212.00	89.21	147.77	11,386.79	-6,469.53	5,509.79	14,436,694.54	1,728,722.74	39.75230517	-80.68581111
19,307.00	89.38	148.83	11,387.96	-6,550.35	5,559.71	14,436,613.72	1,728,772.65	39.75208274	-80.68563453
19,401.00	89.96	148.39	11,388.50	-6,630.59	5,608.67	14,436,533.48	1,728,821.61	39.75186191	-80.68546134
19,494.00	89.65	148.83	11,388.82	-6,709.98	5,657.11	14,436,454.09	1,728,870.05	39.75164342	-80.68528999
19,588.00	88.59	148.83	11,390.26	-6,790.40	5,705.76	14,436,373.68	1,728,918.70	39.75142210	-80.68511792
19,682.00	89.21	147.24	11,392.07	-6,870.13	5,755.51	14,436,293.95	1,728,968.45	39.75120266	-80.68494190
19,776.00	88.02	147.16	11,394.34	-6,949.12	5,806.41	14,436,214.96	1,729,019.36	39.75098524	-80.68476178
19,870.00	88.46	147.95	11,397.22	-7,028.41	5,856.82	14,436,135.67	1,729,069.76	39.75076701	-80.68458344
19,964.00	88.90	150.06	11,399.39	-7,108.96	5,905.21	14,436,055.12	1,729,118.15	39.75054532	-80.68441228
20,057.00	88.02	151.64	11,401.89	-7,190.15	5,950.49	14,435,973.93	1,729,163.43	39.75032192	-80.68425219
20,152.00	88.59	151.46	11,404.70	-7,273.64	5,995.73	14,435,890.44	1,729,208.67	39.75009219	-80.68409229
20,245.00	89.17	150.50	11,406.52	-7,354.94	6,040.84	14,435,809.13	1,729,253.78	39.74986846	-80.68393284
20,338.00	88.07	151.02	11,408.76	-7,436.07	6,086.25	14,435,728.01	1,729,299.19	39.74964523	-80.68377228
20,432.00	88.42	150.94	11,411.64	-7,518.23	6,131.83	14,435,645.85	1,729,344.77	39.74941916	-80.68361115
20,526.00	88.90	150.58	11,413.83	-7,600.23	6,177.73	14,435,563.85	1,729,390.67	39.74919352	-80.68344887
20,620.00	89.38	150.41	11,415.24	-7,682.03	6,224.02	14,435,482.05	1,729,436.96	39.74896843	-80.68328521
20,672.00	89.69	149.97	11,415.67	-7,727.15	6,249.87	14,435,436.93	1,729,462.81	39.74884427	-80.68319382
Survey @ 20672.00 MD 11415.67 TVD									
20,730.00	89.69	149.97	11,415.98	-7,777.36	6,278.90	14,435,386.71	1,729,491.84	39.74870609	-80.68309118
Survey projected to 20730.00 MD 11415.98 TVD									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
148.00	148.00	-0.16	0.60	MWD surveys
20,672.00	11,415.67	-7,727.15	6,249.87	Survey @ 20672.00 MD 11415.67 TVD
20,730.00	11,415.98	-7,777.36	6,278.90	Survey projected to 20730.00 MD 11415.98 TVD