



Well: Hudson S-16 HU (slot P)
Site: Hudson Alt North
Project: Marshall County, West Virginia NAD83 UTM 17N
Design: rev13
Rig: Nabors X08

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Annotation
1	11368.00	22.46	49.550	10622.73	2210.64	2696.84	0.00	0.00	218.60	Survey @ 11368.00 MD 10622.73 TVD
2	11701.50	22.46	49.550	10930.94	2293.30	2793.80	0.00	0.00	224.13	KOP Begin 6°/100' build/turn
3	11905.86	34.71	48.666	11110.04	2357.30	2867.48	6.00	-2.37	227.46	Begin 8°/100' build/turn
4	13102.13	89.00	150.091	11774.00	1969.26	3600.05	8.00	99.99	1010.57	Begin 89.00° lateral
5	30748.83	89.00	150.091	12080.75	-13324.86	12397.87	0.00	0.00	8200.53	PBHL/TD 30748.83 MD 12080.75 TVD

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Hudson N-16HU LP r1311774.00	1969.26	3600.05	4466481.09	1735922.16	39.834034126	-80.659793574	
- plan hits target center							
Hudson N-16HU PBHL 12080.75	-13324.86	12397.87	4451187.00	31744719.962	39.791937000	-80.628681000	
- plan hits target center							

ANNOTATIONS SURVEYS

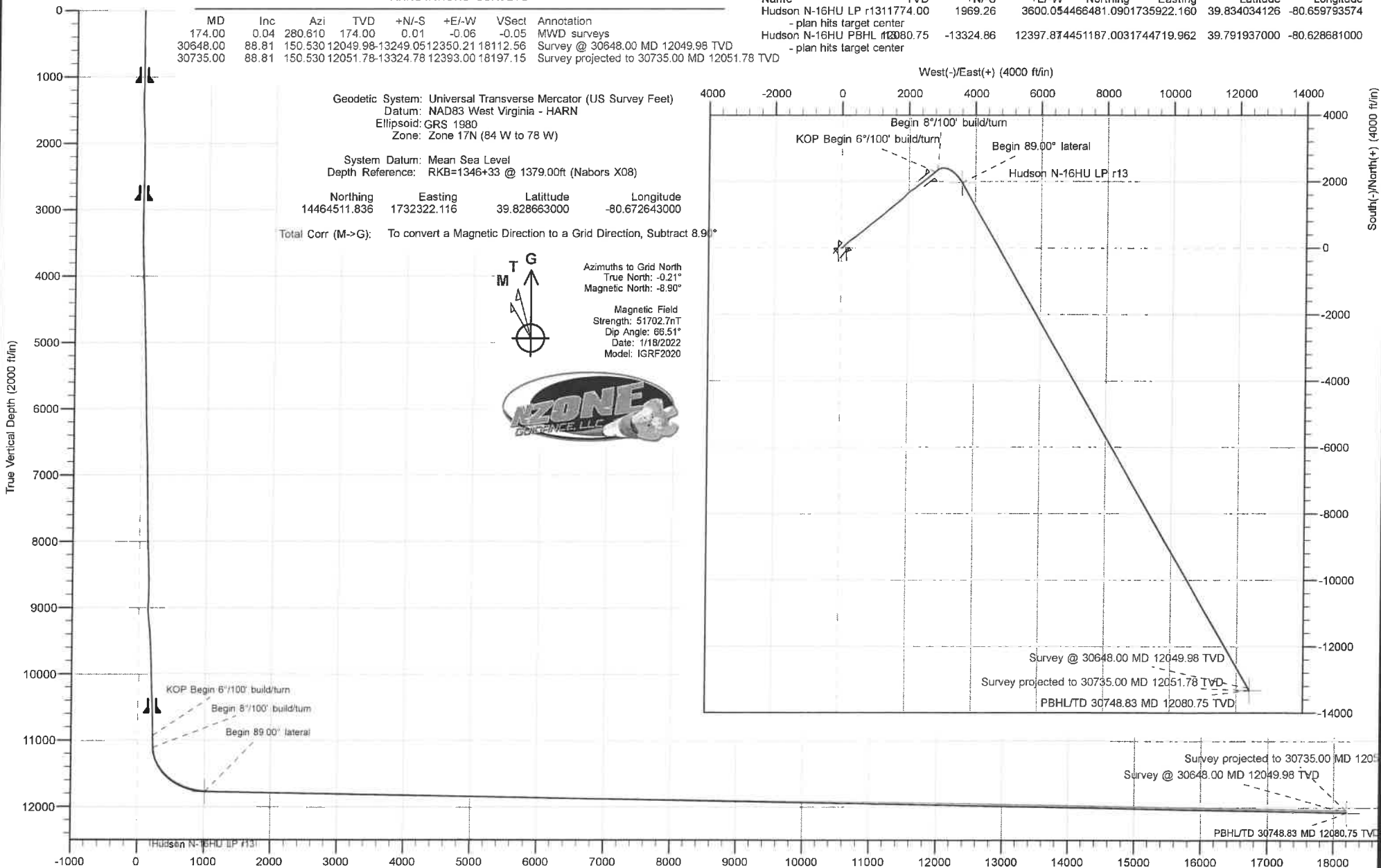
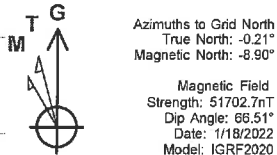
MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Annotation
174.00	0.04	280.610	174.00	0.01	-0.06	-0.05	MWD surveys
30648.00	88.81	150.530	12049.98	-13249.05	12350.21	18112.56	Survey @ 30648.00 MD 12049.98 TVD
30735.00	88.81	150.530	12051.78	-13324.78	12393.00	18197.15	Survey projected to 30735.00 MD 12051.78 TVD

Geodetic System: Universal Transverse Mercator (US Survey Feet)
 Datum: NAD83 West Virginia - HARN
 Ellipsoid: GRS 1980
 Zone: Zone 17N (84 W to 78 W)

System Datum: Mean Sea Level
 Depth Reference: RKB=1346+33 @ 1379.00ft (Nabors X08)

Northing	Easting	Latitude	Longitude
14464511.836	1732322.116	39.828663000	-80.672643000

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.91°





Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hudson S-16 HU (slot P)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Site:	Hudson Alt North	MD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Well:	Hudson S-16 HU (slot P)	North Reference:	Grid
Wellbore:	Original hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original hole	Database:	DB_Feb1422LT

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

Site	Hudson Alt North				
Site Position:		Northing:	14,464,552.095 usft	Latitude:	39.82877400
From:	Lat/Long	Easting:	1,732,278.451 usft	Longitude:	-80.67279800
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "		

Well	Hudson S-16 HU (slot P)					
Well Position	+N-S	0.00 ft	Northing:	14,464,511.836 usft	Latitude:	39.82866300
	+E-W	0.00 ft	Easting:	1,732,322.116 usft	Longitude:	-80.67264300
Position Uncertainty	0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,346.00 ft	
Grid Convergence:	0.21 °					

Wellbore	Original hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	1/18/2022	-8.69	66.51	51,702.66707092

Design	Surveys Original hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N-S (ft)	+E-W (ft)	Direction (°)	
	0.00	0.00	0.00	137.060	

Survey Program	Date 2/17/2022			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
174.00	1,074.00	MWD surf (Original hole)	MWD	MWD - Standard
1,120.00	2,842.00	MWD int (Original hole)	MWD	MWD - Standard
2,962.00	11,368.00	MWD (Original hole)	MWD	MWD - Standard
11,472.00	30,648.00	MWD Lat (Original hole)	MWD	MWD - Standard
30,735.00	30,735.00	Projection (Original hole)	NS-GYRO-MS	North sensing gyrocompassing m/s

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
174.00	0.04	280.610	174.00	0.01	-0.06	-0.05	0.02	0.02	0.00	
MWD surveys										
211.00	0.22	23.440	211.00	0.08	-0.04	-0.09	0.63	0.49	277.92	
241.00	0.22	344.510	241.00	0.19	-0.04	-0.16	0.49	0.00	-129.77	
272.00	0.53	8.770	272.00	0.39	-0.03	-0.30	1.10	1.00	78.28	



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Project: Marshall County, West Virginia NAD83 UTM 17N
Site: Hudson All North
Well: Hudson S-16 HU (slot P)
Wellbore: Original hole
Design: Surveys Original hole

Local Co-ordinate Reference: Well Hudson S-16 HU (slot P)
TVD Reference: RKB=1346+33 @ 1379.00ft (Nabors X08)
MD Reference: RKB=1346+33 @ 1379.00ft (Nabors X08)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
303.00	0.57	23.970	303.00	0.67	0.05	-0.45	0.49	0.13	49.03
333.00	0.44	18.960	333.00	0.91	0.15	-0.57	0.46	-0.43	-16.70
363.00	0.62	40.670	363.00	1.15	0.30	-0.64	0.89	0.60	72.37
394.00	0.61	56.310	393.99	1.36	0.54	-0.63	0.54	-0.03	50.45
424.00	0.62	47.000	423.99	1.56	0.79	-0.60	0.33	0.03	-31.03
455.00	0.66	68.000	454.99	1.75	1.08	-0.54	0.76	0.13	67.74
486.00	0.75	86.990	485.99	1.82	1.45	-0.35	0.80	0.29	61.26
517.00	0.57	91.730	516.99	1.83	1.81	-0.11	0.61	-0.58	15.29
547.00	0.62	100.960	546.98	1.79	2.11	0.13	0.36	0.17	30.77
578.00	0.31	69.500	577.98	1.79	2.36	0.30	1.26	-1.00	-101.48
609.00	0.35	77.140	608.98	1.84	2.53	0.37	0.19	0.13	24.65
639.00	0.35	65.540	638.98	1.90	2.70	0.45	0.24	0.00	-38.67
670.00	0.26	52.180	669.98	1.98	2.84	0.49	0.37	-0.29	-43.10
701.00	0.22	47.090	700.98	2.07	2.94	0.49	0.15	-0.13	-16.42
732.00	0.31	17.640	731.98	2.19	3.01	0.45	0.52	0.29	-95.00
763.00	0.18	34.960	762.98	2.31	3.06	0.40	0.48	-0.42	55.87
794.00	0.31	41.110	793.98	2.41	3.15	0.38	0.43	0.42	19.84
826.00	0.40	41.020	825.98	2.56	3.28	0.36	0.28	0.28	-0.28
857.00	0.57	37.150	856.98	2.76	3.44	0.32	0.56	0.55	-12.48
888.00	0.57	29.510	887.98	3.02	3.61	0.25	0.24	0.00	-24.65
919.00	0.62	51.220	918.98	3.26	3.82	0.21	0.74	0.16	70.03
940.00	0.53	34.250	939.97	3.41	3.96	0.20	0.91	-0.43	-80.81
981.00	0.70	43.910	980.97	3.75	4.24	0.15	0.48	0.41	23.56
1,012.00	0.66	28.630	1,011.97	4.04	4.46	0.08	0.60	-0.13	-49.29
1,043.00	0.53	19.660	1,042.97	4.33	4.59	-0.04	0.51	-0.42	-28.94
1,074.00	0.48	354.000	1,073.97	4.60	4.63	-0.21	0.74	-0.16	-82.77
1,120.00	1.23	335.540	1,119.96	5.24	4.40	-0.84	1.72	1.63	-40.13
1,169.00	1.40	322.710	1,168.95	6.19	3.82	-1.93	0.69	0.35	-26.18
1,263.00	1.27	325.700	1,262.92	7.97	2.54	-4.10	0.16	-0.14	3.18
1,294.00	1.18	328.420	1,293.92	8.52	2.18	-4.76	0.35	-0.29	8.77
1,325.00	0.92	348.290	1,324.91	9.04	1.96	-5.28	1.43	-0.84	64.10
1,357.00	0.44	331.850	1,356.91	9.40	1.85	-5.62	1.60	-1.50	-51.38
1,388.00	0.26	29.510	1,387.91	9.56	1.83	-5.76	1.20	-0.58	186.00
1,419.00	0.44	78.810	1,418.91	9.65	1.98	-5.71	1.08	0.58	159.03
1,450.00	0.88	105.800	1,449.91	9.61	2.33	-5.45	1.70	1.42	87.06
1,497.00	1.45	108.700	1,496.90	9.32	3.24	-4.62	1.22	1.21	6.17
1,544.00	1.98	108.700	1,543.87	8.87	4.57	-3.38	1.13	1.13	0.00
1,639.00	3.47	105.010	1,638.76	7.60	8.90	0.50	1.58	1.57	-3.88
1,734.00	4.88	95.870	1,733.51	6.44	15.70	5.98	1.64	1.48	-9.62
1,828.00	5.54	79.520	1,827.13	6.86	24.14	11.42	1.72	0.70	-17.39
1,922.00	5.49	59.830	1,920.70	9.94	32.49	14.85	2.00	-0.05	-20.95
2,016.00	5.89	47.610	2,014.24	15.45	39.94	15.89	1.35	0.43	-13.00
2,111.00	7.08	48.140	2,108.63	22.65	47.90	16.05	1.25	1.25	0.56
2,207.00	7.08	44.630	2,203.90	30.80	56.46	15.91	0.45	0.00	-3.66



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Survey

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2,301.00	7.51	44.100	2,297.14	39.34	64.81	15.35	0.46	0.46	-0.56
2,395.00	7.56	38.560	2,390.33	48.58	72.94	14.12	0.77	0.05	-5.89
2,489.00	6.72	42.870	2,483.60	57.45	80.53	12.80	1.06	-0.89	4.59
2,583.00	5.80	46.120	2,577.04	64.77	87.70	12.32	1.05	-0.98	3.46
2,678.00	5.19	33.460	2,671.60	71.69	93.53	11.23	1.42	-0.64	-13.33
2,773.00	5.58	29.510	2,766.19	79.29	98.17	8.83	0.57	0.41	-4.16
2,842.00	5.40	37.070	2,834.87	84.80	101.78	7.26	1.08	-0.26	10.96
2,962.00	6.28	44.800	2,954.25	93.96	109.81	6.02	0.98	0.73	6.44
3,056.00	11.07	47.000	3,047.15	103.77	120.04	5.81	5.11	5.10	2.34
3,151.00	14.90	46.210	3,139.70	118.45	135.53	5.61	4.04	4.03	-0.83
3,244.00	16.04	43.660	3,229.33	136.02	153.03	4.67	1.43	1.23	-2.74
3,337.00	15.34	46.910	3,318.86	153.72	170.89	3.88	1.21	-0.75	3.49
3,431.00	14.19	51.040	3,409.76	169.46	188.93	4.65	1.66	-1.22	4.39
3,526.00	14.33	49.280	3,501.84	184.45	206.89	5.91	0.48	0.15	-1.85
3,619.00	15.64	51.220	3,591.67	199.81	225.39	7.27	1.51	1.41	2.09
3,713.00	17.62	53.770	3,681.74	216.16	246.74	9.85	2.24	2.11	2.71
3,808.00	18.85	55.440	3,771.96	233.36	270.98	13.77	1.41	1.29	1.76
3,901.00	18.63	52.980	3,860.04	250.83	295.22	17.49	0.88	-0.24	-2.65
3,996.00	19.95	55.000	3,949.70	269.26	320.61	21.29	1.56	1.39	2.13
4,090.00	19.86	53.850	4,038.09	287.88	346.64	25.39	0.43	-0.10	-1.22
4,184.00	19.42	50.600	4,126.62	307.22	371.61	28.25	1.25	-0.47	-3.46
4,278.00	20.13	52.540	4,215.08	326.97	396.52	30.76	1.03	0.76	2.06
4,372.00	19.42	51.130	4,303.53	346.62	421.53	33.41	0.91	-0.76	-1.50
4,466.00	20.08	51.480	4,392.00	366.48	446.32	35.76	0.71	0.70	0.37
4,560.00	20.48	52.980	4,480.18	386.43	472.08	38.70	0.70	0.43	1.60
4,654.00	19.20	49.550	4,568.60	406.36	496.97	41.07	1.84	-1.36	-3.65
4,749.00	18.90	51.660	4,658.40	426.04	520.93	42.98	0.79	-0.32	2.22
4,843.00	20.61	55.350	4,746.86	444.89	546.48	46.59	2.25	1.82	3.93
4,937.00	21.97	53.410	4,834.45	464.78	574.21	50.92	1.63	1.45	-2.06
5,031.00	20.52	47.530	4,922.07	486.39	600.48	53.00	2.74	-1.54	-6.26
5,124.00	20.00	49.810	5,009.32	507.66	624.66	53.90	1.02	-0.56	2.45
5,217.00	19.95	54.910	5,096.73	527.04	648.79	56.83	1.87	-0.05	5.48
5,313.00	19.73	53.680	5,187.03	546.06	676.25	60.93	0.49	-0.23	-1.28
5,408.00	19.73	51.390	5,276.45	565.56	701.70	63.99	0.81	0.00	-2.41
5,502.00	19.91	50.600	5,364.89	585.62	726.47	66.18	0.34	0.19	-0.84
5,596.00	19.95	49.810	5,453.26	606.13	751.08	67.94	0.29	0.04	-0.84
5,691.00	20.26	50.510	5,542.47	627.05	776.16	69.70	0.41	0.33	0.74
5,785.00	20.35	50.950	5,630.63	647.69	801.41	71.79	0.19	0.10	0.47
5,879.00	20.74	49.370	5,718.65	668.83	826.74	73.57	0.72	0.41	-1.68
5,972.00	19.25	49.110	5,806.04	689.59	850.82	74.78	1.60	-1.60	-0.28
6,066.00	19.47	50.870	5,894.72	709.62	874.69	76.38	0.65	0.23	1.87
6,160.00	19.03	50.510	5,983.47	729.25	898.67	78.34	0.48	-0.47	-0.38
6,255.00	18.63	49.370	6,073.38	748.98	922.14	79.89	0.57	-0.42	-1.20



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MD Reference: RKB=1346+33 @ 1379.00ft (Nabors X08)
North Reference: Grid
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Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
6,349.00	18.72	49.550	6,162.44	768.55	945.01	81.15	0.11	0.10	0.19
6,443.00	19.29	51.570	6,251.31	787.98	968.65	83.02	0.93	0.61	2.15
6,537.00	20.74	54.640	6,339.64	807.27	994.39	86.44	1.90	1.54	3.27
6,631.00	20.52	53.500	6,427.61	826.70	1,021.21	90.48	0.49	-0.23	-1.21
6,726.00	19.69	53.410	6,516.82	846.14	1,047.45	94.12	0.87	-0.87	-0.09
6,821.00	20.00	52.540	6,606.18	865.56	1,073.19	97.44	0.45	0.33	-0.92
6,914.00	22.19	50.870	6,692.94	886.32	1,099.44	100.13	2.44	2.35	-1.80
7,040.00	20.87	49.020	6,810.15	916.06	1,134.85	102.48	1.18	-1.05	-1.47
7,134.00	20.79	51.040	6,898.00	937.53	1,160.46	104.21	0.77	-0.09	2.15
7,200.00	20.74	51.830	6,959.72	952.12	1,178.75	105.99	0.43	-0.08	1.20
7,294.00	19.95	50.160	7,047.85	972.68	1,204.15	108.24	1.04	-0.84	-1.78
7,388.00	20.92	50.250	7,135.94	993.68	1,229.37	110.04	1.03	1.03	0.10
7,481.00	22.72	48.840	7,222.27	1,016.12	1,255.86	111.53	2.02	1.94	-1.52
7,576.00	25.18	46.560	7,309.09	1,042.10	1,284.15	111.92	2.77	2.59	-2.40
7,681.00	26.54	48.400	7,403.57	1,073.03	1,317.91	112.27	1.50	1.30	1.75
7,784.00	25.58	47.440	7,478.13	1,097.46	1,344.98	112.83	1.26	-1.16	-1.16
7,858.00	25.66	49.550	7,562.89	1,124.39	1,375.41	113.85	0.97	0.09	2.24
7,952.00	26.24	51.390	7,647.42	1,150.56	1,407.14	116.30	1.06	0.62	1.96
8,047.00	27.91	48.230	7,732.01	1,178.48	1,440.14	118.34	2.32	1.76	-3.33
8,170.00	29.58	49.900	7,839.85	1,217.22	1,484.83	120.43	1.51	1.36	1.36
8,235.00	29.66	50.070	7,896.35	1,237.88	1,509.44	122.07	0.18	0.12	0.28
8,329.00	29.97	50.430	7,977.91	1,267.76	1,545.37	124.67	0.38	0.33	0.38
8,424.00	29.62	49.460	8,060.35	1,298.13	1,581.50	127.05	0.63	-0.37	-1.02
8,518.00	29.31	50.430	8,142.19	1,327.89	1,616.89	129.37	0.61	-0.33	1.03
8,612.00	29.79	51.390	8,223.97	1,357.12	1,652.88	132.49	0.72	0.51	1.02
8,735.00	31.68	51.130	8,329.69	1,396.46	1,701.90	137.09	1.54	1.54	-0.21
8,801.00	30.63	51.310	8,386.17	1,417.84	1,728.52	139.57	1.60	-1.59	0.27
8,895.00	31.03	49.280	8,466.89	1,448.62	1,765.57	142.28	1.19	0.43	-2.16
8,989.00	30.94	50.780	8,547.47	1,479.70	1,802.66	144.79	0.83	-0.10	1.60
9,082.00	29.62	49.550	8,627.78	1,509.73	1,838.67	147.34	1.57	-1.42	-1.32
9,176.00	27.73	46.210	8,710.26	1,539.94	1,872.14	148.02	2.64	-2.01	-3.55
9,270.00	24.79	42.080	8,794.55	1,569.71	1,901.14	145.98	3.68	-3.13	-4.39
9,364.00	26.67	40.320	8,879.23	1,600.43	1,928.00	141.60	2.16	2.00	-1.87
9,458.00	29.79	42.160	8,962.04	1,633.83	1,957.33	137.33	3.45	3.32	1.96
9,551.00	32.65	48.230	9,041.59	1,667.68	1,991.57	135.88	4.57	3.08	6.53
9,646.00	33.18	55.790	9,121.37	1,699.38	2,032.20	140.33	4.36	0.56	7.96
9,740.00	33.57	56.930	9,199.87	1,728.03	2,075.25	148.69	0.79	0.41	1.21
9,834.00	34.80	57.550	9,277.63	1,756.60	2,119.66	158.03	1.36	1.31	0.66
9,928.00	33.27	55.260	9,355.53	1,785.69	2,163.49	166.59	2.12	-1.63	-2.44
10,024.00	31.16	53.150	9,436.75	1,815.59	2,205.01	172.99	2.49	-2.20	-2.20
10,113.00	30.63	51.660	9,513.12	1,843.47	2,241.22	177.25	1.05	-0.60	-1.67
10,202.00	29.44	51.220	9,590.17	1,871.23	2,276.05	180.65	1.36	-1.34	-0.49
10,296.00	28.13	51.920	9,672.55	1,899.37	2,311.51	184.21	1.44	-1.39	0.74



Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia NAD83 UTM 17N
Site: Hudson Alt North
Well: Hudson S-16 HU (slot P)
Wellbore: Original hole
Design: Surveys Original hole

Local Co-ordinate Reference: Well Hudson S-16 HU (slot P)
TVD Reference: RKB=1346+33 @ 1379.00ft (Nabors X08)
MD Reference: RKB=1346+33 @ 1379.00ft (Nabors X08)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
10,390.00	27.91	50.870	9,755.53	1,926.92	2,346.01	187.54	0.57	-0.23	-1.12
10,484.00	27.29	51.040	9,838.83	1,954.35	2,379.84	190.50	0.66	-0.66	0.18
10,579.00	26.63	50.510	9,923.51	1,981.59	2,413.20	193.30	0.74	-0.69	-0.56
10,672.00	26.41	51.220	10,006.72	2,007.80	2,445.41	196.05	0.41	-0.24	0.76
10,766.00	27.51	49.640	10,090.51	2,034.95	2,478.25	198.54	1.40	1.17	-1.68
10,860.00	28.43	49.640	10,173.53	2,063.50	2,511.84	200.53	0.98	0.98	0.00
10,955.00	29.62	51.570	10,256.60	2,092.74	2,547.47	203.39	1.59	1.25	2.03
11,049.00	30.01	51.830	10,338.15	2,121.70	2,584.15	207.17	0.44	0.41	0.28
11,143.00	28.78	53.330	10,420.05	2,149.75	2,620.78	211.80	1.52	-1.31	1.60
11,237.00	26.15	51.040	10,503.45	2,176.29	2,655.04	215.51	3.01	-2.80	-2.44
11,331.00	23.69	50.510	10,588.69	2,201.33	2,685.73	218.08	2.63	-2.62	-0.56
11,368.00	22.46	49.550	10,622.73	2,210.64	2,696.84	218.84	3.48	-3.32	-2.59
11,472.00	22.01	50.720	10,719.00	2,235.87	2,727.05	220.95	0.61	-0.43	1.13
11,566.00	21.92	49.840	10,806.18	2,258.33	2,754.09	222.92	0.36	-0.10	-0.94
11,660.00	22.05	49.710	10,893.34	2,281.06	2,780.96	224.59	0.15	0.14	-0.14
11,707.00	23.16	50.590	10,936.73	2,292.63	2,794.83	225.56	2.47	2.36	1.87
11,755.00	25.23	51.690	10,980.51	2,304.97	2,810.15	226.97	4.41	4.31	2.29
11,802.00	27.80	52.480	11,022.56	2,317.86	2,826.71	228.82	5.52	5.47	1.68
11,849.00	30.27	53.670	11,063.65	2,331.55	2,844.95	231.22	5.40	5.26	2.53
11,896.00	32.83	53.890	11,103.70	2,346.08	2,864.79	234.09	5.45	5.45	0.47
11,943.00	33.01	57.070	11,143.16	2,360.55	2,885.83	237.84	3.70	0.38	6.77
11,987.00	33.36	60.270	11,179.99	2,373.07	2,906.39	242.68	4.06	0.80	7.27
12,034.00	35.52	64.310	11,218.75	2,385.40	2,929.92	249.69	6.69	4.60	8.60
12,081.00	37.14	70.730	11,256.63	2,396.00	2,955.63	259.44	8.79	3.45	13.66
12,128.00	38.46	76.620	11,293.78	2,404.07	2,983.25	272.35	8.18	2.81	12.53
12,176.00	39.91	83.650	11,331.00	2,409.23	3,013.10	288.90	9.73	3.02	14.65
12,223.00	40.92	89.360	11,366.80	2,411.07	3,043.48	308.25	8.16	2.15	12.15
12,270.00	41.98	95.340	11,402.04	2,409.78	3,074.54	330.36	8.72	2.26	12.72
12,317.00	44.40	101.490	11,436.32	2,405.04	3,106.32	355.48	10.33	5.15	13.09
12,365.00	46.51	106.060	11,470.00	2,396.87	3,139.52	384.07	8.08	4.40	9.52
12,412.00	48.31	110.720	11,501.81	2,385.94	3,172.33	414.42	8.24	3.83	9.91
12,459.00	50.55	114.320	11,532.38	2,372.26	3,205.29	446.90	7.52	4.77	7.66
12,506.00	53.14	118.450	11,561.42	2,355.82	3,238.37	481.47	8.84	5.51	8.79
12,553.00	54.64	121.270	11,589.13	2,336.91	3,271.29	517.73	5.80	3.19	6.00
12,600.00	57.27	123.550	11,615.44	2,316.03	3,304.16	555.41	6.89	5.60	4.85
12,648.00	60.66	127.420	11,640.19	2,292.15	3,337.62	595.69	9.88	7.06	8.06
12,695.00	64.00	129.970	11,662.01	2,266.12	3,370.09	636.86	8.58	7.11	5.43
12,742.00	67.21	132.600	11,681.43	2,237.67	3,402.24	679.44	8.52	6.83	5.60
12,789.00	70.55	135.680	11,698.36	2,207.34	3,433.68	723.21	9.37	7.11	6.55
12,835.00	73.27	137.970	11,712.65	2,175.45	3,463.59	766.93	7.57	5.91	4.98
12,882.00	74.81	140.870	11,725.57	2,141.14	3,492.98	812.07	6.78	3.28	6.17
12,928.00	76.48	142.980	11,736.98	2,106.06	3,520.46	856.47	5.74	3.63	4.59
12,975.00	78.77	144.560	11,747.05	2,069.03	3,547.58	902.06	5.88	4.87	3.36
13,023.00	80.44	146.400	11,755.71	2,030.13	3,574.33	948.76	5.13	3.48	3.83



Survey Report



Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia NAD83 UTM 17N
Site: Hudson Alt North
Well: Hudson S-16 HU (slot P)
Wellbore: Original hole
Design: Surveys Original hole

Local Co-ordinate Reference: Well Hudson S-16 HU (slot P)
TVD Reference: RKB=1346+33 @ 1379.00ft (Nabors X08)
MD Reference: RKB=1346+33 @ 1379.00ft (Nabors X08)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
13,070.00	82.20	147.190	11,762.80	1,991.26	3,599.78	994.55	4.10	3.74	1.68
13,117.00	84.35	149.130	11,768.31	1,951.61	3,624.40	1,040.35	6.14	4.57	4.13
13,164.00	86.95	150.530	11,771.87	1,911.09	3,647.95	1,086.05	6.28	5.53	2.98
13,211.00	88.62	151.060	11,773.69	1,870.10	3,670.86	1,131.67	3.73	3.55	1.13
13,305.00	89.10	150.800	11,775.56	1,787.96	3,716.52	1,222.91	0.58	0.51	-0.28
13,399.00	88.97	150.970	11,777.14	1,705.85	3,762.25	1,314.17	0.23	-0.14	0.18
13,493.00	89.10	152.200	11,778.73	1,623.19	3,806.98	1,405.15	1.32	0.14	1.31
13,588.00	89.14	151.760	11,780.19	1,539.33	3,851.60	1,496.94	0.47	0.04	-0.46
13,603.00	89.16	151.940	11,780.41	1,526.11	3,858.68	1,511.44	1.21	0.13	1.20
13,697.00	88.81	152.640	11,782.07	1,442.90	3,902.38	1,602.13	0.83	-0.37	0.74
13,791.00	88.81	152.820	11,784.02	1,359.37	3,945.44	1,692.61	0.19	0.00	0.19
13,885.00	88.90	150.530	11,785.90	1,276.64	3,990.03	1,783.55	2.44	0.10	-2.44
13,980.00	88.81	149.830	11,787.80	1,194.24	4,037.26	1,876.05	0.74	-0.09	-0.74
14,073.00	89.25	149.480	11,789.38	1,113.99	4,084.24	1,966.80	0.60	0.47	-0.38
14,165.00	89.25	149.480	11,790.58	1,034.75	4,130.95	2,056.64	0.00	0.00	0.00
14,259.00	89.16	149.130	11,791.88	953.92	4,178.93	2,148.49	0.38	-0.10	-0.37
14,354.00	89.16	149.300	11,793.28	872.32	4,227.55	2,241.35	0.18	0.00	0.18
14,447.00	89.34	149.650	11,794.49	792.21	4,274.78	2,332.17	0.42	0.19	0.38
14,541.00	89.08	148.600	11,795.79	711.54	4,323.02	2,424.08	1.15	-0.28	-1.12
14,635.00	89.25	148.950	11,797.16	631.17	4,371.74	2,516.11	0.41	0.18	0.37
14,730.00	89.78	149.130	11,797.97	549.71	4,420.61	2,609.04	0.59	0.56	0.19
14,825.00	89.78	149.130	11,798.33	468.17	4,469.35	2,701.94	0.00	0.00	0.00
14,918.00	89.87	149.650	11,798.61	388.13	4,516.71	2,792.79	0.57	0.10	0.56
15,013.00	89.34	150.010	11,799.27	306.00	4,564.45	2,885.44	0.67	-0.56	0.38
15,106.00	89.08	149.480	11,800.55	225.67	4,611.30	2,976.16	0.63	-0.28	-0.57
15,201.00	88.72	150.890	11,802.37	143.27	4,658.53	3,068.66	1.53	-0.38	1.48
15,296.00	88.81	151.410	11,804.42	60.08	4,704.36	3,160.78	0.56	0.09	0.55
15,390.00	88.81	150.890	11,806.37	-22.24	4,749.70	3,251.93	0.55	0.00	-0.55
15,484.00	88.72	150.360	11,808.40	-104.13	4,795.80	3,343.29	0.57	-0.10	-0.56
15,578.00	88.64	150.180	11,810.57	-185.74	4,842.40	3,434.78	0.21	-0.09	-0.19
15,672.00	88.72	150.710	11,812.73	-267.49	4,888.76	3,526.20	0.57	0.09	0.56
15,767.00	88.81	150.180	11,814.78	-350.11	4,935.61	3,618.60	0.57	0.09	-0.56
15,861.00	88.81	150.530	11,816.73	-431.78	4,982.09	3,710.06	0.37	0.00	0.37
15,956.00	88.81	151.240	11,818.70	-514.76	5,028.30	3,802.28	0.75	0.00	0.75
16,050.00	88.90	151.590	11,820.58	-597.29	5,073.27	3,893.33	0.38	0.10	0.37
16,144.00	89.08	151.590	11,822.24	-679.95	5,117.99	3,984.31	0.19	0.19	0.00
16,239.00	88.99	150.890	11,823.84	-763.22	5,163.69	4,076.40	0.74	-0.09	-0.74
16,333.00	88.90	150.010	11,825.57	-844.98	5,210.04	4,167.83	0.94	-0.10	-0.94
16,426.00	88.99	149.830	11,827.28	-925.44	5,256.64	4,258.48	0.22	0.10	-0.19
16,519.00	89.08	149.830	11,828.85	-1,005.83	5,303.38	4,349.17	0.10	0.10	0.00
16,614.00	88.90	149.830	11,830.62	-1,087.95	5,351.11	4,441.80	0.19	-0.19	0.00
16,708.00	89.16	150.710	11,832.11	-1,169.57	5,397.72	4,533.30	0.98	0.28	0.94
16,802.00	89.25	150.360	11,833.42	-1,251.40	5,443.95	4,624.71	0.38	0.10	-0.37



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hudson S-16 HU (slot P)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Site:	Hudson Alt North	MD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Well:	Hudson S-16 HU (slot P)	North Reference:	Grid
Wellbore:	Original hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original hole	Database:	DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
16,896.00	89.08	150.360	11,834.79	-1,333.09	5,490.44	4,716.18	0.18	-0.18	0.00
16,990.00	89.25	150.180	11,836.16	-1,414.71	5,537.05	4,807.68	0.26	0.18	-0.19
17,084.00	89.34	150.360	11,837.32	-1,496.33	5,583.66	4,899.18	0.21	0.10	0.19
17,179.00	89.43	150.180	11,838.34	-1,578.82	5,630.77	4,991.66	0.21	0.09	-0.19
17,273.00	88.90	148.950	11,839.70	-1,659.86	5,678.38	5,083.42	1.42	-0.56	-1.31
17,367.00	88.55	150.010	11,841.80	-1,740.81	5,726.10	5,175.20	1.19	-0.37	1.13
17,461.00	88.81	150.360	11,843.96	-1,822.35	5,772.83	5,266.72	0.46	0.28	0.37
17,555.00	88.64	150.530	11,846.05	-1,904.10	5,819.18	5,358.14	0.26	-0.18	0.18
17,649.00	88.64	149.650	11,848.28	-1,985.55	5,866.04	5,449.70	0.94	0.00	-0.94
17,743.00	88.64	150.010	11,850.52	-2,066.80	5,913.27	5,541.34	0.38	0.00	0.38
17,837.00	88.37	149.480	11,852.97	-2,147.97	5,960.62	5,633.02	0.63	-0.29	-0.56
17,931.00	88.72	150.010	11,855.36	-2,229.14	6,007.96	5,724.69	0.68	0.37	0.56
18,026.00	88.72	149.830	11,857.48	-2,311.32	6,055.56	5,817.29	0.19	0.00	-0.19
18,119.00	88.64	149.830	11,859.62	-2,391.70	6,102.29	5,907.96	0.09	-0.09	0.00
18,213.00	88.72	149.830	11,861.78	-2,472.95	6,149.52	5,999.61	0.09	0.09	0.00
18,306.00	88.90	149.830	11,863.72	-2,553.33	6,196.25	6,090.29	0.19	0.19	0.00
18,400.00	88.99	150.010	11,865.45	-2,634.66	6,243.35	6,181.92	0.21	0.10	0.19
18,494.00	88.90	150.010	11,867.18	-2,716.06	6,290.33	6,273.51	0.10	-0.10	0.00
18,588.00	88.90	150.010	11,868.98	-2,797.46	6,337.31	6,365.11	0.00	0.00	0.00
18,683.00	88.99	149.830	11,870.73	-2,879.65	6,384.92	6,457.71	0.21	0.09	-0.19
18,777.00	88.90	149.300	11,872.46	-2,960.68	6,432.52	6,549.46	0.57	-0.10	-0.56
18,872.00	88.99	150.010	11,874.21	-3,042.65	6,480.51	6,642.16	0.75	0.09	0.75
18,966.00	88.99	149.830	11,875.87	-3,123.98	6,527.62	6,733.79	0.19	0.00	-0.18
19,061.00	89.16	149.830	11,877.40	-3,206.10	6,575.35	6,826.43	0.18	0.18	0.00
19,154.00	89.08	150.010	11,878.83	-3,286.57	6,621.96	6,917.08	0.21	-0.09	0.19
19,248.00	89.52	149.480	11,879.98	-3,367.76	6,669.32	7,008.78	0.73	0.47	-0.56
19,341.00	89.60	150.010	11,880.69	-3,448.09	6,716.18	7,099.51	0.58	0.09	0.57
19,436.00	89.43	149.480	11,881.50	-3,530.15	6,764.04	7,192.19	0.59	-0.18	-0.56
19,535.00	89.43	149.300	11,882.48	-3,615.35	6,814.45	7,288.90	0.18	0.00	-0.18
19,629.00	89.43	149.830	11,883.42	-3,696.24	6,862.31	7,380.72	0.19	0.00	0.19
19,722.00	89.52	149.850	11,884.27	-3,776.42	6,909.42	7,471.51	0.21	0.10	0.18
19,816.00	89.52	149.830	11,885.05	-3,857.61	6,956.78	7,563.22	0.19	0.00	0.19
19,910.00	89.52	149.480	11,885.84	-3,938.73	7,004.27	7,654.95	0.37	0.00	-0.37
20,005.00	89.60	150.010	11,886.57	-4,020.79	7,052.14	7,747.63	0.56	0.08	0.56
20,099.00	89.34	149.650	11,887.44	-4,102.05	7,099.37	7,839.30	0.47	-0.28	-0.38
20,193.00	89.34	149.480	11,888.53	-4,183.09	7,146.99	7,931.07	0.18	0.00	-0.18
20,288.00	89.34	149.830	11,889.62	-4,265.07	7,194.98	8,023.77	0.37	0.00	0.37
20,382.00	89.43	149.480	11,890.63	-4,346.19	7,242.47	8,115.51	0.38	0.10	-0.37
20,476.00	89.43	149.480	11,891.56	-4,427.16	7,290.20	8,207.30	0.00	0.00	0.00
20,571.00	88.99	149.830	11,892.87	-4,509.14	7,338.19	8,300.01	0.59	-0.46	0.37
20,665.00	89.16	150.180	11,894.39	-4,590.54	7,385.18	8,391.61	0.41	0.18	0.37
20,759.00	89.25	150.010	11,895.70	-4,672.02	7,432.04	8,483.17	0.20	0.10	-0.18
20,854.00	89.16	150.010	11,897.01	-4,754.29	7,479.52	8,575.75	0.09	-0.09	0.00



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hudson S-16 HU (slot P)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Site:	Hudson Alt North	MD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Well:	Hudson S-16 HU (slot P)	North Reference:	Grid
Wellbore:	Original hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original hole	Database:	DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
20,947.00	88.90	149.650	11,898.59	-4,834.68	7,526.25	8,666.44	0.48	-0.28	-0.39
21,041.00	88.64	149.830	11,900.61	-4,915.85	7,573.61	8,758.12	0.34	-0.28	0.19
21,135.00	88.90	150.710	11,902.62	-4,997.46	7,620.21	8,849.61	0.98	0.28	0.94
21,230.00	89.43	150.710	11,904.01	-5,080.31	7,666.69	8,941.92	0.56	0.56	0.00
21,323.00	89.25	150.360	11,905.08	-5,161.27	7,712.43	9,032.35	0.42	-0.19	-0.38
21,417.00	89.16	150.710	11,906.38	-5,243.11	7,758.66	9,123.76	0.38	-0.10	0.37
21,511.00	89.52	150.530	11,907.47	-5,325.01	7,804.77	9,215.13	0.43	0.38	-0.19
21,605.00	89.34	150.530	11,908.40	-5,406.84	7,851.02	9,306.54	0.19	-0.19	0.00
21,700.00	89.16	150.180	11,909.65	-5,489.40	7,898.00	9,398.99	0.41	-0.19	-0.37
21,793.00	89.25	150.360	11,910.94	-5,570.15	7,944.12	9,489.52	0.22	0.10	0.19
21,888.00	89.34	150.360	11,912.10	-5,652.72	7,991.10	9,581.96	0.09	0.09	0.00
21,883.00	89.08	150.010	11,913.41	-5,735.13	8,038.33	9,674.47	0.46	-0.27	-0.37
22,077.00	89.25	150.180	11,914.78	-5,816.61	8,085.19	9,766.04	0.26	0.18	0.18
22,171.00	89.34	150.180	11,915.94	-5,898.16	8,131.93	9,857.58	0.10	0.10	0.00
22,266.00	89.25	150.360	11,917.11	-5,980.64	8,179.03	9,950.06	0.21	-0.09	0.19
22,360.00	89.25	150.360	11,918.34	-6,062.34	8,225.52	10,041.53	0.00	0.00	0.00
22,454.00	89.78	150.360	11,919.14	-6,144.03	8,272.00	10,133.00	0.56	0.56	0.00
22,548.00	89.78	150.530	11,919.50	-6,225.80	8,318.37	10,224.45	0.18	0.00	0.18
22,641.00	90.04	150.710	11,919.64	-6,306.84	8,364.00	10,314.86	0.34	0.28	0.19
22,735.00	89.87	150.360	11,919.72	-6,388.68	8,410.23	10,405.27	0.41	-0.18	-0.37
22,828.00	89.60	150.530	11,920.15	-6,469.58	8,456.11	10,496.74	0.34	-0.29	0.18
22,922.00	89.52	150.710	11,920.87	-6,551.49	8,502.22	10,588.12	0.21	-0.09	0.19
23,015.00	88.99	150.360	11,922.08	-6,632.45	8,547.96	10,678.55	0.68	-0.57	-0.38
23,110.00	89.16	150.710	11,923.61	-6,715.15	8,594.69	10,770.92	0.41	0.18	0.37
23,204.00	88.90	150.890	11,925.20	-6,797.20	8,640.54	10,862.22	0.34	-0.28	0.19
23,298.00	89.08	150.360	11,926.86	-6,879.10	8,686.64	10,953.58	0.60	0.19	-0.56
23,392.00	89.08	150.360	11,928.37	-6,960.79	8,733.12	11,045.05	0.00	0.00	0.00
23,486.00	89.08	150.180	11,929.88	-7,042.40	8,779.73	11,136.55	0.19	0.00	-0.19
23,580.00	89.16	150.360	11,931.32	-7,124.02	8,826.34	11,228.05	0.21	0.09	0.19
23,674.00	89.16	150.360	11,932.70	-7,205.71	8,872.82	11,319.52	0.00	0.00	0.00
23,767.00	89.08	150.010	11,934.13	-7,286.39	8,919.06	11,410.08	0.39	-0.09	-0.38
23,861.00	89.16	150.710	11,935.57	-7,368.08	8,965.54	11,501.55	0.75	0.09	0.74
23,955.00	89.34	150.530	11,936.80	-7,449.99	9,011.65	11,592.92	0.27	0.19	-0.19
24,050.00	89.25	150.530	11,937.97	-7,532.69	9,058.39	11,685.30	0.09	-0.09	0.00
24,144.00	89.16	150.360	11,939.28	-7,614.45	9,104.75	11,776.74	0.20	-0.10	-0.18
24,237.00	89.08	150.360	11,940.70	-7,695.27	9,150.74	11,867.23	0.09	-0.09	0.00
24,331.00	88.16	150.360	11,942.15	-7,776.96	9,197.22	11,958.70	0.09	0.09	0.00
24,426.00	89.08	150.180	11,943.61	-7,859.45	9,244.32	12,051.18	0.21	-0.08	-0.19
24,520.00	89.08	149.830	11,945.12	-7,940.85	9,291.31	12,142.77	0.37	0.00	-0.37
24,614.00	88.99	149.830	11,946.70	-8,022.10	9,338.55	12,234.44	0.10	-0.10	0.00
24,708.00	89.08	149.830	11,948.28	-8,103.36	9,385.78	12,326.10	0.10	0.10	0.00
24,802.00	88.90	150.010	11,949.94	-8,184.68	9,432.89	12,417.73	0.27	-0.19	0.19
24,897.00	88.81	150.180	11,951.84	-8,267.02	9,480.24	12,510.26	0.20	-0.09	0.18
24,992.00	88.90	151.240	11,953.74	-8,349.86	9,526.71	12,602.56	1.12	0.09	1.12



Survey Report



Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia NAD83 UTM 17N
Site: Hudson Alt North
Well: Hudson S-16 HU (slot P)
Wellbore: Original hole
Design: Surveys Original hole

Local Co-ordinate Reference: Well Hudson S-16 HU (slot P)
TVD Reference: RKB=1346+33 @ 1379.00ft (Nabors X08)
MD Reference: RKB=1346+33 @ 1379.00ft (Nabors X08)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
25,086.00	89.34	151.940	11,955.18	-8,432.52	9,571.42	12,693.54	0.88	0.47	0.74
25,161.00	88.99	152.820	11,956.56	-8,516.69	9,615.46	12,785.15	1.00	-0.37	0.93
25,275.00	89.34	149.130	11,957.93	-8,598.86	9,661.06	12,876.37	3.94	0.37	-3.93
25,370.00	89.34	149.130	11,959.03	-8,680.40	9,709.80	12,969.26	0.00	0.00	0.00
25,465.00	89.25	149.130	11,960.20	-8,761.93	9,758.54	13,062.15	0.09	-0.09	0.00
25,559.00	89.43	149.130	11,961.28	-8,842.61	9,806.77	13,154.07	0.19	0.19	0.00
25,654.00	89.43	148.420	11,962.23	-8,923.84	9,856.01	13,247.09	0.75	0.00	-0.75
25,747.00	88.81	148.950	11,963.65	-9,003.29	9,904.34	13,338.17	0.88	-0.67	0.57
25,842.00	88.99	148.600	11,965.48	-9,084.51	9,953.58	13,431.17	0.41	0.19	-0.37
25,936.00	88.90	148.420	11,967.21	-9,164.65	10,002.67	13,523.28	0.21	-0.10	-0.19
26,030.00	88.90	149.480	11,969.01	-9,245.17	10,051.15	13,615.25	1.13	0.00	1.13
26,124.00	89.16	150.010	11,970.60	-9,326.35	10,098.50	13,706.94	0.63	0.28	0.56
26,219.00	88.90	149.830	11,972.21	-9,408.55	10,146.11	13,799.55	0.33	-0.27	-0.19
26,313.00	88.72	150.360	11,974.17	-9,490.01	10,192.96	13,891.10	0.60	-0.19	0.56
26,408.00	88.81	150.530	11,976.21	-9,572.63	10,239.81	13,983.50	0.20	0.09	0.18
26,503.00	88.99	150.180	11,978.04	-9,655.18	10,286.79	14,075.94	0.41	0.19	-0.37
26,597.00	88.55	150.360	11,980.05	-9,736.79	10,333.40	14,167.43	0.51	-0.47	0.19
26,691.00	88.81	150.530	11,982.22	-9,818.54	10,379.75	14,258.85	0.33	0.28	0.18
26,785.00	88.81	150.710	11,984.17	-9,900.43	10,425.86	14,350.21	0.19	0.00	0.19
26,879.00	88.99	150.180	11,985.98	-9,982.18	10,472.22	14,441.64	0.80	0.19	-0.56
26,973.00	88.90	149.480	11,987.71	-10,063.43	10,519.45	14,533.30	0.75	-0.10	-0.74
27,068.00	89.08	150.360	11,989.38	-10,145.63	10,567.06	14,625.90	0.95	0.19	0.93
27,162.00	89.16	150.180	11,990.83	-10,227.24	10,613.67	14,717.40	0.21	0.09	-0.19
27,256.00	89.16	150.180	11,992.20	-10,308.79	10,660.41	14,808.94	0.00	0.00	0.00
27,349.00	89.16	150.180	11,993.57	-10,389.47	10,706.65	14,899.50	0.00	0.00	0.00
27,444.00	89.08	149.650	11,995.03	-10,471.66	10,754.26	14,992.11	0.56	-0.08	-0.56
27,538.00	89.08	149.480	11,996.54	-10,552.70	10,801.87	15,083.67	0.18	0.00	-0.18
27,632.00	89.08	149.300	11,998.04	-10,633.59	10,849.73	15,175.69	0.19	0.00	-0.19
27,727.00	89.16	149.300	11,999.50	-10,715.26	10,898.23	15,268.52	0.08	0.08	0.00
27,820.00	89.25	148.780	12,000.79	-10,795.00	10,946.07	15,359.48	0.57	0.10	-0.56
27,915.00	89.25	148.780	12,002.04	-10,876.24	10,995.30	15,452.49	0.00	0.00	0.00
28,009.00	89.25	150.010	12,003.27	-10,957.14	11,043.15	15,544.31	1.31	0.00	1.31
28,104.00	89.16	150.010	12,004.59	-11,039.41	11,090.64	15,636.89	0.09	-0.09	0.00
28,198.00	88.99	150.360	12,006.10	-11,120.96	11,137.37	15,728.42	0.41	-0.18	0.37
28,292.00	88.99	149.300	12,007.76	-11,202.21	11,184.60	15,820.08	1.13	0.00	-1.13
28,388.00	88.81	148.600	12,009.60	-11,284.44	11,234.11	15,914.00	0.75	-0.19	-0.73
28,482.00	88.90	149.130	12,011.48	-11,364.88	11,282.70	16,006.00	0.57	0.10	0.56
28,576.00	88.81	149.830	12,013.36	-11,445.84	11,330.43	16,097.78	0.75	-0.10	0.74
28,670.00	88.90	150.180	12,015.24	-11,527.24	11,377.41	16,189.37	0.38	0.10	0.37
28,764.00	89.08	150.360	12,016.90	-11,608.85	11,424.02	16,280.87	0.27	0.19	0.19
28,857.00	89.08	150.530	12,018.39	-11,689.74	11,469.88	16,371.33	0.18	0.00	0.18
28,952.00	89.16	151.410	12,019.95	-11,772.79	11,515.98	16,463.53	0.93	0.08	0.93
29,046.00	89.25	151.060	12,021.15	-11,855.19	11,561.21	16,554.66	0.38	0.10	-0.37



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hudson S-16 HU (slot P)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Site:	Hudson Alt North	MD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Well:	Hudson S-16 HU (slot P)	North Reference:	Grid
Wellbore:	Original hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original hole	Database:	DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
29,141.00	89.16	151.410	12,022.47	-11,938.45	11,806.92	16,646.76	0.38	-0.09	0.37
29,235.00	88.81	151.060	12,024.14	-12,020.84	11,652.15	16,737.88	0.53	-0.37	-0.37
29,330.00	88.90	151.410	12,026.03	-12,104.10	11,697.85	16,829.97	0.38	0.09	0.37
29,425.00	88.99	151.060	12,027.78	-12,187.36	11,743.56	16,922.07	0.38	0.09	-0.37
29,520.00	88.72	149.650	12,029.68	-12,269.91	11,790.54	17,014.50	1.51	-0.28	-1.48
29,615.00	88.90	150.010	12,031.65	-12,352.02	11,838.27	17,107.13	0.42	0.19	0.38
29,709.00	88.99	150.360	12,033.39	-12,433.57	11,885.00	17,198.66	0.38	0.10	0.37
29,804.00	88.99	150.010	12,035.06	-12,515.98	11,932.23	17,291.16	0.37	0.00	-0.37
29,898.00	88.99	149.830	12,036.72	-12,597.31	11,979.34	17,382.79	0.19	0.00	-0.19
29,991.00	88.90	150.010	12,038.43	-12,677.77	12,025.94	17,473.44	0.22	-0.10	0.19
30,085.00	89.25	150.360	12,039.95	-12,759.32	12,072.67	17,564.97	0.53	0.37	0.37
30,180.00	88.90	150.530	12,041.48	-12,841.94	12,119.52	17,657.38	0.41	-0.37	0.18
30,274.00	89.16	150.360	12,043.07	-12,923.70	12,165.88	17,748.81	0.33	0.28	-0.18
30,368.00	89.16	150.360	12,044.45	-13,005.39	12,212.37	17,840.28	0.00	0.00	0.00
30,462.00	88.81	150.530	12,046.11	-13,087.15	12,258.73	17,931.71	0.41	-0.37	0.18
30,557.00	88.81	150.530	12,048.09	-13,169.84	12,305.45	18,024.08	0.00	0.00	0.00
30,648.00	88.81	150.530	12,049.98	-13,249.05	12,350.21	18,112.56	0.00	0.00	0.00
Survey @ 30648.00 MD 12049.98 TVD									
30,735.00	88.81	150.530	12,051.78	-13,324.78	12,393.00	18,197.15	0.00	0.00	0.00
Survey projected to 30735.00 MD 12051.78 TVD									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
174.00	174.00	0.01	-0.06	MWD surveys
30,648.00	12,049.98	-13,249.05	12,350.21	Survey @ 30648.00 MD 12049.98 TVD
30,735.00	12,051.78	-13,324.78	12,393.00	Survey projected to 30735.00 MD 12051.78 TVD



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hudson S-16 HU (slot P)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Site:	Hudson Alt North	MD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Well:	Hudson S-16 HU (slot P)	North Reference:	Grid
Wellbore:	Original hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original hole	Database:	DB_Feb1422LT

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

Site	Hudson Alt North				
Site Position:	Northing:	14,464,552.095 usft	Latitude:	39.828774000	
From:	Lat/Long	Easting:	1,732,278.451 usft	Longitude:	-80.672798000
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.21 °

Well	Hudson S-16 HU (slot P)					
Well Position	+N/-S	0.00 ft	Northing:	14,464,511.836 usft	Latitude:	39.828663000
	+E/-W	0.00 ft	Easting:	1,732,322.116 usft	Longitude:	-80.672643000
Position Uncertainty	0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,346.00 ft	

Wellbore	Original hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	1/18/2022	-8.69	66.51	51,702.66707092

Design	Surveys Original hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.00	0.00	0.00	137.060	

Survey Program	Date	2/17/2022			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
174.00	1,074.00	MWD surf (Original hole)	MWD	MWD - Standard	
1,120.00	2,842.00	MWD int (Original hole)	MWD	MWD - Standard	
2,962.00	11,368.00	MWD (Original hole)	MWD	MWD - Standard	
11,472.00	30,648.00	MWD Lat (Original hole)	MWD	MWD - Standard	
30,735.00	30,735.00	Projection (Original hole)	NS-GYRO-MS	North sensing gyrocompassing m/s	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.000	0.00	0.00	0.00	14,464,511.836	1,732,322.116	39.828663000	-80.672643000	
174.00	0.04	280.610	174.00	0.01	-0.06	14,464,511.847	1,732,322.056	39.828663032	-80.672643212	
MWD surveys										
211.00	0.22	23.440	211.00	0.08	-0.04	14,464,511.915	1,732,322.071	39.828663217	-80.672643156	
241.00	0.22	344.510	241.00	0.19	-0.04	14,464,512.023	1,732,322.079	39.828663515	-80.672643128	
272.00	0.53	8.770	272.00	0.39	-0.03	14,464,512.222	1,732,322.085	39.828664061	-80.672643104	
303.00	0.57	23.970	303.00	0.67	0.05	14,464,512.505	1,732,322.169	39.828664836	-80.672642799	



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hudson S-16 HU (slot P)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Site:	Hudson Alt North	MD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Well:	Hudson S-16 HU (slot P)	North Reference:	Grid
Wellbore:	Original hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original hole	Database:	DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
333.00	0.44	18.960	333.00	0.91	0.15	14,464,512.750	1,732,322.267	39.828665509	-80.672642447
363.00	0.62	40.670	363.00	1.15	0.30	14,464,512.982	1,732,322.411	39.828666145	-80.672641933
394.00	0.61	56.310	393.99	1.36	0.54	14,464,513.201	1,732,322.657	39.828666743	-80.672641052
424.00	0.62	47.000	423.99	1.56	0.79	14,464,513.400	1,732,322.909	39.828667288	-80.672640154
455.00	0.66	68.000	454.99	1.75	1.08	14,464,513.582	1,732,323.197	39.828667783	-80.672639125
486.00	0.75	86.990	485.99	1.82	1.45	14,464,513.659	1,732,323.565	39.828667992	-80.672637812
517.00	0.57	91.730	516.99	1.83	1.81	14,464,513.665	1,732,323.922	39.828668005	-80.672636542
547.00	0.62	100.960	546.98	1.79	2.11	14,464,513.630	1,732,324.230	39.828667905	-80.672635443
578.00	0.31	69.500	577.98	1.79	2.36	14,464,513.627	1,732,324.474	39.828667895	-80.672634577
609.00	0.35	77.140	608.98	1.84	2.53	14,464,513.678	1,732,324.645	39.828668032	-80.672633968
639.00	0.35	65.540	638.98	1.90	2.70	14,464,513.736	1,732,324.817	39.828668191	-80.672633352
670.00	0.26	52.180	669.98	1.98	2.84	14,464,513.818	1,732,324.959	39.828668415	-80.672632846
701.00	0.22	47.090	700.98	2.07	2.94	14,464,513.902	1,732,325.058	39.828668644	-80.672632492
732.00	0.31	17.640	731.98	2.19	3.01	14,464,514.022	1,732,325.127	39.828668974	-80.672632244
763.00	0.18	34.960	762.98	2.31	3.06	14,464,514.142	1,732,325.181	39.828669303	-80.672632053
794.00	0.31	41.110	793.98	2.41	3.15	14,464,514.245	1,732,325.264	39.828669585	-80.672631756
826.00	0.40	41.020	825.98	2.56	3.28	14,464,514.395	1,732,325.394	39.828669994	-80.672631290
857.00	0.57	37.150	856.98	2.76	3.44	14,464,514.599	1,732,325.558	39.828670554	-80.672630702
888.00	0.57	29.510	887.98	3.02	3.61	14,464,514.856	1,732,325.727	39.828671259	-80.672630097
919.00	0.62	51.220	918.98	3.26	3.82	14,464,515.096	1,732,325.934	39.828671913	-80.672629358
940.00	0.53	34.250	939.97	3.41	3.96	14,464,515.247	1,732,326.077	39.828672328	-80.672628845
981.00	0.70	43.910	980.97	3.75	4.24	14,464,515.584	1,732,326.357	39.828673251	-80.672627842
1,012.00	0.66	28.630	1,011.97	4.04	4.46	14,464,515.877	1,732,326.574	39.828674054	-80.672627066
1,043.00	0.53	19.660	1,042.97	4.33	4.59	14,464,516.169	1,732,326.708	39.828674854	-80.672626586
1,074.00	0.48	354.000	1,073.97	4.60	4.63	14,464,516.433	1,732,326.743	39.828675579	-80.672626459
1,120.00	1.23	335.540	1,119.96	5.24	4.40	14,464,517.074	1,732,326.518	39.828677342	-80.672627250
1,169.00	1.40	322.710	1,168.95	6.19	3.82	14,464,518.029	1,732,325.938	39.828679970	-80.672629305
1,263.00	1.27	325.700	1,262.92	7.97	2.54	14,464,519.803	1,732,324.655	39.828684855	-80.672633851
1,294.00	1.18	328.420	1,293.92	8.52	2.18	14,464,520.359	1,732,324.294	39.828686385	-80.672635129
1,325.00	0.92	348.290	1,324.91	9.04	1.96	14,464,520.875	1,732,324.077	39.828687803	-80.672635897
1,357.00	0.44	331.850	1,356.91	9.40	1.85	14,464,521.235	1,732,323.966	39.828688792	-80.672636285
1,388.00	0.26	29.510	1,387.91	9.56	1.83	14,464,521.401	1,732,323.945	39.828689249	-80.672636359
1,419.00	0.44	78.810	1,418.91	9.65	1.98	14,464,521.485	1,732,324.096	39.828689479	-80.672635819
1,450.00	0.88	105.800	1,449.91	9.61	2.33	14,464,521.443	1,732,324.442	39.828689361	-80.672634587
1,497.00	1.45	108.700	1,496.90	9.32	3.24	14,464,521.155	1,732,325.353	39.828688558	-80.672631348
1,544.00	1.98	108.700	1,543.87	8.87	4.57	14,464,520.704	1,732,326.685	39.828687306	-80.672626608
1,639.00	3.47	105.010	1,638.76	7.60	8.90	14,464,519.433	1,732,331.017	39.828683773	-80.672611196
1,734.00	4.88	95.870	1,733.51	6.44	15.70	14,464,518.275	1,732,337.814	39.828680525	-80.672587002
1,828.00	5.54	79.520	1,827.13	6.86	24.14	14,464,518.691	1,732,346.253	39.828681583	-80.672556936
1,922.00	5.49	59.830	1,920.70	9.94	32.49	14,464,521.777	1,732,354.603	39.828689973	-80.672527155
2,016.00	5.89	47.610	2,014.24	15.45	39.94	14,464,527.288	1,732,362.053	39.828705034	-80.672500574
2,111.00	7.08	48.140	2,108.63	22.65	47.90	14,464,534.482	1,732,370.014	39.828724709	-80.672472099
2,207.00	7.08	44.630	2,203.90	30.80	56.46	14,464,542.640	1,732,378.576	39.828747027	-80.672441494
2,301.00	7.51	44.100	2,297.14	39.34	64.81	14,464,551.174	1,732,386.921	39.828770380	-80.672411660
2,395.00	7.56	38.560	2,390.33	48.58	72.94	14,464,560.421	1,732,395.050	39.828795691	-80.672382584
2,489.00	6.72	42.870	2,483.60	57.45	80.53	14,464,569.287	1,732,402.647	39.828819964	-80.672355411
2,583.00	5.80	46.120	2,577.04	64.77	87.70	14,464,576.610	1,732,409.812	39.828840003	-80.672329794
2,678.00	5.19	33.460	2,671.60	71.69	93.53	14,464,583.522	1,732,415.641	39.828858927	-80.672308941
2,773.00	5.58	29.510	2,766.19	79.29	98.17	14,464,591.127	1,732,420.286	39.828879763	-80.672292300
2,842.00	5.40	37.070	2,834.87	84.80	101.78	14,464,596.637	1,732,423.895	39.828894859	-80.672279371
2,962.00	6.28	44.800	2,954.25	93.96	109.81	14,464,605.799	1,732,431.924	39.828919941	-80.672250655
3,056.00	11.07	47.000	3,047.15	103.77	120.04	14,464,615.608	1,732,442.152	39.828946774	-80.672214094
3,151.00	14.90	46.210	3,139.70	118.45	135.53	14,464,630.285	1,732,457.645	39.828986926	-80.672158719
3,244.00	16.04	43.660	3,229.33	136.02	153.03	14,464,647.856	1,732,475.147	39.829035002	-80.672096149



Survey Report - Geographic



Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia NAD83 UTM 17N
Site: Hudson Alt North
Well: Hudson S-16 HU (slot P)
Wellbore: Original hole
Design: Surveys Original hole

Local Co-ordinate Reference: Well Hudson S-16 HU (slot P)
TVD Reference: RKB=1346+33 @ 1379.00ft (Nabors X08)
MD Reference: RKB=1346+33 @ 1379.00ft (Nabors X08)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
3,337.00	15.34	46.910	3,318.86	153.72	170.89	14,464,665.555	1,732,493.002	39.829083428	-80.672032324
3,431.00	14.19	51.040	3,409.76	169.46	188.93	14,464,681.294	1,732,511.042	39.829126471	-80.671967862
3,526.00	14.33	49.280	3,501.84	184.45	206.89	14,464,696.285	1,732,529.006	39.829167459	-80.671903679
3,619.00	15.64	51.220	3,591.67	199.81	225.39	14,464,711.646	1,732,547.503	39.829209456	-80.671837597
3,713.00	17.62	53.770	3,681.74	216.16	246.74	14,464,727.992	1,732,568.859	39.829254132	-80.671761315
3,808.00	18.85	55.440	3,771.96	233.36	270.98	14,464,745.197	1,732,593.097	39.829301136	-80.671674758
3,901.00	18.63	52.980	3,860.04	250.83	295.22	14,464,762.664	1,732,617.330	39.829348859	-80.671588214
3,996.00	19.95	55.000	3,949.70	269.26	320.61	14,464,781.097	1,732,642.723	39.829399225	-80.671497527
4,090.00	19.86	53.850	4,038.09	287.88	346.64	14,464,799.714	1,732,668.752	39.829450089	-80.671404571
4,184.00	19.42	50.600	4,126.62	307.22	371.61	14,464,819.053	1,732,693.722	39.829502945	-80.671315380
4,278.00	20.13	52.540	4,215.08	326.97	396.52	14,464,838.810	1,732,718.637	39.829556951	-80.671226375
4,372.00	19.42	51.130	4,303.53	346.62	421.53	14,464,858.455	1,732,743.644	39.829610649	-80.671137047
4,466.00	20.08	51.480	4,392.00	366.48	446.32	14,464,878.311	1,732,768.436	39.829664929	-80.671048481
4,560.00	20.48	52.980	4,480.18	386.43	472.08	14,464,898.262	1,732,794.191	39.829719459	-80.670956483
4,654.00	19.20	49.550	4,568.60	406.36	496.97	14,464,918.193	1,732,819.084	39.829773941	-80.670867553
4,749.00	18.90	51.660	4,658.40	426.04	520.93	14,464,937.872	1,732,843.040	39.829827744	-80.670781968
4,843.00	20.61	55.350	4,746.86	444.89	546.48	14,464,956.725	1,732,868.594	39.829879258	-80.670690702
4,937.00	21.97	53.410	4,834.45	464.78	574.21	14,464,976.614	1,732,896.324	39.829933598	-80.670591670
5,031.00	20.52	47.530	4,922.07	486.39	600.48	14,464,998.223	1,732,922.599	39.829992675	-80.670497796
5,124.00	20.00	49.810	5,009.32	507.66	624.66	14,465,019.492	1,732,946.772	39.830050841	-80.670411416
5,217.00	19.95	54.910	5,096.73	527.04	649.79	14,465,038.877	1,732,971.905	39.830103823	-80.670321639
5,313.00	19.73	53.680	5,187.03	546.06	676.25	14,465,057.890	1,732,998.362	39.830155768	-80.670227151
5,408.00	19.73	51.390	5,276.45	565.56	701.70	14,465,077.394	1,733,023.813	39.830209074	-80.670136242
5,502.00	19.91	50.600	5,364.89	585.62	726.47	14,465,097.455	1,733,048.579	39.830263913	-80.670047763
5,596.00	19.95	49.810	5,453.28	606.13	751.08	14,465,117.963	1,733,073.198	39.830319983	-80.669959805
5,691.00	20.26	50.510	5,542.47	627.05	776.16	14,465,138.882	1,733,098.272	39.830377178	-80.669870217
5,785.00	20.35	50.950	5,630.63	647.69	801.41	14,465,159.529	1,733,123.525	39.830433623	-80.669779996
5,879.00	20.74	49.370	5,718.65	668.83	826.74	14,465,180.664	1,733,148.850	39.830491409	-80.669689513
5,972.00	19.25	49.110	5,806.04	689.59	850.82	14,465,201.423	1,733,172.938	39.830548175	-80.669603440
6,066.00	19.47	50.870	5,894.72	709.62	874.69	14,465,221.453	1,733,196.805	39.830602939	-80.669518166
6,160.00	19.03	50.510	5,983.47	729.25	898.67	14,465,241.086	1,733,220.784	39.830666611	-80.669432495
6,255.00	18.63	49.370	6,073.38	748.98	922.14	14,465,260.816	1,733,244.253	39.830710557	-80.669348641
6,349.00	18.72	49.550	6,162.44	768.55	945.01	14,465,280.380	1,733,267.126	39.830764050	-80.669266909
6,443.00	19.29	51.570	6,251.31	787.98	968.65	14,465,299.817	1,733,290.768	39.830817190	-80.669182441
6,537.00	20.74	54.640	6,339.64	807.27	994.39	14,465,319.101	1,733,316.507	39.830869887	-80.669090507
6,631.00	20.52	53.500	6,427.61	826.70	1,021.21	14,465,338.533	1,733,343.324	39.830922979	-80.668994729
6,726.00	19.69	53.410	6,516.82	846.14	1,047.45	14,465,357.977	1,733,369.580	39.830976111	-80.668901024
6,821.00	20.00	52.540	6,606.18	865.56	1,073.19	14,465,377.398	1,733,395.305	39.831029183	-80.668809063
6,914.00	22.19	50.870	6,692.94	886.32	1,099.44	14,465,398.157	1,733,421.556	39.831085923	-80.668715285
7,040.00	20.87	49.020	6,810.15	916.06	1,134.85	14,465,427.893	1,733,456.959	39.831167225	-80.668588789
7,134.00	20.79	51.040	6,898.00	937.53	1,160.46	14,465,449.363	1,733,482.572	39.831225926	-80.668497274
7,200.00	20.74	51.830	6,959.72	952.12	1,178.75	14,465,463.950	1,733,500.887	39.831265799	-80.668431914
7,294.00	19.95	50.160	7,047.85	972.68	1,204.15	14,465,484.510	1,733,526.266	39.831322003	-80.668341172
7,388.00	20.92	50.250	7,135.94	993.68	1,229.37	14,465,505.615	1,733,551.483	39.831379431	-80.668251073
7,481.00	22.72	48.840	7,222.27	1,016.12	1,255.66	14,465,527.954	1,733,577.772	39.831440787	-80.668157136
7,576.00	25.18	46.560	7,309.09	1,042.10	1,284.15	14,465,553.929	1,733,606.263	39.831511830	-80.668055308
7,681.00	26.54	48.400	7,403.57	1,073.03	1,317.91	14,465,584.864	1,733,640.026	39.831596440	-80.667934637
7,764.00	25.58	47.440	7,478.13	1,097.46	1,344.98	14,465,609.296	1,733,667.091	39.831663258	-80.667837907
7,858.00	25.66	49.550	7,562.89	1,124.39	1,375.41	14,465,636.226	1,733,697.527	39.831736905	-80.667729140
7,952.00	26.24	51.390	7,647.42	1,150.56	1,407.14	14,465,662.398	1,733,729.253	39.831808456	-80.667615785
8,047.00	27.91	48.230	7,732.01	1,178.48	1,440.14	14,465,690.318	1,733,762.250	39.831884792	-80.667497879
8,170.00	29.58	49.900	7,839.85	1,217.22	1,484.83	14,465,729.052	1,733,806.946	39.831990709	-80.667338158
8,235.00	29.66	50.070	7,896.35	1,237.88	1,509.44	14,465,749.709	1,733,831.551	39.832047185	-80.667250243
8,329.00	29.97	50.430	7,977.91	1,267.76	1,545.37	14,465,779.593	1,733,867.484	39.832128688	-80.667121852



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hudson S-16 HU (slot P)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Site:	Hudson Alt North	MD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Well:	Hudson S-16 HU (slot P)	North Reference:	Grid
Wellbore:	Original hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original hole	Database:	DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
8,424.00	29.62	49.460	8,060.35	1,298.13	1,581.50	14,465,809.968	1,733,903.617	39.832211936	-80.668992745
8,518.00	29.31	50.430	8,142.19	1,327.89	1,616.89	14,465,839.724	1,733,939.006	39.832293289	-80.668666293
8,612.00	29.79	51.390	8,223.97	1,357.12	1,652.88	14,465,868.952	1,733,974.988	39.832373188	-80.666737735
8,735.00	31.68	51.130	8,329.69	1,396.46	1,701.90	14,465,908.291	1,734,024.015	39.832480720	-80.666562579
8,801.00	30.63	51.310	8,386.17	1,417.84	1,728.52	14,465,929.678	1,734,050.632	39.832539180	-80.666467483
8,895.00	31.03	49.280	8,466.89	1,448.62	1,765.57	14,465,960.453	1,734,087.687	39.832623316	-80.666335085
8,989.00	30.94	50.780	8,547.47	1,479.70	1,802.66	14,465,991.538	1,734,124.771	39.832708303	-80.666202577
9,082.00	29.62	49.550	8,627.78	1,509.73	1,838.67	14,466,021.567	1,734,160.783	39.832790400	-80.666073900
9,176.00	27.73	46.210	8,710.26	1,539.94	1,872.14	14,466,051.776	1,734,194.252	39.832873019	-80.665954279
9,270.00	24.79	42.080	8,794.55	1,569.71	1,901.14	14,466,081.546	1,734,223.255	39.832954475	-80.665850574
9,364.00	26.67	40.320	8,879.23	1,600.43	1,928.00	14,466,112.260	1,734,250.115	39.833038548	-80.665754489
9,458.00	29.79	42.160	8,962.04	1,633.83	1,957.33	14,466,145.663	1,734,279.446	39.833129978	-80.665649565
9,551.00	32.65	48.230	9,041.59	1,667.88	1,991.57	14,466,179.515	1,734,313.679	39.833222592	-80.665527176
9,646.00	33.18	55.790	9,121.37	1,699.38	2,032.20	14,466,211.215	1,734,354.307	39.833309230	-80.665382033
9,740.00	33.57	56.930	9,199.87	1,728.03	2,075.25	14,466,239.858	1,734,397.358	39.833387447	-80.665228301
9,834.00	34.80	57.550	9,277.63	1,756.60	2,119.66	14,466,268.433	1,734,441.773	39.833465464	-80.665069707
9,928.00	33.27	55.260	9,355.53	1,785.69	2,163.49	14,466,297.521	1,734,485.601	39.833544896	-80.664913203
10,024.00	31.16	53.150	9,436.75	1,815.59	2,205.01	14,466,327.426	1,734,527.119	39.833626584	-80.664764911
10,113.00	30.63	51.660	9,513.12	1,843.47	2,241.22	14,466,355.299	1,734,563.328	39.833702769	-80.664635559
10,202.00	29.44	51.220	9,590.17	1,871.23	2,276.05	14,466,383.064	1,734,598.163	39.833778658	-80.664511103
10,296.00	28.13	51.920	9,672.55	1,899.37	2,311.51	14,466,411.201	1,734,633.616	39.833855584	-80.664384441
10,390.00	27.91	50.870	9,755.53	1,926.92	2,346.01	14,466,438.752	1,734,668.124	39.833930869	-80.664261149
10,484.00	27.29	51.040	9,838.83	1,954.35	2,379.84	14,466,466.186	1,734,701.947	39.834005859	-80.664140304
10,579.00	26.63	50.510	9,923.51	1,981.59	2,413.20	14,466,493.419	1,734,735.313	39.834080305	-80.664021087
10,672.00	26.41	51.220	10,006.72	2,007.80	2,445.41	14,466,519.629	1,734,767.521	39.834151949	-80.663906006
10,766.00	27.51	49.640	10,090.51	2,034.95	2,478.25	14,466,546.782	1,734,800.362	39.834226180	-80.663788661
10,860.00	28.43	49.640	10,173.53	2,063.50	2,511.84	14,466,575.332	1,734,833.955	39.834304237	-80.663668615
10,955.00	29.62	51.570	10,256.60	2,092.74	2,547.47	14,466,604.570	1,734,869.580	39.834384164	-80.663541324
11,049.00	30.01	51.830	10,338.15	2,121.70	2,584.15	14,466,633.536	1,734,906.258	39.834463332	-80.663410283
11,143.00	28.78	53.330	10,420.05	2,149.75	2,620.78	14,466,661.578	1,734,942.890	39.834539964	-80.663279418
11,237.00	26.15	51.040	10,503.45	2,176.29	2,655.04	14,466,688.122	1,734,977.154	39.834612504	-80.663157011
11,331.00	23.69	50.510	10,588.69	2,201.33	2,685.73	14,466,713.159	1,735,007.839	39.834680945	-80.663047370
11,368.00	22.46	49.550	10,622.73	2,210.64	2,696.84	14,466,722.472	1,735,018.954	39.834706405	-80.663007652
11,472.00	22.01	50.720	10,719.00	2,235.87	2,727.05	14,466,747.699	1,735,049.156	39.834775371	-80.662899727
11,566.00	21.92	49.840	10,806.18	2,258.33	2,754.09	14,466,770.166	1,735,076.200	39.834836792	-80.662803092
11,660.00	22.05	49.710	10,893.34	2,281.06	2,780.96	14,466,792.892	1,735,103.068	39.834898923	-80.662707079
11,707.00	23.16	50.590	10,936.73	2,292.63	2,794.83	14,466,804.465	1,735,116.939	39.834930562	-80.662657513
11,755.00	25.23	51.690	10,980.51	2,304.97	2,810.15	14,466,816.801	1,735,132.261	39.834964280	-80.662602768
11,802.00	27.80	52.480	11,022.56	2,317.86	2,826.71	14,466,829.688	1,735,148.816	39.834999499	-80.662543621
11,849.00	30.27	53.670	11,063.65	2,331.55	2,844.95	14,466,843.383	1,735,167.055	39.835036920	-80.662478467
11,896.00	32.83	53.890	11,103.70	2,346.08	2,864.79	14,466,857.912	1,735,186.895	39.835076613	-80.662407601
11,943.00	33.01	57.070	11,143.16	2,360.55	2,885.83	14,466,872.381	1,735,207.935	39.835116130	-80.662332458
11,987.00	33.36	60.270	11,179.99	2,373.07	2,906.39	14,466,884.896	1,735,228.501	39.835150288	-80.662259028
12,034.00	35.52	64.310	11,218.75	2,385.40	2,929.92	14,466,897.227	1,735,252.033	39.835183906	-80.662175041
12,081.00	37.14	70.730	11,256.63	2,396.00	2,955.63	14,466,907.832	1,735,277.741	39.835212765	-80.662083321
12,128.00	38.46	76.620	11,293.78	2,404.07	2,983.25	14,466,915.900	1,735,305.364	39.835234634	-80.661984813
12,176.00	39.91	83.650	11,331.00	2,409.23	3,013.10	14,466,921.060	1,735,335.206	39.835248496	-80.661878441
12,223.00	40.92	89.360	11,366.80	2,411.07	3,043.48	14,466,922.901	1,735,365.594	39.835253234	-80.661770170
12,270.00	41.98	95.340	11,402.04	2,409.78	3,074.54	14,466,921.609	1,735,396.649	39.835249364	-80.661659564
12,317.00	44.40	101.490	11,436.32	2,405.04	3,106.32	14,466,916.868	1,735,428.431	39.835236015	-80.661546416
12,365.00	46.51	106.060	11,470.00	2,396.87	3,139.52	14,466,908.703	1,735,461.631	39.835213247	-80.661428261
12,412.00	48.31	110.720	11,501.81	2,385.94	3,172.33	14,466,897.774	1,735,494.441	39.835182891	-80.661311534
12,459.00	50.55	114.320	11,532.38	2,372.26	3,205.29	14,466,884.088	1,735,527.401	39.835144963	-80.661194310
12,506.00	53.14	118.450	11,561.42	2,355.82	3,238.37	14,466,867.650	1,735,560.483	39.835099477	-80.661076688



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hudson S-16 HU (slot P)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Site:	Hudson Alt North	MD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Well:	Hudson S-16 HU (slot P)	North Reference:	Grid
Wellbore:	Original hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original hole	Database:	DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
12,553.00	54.64	121.270	11,589.13	2,336.91	3,271.29	14,466,848.741	1,735,593.402	39.835047206	-80.660959681
12,600.00	57.27	123.550	11,615.44	2,316.03	3,304.16	14,466,827.862	1,735,626.267	39.834999526	-80.660842893
12,648.00	60.66	127.420	11,640.19	2,292.15	3,337.62	14,466,803.978	1,735,659.728	39.834923585	-80.660724023
12,695.00	64.00	129.970	11,662.01	2,266.12	3,370.09	14,466,777.950	1,735,692.198	39.834851770	-80.660608710
12,742.00	67.21	132.600	11,681.43	2,237.87	3,402.24	14,466,749.706	1,735,724.346	39.834773869	-80.660494576
12,789.00	70.55	135.680	11,698.36	2,207.34	3,433.68	14,466,719.173	1,735,755.791	39.834689950	-80.660382977
12,835.00	73.27	137.970	11,712.65	2,175.45	3,463.59	14,466,687.285	1,735,785.699	39.834601809	-80.660276870
12,882.00	74.81	140.870	11,725.57	2,141.14	3,492.98	14,466,652.967	1,735,815.087	39.834507258	-80.660172652
12,928.00	76.48	142.980	11,736.98	2,106.06	3,520.46	14,466,617.888	1,735,842.564	39.834410636	-80.660075251
12,975.00	78.77	144.560	11,747.05	2,069.03	3,547.58	14,466,580.859	1,735,869.692	39.834308661	-80.659979119
13,023.00	80.44	146.400	11,755.71	2,030.13	3,574.33	14,466,541.961	1,735,896.443	39.834201561	-80.659884356
13,070.00	82.20	147.190	11,762.80	1,991.26	3,599.78	14,466,503.088	1,735,921.885	39.834094539	-80.659794255
13,117.00	84.35	149.130	11,768.31	1,951.61	3,624.40	14,466,463.438	1,735,946.505	39.833985396	-80.659707083
13,164.00	86.95	150.530	11,771.87	1,911.09	3,647.95	14,466,422.926	1,735,970.054	39.833873894	-80.659623757
13,211.00	88.62	151.060	11,773.69	1,870.10	3,670.86	14,466,381.933	1,735,992.969	39.833761078	-80.659542688
13,305.00	89.10	150.800	11,775.56	1,787.96	3,716.52	14,466,299.791	1,736,038.632	39.833535021	-80.659381146
13,399.00	88.97	150.970	11,777.14	1,705.85	3,762.25	14,466,217.680	1,736,084.363	39.833309048	-80.659219365
13,493.00	89.10	152.200	11,778.73	1,623.19	3,806.98	14,466,135.019	1,736,129.086	39.833081573	-80.659061181
13,588.00	89.14	151.780	11,780.19	1,539.33	3,851.60	14,466,051.164	1,736,173.709	39.832850823	-80.658903368
13,603.00	89.16	151.940	11,780.41	1,526.11	3,858.68	14,466,037.940	1,736,180.785	39.832814432	-80.658878343
13,697.00	88.81	152.640	11,782.07	1,442.90	3,902.38	14,465,954.735	1,736,224.488	39.832658473	-80.658723804
13,791.00	88.81	152.820	11,784.02	1,359.37	3,945.44	14,465,871.200	1,736,267.547	39.832355618	-80.658571559
13,885.00	88.90	150.530	11,785.90	1,276.64	3,990.03	14,465,788.477	1,736,312.136	39.832127974	-80.658413859
13,980.00	88.81	149.830	11,787.80	1,194.24	4,037.26	14,465,706.073	1,736,359.367	39.831901179	-80.658246742
14,073.00	89.25	149.480	11,789.38	1,113.99	4,084.24	14,465,625.826	1,736,406.344	39.831680309	-80.658080502
14,165.00	89.25	149.480	11,790.58	1,034.75	4,130.95	14,465,546.580	1,736,453.062	39.831462190	-80.657915176
14,259.00	89.16	149.130	11,791.88	953.92	4,178.93	14,465,465.757	1,736,501.041	39.831239730	-80.657745377
14,354.00	89.16	149.300	11,793.28	872.32	4,227.55	14,465,384.152	1,736,549.658	39.831015114	-80.657573316
14,447.00	89.34	149.650	11,794.49	792.21	4,274.78	14,465,304.049	1,736,596.890	39.830794835	-80.657406172
14,541.00	89.08	148.600	11,795.79	711.54	4,323.02	14,465,223.379	1,736,645.122	39.830572589	-80.657235473
14,635.00	89.25	148.950	11,797.16	631.17	4,371.74	14,465,143.004	1,736,693.846	39.830351351	-80.657063018
14,730.00	89.78	149.130	11,797.97	549.71	4,420.61	14,465,061.543	1,736,742.716	39.830127124	-80.656890061
14,825.00	89.78	149.130	11,798.33	468.17	4,469.35	14,464,980.002	1,736,791.459	39.829902681	-80.656717557
14,918.00	89.87	149.650	11,798.61	388.13	4,516.71	14,464,899.962	1,736,838.814	39.829682374	-80.656549980
15,013.00	89.34	150.010	11,799.27	306.00	4,564.45	14,464,817.833	1,736,886.556	39.829456327	-80.656381051
15,106.00	89.08	149.480	11,800.55	225.67	4,611.30	14,464,737.509	1,736,933.409	39.829235244	-80.656215266
15,201.00	88.72	150.890	11,802.37	143.27	4,658.53	14,464,655.101	1,736,980.634	39.829008435	-80.656048189
15,296.00	88.81	151.410	11,804.42	60.08	4,704.36	14,464,571.912	1,737,026.463	39.828779494	-80.655886095
15,390.00	88.81	150.890	11,806.37	-22.24	4,749.70	14,464,489.597	1,737,071.809	39.828552959	-80.655725706
15,484.00	88.72	150.360	11,808.40	-104.13	4,795.80	14,464,407.702	1,737,117.908	39.828327570	-80.655562636
15,578.00	88.64	150.180	11,810.57	-185.74	4,842.40	14,464,326.097	1,737,164.511	39.828102971	-80.655397763
15,672.00	88.72	150.710	11,812.73	-267.49	4,888.76	14,464,244.350	1,737,210.865	39.827877986	-80.655233782
15,767.00	88.81	150.180	11,814.78	-350.11	4,935.61	14,464,161.731	1,737,257.713	39.827650599	-80.655068053
15,861.00	88.81	150.530	11,816.73	-431.78	4,982.09	14,464,080.053	1,737,304.198	39.827425800	-80.654903608
15,956.00	88.81	151.240	11,818.70	-514.76	5,028.30	14,463,997.075	1,737,350.411	39.827197435	-80.654740148
16,050.00	88.90	151.590	11,820.58	-597.29	5,073.27	14,463,914.550	1,737,395.377	39.826970325	-80.654581124
16,144.00	89.08	151.590	11,822.24	-679.95	5,117.99	14,463,831.884	1,737,440.093	39.826742831	-80.654422994
16,239.00	88.99	150.890	11,823.84	-763.22	5,163.69	14,463,748.615	1,737,485.795	39.826513672	-80.654261364
16,333.00	88.90	150.010	11,825.57	-844.98	5,210.04	14,463,666.857	1,737,532.146	39.826288653	-80.654097402
16,426.00	88.99	149.830	11,827.28	-925.44	5,256.64	14,463,586.395	1,737,578.750	39.826067193	-80.653932519
16,519.00	89.08	149.830	11,828.85	-1,005.83	5,303.38	14,463,506.005	1,737,625.482	39.825845926	-80.653767182
16,614.00	88.90	149.830	11,830.52	-1,087.95	5,351.11	14,463,423.887	1,737,673.218	39.825619903	-80.653598293
16,708.00	89.16	150.710	11,832.11	-1,169.57	5,397.72	14,463,342.272	1,737,719.827	39.825395276	-80.653433415
16,802.00	89.25	150.360	11,833.42	-1,251.40	5,443.95	14,463,260.439	1,737,766.060	39.825170051	-80.653269877



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hudson S-16 HU (slot P)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Site:	Hudson Alt North	MD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Well:	Hudson S-16 HU (slot P)	North Reference:	Grid
Wellbore:	Original hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original hole	Database:	DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
16,896.00	89.08	150.360	11,834.79	-1,333.09	5,490.44	14,463,178.748	1,737,812.543	39.824945213	-80.653105451
16,990.00	89.25	150.180	11,836.16	-1,414.71	5,537.05	14,463,097.130	1,737,859.154	39.824720575	-80.652940568
17,084.00	89.34	150.360	11,837.32	-1,496.33	5,583.66	14,463,015.509	1,737,905.766	39.824495930	-80.652775681
17,179.00	89.43	150.180	11,838.34	-1,578.82	5,630.77	14,462,933.019	1,737,952.875	39.824268891	-80.652609039
17,273.00	88.90	148.950	11,839.70	-1,659.86	5,678.38	14,462,851.982	1,738,000.485	39.824045838	-80.652440591
17,367.00	88.55	150.010	11,841.80	-1,740.81	5,726.10	14,462,771.027	1,738,048.209	39.823823008	-80.652271737
17,461.00	88.81	150.360	11,843.96	-1,822.35	5,772.83	14,462,689.491	1,738,094.934	39.823598593	-80.652106454
17,555.00	88.64	150.530	11,846.05	-1,904.10	5,819.18	14,462,607.743	1,738,141.288	39.823373598	-80.651942492
17,649.00	88.64	149.650	11,848.28	-1,985.55	5,866.04	14,462,526.287	1,738,188.147	39.823149400	-80.651776732
17,743.00	88.64	150.010	11,850.52	-2,066.80	5,913.27	14,462,445.043	1,738,235.375	39.822925783	-80.651609655
17,837.00	88.37	149.480	11,852.97	-2,147.97	5,960.62	14,462,363.875	1,738,282.720	39.822702370	-80.651442160
17,931.00	88.72	150.010	11,855.36	-2,229.14	6,007.96	14,462,282.705	1,738,330.066	39.822478953	-80.651274682
18,026.00	88.72	149.830	11,857.48	-2,311.32	6,055.56	14,462,200.520	1,738,377.669	39.822252744	-80.651106266
18,119.00	88.64	149.830	11,859.62	-2,391.70	6,102.29	14,462,120.140	1,738,424.395	39.822031500	-80.650940967
18,213.00	88.72	149.830	11,861.78	-2,472.95	6,149.52	14,462,038.895	1,738,471.624	39.821807877	-80.650773892
18,306.00	88.90	149.830	11,863.72	-2,553.33	6,196.25	14,461,958.510	1,738,518.352	39.821586622	-80.650608588
18,400.00	88.99	150.010	11,865.45	-2,634.66	6,243.35	14,461,877.184	1,738,565.458	39.821362775	-80.650441955
18,494.00	88.90	150.010	11,867.18	-2,716.06	6,290.33	14,461,795.783	1,738,612.436	39.821138726	-80.650275780
18,588.00	88.90	150.010	11,868.98	-2,797.46	6,337.31	14,461,714.384	1,738,659.413	39.820914681	-80.650109607
18,683.00	88.99	149.830	11,870.73	-2,879.65	6,384.92	14,461,632.192	1,738,707.019	39.820688452	-80.649941205
18,777.00	88.90	149.300	11,872.46	-2,960.68	6,432.52	14,461,551.159	1,738,754.628	39.820465405	-80.649772782
18,872.00	88.99	150.010	11,874.21	-3,042.65	6,480.51	14,461,469.188	1,738,802.614	39.820239780	-80.649603028
18,968.00	88.99	149.830	11,875.87	-3,123.98	6,527.62	14,461,387.861	1,738,849.720	39.820015928	-80.649436399
19,061.00	89.16	149.830	11,877.40	-3,206.10	6,575.35	14,461,305.740	1,738,897.457	39.819789894	-80.649267534
19,154.00	89.08	150.010	11,878.83	-3,286.57	6,621.96	14,461,225.275	1,738,944.064	39.819568415	-80.649102674
19,248.00	89.52	149.480	11,879.98	-3,367.76	6,669.32	14,461,144.085	1,738,991.422	39.819344939	-80.648935150
19,341.00	89.60	150.010	11,880.69	-3,448.09	6,716.18	14,461,063.755	1,739,038.279	39.819123830	-80.648769402
19,436.00	89.43	149.480	11,881.50	-3,530.15	6,764.04	14,460,981.698	1,739,086.142	39.818897968	-80.648600091
19,535.00	89.43	149.300	11,882.48	-3,615.35	6,814.45	14,460,896.498	1,739,136.550	39.818663444	-80.648421766
19,629.00	89.43	149.480	11,883.42	-3,696.24	6,862.31	14,460,815.601	1,739,184.411	39.818440766	-80.648252449
19,722.00	89.52	149.650	11,884.27	-3,776.42	6,909.42	14,460,735.420	1,739,231.519	39.818220061	-80.648085807
19,816.00	89.52	149.830	11,885.06	-3,857.61	6,956.78	14,460,654.230	1,739,278.886	39.817996585	-80.647918256
19,910.00	89.52	149.480	11,885.84	-3,938.73	7,004.27	14,460,573.112	1,739,326.374	39.817773301	-80.647750279
20,005.00	89.60	150.010	11,886.57	-4,020.79	7,052.14	14,460,491.054	1,739,374.238	39.817547435	-80.647580972
20,099.00	89.34	149.650	11,887.44	-4,102.05	7,099.37	14,460,409.792	1,739,421.477	39.817323758	-80.647413683
20,193.00	89.34	149.480	11,888.53	-4,183.09	7,146.99	14,460,328.750	1,739,469.090	39.817100684	-80.647245458
20,288.00	89.34	149.830	11,889.62	-4,265.07	7,194.98	14,460,246.771	1,739,517.081	39.816875030	-80.647075702
20,382.00	89.43	149.480	11,890.63	-4,346.19	7,242.47	14,460,165.654	1,739,564.569	39.816651750	-80.646907732
20,476.00	89.43	149.480	11,891.56	-4,427.16	7,290.20	14,460,084.681	1,739,612.302	39.816428864	-80.646738879
20,571.00	88.99	149.830	11,892.87	-4,509.14	7,338.19	14,460,002.705	1,739,660.292	39.816203217	-80.646569131
20,665.00	89.16	150.180	11,894.39	-4,590.54	7,385.18	14,459,921.305	1,739,707.279	39.815979166	-80.646402949
20,759.00	89.25	150.010	11,895.70	-4,672.02	7,432.04	14,459,839.829	1,739,754.139	39.815754905	-80.646237218
20,854.00	89.16	150.010	11,897.01	-4,754.29	7,479.52	14,459,757.557	1,739,801.620	39.815528450	-80.646069290
20,947.00	88.90	149.650	11,898.59	-4,834.68	7,526.25	14,459,677.166	1,739,848.352	39.815307172	-80.645904004
21,041.00	88.64	149.830	11,900.61	-4,915.85	7,573.61	14,459,595.993	1,739,895.710	39.815083737	-80.645736501
21,135.00	88.90	150.710	11,902.62	-4,997.46	7,620.21	14,459,514.386	1,739,942.314	39.814859119	-80.645571688
21,230.00	89.43	150.710	11,904.01	-5,080.31	7,666.69	14,459,431.541	1,739,988.786	39.814631100	-80.645407366
21,323.00	89.25	150.360	11,905.08	-5,161.27	7,712.43	14,459,350.575	1,740,034.528	39.814408253	-80.645245615
21,417.00	89.16	150.710	11,906.38	-5,243.11	7,758.66	14,459,268.742	1,740,080.762	39.814183016	-80.645082130
21,511.00	89.52	150.530	11,907.47	-5,325.01	7,804.77	14,459,186.837	1,740,126.875	39.813957585	-80.644919075
21,605.00	89.34	150.530	11,908.40	-5,406.84	7,851.02	14,459,105.004	1,740,173.117	39.813732348	-80.644755559
21,700.00	89.16	150.180	11,909.65	-5,489.40	7,898.00	14,459,022.446	1,740,220.102	39.813505113	-80.644589410
21,793.00	89.25	150.360	11,910.94	-5,570.15	7,944.12	14,458,941.695	1,740,266.218	39.813282850	-80.644426334
21,888.00	89.34	150.360	11,912.10	-5,652.72	7,991.10	14,458,859.133	1,740,313.196	39.813055601	-80.644260211



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hudson S-16 HU (slot P)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Site:	Hudson Alt North	MD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Well:	Hudson S-16 HU (slot P)	North Reference:	Grid
Wellbore:	Original hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original hole	Database:	DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
21,983.00	89.08	150.010	11,913.41	-5,735.13	8,038.33	14,458,776.715	1,740,360.426	39.812828749	-80.644093194
22,077.00	89.25	150.180	11,914.78	-5,816.81	8,085.19	14,458,695.240	1,740,407.286	39.812604487	-80.643927480
22,171.00	89.34	150.180	11,915.94	-5,898.16	8,131.93	14,458,613.693	1,740,454.026	39.812380029	-80.643762194
22,266.00	89.25	150.360	11,917.11	-5,980.64	8,179.03	14,458,531.204	1,740,501.134	39.812152980	-80.643595613
22,360.00	89.25	150.360	11,918.34	-6,062.34	8,225.52	14,458,449.511	1,740,547.618	39.811928124	-80.643431245
22,454.00	89.78	150.360	11,919.14	-6,144.03	8,272.00	14,458,367.814	1,740,594.103	39.811703257	-80.643268871
22,548.00	89.78	150.530	11,919.50	-6,225.80	8,318.37	14,458,286.046	1,740,640.469	39.811478195	-80.643102926
22,641.00	90.04	150.710	11,919.64	-6,306.84	8,364.00	14,458,205.008	1,740,686.095	39.811255145	-80.642941608
22,735.00	89.87	150.360	11,919.72	-6,388.68	8,410.23	14,458,123.166	1,740,732.332	39.811029883	-80.642778123
22,828.00	89.60	150.530	11,920.15	-6,469.58	8,456.11	14,458,042.268	1,740,778.205	39.810807216	-80.642615925
22,922.00	89.52	150.710	11,920.87	-6,551.49	8,502.22	14,457,960.361	1,740,824.320	39.810581773	-80.642452850
23,015.00	88.99	150.360	11,922.08	-6,632.45	8,547.96	14,457,879.397	1,740,870.061	39.810358926	-80.642291181
23,110.00	89.16	150.710	11,923.61	-6,715.15	8,594.69	14,457,796.696	1,740,916.785	39.810131297	-80.642125953
23,204.00	88.90	150.890	11,925.20	-6,797.20	8,640.54	14,457,714.653	1,740,962.637	39.809905485	-80.641963848
23,298.00	89.08	150.360	11,926.86	-6,879.10	8,686.64	14,457,632.752	1,741,008.739	39.809680059	-80.641800854
23,392.00	89.08	150.360	11,928.37	-6,960.79	8,733.12	14,457,551.063	1,741,055.220	39.809455211	-80.641636505
23,486.00	89.08	150.180	11,929.88	-7,042.40	8,779.73	14,457,469.447	1,741,101.830	39.809230561	-80.641471700
23,580.00	89.16	150.360	11,931.32	-7,124.02	8,826.34	14,457,387.830	1,741,148.440	39.809005908	-80.641306894
23,674.00	89.16	150.360	11,932.70	-7,205.71	8,872.82	14,457,306.138	1,741,194.923	39.808781054	-80.641142546
23,767.00	89.08	150.010	11,934.13	-7,286.39	8,919.06	14,457,225.458	1,741,241.157	39.808558978	-80.640979068
23,861.00	89.16	150.710	11,935.57	-7,368.08	8,965.54	14,457,143.768	1,741,287.638	39.808334127	-80.640814724
23,955.00	89.34	150.530	11,936.80	-7,449.99	9,011.65	14,457,061.865	1,741,333.751	39.808108694	-80.640651700
24,050.00	89.25	150.530	11,937.97	-7,532.69	9,058.39	14,456,979.164	1,741,380.484	39.807881060	-80.640486477
24,144.00	89.16	150.360	11,939.28	-7,614.45	9,104.75	14,456,897.403	1,741,426.848	39.807656015	-80.640322564
24,237.00	89.08	150.360	11,940.70	-7,695.27	9,150.74	14,456,816.582	1,741,472.833	39.807433553	-80.640159972
24,331.00	89.16	150.360	11,942.15	-7,776.96	9,197.22	14,456,734.891	1,741,519.315	39.807208699	-80.639995632
24,426.00	89.08	150.180	11,943.61	-7,859.45	9,244.32	14,456,652.406	1,741,566.421	39.806981655	-80.639829083
24,520.00	89.08	149.830	11,945.12	-7,940.85	9,291.31	14,456,571.006	1,741,613.408	39.806757593	-80.639662944
24,614.00	88.99	149.830	11,946.70	-8,022.10	9,338.55	14,456,489.751	1,741,660.643	39.806533926	-80.639495922
24,708.00	89.08	149.830	11,948.28	-8,103.36	9,385.78	14,456,408.496	1,741,707.877	39.806310259	-80.639328901
24,802.00	88.90	150.010	11,949.94	-8,184.68	9,432.89	14,456,327.169	1,741,754.983	39.806086392	-80.639162339
24,897.00	88.81	150.180	11,951.84	-8,267.02	9,480.24	14,456,244.834	1,741,802.337	39.805859759	-80.638994910
24,992.00	88.90	151.240	11,953.74	-8,349.86	9,526.71	14,456,161.997	1,741,848.804	39.805631755	-80.638830649
25,086.00	89.34	151.940	11,955.18	-8,432.52	9,571.42	14,456,079.329	1,741,893.521	39.805404232	-80.638672615
25,181.00	88.99	152.820	11,956.56	-8,516.89	9,615.46	14,455,995.165	1,741,937.559	39.805172610	-80.638517026
25,275.00	89.34	149.130	11,957.93	-8,598.86	9,661.06	14,455,912.994	1,741,983.154	39.804946444	-80.638355861
25,370.00	89.34	149.130	11,959.03	-8,680.40	9,709.80	14,455,831.458	1,742,031.894	39.804721986	-80.638183490
25,465.00	89.25	149.130	11,960.20	-8,761.93	9,758.54	14,455,749.922	1,742,080.634	39.804497529	-80.638011121
25,559.00	89.43	149.130	11,961.28	-8,842.61	9,806.77	14,455,669.245	1,742,128.861	39.804275434	-80.637840567
25,654.00	89.43	148.420	11,962.23	-8,923.84	9,856.01	14,455,588.011	1,742,178.107	39.804051800	-80.637666397
25,747.00	88.81	148.950	11,963.65	-9,003.29	9,904.34	14,455,508.569	1,742,226.436	39.803833097	-80.637495462
25,842.00	88.99	148.600	11,965.48	-9,084.51	9,953.58	14,455,427.347	1,742,275.675	39.803609493	-80.637321317
25,936.00	88.90	148.420	11,967.21	-9,164.65	10,002.67	14,455,347.204	1,742,324.768	39.803388855	-80.637147679
26,030.00	88.90	149.480	11,969.01	-9,245.17	10,051.15	14,455,266.688	1,742,373.242	39.803167202	-80.636976249
26,124.00	89.16	150.010	11,970.80	-9,326.35	10,098.50	14,455,185.504	1,742,420.597	39.802943723	-80.636808815
26,219.00	88.90	149.830	11,972.21	-9,408.55	10,146.11	14,455,103.310	1,742,468.204	39.802717469	-80.636640496
26,313.00	88.72	150.360	11,974.17	-9,490.01	10,192.96	14,455,021.844	1,742,515.059	39.802493222	-80.636474849
26,408.00	88.81	150.530	11,976.21	-9,572.63	10,239.81	14,454,939.225	1,742,561.908	39.802265807	-80.636309241
26,503.00	88.99	150.180	11,978.04	-9,655.18	10,286.79	14,454,856.675	1,742,608.888	39.802038582	-80.636143164
26,597.00	88.55	150.360	11,980.05	-9,736.79	10,333.40	14,454,775.067	1,742,655.493	39.801813948	-80.635978412
26,691.00	88.81	150.530	11,982.22	-9,818.54	10,379.75	14,454,693.320	1,742,701.847	39.801588934	-80.635814556
26,785.00	88.81	150.710	11,984.17	-9,900.43	10,425.86	14,454,611.428	1,742,747.953	39.801363523	-80.635651585
26,879.00	88.99	150.180	11,985.98	-9,982.18	10,472.22	14,454,529.674	1,742,794.311	39.801138491	-80.635487718
26,973.00	88.90	149.480	11,987.71	-10,063.43	10,519.45	14,454,448.422	1,742,841.544	39.800913495	-80.635320729



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Weil Hudson S-16 HU (slot P)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Site:	Hudson Alt North	MD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Well:	Hudson S-16 HU (slot P)	North Reference:	Grid
Wellbore:	Original hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original hole	Database:	DB_Feb1422LT

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
27,068.00	89.08	150.360	11,989.38	-10,145.83	10,567.06	14,454,366.230	1,742,889.150	39.800688574	-80.635152423
27,162.00	89.16	150.180	11,990.83	-10,227.24	10,613.67	14,454,284.613	1,742,935.761	39.800463912	-80.634987658
27,256.00	89.16	150.180	11,992.20	-10,308.79	10,660.41	14,454,203.068	1,742,982.500	39.800239448	-80.634822435
27,349.00	89.16	150.180	11,993.57	-10,389.47	10,706.65	14,454,122.391	1,743,028.741	39.800017371	-80.634658971
27,444.00	89.08	149.650	11,995.03	-10,471.66	10,754.26	14,454,040.199	1,743,076.357	39.799791120	-80.634490637
27,538.00	89.08	149.480	11,996.54	-10,552.70	10,801.87	14,453,959.163	1,743,123.968	39.799568041	-80.634322307
27,632.00	89.08	149.300	11,998.04	-10,633.59	10,849.73	14,453,878.272	1,743,171.825	39.799345359	-80.634153095
27,727.00	89.16	149.300	11,999.50	-10,715.26	10,898.23	14,453,796.596	1,743,220.321	39.799120512	-80.633981625
27,820.00	89.25	148.780	12,000.79	-10,795.00	10,946.07	14,453,716.854	1,743,268.159	39.798900985	-80.633812469
27,915.00	89.25	148.780	12,002.04	-10,876.24	10,995.30	14,453,635.619	1,743,317.396	39.798677341	-80.633638356
28,009.00	89.25	150.010	12,003.27	-10,957.14	11,043.15	14,453,554.722	1,743,365.248	39.798454641	-80.633469170
28,104.00	89.16	150.010	12,004.59	-11,039.41	11,090.64	14,453,472.449	1,743,412.729	39.798228167	-80.633301325
28,198.00	88.99	150.360	12,006.10	-11,120.96	11,137.37	14,453,390.901	1,743,459.459	39.798003695	-80.633136142
28,292.00	88.99	149.300	12,007.76	-11,202.21	11,184.60	14,453,309.649	1,743,506.692	39.797780025	-80.632969167
28,388.00	88.81	148.600	12,009.60	-11,284.44	11,234.11	14,453,227.420	1,743,556.198	39.797553647	-80.632794116
28,482.00	88.90	149.130	12,011.48	-11,364.88	11,282.70	14,453,146.977	1,743,604.792	39.797332184	-80.632622889
28,576.00	88.81	149.830	12,013.36	-11,445.84	11,330.43	14,453,066.017	1,743,652.519	39.797109312	-80.632453555
28,670.00	88.90	150.180	12,015.24	-11,527.24	11,377.41	14,452,984.623	1,743,699.502	39.796885256	-80.632287475
28,764.00	89.08	150.360	12,016.90	-11,608.85	11,424.02	14,452,903.009	1,743,746.110	39.796660599	-80.632122735
28,857.00	89.08	150.530	12,018.39	-11,689.74	11,469.88	14,452,822.121	1,743,791.977	39.796437942	-80.631960625
28,952.00	89.16	151.410	12,019.85	-11,772.79	11,515.98	14,452,739.067	1,743,838.072	39.796209336	-80.631797738
29,046.00	89.25	151.060	12,021.15	-11,855.19	11,561.21	14,452,656.675	1,743,883.302	39.795982557	-80.631637919
29,141.00	89.16	151.410	12,022.47	-11,938.45	11,606.92	14,452,573.406	1,743,929.013	39.795753365	-80.631476402
29,235.00	88.81	151.060	12,024.14	-12,020.84	11,652.15	14,452,491.019	1,743,974.240	39.795526600	-80.631316596
29,330.00	88.90	151.410	12,026.03	-12,104.10	11,697.85	14,452,407.759	1,744,019.947	39.795297431	-80.631155097
29,425.00	88.99	151.060	12,027.78	-12,187.36	11,743.56	14,452,324.496	1,744,065.655	39.795068255	-80.630993595
29,520.00	88.72	149.650	12,029.68	-12,269.91	11,790.54	14,452,241.950	1,744,112.633	39.794841031	-80.630827559
29,615.00	88.90	150.010	12,031.65	-12,352.02	11,838.27	14,452,159.836	1,744,160.366	39.794614989	-80.630658831
29,709.00	88.99	150.360	12,033.39	-12,433.57	11,885.00	14,452,078.293	1,744,207.095	39.794390522	-80.630493672
29,804.00	88.99	150.010	12,035.06	-12,515.98	11,932.23	14,451,995.881	1,744,254.322	39.794163663	-80.630326754
29,898.00	88.99	149.830	12,036.72	-12,597.31	11,979.34	14,451,914.553	1,744,301.428	39.793939783	-80.630160250
29,991.00	88.90	150.010	12,038.43	-12,677.77	12,025.94	14,451,834.091	1,744,348.032	39.793718288	-80.629995521
30,085.00	89.25	150.360	12,039.95	-12,759.32	12,072.67	14,451,752.545	1,744,394.763	39.793493811	-80.629830360
30,180.00	88.90	150.530	12,041.48	-12,841.94	12,119.52	14,451,669.917	1,744,441.616	39.793266364	-80.629664779
30,274.00	89.16	150.360	12,043.07	-12,923.70	12,165.88	14,451,588.160	1,744,487.976	39.793041313	-80.629500944
30,368.00	89.16	150.360	12,044.45	-13,005.39	12,212.37	14,451,506.469	1,744,534.458	39.792816442	-80.629336672
30,462.00	88.81	150.530	12,046.11	-13,087.15	12,258.73	14,451,424.713	1,744,580.817	39.792591394	-80.629172841
30,557.00	88.81	150.530	12,048.09	-13,169.84	12,305.45	14,451,342.023	1,744,627.544	39.792363775	-80.629007716
30,648.00	88.81	150.530	12,049.98	-13,249.05	12,350.21	14,451,262.814	1,744,672.303	39.792145741	-80.628849544
Survey @ 30648.00 MD 12049.98 TVD									
30,735.00	88.81	150.530	12,051.78	-13,324.78	12,393.00	14,451,187.087	1,744,715.095	39.791937290	-80.628698326
Survey projected to 30735.00 MD 12051.78 TVD									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
174.00	174.00	0.01	-0.06	MWD surveys
30,648.00	12,049.98	-13,249.05	12,350.21	Survey @ 30648.00 MD 12049.98 TVD
30,735.00	12,051.78	-13,324.78	12,393.00	Survey projected to 30735.00 MD 12051.78 TVD



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Hudson S-16 HU (slot P)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Site:	Hudson Alt North	MD Reference:	RKB=1346+33 @ 1379.00ft (Nabors X08)
Well:	Hudson S-16 HU (slot P)	North Reference:	Grid
Wellbore:	Original hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original hole	Database:	DB_Feb1422LT