



Well: Van Winkle S-20 HU (slot A)
 Site: Van Winkle
 Project: Marshall County, West Virginia NAD83 UTM 17N
 Design: rev6
 Rig: Nabors B28

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
Van Winkle S-20HU LP r6	11003.00	-1533.86	-2229.54	14445758.814	1714883.645	39.777321000	-80.734954000
- plan misses target center by 0.01ft at 11978.83ft MD (11003.00 TVD, -1533.87 N, -2229.54 E)							
Van Winkle S-20HU PBHL r6	11261.00	-14369.94	5123.66	14432922.766	1722236.823	39.742007000	-80.708931000
- plan hits target center							

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Annotation
180.00	0.03	157.580	180.00	-0.04	0.02	0.05	MWD surveys
26753.00	88.64	150.300	11248.34	-14341.44	5109.40	15224.42	Survey @ 26753.00 MD 11248.34 TVD
26787.00	88.64	150.300	11249.15	-14370.97	5126.24	15257.88	Survey Proj. to 26787.00 MD 11249.15 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=753+26 @ 779.00ft (Nabors B28)

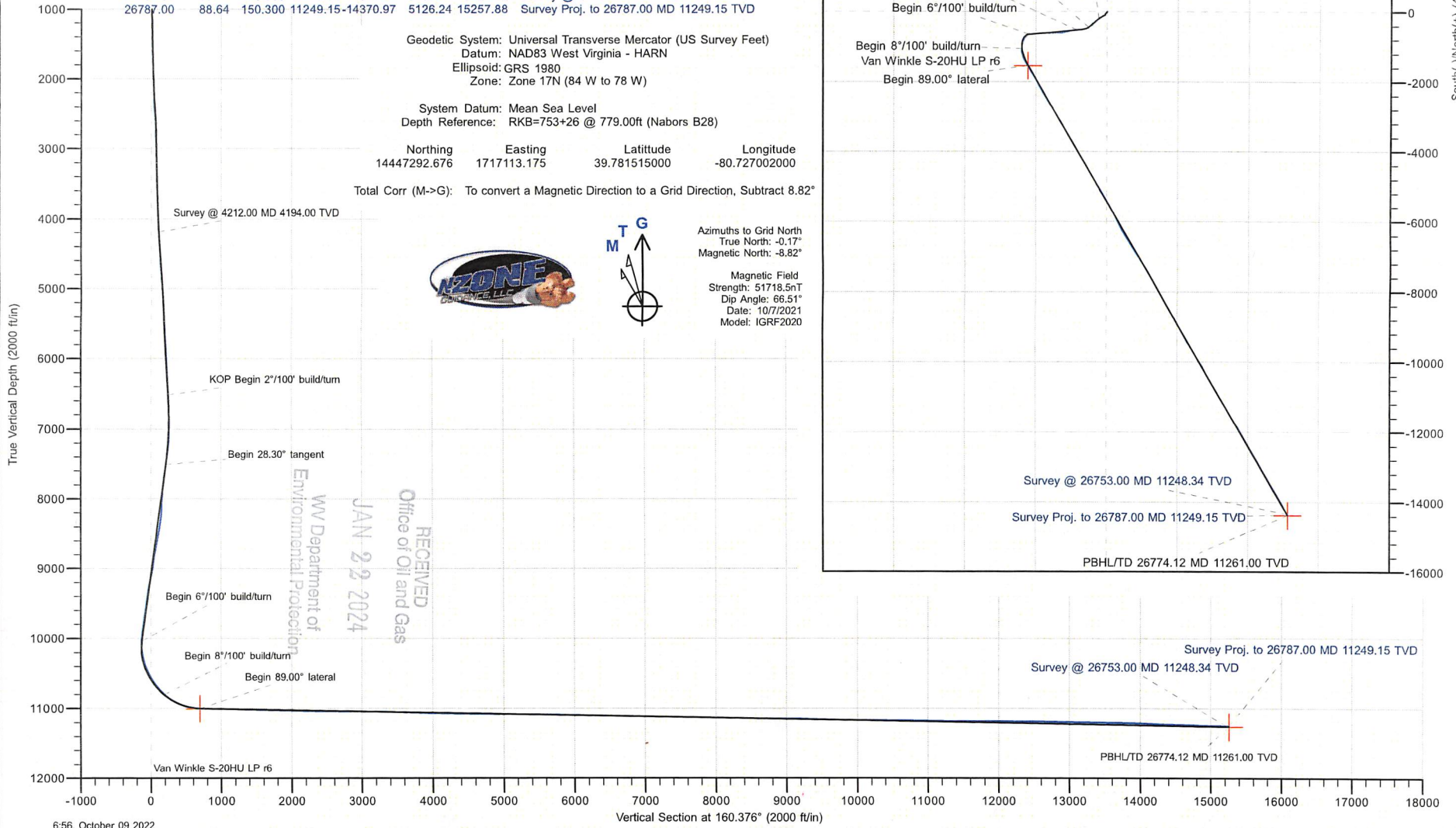
Northing	Easting	Latitude	Longitude
14447292.676	1717113.175	39.781515000	-80.727002000

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.82°



Azimuths to Grid North
 True North: -0.17°
 Magnetic North: -8.82°

Magnetic Field
 Strength: 51718.5nT
 Dip Angle: 66.51°
 Date: 10/7/2021
 Model: IGRF2020



SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Annotation
1	4212.00	9.49	229.890	4194.00	-196.78	-228.75	0.00	0.00	108.52	Survey @ 4212.00 MD 4194.00 TVD
2	6564.19	9.49	229.890	6514.00	-446.63	-525.36	0.00	0.00	244.25	KOP Begin 2°/100' build/turn
3	7622.93	28.30	264.890	7513.65	-526.12	-845.70	2.00	48.82	211.54	Begin 28.30° tangent
4	10489.55	28.30	264.890	10037.74	-647.16	-2199.15	0.00	0.00	-129.00	Begin 6°/100' build/turn
5	11420.32	50.00	174.170	10808.68	-1054.22	-2398.72	6.00	-112.24	187.39	Begin 8°/100' build/turn
6	11978.81	89.00	150.194	11003.00	-1533.86	-2229.54	8.00	-35.30	695.99	Begin 89.00° lateral
7	26774.12	89.00	150.194	11261.00	-14369.94	5123.66	0.00	0.0015256.05		PBHL/TD 26774.12 MD 11261.00 TVD

West(-)/East(+) (4000 ft/in)

South(-)/North(+) (4000 ft/in)

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 Office of Oil and Gas
 JAN 22 2024
 WV Department of
 Environmental Protection



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle S-20 HU (slot A)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

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	Van Winkle				
Site Position:		Northing:	14,447,369.493 usft	Latitude:	39.781725330
From:	Lat/Long	Easting:	1,717,188.440 usft	Longitude:	-80.726733270
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "		

Well	Van Winkle S-20 HU (slot A)					
Well Position	+N/-S	0.00 ft	Northing:	14,447,292.676 usft	Latitude:	39.781515000
	+E/-W	0.00 ft	Easting:	1,717,113.176 usft	Longitude:	-80.727002000
Position Uncertainty	0.00 ft		Wellhead Elevation:	ft	Ground Level:	753.00 ft
Grid Convergence:	0.17 °					

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	10/7/2021	-8.65	66.51	51,718.52210885

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	160.380	

Survey Program	Date	10/9/2022			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
180.00	2,220.00	MWD surf (Original Hole)	MWD	MWD - Standard	RECEIVED Office of Oil and Gas JAN 22 2024
2,252.00	4,212.00	MWD 2252-4212 MD (Original Hole)	MWD	MWD - Standard	
4,253.00	26,753.00	MWD (Original Hole)	MWD	MWD - Standard	
26,787.00	26,787.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey	WV Department of Environmental Protection									
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	
180.00	0.03	157.580	180.00	-0.04	0.02	0.05	0.02	0.02	0.00	
MWD surveys										
208.00	0.19	141.570	208.00	-0.09	0.05	0.10	0.58	0.57	-57.18	
238.00	0.08	115.390	238.00	-0.13	0.10	0.16	0.41	-0.37	-87.27	
266.00	0.31	160.010	266.00	-0.21	0.14	0.25	0.93	0.82	159.36	
296.00	0.22	177.680	296.00	-0.35	0.17	0.39	0.40	-0.30	58.90	

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Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

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)	
325.00	0.31	138.390	325.00	-0.46	0.23	0.51	0.68	0.31	-135.48	
356.00	0.22	173.280	356.00	-0.58	0.29	0.65	0.58	-0.29	112.55	
388.00	0.40	169.680	388.00	-0.76	0.32	0.82	0.57	0.56	-11.25	
419.00	0.40	163.880	419.00	-0.97	0.37	1.03	0.13	0.00	-18.71	
451.00	0.70	171.080	451.00	-1.27	0.43	1.34	0.96	0.94	22.50	
482.00	0.79	171.950	481.99	-1.66	0.49	1.73	0.29	0.29	2.81	
514.00	0.70	177.590	513.99	-2.08	0.53	2.13	0.36	-0.28	17.63	
545.00	0.48	192.530	544.99	-2.39	0.51	2.43	0.86	-0.71	48.19	
577.00	0.48	188.580	576.99	-2.66	0.46	2.66	0.10	0.00	-12.34	
608.00	1.01	186.380	607.99	-3.06	0.41	3.02	1.71	1.71	-7.10	
640.00	0.88	202.020	639.98	-3.57	0.28	3.45	0.90	-0.41	48.88	
672.00	0.70	176.980	671.98	-3.99	0.20	3.82	1.20	-0.56	-78.25	
703.00	0.88	204.220	702.98	-4.39	0.11	4.18	1.33	0.58	87.87	
734.00	1.19	198.770	733.97	-4.92	-0.09	4.60	1.05	1.00	-17.58	
766.00	1.10	202.820	765.96	-5.51	-0.31	5.09	0.38	-0.28	12.66	
798.00	1.10	204.750	797.96	-6.08	-0.56	5.54	0.12	0.00	6.03	
829.00	0.70	211.340	828.95	-6.51	-0.78	5.87	1.33	-1.29	21.26	
861.00	0.88	185.240	860.95	-6.92	-0.91	6.21	1.24	0.56	-81.56	
893.00	1.01	190.250	892.95	-7.44	-0.98	6.68	0.48	0.41	15.66	
925.00	1.01	195.520	924.94	-7.99	-1.11	7.16	0.29	0.00	16.47	
957.00	1.10	197.980	956.94	-8.56	-1.28	7.63	0.31	0.28	7.69	
988.00	0.88	196.490	987.93	-9.07	-1.44	8.06	0.71	-0.71	-4.81	
1,020.00	1.19	213.970	1,019.93	-9.58	-1.69	8.45	1.37	0.97	54.63	
1,052.00	1.01	200.090	1,051.92	-10.12	-1.97	8.87	1.00	-0.56	-43.38	
1,083.00	1.41	216.790	1,082.91	-10.68	-2.30	9.29	1.71	1.29	53.87	
1,115.00	1.19	207.730	1,114.91	-11.29	-2.69	9.73	0.94	-0.69	-28.31	
1,147.00	1.19	214.770	1,146.90	-11.86	-3.03	10.15	0.46	0.00	22.00	
1,179.00	1.89	223.730	1,178.89	-12.51	-3.58	10.58	2.31	2.19	28.00	
1,210.00	2.11	223.560	1,209.87	-13.29	-4.33	11.07	0.71	0.71	-0.55	
1,242.00	2.29	224.880	1,241.84	-14.17	-5.19	11.61	0.58	0.56	4.13	
1,274.00	2.20	222.680	1,273.82	-15.08	-6.06	12.17	0.39	-0.28	-6.88	
1,306.00	2.42	225.670	1,305.79	-16.00	-6.96	12.74	0.78	0.69	9.34	
1,338.00	2.90	233.750	1,337.76	-16.95	-8.09	13.25	1.90	1.50	25.25	
1,369.00	2.81	236.130	1,368.72	-17.84	-9.36	13.66	0.48	-0.29	7.68	
1,401.00	3.21	235.070	1,400.68	-18.79	-10.74	14.09	1.26	1.25	-3.31	
1,433.00	3.30	230.940	1,432.62	-19.88	-12.19	14.64	0.78	0.28	-12.91	
1,465.00	3.52	232.350	1,464.57	-21.06	-13.68	15.25	0.74	0.69	4.41	
1,496.00	3.69	232.170	1,495.51	-22.26	-15.22	15.85	0.55	0.55	-0.58	
1,528.00	3.52	238.240	1,527.44	-23.41	-16.87	16.38	1.30	-0.53	18.97	
1,560.00	3.69	234.460	1,559.38	-24.52	-18.55	16.87	0.91	0.53	-11.81	
1,590.00	3.78	231.120	1,589.32	-25.70	-20.10	17.46	0.78	0.30	-11.13	
1,622.00	3.91	233.310	1,621.24	-27.02	-21.80	18.13	0.61	0.41	6.84	
1,652.00	3.52	229.000	1,651.18	-28.23	-23.31	18.77	1.60	-1.30	-14.37	
1,683.00	3.78	221.890	1,682.12	-29.62	-24.71	19.60	1.68	0.84	-22.94	

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Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

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)
1,714.00	4.21	220.480	1,713.04	-31.24	-26.13	20.65	1.42	1.39	-4.55
1,746.00	4.48	222.410	1,744.95	-33.06	-27.74	21.83	0.96	0.84	6.03
1,777.00	4.00	223.910	1,775.87	-34.73	-29.31	22.88	1.59	-1.55	4.84
1,808.00	4.00	223.820	1,806.79	-36.29	-30.81	23.84	0.02	0.00	-0.29
1,839.00	3.69	215.820	1,837.72	-37.88	-32.14	24.89	2.00	-1.00	-25.81
1,871.00	3.52	213.360	1,869.66	-39.54	-33.28	26.07	0.72	-0.53	-7.69
1,903.00	3.69	215.030	1,901.59	-41.20	-34.41	27.25	0.62	0.53	5.22
1,935.00	3.30	215.740	1,933.54	-42.79	-35.54	28.37	1.23	-1.22	2.22
1,966.00	3.78	220.220	1,964.48	-44.30	-36.72	29.39	1.79	1.55	14.45
1,998.00	4.00	217.840	1,996.40	-45.98	-38.09	30.52	0.85	0.69	-7.44
2,029.00	3.69	219.160	2,027.33	-47.61	-39.38	31.62	1.04	-1.00	4.26
2,061.00	3.91	226.370	2,059.26	-49.16	-40.82	32.60	1.64	0.69	22.53
2,093.00	3.69	226.370	2,091.19	-50.62	-42.36	33.46	0.69	-0.69	0.00
2,124.00	3.60	223.910	2,122.13	-52.01	-43.75	34.30	0.58	-0.29	-7.94
2,188.00	4.00	223.910	2,185.99	-55.07	-46.69	36.19	0.63	0.63	0.00
2,220.00	3.78	221.890	2,217.91	-56.66	-48.17	37.19	0.81	-0.69	-6.31
2,252.00	3.21	218.550	2,249.86	-58.14	-49.44	38.17	1.89	-1.78	-10.44
2,284.00	2.81	213.710	2,281.81	-59.50	-50.43	39.11	1.48	-1.25	-15.13
2,316.00	2.90	207.910	2,313.77	-60.87	-51.24	40.13	0.95	0.28	-18.13
2,347.00	3.12	198.950	2,344.73	-62.36	-51.88	41.31	1.67	0.71	-28.90
2,379.00	3.38	187.520	2,376.68	-64.12	-52.29	42.83	2.18	0.81	-35.72
2,411.00	3.91	170.210	2,408.61	-66.13	-52.23	44.75	3.80	1.66	-54.09
2,443.00	4.61	161.420	2,440.53	-68.42	-51.63	47.11	2.99	2.19	-27.47
2,474.00	5.49	153.330	2,471.41	-70.93	-50.57	49.83	3.65	2.84	-26.10
2,506.00	5.49	156.760	2,503.26	-73.70	-49.28	52.87	1.03	0.00	10.72
2,537.00	5.10	172.840	2,534.13	-76.43	-48.52	55.70	4.93	-1.26	51.87
2,569.00	5.19	190.950	2,566.00	-79.26	-48.62	58.34	5.06	0.28	56.59
2,601.00	5.80	208.090	2,597.86	-82.11	-49.66	60.67	5.45	1.91	53.56
2,632.00	6.20	219.950	2,628.69	-84.78	-51.47	62.57	4.19	1.29	38.26
2,664.00	6.90	229.270	2,660.48	-87.35	-54.04	64.14	3.97	2.19	29.13
2,695.00	6.42	233.230	2,691.27	-89.61	-56.83	65.32	2.14	-1.55	12.77
2,727.00	5.58	239.990	2,723.09	-91.46	-59.62	66.13	3.43	-2.63	21.13
2,758.00	5.41	243.250	2,753.95	-92.87	-62.23	66.58	1.15	-0.55	10.52
2,789.00	5.41	242.630	2,784.81	-94.20	-64.83	66.96	0.19	0.00	-2.00
2,820.00	5.32	241.840	2,815.68	-95.55	-67.39	67.37	0.38	-0.29	-2.55
2,852.00	5.10	235.160	2,847.55	-97.06	-69.87	67.96	2.02	-0.69	-20.88
2,884.00	5.19	234.630	2,879.42	-98.71	-72.22	68.73	0.32	0.28	-1.66
2,915.00	5.32	240.340	2,910.29	-100.23	-74.61	69.36	1.74	0.42	18.42
2,945.00	5.58	240.780	2,940.15	-101.63	-77.09	69.85	0.88	0.87	1.47
2,977.00	5.41	244.040	2,972.01	-103.05	-79.80	70.27	1.11	-0.53	10.19
3,008.00	5.49	243.250	3,002.86	-104.36	-82.44	70.62	0.35	0.26	-2.55
3,040.00	5.80	244.560	3,034.71	-105.74	-85.27	70.97	1.05	0.97	4.09
3,072.00	6.02	242.980	3,066.54	-107.20	-88.22	71.35	0.85	0.69	-4.94



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Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

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)
3,103.00	5.80	241.750	3,097.37	-108.68	-91.05	71.80	0.82	-0.71	-3.97
3,135.00	6.02	243.250	3,129.20	-110.20	-93.97	72.25	0.84	0.69	4.69
3,167.00	6.50	241.750	3,161.01	-111.81	-97.07	72.73	1.58	1.50	-4.69
3,198.00	7.29	244.040	3,191.79	-113.51	-100.38	73.21	2.70	2.55	7.39
3,229.00	8.39	246.760	3,222.50	-115.26	-104.23	73.57	3.74	3.55	8.77
3,261.00	9.18	246.230	3,254.12	-117.21	-108.71	73.90	2.48	2.47	-1.66
3,293.00	9.18	247.730	3,285.71	-119.21	-113.41	74.20	0.75	0.00	4.69
3,324.00	9.32	246.760	3,316.31	-121.13	-118.00	74.48	0.68	0.45	-3.13
3,355.00	9.01	243.510	3,346.92	-123.21	-122.48	74.93	1.95	-1.00	-10.48
3,387.00	8.79	237.180	3,378.53	-125.65	-126.78	75.78	3.13	-0.69	-19.78
3,419.00	9.18	236.390	3,410.14	-128.39	-130.96	76.96	1.28	1.22	-2.47
3,451.00	9.10	233.660	3,441.73	-131.30	-135.12	78.30	1.38	-0.25	-8.53
3,483.00	9.10	231.820	3,473.33	-134.36	-139.15	79.84	0.91	0.00	-5.75
3,515.00	8.88	229.010	3,504.94	-137.55	-143.01	81.54	1.53	-0.69	-8.78
3,546.00	8.48	229.710	3,535.58	-140.60	-146.56	83.22	1.33	-1.29	2.26
3,578.00	7.29	235.510	3,567.28	-143.27	-150.03	84.58	4.47	-3.72	18.13
3,610.00	7.12	233.750	3,599.03	-145.59	-153.30	85.66	0.87	-0.53	-5.50
3,642.00	7.12	235.770	3,630.78	-147.88	-156.54	86.73	0.78	0.00	6.31
3,673.00	6.99	237.440	3,661.54	-149.98	-159.72	87.64	0.78	-0.42	5.39
3,705.00	7.69	239.110	3,693.28	-152.12	-163.20	88.49	2.29	2.19	5.22
3,737.00	7.91	237.090	3,724.99	-154.42	-166.88	89.42	1.10	0.69	-6.31
3,768.00	8.31	238.590	3,755.68	-156.75	-170.59	90.37	1.46	1.29	4.84
3,800.00	9.01	238.060	3,787.31	-159.28	-174.69	91.37	2.20	2.19	-1.66
3,832.00	9.01	237.530	3,818.92	-161.95	-178.93	92.47	0.26	0.00	-1.66
3,864.00	9.49	237.880	3,850.50	-164.70	-183.27	93.59	1.51	1.50	1.09
3,895.00	9.40	238.590	3,881.08	-167.37	-187.60	94.66	0.47	-0.29	2.29
3,927.00	9.32	238.670	3,912.65	-170.08	-192.04	95.72	0.25	-0.25	0.25
3,959.00	8.70	237.180	3,944.26	-172.74	-196.29	96.80	2.07	-1.94	-4.66
3,990.00	8.70	235.950	3,974.90	-175.33	-200.20	97.92	0.60	0.00	-3.97
4,022.00	8.79	235.950	4,006.53	-178.05	-204.23	99.13	0.28	0.28	0.00
4,054.00	9.01	234.810	4,038.14	-180.86	-208.31	100.42	0.88	0.69	-3.56
4,086.00	9.18	234.190	4,069.74	-183.80	-212.43	101.80	0.61	0.53	-1.94
4,117.00	9.49	232.520	4,100.33	-186.80	-216.46	103.27	1.33	1.00	-5.39
4,149.00	9.58	231.290	4,131.89	-190.07	-220.63	104.95	0.70	0.28	-3.84
4,180.00	9.71	230.330	4,162.45	-193.35	-224.66	106.69	0.67	0.42	-3.10
4,212.00	9.49	229.890	4,194.00	-196.78	-228.75	108.54	0.72	-0.69	-1.38
4,253.00	9.79	229.750	4,234.42	-201.21	-234.00	110.95	0.73	0.73	-0.34
4,347.00	9.93	226.300	4,327.04	-211.97	-245.95	117.08	0.65	0.15	-3.67
4,443.00	8.56	225.720	4,421.79	-222.68	-257.05	123.43	1.43	-1.43	-0.60
4,536.00	7.67	230.950	4,513.86	-231.42	-266.83	128.39	1.24	-0.96	5.62
4,630.00	8.68	231.910	4,606.90	-239.75	-277.28	132.72	1.08	1.07	1.02
4,724.00	10.10	231.800	4,699.64	-249.22	-289.34	137.60	1.51	1.51	-0.12
4,817.00	10.72	230.950	4,791.11	-259.71	-302.47	143.07	0.69	0.67	-0.91



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle S-20 HU (slot A)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
4,911.00	11.50	228.480	4,883.35	-271.43	-316.28	149.47	0.97	0.83	-2.63	
5,004.00	9.83	227.510	4,974.74	-282.94	-329.07	156.02	1.81	-1.80	-1.04	
5,097.00	9.57	225.480	5,066.41	-293.72	-340.44	162.36	0.46	-0.28	-2.18	
5,191.00	9.49	230.190	5,159.11	-304.16	-351.96	168.32	0.83	-0.09	5.01	
5,284.00	10.61	229.400	5,250.68	-314.64	-364.35	174.03	1.21	1.20	-0.85	
5,377.00	10.36	230.770	5,342.13	-325.51	-377.33	179.91	0.38	-0.27	1.47	
5,471.00	10.21	230.820	5,434.62	-336.11	-390.34	185.53	0.16	-0.16	0.05	
5,564.00	9.76	230.490	5,526.21	-346.34	-402.81	190.97	0.49	-0.48	-0.35	
5,657.00	10.41	227.940	5,617.77	-356.98	-415.13	196.86	0.85	0.70	-2.74	
5,752.00	10.70	224.520	5,711.17	-369.02	-427.68	203.99	0.73	0.31	-3.60	
5,846.00	9.78	224.310	5,803.67	-380.95	-439.38	211.30	0.98	-0.98	-0.22	
5,940.00	9.33	228.880	5,896.37	-391.68	-450.70	217.60	0.94	-0.48	4.86	
6,034.00	8.39	231.610	5,989.24	-400.95	-461.81	222.60	1.10	-1.00	2.90	
6,127.00	8.19	231.890	6,081.27	-409.25	-472.34	226.88	0.22	-0.22	0.30	
6,221.00	7.63	230.840	6,174.38	-417.32	-482.45	231.10	0.62	-0.60	-1.12	
6,314.00	8.25	230.990	6,266.48	-425.42	-492.42	235.38	0.67	0.67	0.16	
6,407.00	9.82	232.200	6,358.33	-434.48	-503.87	240.07	1.70	1.69	1.30	
6,500.00	11.67	234.540	6,449.69	-444.80	-517.80	245.11	2.04	1.99	2.52	
6,593.00	12.81	235.790	6,540.58	-456.05	-533.99	250.27	1.26	1.23	1.34	
6,686.00	12.66	239.090	6,631.29	-467.09	-551.26	254.86	0.80	-0.16	3.55	
6,781.00	13.00	244.050	6,723.92	-477.11	-569.80	258.08	1.21	0.36	5.22	
6,875.00	13.05	247.930	6,815.51	-485.72	-589.14	259.70	0.93	0.05	4.13	
6,969.00	12.73	250.490	6,907.14	-493.17	-608.74	260.13	0.70	-0.34	2.72	
7,062.00	12.37	255.230	6,997.92	-499.13	-628.03	259.27	1.17	-0.39	5.10	
7,156.00	13.40	262.630	7,089.56	-503.10	-648.57	256.11	2.07	1.10	7.87	
7,266.00	16.59	264.210	7,195.80	-506.32	-676.84	249.65	2.92	2.90	1.44	
7,344.00	18.76	265.350	7,270.11	-508.46	-700.42	243.75	2.82	2.78	1.46	
7,438.00	20.98	267.620	7,358.51	-510.38	-732.31	234.85	2.50	2.36	2.41	
7,532.00	23.47	269.810	7,445.52	-511.14	-767.85	223.64	2.79	2.65	2.33	
7,625.00	26.62	270.860	7,529.77	-510.89	-807.21	210.18	3.42	3.39	1.13	
7,723.00	27.62	267.680	7,617.00	-511.48	-851.86	195.75	1.80	1.02	-3.24	
7,817.00	27.75	263.850	7,700.24	-514.71	-895.40	184.17	1.90	0.14	-4.07	
7,909.00	29.34	260.670	7,781.06	-520.66	-938.94	175.15	2.39	1.73	-3.46	
8,003.00	30.50	259.010	7,862.53	-528.94	-985.08	167.46	1.52	1.23	-1.77	
8,096.00	29.26	257.780	7,943.17	-538.25	-1,030.47	160.99	1.49	-1.33	-1.32	
8,190.00	28.12	256.690	8,025.63	-548.21	-1,074.48	155.60	1.33	-1.21	-1.16	
8,283.00	26.78	252.740	8,108.16	-559.48	-1,115.82	152.32	2.43	-1.44	-4.25	
8,377.00	29.05	256.030	8,191.22	-571.27	-1,158.19	149.20	2.92	2.41	3.50	
8,470.00	29.61	261.310	8,272.32	-580.19	-1,202.83	142.62	2.84	0.60	5.68	
8,564.00	31.42	263.680	8,353.30	-586.40	-1,250.14	132.58	2.31	1.93	2.52	
8,656.00	32.95	266.480	8,431.16	-590.58	-1,298.95	120.13	2.32	1.66	3.04	
8,750.00	32.60	268.930	8,510.20	-592.62	-1,349.79	104.98	1.46	-0.37	2.61	
8,843.00	32.61	270.540	8,588.54	-592.85	-1,399.90	88.37	0.93	0.01	1.73	
8,937.00	31.26	270.280	8,668.32	-592.49	-1,449.62	71.34	1.44	-1.44	-0.28	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle S-20 HU (slot A)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

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)
9,030.00	29.52	266.120	8,748.54	-593.93	-1,496.61	56.91	2.94	-1.87	-4.47
9,123.00	29.23	263.490	8,829.59	-598.05	-1,542.03	45.54	1.42	-0.31	-2.83
9,214.00	29.09	262.860	8,909.06	-603.32	-1,586.06	35.72	0.37	-0.15	-0.69
9,306.00	29.32	267.090	8,989.37	-607.24	-1,630.75	24.41	2.26	0.25	4.60
9,399.00	29.50	270.430	9,070.39	-608.23	-1,676.39	10.01	1.77	0.19	3.59
9,491.00	29.86	271.250	9,150.32	-607.56	-1,721.94	-5.91	0.59	0.39	0.89
9,584.00	29.62	269.330	9,231.07	-607.32	-1,768.07	-21.62	1.06	-0.26	-2.06
9,677.00	28.69	266.700	9,312.29	-608.88	-1,813.34	-35.36	1.70	-1.00	-2.83
9,771.00	28.73	265.870	9,394.74	-611.80	-1,858.40	-47.73	0.43	0.04	-0.88
9,864.00	29.07	265.820	9,476.16	-615.06	-1,903.23	-59.72	0.37	0.37	-0.05
9,957.00	29.34	266.240	9,557.33	-618.20	-1,948.50	-71.96	0.36	0.29	0.45
10,051.00	28.03	264.170	9,639.80	-621.95	-1,993.45	-83.52	1.75	-1.39	-2.20
10,144.00	27.93	262.180	9,721.93	-627.14	-2,036.77	-93.18	1.01	-0.11	-2.14
10,238.00	28.98	263.510	9,804.57	-632.71	-2,081.21	-102.86	1.30	1.12	1.41
10,284.00	29.43	267.170	9,844.73	-634.52	-2,103.57	-108.65	4.00	0.98	7.96
10,373.00	27.40	268.230	9,923.00	-636.24	-2,145.88	-121.25	2.35	-2.28	1.19
10,420.00	27.57	268.010	9,964.70	-636.95	-2,167.56	-127.86	0.42	0.36	-0.47
10,466.00	27.13	261.010	10,005.57	-638.96	-2,188.56	-133.02	7.05	-0.96	-15.22
10,513.00	26.60	251.440	10,047.51	-643.98	-2,209.13	-135.19	9.26	-1.13	-20.36
10,560.00	26.07	245.750	10,089.64	-651.58	-2,228.53	-134.55	5.49	-1.13	-12.11
10,607.00	26.12	243.240	10,131.85	-660.48	-2,247.18	-132.43	2.35	0.11	-5.34
10,653.00	26.29	236.060	10,173.13	-670.72	-2,264.68	-128.65	6.90	0.37	-15.61
10,700.00	26.60	228.920	10,215.23	-683.45	-2,281.25	-122.23	6.79	0.66	-15.19
10,748.00	26.20	224.380	10,258.23	-698.09	-2,296.76	-113.65	4.29	-0.83	-9.46
10,795.00	26.38	222.310	10,300.37	-713.23	-2,311.05	-104.19	1.99	0.38	-4.40
10,842.00	27.13	217.110	10,342.34	-729.50	-2,324.55	-93.39	5.23	1.60	-11.06
10,889.00	28.81	211.820	10,383.85	-747.67	-2,336.99	-80.45	6.37	3.57	-11.26
10,936.00	30.36	207.680	10,424.73	-767.82	-2,348.48	-65.34	5.46	3.30	-8.81
10,983.00	31.55	204.150	10,465.04	-789.56	-2,359.03	-48.40	4.62	2.53	-7.51
11,031.00	32.92	201.200	10,505.64	-813.18	-2,368.88	-29.46	4.35	2.85	-6.15
11,078.00	34.38	197.980	10,544.77	-837.71	-2,377.60	-9.28	4.90	3.11	-6.85
11,125.00	35.84	194.940	10,583.22	-863.63	-2,385.24	12.57	4.85	3.11	-6.47
11,172.00	37.91	191.500	10,620.82	-891.08	-2,391.67	36.27	6.22	4.40	-7.32
11,219.00	39.77	188.460	10,657.43	-920.10	-2,396.76	61.90	5.67	3.96	-6.47
11,266.00	42.38	184.810	10,692.86	-950.77	-2,400.30	89.59	7.54	5.55	-7.77
11,313.00	44.54	182.510	10,726.98	-983.02	-2,402.35	119.29	5.70	4.60	-4.89
11,360.00	46.40	185.030	10,759.94	-1,016.45	-2,404.57	150.03	5.50	3.96	5.36
11,408.00	48.12	186.390	10,792.51	-1,051.53	-2,408.08	181.89	4.14	3.58	2.83
11,455.00	51.66	181.990	10,822.80	-1,087.36	-2,410.67	214.77	10.39	7.53	-9.36
11,502.00	55.24	177.890	10,850.79	-1,125.09	-2,410.60	250.34	10.35	7.62	-8.72
11,549.00	59.17	172.780	10,876.25	-1,164.44	-2,407.35	288.49	12.38	8.36	-10.87
11,596.00	62.57	167.580	10,899.14	-1,204.86	-2,400.32	328.93	12.07	7.23	-11.06
11,643.00	65.14	162.240	10,919.86	-1,245.57	-2,389.32	370.96	11.57	5.47	-11.36

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle S-20 HU (slot A)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

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)
11,690.00	67.39	156.820	10,938.79	-1,285.85	-2,374.27	413.96	11.59	4.79	-11.53
11,737.00	70.39	152.640	10,955.72	-1,325.47	-2,355.54	457.57	10.47	6.38	-8.89
11,785.00	73.80	151.890	10,970.48	-1,365.89	-2,334.29	502.78	7.26	7.10	-1.56
11,832.00	77.64	150.830	10,982.07	-1,405.86	-2,312.46	547.76	8.46	8.17	-2.26
11,879.00	81.35	150.300	10,990.64	-1,446.10	-2,289.75	593.29	7.97	7.89	-1.13
11,926.00	85.51	149.640	10,996.01	-1,486.51	-2,266.39	639.20	8.96	8.85	-1.40
11,972.00	87.85	149.460	10,998.68	-1,526.10	-2,243.11	684.30	5.10	5.09	-0.39
12,066.00	88.47	150.570	11,001.70	-1,607.47	-2,196.16	776.72	1.35	0.66	1.18
12,160.00	88.73	149.900	11,003.99	-1,689.05	-2,149.51	869.22	0.76	0.28	-0.71
12,255.00	88.60	150.080	11,006.21	-1,771.29	-2,102.01	962.64	0.23	-0.14	0.19
12,349.00	88.51	150.740	11,008.58	-1,853.00	-2,055.61	1,055.19	0.71	-0.10	0.70
12,442.00	88.56	150.570	11,010.95	-1,934.04	-2,010.05	1,146.82	0.19	0.05	-0.18
12,537.00	88.20	150.650	11,013.64	-2,016.78	-1,963.44	1,240.40	0.39	-0.38	0.08
12,631.00	88.82	150.210	11,016.08	-2,098.51	-1,917.07	1,332.96	0.81	0.66	-0.47
12,725.00	88.60	150.570	11,018.20	-2,180.22	-1,870.64	1,425.51	0.45	-0.23	0.38
12,819.00	88.78	150.480	11,020.35	-2,262.03	-1,824.40	1,518.10	0.21	0.19	-0.10
12,914.00	88.69	149.680	11,022.45	-2,344.35	-1,777.03	1,611.54	0.85	-0.09	-0.84
13,008.00	89.09	149.600	11,024.27	-2,425.44	-1,729.52	1,703.88	0.43	0.43	-0.09
13,103.00	89.13	149.550	11,025.74	-2,507.35	-1,681.42	1,797.18	0.07	0.04	-0.05
13,197.00	89.13	150.080	11,027.17	-2,588.59	-1,634.16	1,889.58	0.56	0.00	0.56
13,291.00	89.22	150.210	11,028.52	-2,670.11	-1,587.37	1,982.07	0.17	0.10	0.14
13,386.00	88.69	148.050	11,030.26	-2,751.63	-1,538.64	2,075.23	2.34	-0.56	-2.27
13,481.00	88.95	149.200	11,032.21	-2,832.72	-1,489.19	2,168.21	1.24	0.27	1.21
13,576.00	88.78	148.360	11,034.09	-2,913.95	-1,439.96	2,261.25	0.90	-0.18	-0.88
13,669.00	88.73	148.190	11,036.12	-2,993.03	-1,391.07	2,352.16	0.19	-0.05	-0.18
13,764.00	88.95	150.120	11,038.04	-3,074.58	-1,342.37	2,445.32	2.04	0.23	2.03
13,858.00	88.82	149.640	11,039.87	-3,155.87	-1,295.21	2,537.73	0.53	-0.14	-0.51
13,952.00	89.04	149.770	11,041.62	-3,237.02	-1,247.80	2,630.09	0.27	0.23	0.14
14,047.00	88.95	149.990	11,043.29	-3,319.18	-1,200.14	2,723.48	0.25	-0.09	0.23
14,142.00	88.82	150.790	11,045.14	-3,401.75	-1,153.21	2,817.02	0.85	-0.14	0.84
14,236.00	88.78	150.700	11,047.11	-3,483.75	-1,107.28	2,909.68	0.10	-0.04	-0.10
14,331.00	90.28	151.890	11,047.89	-3,567.07	-1,061.66	3,003.48	2.02	1.58	1.25
14,425.00	89.97	151.490	11,047.68	-3,649.82	-1,017.08	3,096.40	0.54	-0.33	-0.43
14,519.00	89.62	151.490	11,048.02	-3,732.42	-972.21	3,189.27	0.37	-0.37	0.00
14,614.00	89.57	153.390	11,048.69	-3,816.64	-928.26	3,283.35	2.00	-0.05	2.00
14,709.00	88.47	148.850	11,050.31	-3,899.79	-882.40	3,377.07	4.92	-1.16	-4.78
14,803.00	88.42	149.420	11,052.87	-3,980.44	-834.19	3,469.24	0.61	-0.05	0.61
14,897.00	88.33	149.160	11,055.53	-4,061.23	-786.21	3,561.44	0.29	-0.10	-0.28
14,992.00	88.56	149.420	11,058.11	-4,142.88	-737.71	3,654.63	0.37	0.24	0.27
15,086.00	88.51	149.680	11,060.51	-4,223.89	-690.09	3,746.93	0.28	-0.05	0.28
15,181.00	88.51	149.950	11,062.98	-4,305.98	-642.34	3,840.29	0.28	0.00	0.28
15,276.00	88.29	149.950	11,065.64	-4,388.17	-594.78	3,933.68	0.23	-0.23	0.00
15,370.00	88.91	149.420	11,067.93	-4,469.30	-547.35	4,026.02	0.87	0.66	-0.56



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle S-20 HU (slot A)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
15,464.00	88.73	149.070	11,069.87	-4,550.06	-499.29	4,118.23	0.42	-0.19	-0.37
15,558.00	88.82	149.290	11,071.88	-4,630.77	-451.14	4,210.42	0.25	0.10	0.23
15,653.00	88.78	149.290	11,073.87	-4,712.43	-402.64	4,303.63	0.04	-0.04	0.00
15,748.00	89.40	148.980	11,075.38	-4,793.96	-353.91	4,396.79	0.73	0.65	-0.33
15,842.00	89.26	148.890	11,076.47	-4,874.47	-305.41	4,488.91	0.18	-0.15	-0.10
15,937.00	89.26	149.070	11,077.70	-4,955.88	-256.45	4,582.03	0.19	0.00	0.19
16,031.00	89.26	150.120	11,078.92	-5,036.95	-208.88	4,674.36	1.12	0.00	1.12
16,126.00	89.53	150.170	11,079.92	-5,119.33	-161.59	4,767.85	0.29	0.28	0.05
16,220.00	89.31	149.950	11,080.87	-5,200.78	-114.68	4,860.32	0.33	-0.23	-0.23
16,315.00	89.62	150.300	11,081.76	-5,283.16	-67.36	4,953.80	0.49	0.33	0.37
16,409.00	89.62	149.860	11,082.38	-5,364.63	-20.48	5,046.28	0.47	0.00	-0.47
16,503.00	89.40	150.480	11,083.18	-5,446.17	26.28	5,138.79	0.70	-0.23	0.66
16,597.00	89.40	150.480	11,084.17	-5,527.96	72.59	5,231.38	0.00	0.00	0.00
16,696.00	89.17	152.640	11,085.40	-5,615.00	119.73	5,329.20	2.19	-0.23	2.18
16,790.00	89.57	153.120	11,086.44	-5,698.66	162.58	5,422.39	0.66	0.43	0.51
16,884.00	88.73	153.300	11,087.83	-5,782.56	204.94	5,515.64	0.91	-0.89	0.19
16,977.00	89.22	153.870	11,089.50	-5,865.84	246.31	5,607.97	0.81	0.53	0.61
17,072.00	89.62	156.210	11,090.46	-5,951.95	286.39	5,702.55	2.50	0.42	2.46
17,119.00	89.48	155.460	11,090.83	-5,994.83	305.63	5,749.40	1.62	-0.30	-1.60
17,166.00	89.04	153.170	11,091.43	-6,037.18	326.00	5,796.13	4.96	-0.94	-4.87
17,213.00	89.00	150.480	11,092.24	-6,078.60	348.19	5,842.60	5.72	-0.09	-5.72
17,259.00	89.22	150.040	11,092.95	-6,118.54	371.00	5,887.88	1.07	0.48	-0.96
17,306.00	89.44	150.700	11,093.50	-6,159.39	394.24	5,934.16	1.48	0.47	1.40
17,353.00	89.35	151.270	11,094.00	-6,200.49	417.03	5,980.52	1.23	-0.19	1.21
17,400.00	89.31	151.270	11,094.55	-6,241.70	439.62	6,026.93	0.09	-0.09	0.00
17,447.00	89.00	150.300	11,095.24	-6,282.72	462.56	6,073.26	2.17	-0.66	-2.06
17,541.00	88.38	148.140	11,097.39	-6,363.45	510.65	6,165.46	2.39	-0.66	-2.30
17,635.00	88.16	147.790	11,100.23	-6,443.10	560.49	6,257.22	0.44	-0.23	-0.37
17,730.00	89.13	147.750	11,102.47	-6,523.44	611.14	6,349.90	1.02	1.02	-0.04
17,823.00	89.53	147.700	11,103.56	-6,602.06	660.79	6,440.63	0.43	0.43	-0.05
17,917.00	89.31	147.170	11,104.51	-6,681.28	711.39	6,532.24	0.61	-0.23	-0.56
18,011.00	89.40	147.570	11,105.57	-6,760.44	762.07	6,623.82	0.44	0.10	0.43
18,105.00	89.22	148.890	11,106.70	-6,840.35	811.56	6,715.71	1.42	-0.19	1.40
18,200.00	88.86	149.950	11,108.30	-6,922.12	859.88	6,808.96	1.18	-0.38	1.12
18,294.00	88.64	150.040	11,110.35	-7,003.51	906.88	6,901.40	0.25	-0.23	0.10
18,388.00	88.73	150.210	11,112.50	-7,084.99	953.69	6,993.87	0.20	0.10	0.18
18,482.00	88.60	149.770	11,114.69	-7,166.37	1,000.69	7,086.30	0.49	-0.14	-0.47
18,576.00	88.78	150.040	11,116.84	-7,247.68	1,047.81	7,178.71	0.35	0.19	0.29
18,670.00	88.51	149.860	11,119.07	-7,329.02	1,094.87	7,271.13	0.35	-0.29	-0.19
18,764.00	89.26	150.170	11,120.89	-7,410.42	1,141.84	7,363.58	0.86	0.80	0.33
18,858.00	89.04	149.380	11,122.29	-7,491.63	1,189.15	7,455.96	0.87	-0.23	-0.84
18,952.00	89.13	149.900	11,123.79	-7,572.73	1,236.65	7,548.31	0.56	0.10	0.55
19,046.00	88.95	150.040	11,125.37	-7,654.10	1,283.69	7,640.75	0.24	-0.19	0.15
19,140.00	89.09	150.080	11,126.97	-7,735.55	1,330.60	7,733.21	0.15	0.15	0.04



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle S-20 HU (slot A)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
19,234.00	89.09	150.120	11,128.47	-7,817.02	1,377.45	7,825.69	0.04	0.00	0.04
19,326.00	89.00	149.770	11,130.00	-7,896.64	1,423.52	7,916.16	0.39	-0.10	-0.38
19,420.00	89.00	149.510	11,131.64	-7,977.74	1,471.02	8,008.50	0.28	0.00	-0.28
19,513.00	89.09	149.820	11,133.19	-8,058.00	1,517.99	8,099.86	0.35	0.10	0.33
19,607.00	89.09	149.640	11,134.68	-8,139.17	1,565.36	8,192.23	0.19	0.00	-0.19
19,701.00	89.00	150.570	11,136.25	-8,220.65	1,612.21	8,284.71	0.99	-0.10	0.99
19,795.00	88.95	150.480	11,137.93	-8,302.47	1,658.45	8,377.31	0.11	-0.05	-0.10
19,889.00	89.00	150.650	11,139.61	-8,384.32	1,704.64	8,469.92	0.19	0.05	0.18
19,983.00	89.04	150.830	11,141.22	-8,466.32	1,750.58	8,562.58	0.20	0.04	0.19
20,077.00	89.04	150.390	11,142.80	-8,548.21	1,796.70	8,655.20	0.47	0.00	-0.47
20,170.00	88.95	150.610	11,144.43	-8,629.14	1,842.49	8,746.81	0.26	-0.10	0.24
20,263.00	89.00	150.610	11,146.09	-8,710.16	1,888.12	8,838.44	0.05	0.05	0.00
20,363.00	89.84	150.260	11,147.10	-8,797.13	1,937.46	8,936.93	0.91	0.84	-0.35
20,455.00	89.57	152.280	11,147.58	-8,877.80	1,981.68	9,027.77	2.22	-0.29	2.20
20,549.00	89.70	152.550	11,148.17	-8,961.11	2,025.21	9,120.86	0.32	0.14	0.29
20,643.00	88.78	152.950	11,149.42	-9,044.67	2,068.24	9,214.02	1.07	-0.98	0.43
20,738.00	88.91	150.700	11,151.34	-9,128.39	2,113.09	9,307.93	2.37	0.14	-2.37
20,832.00	88.29	150.210	11,153.63	-9,210.14	2,159.43	9,400.50	0.84	-0.66	-0.52
20,926.00	88.11	149.950	11,156.59	-9,291.58	2,206.29	9,492.94	0.34	-0.19	-0.28
21,021.00	88.95	150.040	11,159.02	-9,373.82	2,253.78	9,586.35	0.89	0.88	0.09
21,115.00	88.29	149.290	11,161.29	-9,454.92	2,301.24	9,678.68	1.06	-0.70	-0.80
21,210.00	88.29	148.270	11,164.12	-9,536.13	2,350.46	9,771.70	1.07	0.00	-1.07
21,305.00	89.13	148.540	11,166.26	-9,617.02	2,400.22	9,864.61	0.93	0.88	0.28
21,400.00	89.26	148.490	11,167.60	-9,698.03	2,449.83	9,957.57	0.15	0.14	-0.05
21,494.00	89.97	148.890	11,168.23	-9,778.34	2,498.68	10,049.62	0.87	0.76	0.43
21,588.00	89.70	147.700	11,168.50	-9,858.31	2,548.08	10,141.53	1.30	-0.29	-1.27
21,682.00	89.66	150.300	11,169.02	-9,938.87	2,596.49	10,233.67	2.77	-0.04	2.77
21,777.00	89.93	152.060	11,169.36	-10,022.10	2,642.28	10,327.45	1.87	0.28	1.85
21,872.00	89.44	150.260	11,169.88	-10,105.32	2,688.10	10,421.22	1.96	-0.52	-1.89
21,966.00	89.57	151.670	11,170.70	-10,187.50	2,733.72	10,513.94	1.51	0.14	1.50
22,060.00	89.57	151.360	11,171.40	-10,270.12	2,778.55	10,606.82	0.33	0.00	-0.33
22,154.00	89.75	150.870	11,171.96	-10,352.42	2,823.96	10,699.59	0.56	0.19	-0.52
22,249.00	90.32	149.990	11,171.90	-10,435.04	2,870.84	10,793.16	1.10	0.60	-0.93
22,343.00	90.19	150.480	11,171.48	-10,516.64	2,917.50	10,885.69	0.54	-0.14	0.52
22,437.00	88.11	151.010	11,172.88	-10,598.64	2,963.43	10,978.35	2.28	-2.21	0.56
22,531.00	88.25	152.020	11,175.86	-10,681.22	3,008.24	11,071.18	1.08	0.15	1.07
22,625.00	88.20	150.830	11,178.78	-10,763.73	3,053.18	11,163.98	1.27	-0.05	-1.27
22,719.00	88.20	152.020	11,181.73	-10,846.23	3,098.12	11,256.79	1.27	0.00	1.27
22,813.00	89.84	152.500	11,183.34	-10,929.41	3,141.86	11,349.83	1.82	1.74	0.51
22,908.00	90.28	150.080	11,183.24	-11,012.73	3,187.49	11,443.63	2.59	0.46	-2.55
23,007.00	90.50	149.160	11,182.56	-11,098.13	3,237.56	11,540.89	0.96	0.22	-0.93
23,101.00	90.23	146.730	11,181.96	-11,177.79	3,287.44	11,632.67	2.60	-0.29	-2.59
23,195.00	90.23	148.100	11,181.59	-11,256.99	3,338.07	11,724.27	1.46	0.00	1.46



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle S-20 HU (slot A)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

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)
23,288.00	90.32	148.270	11,181.14	-11,336.02	3,387.09	11,815.17	0.21	0.10	0.18
23,381.00	90.28	149.730	11,180.65	-11,415.73	3,434.99	11,906.34	1.57	-0.04	1.57
23,474.00	90.19	149.950	11,180.27	-11,496.14	3,481.71	11,997.77	0.26	-0.10	0.24
23,568.00	90.28	149.900	11,179.89	-11,577.49	3,528.82	12,090.21	0.11	0.10	-0.05
23,662.00	89.17	149.900	11,180.34	-11,658.81	3,575.96	12,182.64	1.18	-1.18	0.00
23,756.00	89.22	150.920	11,181.66	-11,740.54	3,622.37	12,275.21	1.09	0.05	1.09
23,849.00	89.22	149.510	11,182.92	-11,821.25	3,668.56	12,366.74	1.52	0.00	-1.52
23,942.00	89.26	149.460	11,184.16	-11,901.36	3,715.78	12,458.06	0.07	0.04	-0.05
24,035.00	89.04	149.380	11,185.54	-11,981.41	3,763.09	12,549.35	0.25	-0.24	-0.09
24,129.00	89.04	149.330	11,187.11	-12,062.28	3,811.00	12,641.60	0.05	0.00	-0.05
24,223.00	89.26	149.330	11,188.51	-12,143.12	3,858.94	12,733.85	0.23	0.23	0.00
24,316.00	89.17	149.820	11,189.78	-12,223.30	3,906.03	12,825.19	0.54	-0.10	0.53
24,409.00	89.26	149.680	11,191.05	-12,303.63	3,952.88	12,916.59	0.18	0.10	-0.15
24,503.00	89.17	150.430	11,192.34	-12,385.08	3,999.79	13,009.05	0.80	-0.10	0.80
24,597.00	88.95	150.790	11,193.88	-12,466.97	4,045.92	13,101.68	0.45	-0.23	0.38
24,691.00	89.17	150.740	11,195.43	-12,548.98	4,091.82	13,194.35	0.24	0.23	-0.05
24,786.00	89.31	150.520	11,196.69	-12,631.76	4,138.41	13,287.96	0.27	0.15	-0.23
24,879.00	89.31	150.520	11,197.81	-12,712.72	4,184.17	13,379.58	0.00	0.00	0.00
24,972.00	89.31	150.790	11,198.93	-12,793.78	4,229.75	13,471.24	0.29	0.00	0.29
25,066.00	89.22	150.960	11,200.13	-12,875.89	4,275.49	13,563.94	0.20	-0.10	0.18
25,160.00	88.64	150.390	11,201.89	-12,957.83	4,321.52	13,656.58	0.87	-0.62	-0.61
25,252.00	88.82	150.040	11,203.93	-13,037.65	4,367.21	13,747.11	0.43	0.20	-0.38
25,346.00	88.60	151.530	11,206.04	-13,119.67	4,413.08	13,839.77	1.60	-0.23	1.59
25,440.00	88.73	150.870	11,208.23	-13,202.02	4,458.35	13,932.54	0.72	0.14	-0.70
25,533.00	87.72	150.350	11,211.11	-13,283.01	4,503.97	14,024.15	1.22	-1.09	-0.56
25,627.00	87.80	150.740	11,214.79	-13,364.80	4,550.16	14,116.70	0.42	0.09	0.41
25,721.00	87.80	149.770	11,218.40	-13,446.35	4,596.76	14,209.16	1.03	0.00	-1.03
25,814.00	87.67	149.510	11,222.07	-13,526.54	4,643.73	14,300.46	0.31	-0.14	-0.28
25,909.00	87.67	149.640	11,225.93	-13,608.39	4,691.80	14,393.70	0.14	0.00	0.14
26,005.00	87.45	149.460	11,230.02	-13,691.07	4,740.40	14,487.91	0.30	-0.23	-0.19
26,101.00	88.64	150.480	11,233.30	-13,774.13	4,788.42	14,582.27	1.63	1.24	1.06
26,196.00	88.64	150.260	11,235.55	-13,856.69	4,835.37	14,675.80	0.23	0.00	-0.23
26,292.00	88.60	150.650	11,237.86	-13,940.18	4,882.70	14,770.33	0.41	-0.04	0.41
26,387.00	88.64	150.790	11,240.15	-14,023.02	4,929.15	14,863.96	0.15	0.04	0.15
26,483.00	88.69	149.860	11,242.39	-14,106.40	4,976.66	14,958.46	0.97	0.05	-0.97
26,578.00	88.64	150.960	11,244.60	-14,188.99	5,023.56	15,051.99	1.16	-0.05	1.16
26,674.00	88.91	150.570	11,246.65	-14,272.74	5,070.43	15,146.62	0.49	0.28	-0.41
26,753.00	88.64	150.300	11,248.34	-14,341.44	5,109.40	15,224.42	0.48	-0.34	-0.34
Survey @ 26753.00 MD 11248.34 TVD									
26,787.00	88.64	150.300	11,249.15	-14,370.97	5,126.24	15,257.88	0.00	0.00	0.00
Survey Proj. to 26787.00 MD 11249.15 TVD									



Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle S-20 HU (slot A)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Design Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
180.00	180.00	-0.04	0.02	MWD surveys
26,753.00	11,248.34	-14,341.44	5,109.40	Survey @ 26753.00 MD 11248.34 TVD
26,787.00	11,249.15	-14,370.97	5,126.24	Survey Proj. to 26787.00 MD 11249.15 TVD



Survey Report - Geographic



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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	Van Winkle				
Site Position:		Northing:	14,447,369.493 usft	Latitude:	39.781725330
From:	Lat/Long	Easting:	1,717,188.440 usft	Longitude:	-80.726733270
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.17 °

Well	Van Winkle S-20 HU (slot A)					
Well Position	+N/-S	0.00 ft	Northing:	14,447,292.676 usft	Latitude:	39.781515000
	+E/-W	0.00 ft	Easting:	1,717,113.176 usft	Longitude:	-80.727002000
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	753.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	10/7/2021	-8.65	66.51	51,718.52210885

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	160.380

Survey Program	Date 10/9/2022				
	From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
	180.00	2,220.00	MWD surf (Original Hole)	MWD	MWD - Standard
	2,252.00	4,212.00	MWD 2252-4212 MD (Original Hole)	MWD	MWD - Standard
	4,253.00	26,753.00	MWD (Original Hole)	MWD	MWD - Standard
	26,787.00	26,787.00	Projection (Original Hole)	MWD	MWD - Standard

Survey										
	Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
	0.00	0.00	0.000	0.00	0.00	0.00	14,447,292.676	1,717,113.176	39.781515000	-80.727002000
	180.00	0.03	157.580	180.00	-0.04	0.02	14,447,292.632	1,717,113.194	39.781514880	-80.727001937
	MWD surveys									
	208.00	0.19	141.570	208.00	-0.09	0.05	14,447,292.589	1,717,113.225	39.781514762	-80.727001824
	238.00	0.08	115.390	238.00	-0.13	0.10	14,447,292.541	1,717,113.275	39.781514629	-80.727001648
	266.00	0.31	160.010	266.00	-0.21	0.14	14,447,292.462	1,717,113.319	39.781514411	-80.727001493
	296.00	0.22	177.680	296.00	-0.35	0.17	14,447,292.328	1,717,113.349	39.781514043	-80.727001388
	325.00	0.31	138.390	325.00	-0.46	0.23	14,447,292.213	1,717,113.403	39.781513729	-80.727001196



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Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
356.00	0.22	173.280	356.00	-0.58	0.29	14,447,292.092	1,717,113.466	39.781513393	-80.727000974
388.00	0.40	169.680	388.00	-0.76	0.32	14,447,291.921	1,717,113.493	39.781512924	-80.727000879
419.00	0.40	163.880	419.00	-0.97	0.37	14,447,291.710	1,717,113.543	39.781512346	-80.727000705
451.00	0.70	171.080	451.00	-1.27	0.43	14,447,291.410	1,717,113.604	39.781511520	-80.727000490
482.00	0.79	171.950	481.99	-1.66	0.49	14,447,291.011	1,717,113.663	39.781510425	-80.727000284
514.00	0.70	177.590	513.99	-2.08	0.53	14,447,290.598	1,717,113.702	39.781509288	-80.727000149
545.00	0.48	192.530	544.99	-2.39	0.51	14,447,290.282	1,717,113.682	39.781508421	-80.727000224
577.00	0.48	188.580	576.99	-2.66	0.46	14,447,290.018	1,717,113.633	39.781507698	-80.727000402
608.00	1.01	186.380	607.99	-3.06	0.41	14,447,289.618	1,717,113.583	39.781506600	-80.727000583
640.00	0.88	202.020	639.98	-3.57	0.28	14,447,289.110	1,717,113.460	39.781505206	-80.727001028
672.00	0.70	176.980	671.98	-3.99	0.20	14,447,288.687	1,717,113.378	39.781504045	-80.727001324
703.00	0.88	204.220	702.98	-4.39	0.11	14,447,288.281	1,717,113.290	39.781502930	-80.727001640
734.00	1.19	198.770	733.97	-4.92	-0.09	14,447,287.759	1,717,113.089	39.781501498	-80.727002362
766.00	1.10	202.820	765.96	-5.51	-0.31	14,447,287.161	1,717,112.863	39.781499859	-80.727003174
798.00	1.10	204.750	797.96	-6.08	-0.56	14,447,286.599	1,717,112.615	39.781498317	-80.727004061
829.00	0.70	211.340	828.95	-6.51	-0.78	14,447,286.167	1,717,112.392	39.781497133	-80.727004860
861.00	0.88	185.240	860.95	-6.92	-0.91	14,447,285.756	1,717,112.268	39.781496003	-80.727005306
893.00	1.01	190.250	892.95	-7.44	-0.98	14,447,285.233	1,717,112.195	39.781494570	-80.727005570
925.00	1.01	195.520	924.94	-7.99	-1.11	14,447,284.684	1,717,112.070	39.781493062	-80.727006024
957.00	1.10	197.980	956.94	-8.56	-1.28	14,447,284.120	1,717,111.900	39.781491515	-80.727006636
988.00	0.88	196.490	987.93	-9.07	-1.44	14,447,283.609	1,717,111.740	39.781490112	-80.727007209
1,020.00	1.19	213.970	1,019.93	-9.58	-1.69	14,447,283.098	1,717,111.485	39.781488710	-80.727008124
1,052.00	1.01	200.090	1,051.92	-10.12	-1.97	14,447,282.557	1,717,111.202	39.781487229	-80.727009135
1,083.00	1.41	216.790	1,082.91	-10.68	-2.30	14,447,281.995	1,717,110.880	39.781485688	-80.727010288
1,115.00	1.19	207.730	1,114.91	-11.29	-2.69	14,447,281.386	1,717,110.490	39.781484017	-80.727011684
1,147.00	1.19	214.770	1,146.90	-11.86	-3.03	14,447,280.819	1,717,110.145	39.781482463	-80.727012915
1,179.00	1.89	223.730	1,178.89	-12.51	-3.58	14,447,280.165	1,717,109.591	39.781480671	-80.727014895
1,210.00	2.11	223.560	1,209.87	-13.29	-4.33	14,447,279.382	1,717,108.844	39.781478527	-80.727017562
1,242.00	2.29	224.880	1,241.84	-14.17	-5.19	14,447,278.502	1,717,107.987	39.781476118	-80.727020622
1,274.00	2.20	222.680	1,273.82	-15.08	-6.06	14,447,277.597	1,717,107.120	39.781473641	-80.727023719
1,306.00	2.42	225.670	1,305.79	-16.00	-6.96	14,447,276.674	1,717,106.220	39.781471112	-80.727026932
1,338.00	2.90	233.750	1,337.76	-16.95	-8.09	14,447,275.723	1,717,105.084	39.781468510	-80.727030986
1,369.00	2.81	236.130	1,368.72	-17.84	-9.36	14,447,274.836	1,717,103.821	39.781466084	-80.727035492
1,401.00	3.21	235.070	1,400.68	-18.79	-10.74	14,447,273.885	1,717,102.435	39.781463487	-80.727040435
1,433.00	3.30	230.940	1,432.62	-19.88	-12.19	14,447,272.792	1,717,100.985	39.781460496	-80.727045607
1,465.00	3.52	232.350	1,464.57	-21.06	-13.68	14,447,271.612	1,717,099.492	39.781457267	-80.727050934
1,496.00	3.69	232.170	1,495.51	-22.26	-15.22	14,447,270.419	1,717,097.951	39.781454003	-80.727056433
1,528.00	3.52	238.240	1,527.44	-23.41	-16.87	14,447,269.270	1,717,096.302	39.781450862	-80.727062314
1,560.00	3.69	234.460	1,559.38	-24.52	-18.55	14,447,268.154	1,717,094.629	39.781447813	-80.727068281
1,590.00	3.78	231.120	1,589.32	-25.70	-20.10	14,447,266.972	1,717,093.074	39.781444580	-80.727073830
1,622.00	3.91	233.310	1,621.24	-27.02	-21.80	14,447,265.658	1,717,091.378	39.781440986	-80.727079881
1,652.00	3.52	229.000	1,651.18	-28.23	-23.31	14,447,264.443	1,717,089.863	39.781437661	-80.727085288
1,683.00	3.78	221.890	1,682.12	-29.62	-24.71	14,447,263.058	1,717,088.462	39.781433869	-80.727090288
1,714.00	4.21	220.480	1,713.04	-31.24	-26.13	14,447,261.432	1,717,087.041	39.781429415	-80.727095363
1,746.00	4.48	222.410	1,744.95	-33.06	-27.74	14,447,259.616	1,717,085.436	39.781424440	-80.727101097
1,777.00	4.00	223.910	1,775.87	-34.73	-29.31	14,447,257.943	1,717,083.869	39.781419859	-80.727106691
1,808.00	4.00	223.820	1,806.79	-36.29	-30.81	14,447,256.384	1,717,082.371	39.781415590	-80.727112042
1,839.00	3.69	215.820	1,837.72	-37.88	-32.14	14,447,254.795	1,717,081.038	39.781411238	-80.727116802
1,871.00	3.52	213.360	1,869.66	-39.54	-33.28	14,447,253.139	1,717,079.896	39.781406701	-80.727120887
1,903.00	3.69	215.030	1,901.59	-41.20	-34.41	14,447,251.476	1,717,078.764	39.781402141	-80.727124932
1,935.00	3.30	215.740	1,933.54	-42.79	-35.54	14,447,249.885	1,717,077.635	39.781397782	-80.727128968
1,966.00	3.78	220.220	1,964.48	-44.30	-36.72	14,447,248.380	1,717,076.454	39.781393660	-80.727133188
1,998.00	4.00	217.840	1,996.40	-45.98	-38.09	14,447,246.693	1,717,075.088	39.781389039	-80.727138068
2,029.00	3.69	219.160	2,027.33	-47.61	-39.38	14,447,245.066	1,717,073.795	39.781384581	-80.727142689



Survey Report - Geographic



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Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
2,061.00	3.91	226.370	2,059.26	-49.16	-40.82	14,447,243.515	1,717,072.355	39.781380333	-80.727147831	
2,093.00	3.69	226.370	2,091.19	-50.62	-42.36	14,447,242.052	1,717,070.820	39.781376327	-80.727153311	
2,124.00	3.60	223.910	2,122.13	-52.01	-43.75	14,447,240.662	1,717,069.423	39.781372523	-80.727158298	
2,188.00	4.00	223.910	2,185.99	-55.07	-46.69	14,447,237.606	1,717,066.482	39.781364156	-80.727168802	
2,220.00	3.78	221.890	2,217.91	-56.66	-48.17	14,447,236.017	1,717,065.003	39.781359803	-80.727174081	
2,252.00	3.21	218.550	2,249.86	-58.14	-49.44	14,447,234.531	1,717,063.741	39.781355733	-80.727178591	
2,284.00	2.81	213.710	2,281.81	-59.50	-50.43	14,447,233.178	1,717,062.747	39.781352025	-80.727182143	
2,316.00	2.90	207.910	2,313.77	-60.87	-51.24	14,447,231.810	1,717,061.933	39.781348276	-80.727185056	
2,347.00	3.12	198.950	2,344.73	-62.36	-51.88	14,447,230.319	1,717,061.292	39.781320642	-80.727187354	
2,379.00	3.38	187.520	2,376.68	-64.12	-52.29	14,447,228.560	1,717,060.885	39.781339360	-80.727188819	
2,411.00	3.91	170.210	2,408.61	-66.13	-52.23	14,447,226.550	1,717,060.948	39.781333838	-80.727188620	
2,443.00	4.61	161.420	2,440.53	-68.42	-51.63	14,447,224.256	1,717,061.543	39.781327533	-80.727186526	
2,474.00	5.49	153.330	2,471.41	-70.93	-50.57	14,447,221.750	1,717,062.605	39.781320642	-80.727182771	
2,506.00	5.49	156.760	2,503.26	-73.70	-49.28	14,447,218.975	1,717,063.896	39.781313011	-80.727178206	
2,537.00	5.10	172.840	2,534.13	-76.43	-48.52	14,447,216.245	1,717,064.653	39.781305508	-80.727175541	
2,569.00	5.19	190.950	2,566.00	-79.26	-48.62	14,447,213.413	1,717,064.556	39.781297730	-80.727175919	
2,601.00	5.80	208.090	2,597.86	-82.11	-49.66	14,447,210.565	1,717,063.519	39.781289919	-80.727179639	
2,632.00	6.20	219.950	2,628.69	-84.78	-51.47	14,447,207.900	1,717,061.707	39.781282614	-80.727186119	
2,664.00	6.90	229.270	2,660.48	-87.35	-54.04	14,447,205.321	1,717,059.141	39.781275553	-80.727195282	
2,695.00	6.42	233.230	2,691.27	-89.61	-56.83	14,447,203.069	1,717,056.341	39.781269391	-80.727205271	
2,727.00	5.58	239.990	2,723.09	-91.46	-59.62	14,447,201.220	1,717,053.561	39.781264336	-80.727215187	
2,758.00	5.41	243.250	2,753.95	-92.87	-62.23	14,447,199.808	1,717,050.951	39.781260481	-80.727224493	
2,789.00	5.41	242.630	2,784.81	-94.20	-64.83	14,447,198.478	1,717,048.348	39.781256851	-80.727233771	
2,820.00	5.32	241.840	2,815.68	-95.55	-67.39	14,447,197.128	1,717,045.783	39.781253165	-80.727242915	
2,852.00	5.10	235.160	2,847.55	-97.06	-69.87	14,447,195.616	1,717,043.308	39.781249032	-80.727251742	
2,884.00	5.19	234.630	2,879.42	-98.71	-72.22	14,447,193.965	1,717,040.960	39.781245419	-80.727260116	
2,915.00	5.32	240.340	2,910.29	-100.23	-74.61	14,447,192.442	1,717,038.568	39.781240357	-80.727268647	
2,945.00	5.58	240.780	2,940.15	-101.63	-77.09	14,447,191.042	1,717,036.087	39.781236532	-80.727277495	
2,977.00	5.41	244.040	2,972.01	-103.05	-79.80	14,447,189.622	1,717,033.372	39.781232656	-80.727287171	
3,008.00	5.49	243.250	3,002.86	-104.36	-82.44	14,447,188.315	1,717,030.734	39.781229088	-80.727296575	
3,040.00	5.80	244.560	3,034.71	-105.74	-85.27	14,447,186.932	1,717,027.907	39.781225312	-80.727306653	
3,072.00	6.02	242.980	3,066.54	-107.20	-88.22	14,447,185.475	1,717,024.952	39.781221336	-80.727317187	
3,103.00	5.80	241.750	3,097.37	-108.68	-91.05	14,447,183.995	1,717,022.124	39.781217295	-80.727327269	
3,135.00	6.02	243.250	3,129.20	-110.20	-93.97	14,447,182.474	1,717,019.202	39.781213144	-80.727337688	
3,167.00	6.50	241.750	3,161.01	-111.81	-97.07	14,447,180.862	1,717,016.108	39.781208741	-80.727348718	
3,198.00	7.29	244.040	3,191.79	-113.51	-100.38	14,447,179.170	1,717,012.794	39.781204124	-80.727360533	
3,229.00	8.39	246.760	3,222.50	-115.26	-104.23	14,447,177.417	1,717,008.947	39.781199340	-80.727374243	
3,261.00	9.18	246.230	3,254.12	-117.21	-108.71	14,447,175.467	1,717,004.466	39.781194022	-80.727390215	
3,293.00	9.18	247.730	3,285.71	-119.21	-113.41	14,447,173.471	1,716,999.768	39.781188580	-80.727406960	
3,324.00	9.32	246.760	3,316.31	-121.13	-118.00	14,447,171.543	1,716,995.173	39.781183324	-80.727423336	
3,355.00	9.01	243.510	3,346.92	-123.21	-122.48	14,447,169.470	1,716,990.694	39.781177668	-80.727439301	
3,387.00	8.79	237.180	3,378.53	-125.65	-126.78	14,447,167.027	1,716,986.396	39.781170995	-80.727454624	
3,419.00	9.18	236.390	3,410.14	-128.39	-130.96	14,447,164.289	1,716,982.215	39.781163510	-80.727469534	
3,451.00	9.10	233.660	3,441.73	-131.30	-135.12	14,447,161.376	1,716,978.051	39.781155547	-80.727484388	
3,483.00	9.10	231.820	3,473.33	-134.36	-139.15	14,447,158.312	1,716,974.024	39.781147167	-80.727498757	
3,515.00	8.88	229.010	3,504.94	-137.55	-143.01	14,447,155.128	1,716,970.170	39.781138454	-80.727512507	
3,546.00	8.48	229.710	3,535.58	-140.60	-146.56	14,447,152.081	1,716,966.621	39.781130114	-80.727525175	
3,578.00	7.29	235.510	3,567.28	-143.27	-150.03	14,447,149.405	1,716,963.147	39.781122796	-80.727537566	
3,610.00	7.12	233.750	3,599.03	-145.59	-153.30	14,447,147.083	1,716,959.875	39.781116445	-80.727549240	
3,642.00	7.12	235.770	3,630.78	-147.88	-156.54	14,447,144.795	1,716,956.636	39.781110188	-80.727560794	
3,673.00	6.99	237.440	3,661.54	-149.98	-159.72	14,447,142.699	1,716,953.457	39.781104459	-80.727572129	
3,705.00	7.69	239.110	3,693.28	-152.12	-163.20	14,447,140.552	1,716,949.979	39.781098592	-80.727584534	
3,737.00	7.91	237.090	3,724.99	-154.42	-166.88	14,447,138.256	1,716,946.293	39.781092318	-80.727597678	
3,768.00	8.31	238.590	3,755.68	-156.75	-170.59	14,447,135.930	1,716,942.590	39.781085960	-80.727610883	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle S-20 HU (slot A)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
3,800.00	9.01	238.060	3,787.31	-159.28	-174.69	14,447,133.399	1,716,938.490	39.781079044	-80.727625503
3,832.00	9.01	237.530	3,818.92	-161.95	-178.93	14,447,130.728	1,716,934.250	39.781071745	-80.727640625
3,864.00	9.49	237.880	3,850.50	-164.70	-183.27	14,447,127.980	1,716,929.902	39.781064235	-80.727656132
3,895.00	9.40	238.590	3,881.08	-167.37	-187.60	14,447,125.302	1,716,925.577	39.781056916	-80.727671556
3,927.00	9.32	238.670	3,912.65	-170.08	-192.04	14,447,122.593	1,716,921.133	39.781049513	-80.727687401
3,959.00	8.70	237.180	3,944.26	-172.74	-196.29	14,447,119.934	1,716,916.886	39.781042246	-80.727702548
3,990.00	8.70	235.950	3,974.90	-175.33	-200.20	14,447,117.350	1,716,912.973	39.781035184	-80.727716503
4,022.00	8.79	235.950	4,006.53	-178.05	-204.23	14,447,114.626	1,716,908.942	39.781027736	-80.727730881
4,054.00	9.01	234.810	4,038.14	-180.86	-208.31	14,447,111.813	1,716,904.869	39.781020045	-80.727745411
4,086.00	9.18	234.190	4,069.74	-183.80	-212.43	14,447,108.876	1,716,900.751	39.781012012	-80.727760100
4,117.00	9.49	232.520	4,100.33	-186.80	-216.46	14,447,105.874	1,716,896.717	39.781003802	-80.727774488
4,149.00	9.58	231.290	4,131.89	-190.07	-220.63	14,447,102.603	1,716,892.546	39.780994855	-80.727789371
4,180.00	9.71	230.330	4,162.45	-193.35	-224.66	14,447,099.321	1,716,888.521	39.780985875	-80.727803734
4,212.00	9.49	229.890	4,194.00	-196.78	-228.75	14,447,095.899	1,716,884.426	39.780976511	-80.727818346
4,253.00	9.79	229.750	4,234.42	-201.21	-234.00	14,447,091.469	1,716,879.181	39.780964390	-80.727837064
4,347.00	9.93	226.300	4,327.04	-211.97	-245.95	14,447,080.706	1,716,867.221	39.780934931	-80.727879748
4,443.00	8.56	225.720	4,421.79	-222.68	-257.05	14,447,069.999	1,716,856.122	39.780905618	-80.727919373
4,536.00	7.67	230.950	4,513.86	-231.42	-266.83	14,447,061.256	1,716,846.346	39.780881691	-80.727954261
4,630.00	8.68	231.910	4,606.90	-239.75	-277.28	14,447,052.929	1,716,835.892	39.780858908	-80.727991562
4,724.00	10.10	231.800	4,699.64	-249.22	-289.34	14,447,043.455	1,716,823.832	39.780832992	-80.728034592
4,817.00	10.72	230.950	4,791.11	-259.71	-302.47	14,447,032.963	1,716,810.706	39.780804288	-80.728081424
4,911.00	11.50	228.480	4,883.35	-271.43	-316.28	14,447,021.244	1,716,796.901	39.780772218	-80.728130690
5,004.00	9.83	227.510	4,974.74	-282.94	-329.07	14,447,009.735	1,716,784.105	39.780740720	-80.728176360
5,097.00	9.57	225.480	5,066.41	-293.72	-340.44	14,446,998.953	1,716,772.739	39.780711202	-80.728216933
5,191.00	9.49	230.190	5,159.11	-304.16	-351.96	14,446,988.512	1,716,761.214	39.780682626	-80.728258064
5,284.00	10.61	229.400	5,250.68	-314.64	-364.35	14,446,978.032	1,716,748.824	39.780653947	-80.728302279
5,377.00	10.36	230.770	5,342.13	-325.51	-377.33	14,446,967.171	1,716,735.846	39.780624230	-80.728348591
5,471.00	10.21	230.820	5,434.62	-336.11	-390.34	14,446,956.563	1,716,722.841	39.780595204	-80.728394995
5,564.00	9.76	230.490	5,526.21	-346.34	-402.81	14,446,946.340	1,716,710.370	39.780567235	-80.728439494
5,657.00	10.41	227.940	5,617.77	-356.98	-415.13	14,446,935.697	1,716,698.050	39.780538106	-80.728483460
5,752.00	10.70	224.520	5,711.17	-369.02	-427.68	14,446,923.659	1,716,685.494	39.780505151	-80.728528282
5,846.00	9.78	224.310	5,803.67	-380.95	-439.38	14,446,911.724	1,716,673.798	39.780472472	-80.728570040
5,940.00	9.33	228.880	5,896.37	-391.68	-450.70	14,446,901.000	1,716,662.481	39.780443115	-80.728610438
6,034.00	8.39	231.610	5,989.24	-400.95	-461.81	14,446,890.730	1,716,651.365	39.780417750	-80.728650102
6,127.00	8.19	231.890	6,081.27	-409.25	-472.34	14,446,883.428	1,716,640.835	39.780395039	-80.728687672
6,221.00	7.63	230.840	6,174.38	-417.32	-482.45	14,446,875.355	1,716,630.728	39.780372952	-80.728723733
6,314.00	8.25	230.990	6,266.48	-425.42	-492.42	14,446,867.256	1,716,620.756	39.780350793	-80.728759315
6,407.00	9.82	232.200	6,358.33	-434.48	-503.87	14,446,858.195	1,716,609.304	39.780326003	-80.728800174
6,500.00	11.67	234.540	6,449.69	-444.80	-517.80	14,446,847.876	1,716,595.376	39.780297782	-80.728849863
6,593.00	12.81	235.790	6,540.58	-456.05	-533.99	14,446,836.623	1,716,579.188	39.780267012	-80.728907603
6,686.00	12.66	239.090	6,631.29	-467.09	-551.26	14,446,825.591	1,716,561.918	39.780236859	-80.728969192
6,781.00	13.00	244.050	6,723.92	-477.11	-569.80	14,446,815.567	1,716,543.377	39.780209486	-80.729035292
6,875.00	13.05	247.930	6,815.51	-485.72	-589.14	14,446,806.953	1,716,524.035	39.780185989	-80.729104230
6,969.00	12.73	250.490	6,907.14	-493.17	-608.74	14,446,799.506	1,716,504.438	39.780165702	-80.729174064
7,062.00	12.37	255.230	6,997.92	-499.13	-628.03	14,446,793.545	1,716,485.147	39.780149490	-80.729242791
7,156.00	13.40	262.630	7,089.56	-503.10	-648.57	14,446,789.580	1,716,464.607	39.780138773	-80.729315943
7,266.00	16.59	264.210	7,195.80	-506.32	-676.84	14,446,786.360	1,716,436.335	39.780130164	-80.729416607
7,344.00	18.76	265.350	7,270.11	-508.46	-700.42	14,446,784.220	1,716,412.753	39.780124482	-80.729500569
7,438.00	20.98	267.620	7,358.51	-510.38	-732.31	14,446,782.295	1,716,380.869	39.780119461	-80.729614074
7,532.00	23.47	269.810	7,445.52	-511.14	-767.85	14,446,781.534	1,716,345.331	39.780117666	-80.729740575
7,625.00	26.62	270.860	7,529.77	-510.89	-807.21	14,446,781.786	1,716,305.968	39.780118682	-80.729880676
7,723.00	27.62	267.680	7,617.00	-511.48	-851.86	14,446,781.196	1,716,261.314	39.780117431	-80.730039624
7,817.00	27.75	263.850	7,700.24	-514.71	-895.40	14,446,777.969	1,716,217.781	39.780108930	-80.730194607
7,909.00	29.34	260.670	7,781.06	-520.66	-938.94	14,446,772.019	1,716,174.239	39.780092952	-80.730349651



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle S-20 HU (slot A)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
8,003.00	30.50	259.010	7,862.53	-528.94	-985.08	14,446,763.738	1,716,128.095	39.780070590	-80.730513982
8,096.00	29.26	257.780	7,943.17	-538.25	-1,030.47	14,446,754.428	1,716,082.713	39.780045396	-80.730675615
8,190.00	28.12	256.690	8,025.63	-548.21	-1,074.48	14,446,744.465	1,716,038.702	39.780018399	-80.730832371
8,283.00	26.78	252.740	8,108.16	-559.48	-1,115.82	14,446,733.201	1,715,997.361	39.779987808	-80.730979637
8,377.00	29.05	256.030	8,191.22	-571.27	-1,158.19	14,446,721.406	1,715,954.983	39.779955765	-80.731130600
8,470.00	29.61	261.310	8,272.32	-580.19	-1,202.83	14,446,712.483	1,715,910.353	39.779931626	-80.731289552
8,564.00	31.42	263.680	8,353.30	-586.40	-1,250.14	14,446,706.276	1,715,863.038	39.779914971	-80.731458024
8,656.00	32.95	266.480	8,431.16	-590.58	-1,298.95	14,446,702.100	1,715,814.225	39.779903904	-80.731631809
8,750.00	32.60	268.930	8,510.20	-592.62	-1,349.79	14,446,694.057	1,715,763.390	39.779885713	-80.731812772
8,843.00	32.61	270.540	8,588.54	-592.85	-1,399.90	14,446,699.826	1,715,713.282	39.779898489	-80.731991125
8,937.00	31.26	270.280	8,668.32	-592.49	-1,449.62	14,446,700.183	1,715,663.562	39.779899880	-80.732168089
9,030.00	29.52	266.120	8,748.54	-593.93	-1,496.61	14,446,698.751	1,715,616.565	39.779896331	-80.732335385
9,123.00	29.23	263.490	8,829.59	-598.05	-1,542.03	14,446,694.626	1,715,571.143	39.779885376	-80.732497100
9,214.00	29.09	262.860	8,909.06	-603.32	-1,586.06	14,446,689.357	1,715,527.118	39.779871268	-80.732653855
9,306.00	29.32	267.090	8,989.37	-607.24	-1,630.75	14,446,685.433	1,715,482.426	39.779860859	-80.732812972
9,399.00	29.50	270.430	9,070.39	-608.23	-1,676.39	14,446,684.449	1,715,436.785	39.779858529	-80.732975435
9,491.00	29.86	271.250	9,150.32	-607.56	-1,721.94	14,446,685.119	1,715,391.237	39.779860741	-80.733137549
9,584.00	29.62	269.330	9,231.07	-607.32	-1,768.07	14,446,685.355	1,715,345.109	39.779861768	-80.733301732
9,677.00	28.69	266.700	9,312.29	-608.88	-1,813.34	14,446,683.801	1,715,299.839	39.779857871	-80.733462879
9,771.00	28.73	265.870	9,394.74	-611.80	-1,858.40	14,446,680.875	1,715,254.779	39.779850203	-80.733623291
9,864.00	29.07	265.820	9,476.16	-615.06	-1,903.23	14,446,677.619	1,715,209.952	39.779841626	-80.733782880
9,957.00	29.34	266.240	9,557.33	-618.20	-1,948.50	14,446,674.478	1,715,164.684	39.779833370	-80.733944040
10,051.00	28.03	264.170	9,639.80	-621.95	-1,993.45	14,446,670.724	1,715,119.728	39.779823427	-80.734104092
10,144.00	27.93	262.180	9,721.93	-627.14	-2,036.77	14,446,665.541	1,715,076.410	39.779809545	-80.734258328
10,238.00	28.98	263.510	9,804.57	-632.71	-2,081.21	14,446,659.971	1,715,031.973	39.779794612	-80.734416554
10,284.00	29.43	267.170	9,844.73	-634.52	-2,103.57	14,446,658.153	1,715,009.612	39.779789803	-80.734596165
10,373.00	27.40	268.230	9,923.00	-636.24	-2,145.88	14,446,656.441	1,714,967.299	39.779785445	-80.734646788
10,420.00	27.57	268.010	9,964.70	-636.95	-2,167.56	14,446,655.729	1,714,945.620	39.779783667	-80.734723960
10,466.00	27.13	261.010	10,005.57	-638.96	-2,188.56	14,446,653.720	1,714,924.616	39.779778320	-80.734798740
10,513.00	26.60	251.440	10,047.51	-643.98	-2,209.13	14,446,648.694	1,714,904.046	39.779764684	-80.734872007
10,560.00	26.07	245.750	10,089.64	-651.58	-2,228.53	14,446,641.102	1,714,884.652	39.779743991	-80.734941119
10,607.00	26.12	243.240	10,131.85	-660.48	-2,247.18	14,446,632.202	1,714,865.997	39.779719700	-80.735007610
10,653.00	26.29	236.060	10,173.13	-670.72	-2,264.68	14,446,621.952	1,714,848.500	39.779691695	-80.735069997
10,700.00	26.60	228.920	10,215.23	-683.45	-2,281.25	14,446,609.223	1,714,831.929	39.779685672	-80.735129112
10,748.00	26.20	224.380	10,258.23	-698.09	-2,296.76	14,446,594.587	1,714,816.416	39.779616803	-80.735184483
10,795.00	26.38	222.310	10,300.37	-713.23	-2,311.05	14,446,579.450	1,714,802.130	39.779575348	-80.735235489
10,842.00	27.13	217.110	10,342.34	-729.50	-2,324.55	14,446,563.179	1,714,788.634	39.779530775	-80.735283698
10,889.00	28.81	211.820	10,383.85	-747.67	-2,336.99	14,446,545.007	1,714,776.194	39.779480969	-80.735328166
10,936.00	30.36	207.680	10,424.73	-767.82	-2,348.48	14,446,524.862	1,714,764.704	39.779425740	-80.735369276
10,983.00	31.55	204.150	10,465.04	-789.56	-2,359.03	14,446,503.121	1,714,754.154	39.779366119	-80.735407053
11,031.00	32.92	201.200	10,505.64	-813.18	-2,368.88	14,446,479.499	1,714,744.299	39.779301327	-80.735442381
11,078.00	34.38	197.980	10,544.77	-837.71	-2,377.60	14,446,454.967	1,714,735.583	39.779234026	-80.735473661
11,125.00	35.84	194.940	10,583.22	-863.63	-2,385.24	14,446,429.047	1,714,727.938	39.779162904	-80.735501143
11,172.00	37.91	191.500	10,620.82	-891.08	-2,391.67	14,446,401.598	1,714,721.511	39.779087573	-80.735524309
11,219.00	39.77	188.460	10,657.43	-920.10	-2,396.76	14,446,372.574	1,714,716.420	39.779007907	-80.735542735
11,266.00	42.38	184.810	10,692.86	-950.77	-2,400.30	14,446,341.910	1,714,712.879	39.778923725	-80.735555661
11,313.00	44.54	182.510	10,726.98	-983.02	-2,402.35	14,446,309.653	1,714,710.828	39.778835154	-80.735563298
11,360.00	46.40	185.030	10,759.94	-1,016.45	-2,404.57	14,446,276.228	1,714,708.614	39.778743377	-80.735571531
11,408.00	48.12	186.390	10,792.51	-1,051.53	-2,408.08	14,446,241.153	1,714,705.101	39.778647081	-80.735584403
11,455.00	51.66	181.990	10,822.80	-1,087.36	-2,410.67	14,446,205.322	1,714,702.512	39.778548702	-80.735593994
11,502.00	55.24	177.890	10,850.79	-1,125.09	-2,410.60	14,446,167.585	1,714,702.583	39.778445066	-80.735594139
11,549.00	59.17	172.780	10,876.25	-1,164.44	-2,407.35	14,446,128.239	1,714,705.833	39.778336984	-80.735582986
11,596.00	62.57	167.580	10,899.14	-1,204.86	-2,400.32	14,446,087.817	1,714,712.861	39.778225917	-80.735558396
11,643.00	65.14	162.240	10,919.86	-1,245.57	-2,389.32	14,446,047.110	1,714,723.859	39.778114036	-80.735519679



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle S-20 HU (slot A)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
11,690.00	67.39	156.820	10,938.79	-1,285.85	-2,374.27	14,446,006.831	1,714,738.913	39.778003297	-80.735466519
11,737.00	70.39	152.640	10,955.72	-1,325.47	-2,355.54	14,445,967.204	1,714,757.638	39.777894317	-80.735400292
11,785.00	73.80	151.890	10,970.48	-1,365.89	-2,334.29	14,445,926.784	1,714,778.893	39.777783141	-80.735325063
11,832.00	77.64	150.830	10,982.07	-1,405.86	-2,312.46	14,445,886.819	1,714,800.723	39.777673209	-80.735247786
11,879.00	81.35	150.300	10,990.64	-1,446.10	-2,289.75	14,445,846.580	1,714,823.431	39.777562517	-80.735167389
11,926.00	85.51	149.640	10,996.01	-1,486.51	-2,266.39	14,445,806.166	1,714,846.793	39.777451340	-80.735084662
11,972.00	87.85	149.460	10,998.68	-1,526.10	-2,243.11	14,445,766.580	1,714,870.065	39.777342438	-80.735002251
12,066.00	88.47	150.570	11,001.70	-1,607.47	-2,196.16	14,445,685.205	1,714,917.018	39.77718578	-80.734835992
12,160.00	88.73	149.900	11,003.99	-1,689.05	-2,149.51	14,445,603.632	1,714,963.669	39.776894176	-80.734670811
12,255.00	88.60	150.080	11,006.21	-1,771.29	-2,102.01	14,445,521.390	1,715,011.171	39.776667932	-80.734502613
12,349.00	88.51	150.740	11,008.58	-1,853.00	-2,055.61	14,445,439.676	1,715,057.572	39.776443415	-80.734338326
12,442.00	88.56	150.570	11,010.95	-1,934.04	-2,010.05	14,445,358.636	1,715,103.133	39.776220217	-80.734177022
12,537.00	88.20	150.650	11,013.64	-2,016.78	-1,963.44	14,445,275.896	1,715,149.736	39.775992610	-80.734012031
12,631.00	88.82	150.210	11,016.08	-2,098.51	-1,917.07	14,445,194.168	1,715,196.107	39.775767783	-80.733847852
12,725.00	88.60	150.570	11,018.20	-2,180.22	-1,870.64	14,445,112.465	1,715,242.540	39.775543025	-80.733683457
12,819.00	88.78	150.480	11,020.35	-2,262.03	-1,824.40	14,445,030.653	1,715,288.780	39.775317969	-80.733519750
12,914.00	88.69	149.680	11,022.45	-2,344.35	-1,777.03	14,444,948.335	1,715,336.153	39.775091515	-80.733352017
13,008.00	89.09	149.600	11,024.27	-2,425.44	-1,729.52	14,444,867.241	1,715,383.654	39.774868421	-80.733183815
13,103.00	89.13	149.550	11,025.74	-2,507.35	-1,681.42	14,444,785.333	1,715,431.758	39.774643086	-80.733013481
13,197.00	89.13	150.080	11,027.17	-2,588.59	-1,634.16	14,444,704.089	1,715,479.014	39.774419580	-80.732846153
13,291.00	89.22	150.210	11,028.52	-2,670.11	-1,587.37	14,444,622.572	1,715,525.803	39.774195330	-80.732680495
13,386.00	88.69	148.050	11,030.26	-2,751.63	-1,538.64	14,444,541.049	1,715,574.536	39.773971047	-80.732507921
13,481.00	88.95	149.200	11,032.21	-2,832.72	-1,489.19	14,444,459.959	1,715,623.985	39.773747945	-80.732332793
13,576.00	88.78	148.360	11,034.09	-2,913.95	-1,439.96	14,444,378.734	1,715,673.215	39.773524474	-80.732158445
13,669.00	88.73	148.190	11,036.12	-2,993.03	-1,391.07	14,444,299.648	1,715,722.107	39.773306883	-80.731985281
13,764.00	88.95	150.120	11,038.04	-3,074.58	-1,342.37	14,444,218.106	1,715,770.803	39.773082545	-80.731812842
13,858.00	88.82	149.640	11,039.87	-3,155.87	-1,295.21	14,444,136.814	1,715,817.964	39.772858907	-80.731645863
13,952.00	89.04	149.770	11,041.62	-3,237.02	-1,247.80	14,444,055.665	1,715,865.374	39.772635660	-80.731477997
14,047.00	88.95	149.990	11,043.29	-3,319.18	-1,200.14	14,443,973.505	1,715,913.040	39.772409634	-80.731309237
14,142.00	88.82	150.790	11,045.14	-3,401.75	-1,153.21	14,443,890.928	1,715,959.969	39.772182468	-80.731143100
14,236.00	88.78	150.700	11,047.11	-3,483.75	-1,107.28	14,443,808.936	1,716,005.897	39.771956916	-80.730980523
14,331.00	90.28	151.890	11,047.89	-3,567.07	-1,061.66	14,443,725.618	1,716,051.521	39.771727725	-80.730819040
14,425.00	89.97	151.490	11,047.68	-3,649.82	-1,017.08	14,443,642.861	1,716,096.100	39.771500085	-80.730661275
14,519.00	89.62	151.490	11,048.02	-3,732.42	-972.21	14,443,560.261	1,716,140.967	39.771272872	-80.730502482
14,614.00	89.57	153.390	11,048.69	-3,816.64	-928.26	14,443,476.047	1,716,184.918	39.771041234	-80.730346967
14,709.00	88.47	148.850	11,050.31	-3,899.79	-882.40	14,443,392.897	1,716,230.781	39.770812502	-80.730184638
14,803.00	88.42	149.420	11,052.87	-3,980.44	-834.19	14,443,312.240	1,716,278.986	39.770590596	-80.730013946
14,897.00	88.33	149.160	11,055.53	-4,061.23	-786.21	14,443,231.455	1,716,326.972	39.770368341	-80.729844039
14,992.00	88.56	149.420	11,058.11	-4,142.88	-737.71	14,443,149.808	1,716,375.470	39.770143714	-80.729672320
15,086.00	88.51	149.680	11,060.51	-4,223.89	-690.09	14,443,068.800	1,716,423.092	39.769920849	-80.729503711
15,181.00	88.51	149.950	11,062.98	-4,305.98	-642.34	14,442,986.709	1,716,470.841	39.769695010	-80.729334664
15,276.00	88.29	149.950	11,065.64	-4,388.17	-594.78	14,442,904.510	1,716,518.394	39.769468875	-80.729166316
15,370.00	88.91	149.420	11,067.93	-4,469.30	-547.35	14,442,823.389	1,716,565.826	39.769245699	-80.728998387
15,464.00	88.73	149.070	11,069.87	-4,550.06	-499.29	14,442,742.626	1,716,613.884	39.769023504	-80.728828228
15,558.00	88.82	149.290	11,071.88	-4,630.77	-451.14	14,442,661.919	1,716,662.033	39.768801461	-80.728657747
15,653.00	88.78	149.290	11,073.87	-4,712.43	-402.64	14,442,580.260	1,716,710.539	39.768576798	-80.728486009
15,748.00	89.40	148.980	11,075.38	-4,793.96	-353.91	14,442,498.725	1,716,759.269	39.768352475	-80.728313471
15,842.00	89.26	148.890	11,076.47	-4,874.47	-305.41	14,442,418.212	1,716,807.770	39.768130960	-80.728141736
15,937.00	89.26	149.070	11,077.70	-4,955.88	-256.45	14,442,336.805	1,716,856.723	39.767906986	-80.727968406
16,031.00	89.26	150.120	11,078.92	-5,036.95	-208.88	14,442,255.741	1,716,904.293	39.767683965	-80.727799996
16,126.00	89.53	150.170	11,079.92	-5,119.33	-161.59	14,442,173.353	1,716,951.581	39.767461312	-80.727632601
16,220.00	89.31	149.950	11,080.87	-5,200.78	-114.68	14,442,091.902	1,716,998.494	39.767233233	-80.727466536
16,315.00	89.62	150.300	11,081.76	-5,283.16	-67.36	14,442,009.530	1,717,045.812	39.767006622	-80.727299039
16,409.00	89.62	149.860	11,082.38	-5,364.63	-20.48	14,441,928.061	1,717,092.697	39.766782492	-80.727133073



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Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
16,503.00	89.40	150.480	11,083.18	-5,446.17	26.28	14,441,846.519	1,717,139.453	39.766558164	-80.726967568
16,597.00	89.40	150.480	11,084.17	-5,527.96	72.59	14,441,764.726	1,717,185.767	39.766333151	-80.726803642
16,696.00	89.17	152.640	11,085.40	-5,615.00	119.73	14,441,677.686	1,717,232.908	39.766093720	-80.726636829
16,790.00	89.57	153.120	11,086.44	-5,698.66	162.58	14,441,594.027	1,717,275.755	39.765863609	-80.726485260
16,884.00	88.73	153.300	11,087.83	-5,782.56	204.94	14,441,510.126	1,717,318.118	39.765632841	-80.726335420
16,977.00	89.22	153.870	11,089.50	-5,865.84	246.31	14,441,426.850	1,717,359.484	39.765403794	-80.726189121
17,072.00	89.62	156.210	11,090.46	-5,951.95	286.39	14,441,340.734	1,717,399.567	39.765166958	-80.726047417
17,119.00	89.48	155.460	11,090.83	-5,994.83	305.63	14,441,297.854	1,717,418.807	39.765049037	-80.725979419
17,166.00	89.04	153.170	11,091.43	-6,037.18	326.00	14,441,255.504	1,717,439.174	39.764932563	-80.725907400
17,213.00	89.00	150.480	11,092.24	-6,078.60	348.19	14,441,214.083	1,717,461.361	39.764818623	-80.725828900
17,259.00	89.22	150.040	11,092.95	-6,118.54	371.00	14,441,174.147	1,717,484.177	39.764708756	-80.725748142
17,306.00	89.44	150.700	11,093.50	-6,159.39	394.24	14,441,133.296	1,717,507.412	39.764596373	-80.725665905
17,353.00	89.35	151.270	11,094.00	-6,200.49	417.03	14,441,092.198	1,717,530.207	39.764483313	-80.725585234
17,400.00	89.31	151.270	11,094.55	-6,241.70	439.62	14,441,050.987	1,717,552.798	39.764369946	-80.725505294
17,447.00	89.00	150.300	11,095.24	-6,282.72	462.56	14,441,009.970	1,717,575.735	39.764257111	-80.725424119
17,541.00	88.38	148.140	11,097.39	-6,363.45	510.65	14,440,929.238	1,717,623.823	39.764034992	-80.725253878
17,635.00	88.16	147.790	11,100.23	-6,443.10	560.49	14,440,849.588	1,717,673.661	39.763815833	-80.725177397
17,730.00	89.13	147.750	11,102.47	-6,523.44	611.14	14,440,769.250	1,717,724.312	39.763594775	-80.724898035
17,823.00	89.53	147.700	11,103.56	-6,602.06	660.79	14,440,690.625	1,717,773.968	39.763378429	-80.724722191
17,917.00	89.31	147.170	11,104.51	-6,681.28	711.39	14,440,611.408	1,717,824.562	39.763160451	-80.724543023
18,011.00	89.40	147.570	11,105.57	-6,760.44	762.07	14,440,532.249	1,717,875.244	39.762942631	-80.724363538
18,105.00	89.22	148.890	11,106.70	-6,840.35	811.56	14,440,452.341	1,717,924.731	39.762722763	-80.724188315
18,200.00	88.86	149.950	11,108.30	-6,922.12	859.88	14,440,370.567	1,717,973.054	39.762497780	-80.724017257
18,294.00	88.64	150.040	11,110.35	-7,003.51	906.88	14,440,289.184	1,718,020.050	39.762273883	-80.723850918
18,388.00	88.73	150.210	11,112.50	-7,084.99	953.69	14,440,207.697	1,718,066.860	39.762049700	-80.723685243
18,482.00	88.60	149.770	11,114.69	-7,166.37	1,000.69	14,440,126.321	1,718,113.861	39.761825822	-80.723518887
18,576.00	88.78	150.040	11,116.84	-7,247.68	1,047.81	14,440,045.014	1,718,160.983	39.761602132	-80.723352100
18,670.00	88.51	149.860	11,119.07	-7,329.02	1,094.87	14,439,963.672	1,718,208.041	39.761378344	-80.723185544
18,764.00	89.26	150.170	11,120.89	-7,410.42	1,141.84	14,439,882.270	1,718,255.010	39.761154392	-80.723019305
18,858.00	89.04	149.380	11,122.29	-7,491.63	1,189.15	14,439,801.058	1,718,302.324	39.760930961	-80.722851840
18,952.00	89.13	149.900	11,123.79	-7,572.73	1,236.65	14,439,719.960	1,718,349.828	39.760707838	-80.722683696
19,046.00	88.95	150.040	11,125.37	-7,654.10	1,283.69	14,439,638.589	1,718,396.864	39.760483973	-80.722517223
19,140.00	89.09	150.080	11,126.97	-7,735.55	1,330.60	14,439,557.146	1,718,443.772	39.760259909	-80.722351208
19,234.00	89.09	150.120	11,128.47	-7,817.02	1,377.45	14,439,475.668	1,718,490.624	39.760035750	-80.722185391
19,326.00	89.00	149.770	11,130.00	-7,896.64	1,423.52	14,439,396.049	1,718,536.693	39.759816702	-80.722022344
19,420.00	89.00	149.510	11,131.64	-7,977.74	1,471.02	14,439,314.952	1,718,584.197	39.759593583	-80.721854206
19,513.00	89.09	149.820	11,133.19	-8,058.00	1,517.99	14,439,234.697	1,718,631.160	39.759372778	-80.721687984
19,607.00	89.09	149.640	11,134.68	-8,139.17	1,565.36	14,439,153.523	1,718,678.537	39.759149449	-80.721520301
19,701.00	89.00	150.570	11,136.25	-8,220.65	1,612.21	14,439,072.043	1,718,725.381	39.758925282	-80.721354521
19,795.00	88.95	150.480	11,137.93	-8,302.47	1,658.45	14,438,990.223	1,718,771.625	39.758700186	-80.721190877
19,889.00	89.00	150.650	11,139.61	-8,384.32	1,704.64	14,438,908.370	1,718,817.813	39.758475001	-80.721027437
19,983.00	89.04	150.830	11,141.22	-8,466.32	1,750.58	14,438,826.376	1,718,863.751	39.758249429	-80.720864889
20,077.00	89.04	150.390	11,142.80	-8,548.21	1,796.70	14,438,744.486	1,718,909.875	39.758024141	-80.720701678
20,170.00	88.95	150.610	11,144.43	-8,629.14	1,842.49	14,438,663.555	1,718,955.663	39.757801491	-80.720539652
20,263.00	89.00	150.610	11,146.09	-8,710.16	1,888.12	14,438,582.537	1,719,001.295	39.757578603	-80.720378183
20,363.00	89.84	150.260	11,147.10	-8,797.13	1,937.46	14,438,495.563	1,719,050.633	39.757339325	-80.720203596
20,455.00	89.57	152.280	11,147.58	-8,877.80	1,981.68	14,438,414.895	1,719,094.853	39.757117407	-80.720047151
20,549.00	89.70	152.550	11,148.17	-8,961.11	2,025.21	14,438,331.582	1,719,138.380	39.756888234	-80.719893201
20,643.00	88.78	152.950	11,149.42	-9,044.67	2,068.24	14,438,248.023	1,719,181.416	39.756658389	-80.719741004
20,738.00	88.91	150.700	11,151.34	-9,128.39	2,113.09	14,438,164.302	1,719,226.260	39.756428083	-80.719582376
20,832.00	88.29	150.210	11,153.63	-9,210.14	2,159.43	14,438,082.550	1,719,272.597	39.756203171	-80.719418412
20,926.00	88.11	149.950	11,156.59	-9,291.58	2,206.29	14,438,001.119	1,719,319.460	39.755979135	-80.719252576
21,021.00	88.95	150.040	11,159.02	-9,373.82	2,253.78	14,437,918.879	1,719,366.951	39.755752871	-80.719084515
21,115.00	88.29	149.290	11,161.29	-9,454.92	2,301.24	14,437,837.773	1,719,414.412	39.755529724	-80.718916551



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Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

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21,210.00	88.29	148.270	11,164.12	-9,536.13	2,350.46	14,437,756.568	1,719,463.630	39.755306289	-80.718742336	
21,305.00	89.13	148.540	11,166.26	-9,617.02	2,400.22	14,437,675.671	1,719,513.389	39.755083694	-80.718566197	
21,400.00	89.26	148.490	11,167.60	-9,698.03	2,449.83	14,437,594.665	1,719,563.000	39.754860802	-80.718390583	
21,494.00	89.97	148.890	11,168.23	-9,778.34	2,498.68	14,437,514.357	1,719,611.847	39.754639832	-80.718217681	
21,588.00	89.70	147.700	11,168.50	-9,858.31	2,548.08	14,437,434.388	1,719,661.247	39.754419786	-80.718042810	
21,682.00	89.66	150.300	11,169.02	-9,938.87	2,596.49	14,437,353.822	1,719,709.656	39.754198113	-80.717871474	
21,777.00	89.93	152.060	11,169.36	-10,022.10	2,642.28	14,437,270.593	1,719,755.449	39.753969146	-80.717709473	
21,872.00	89.44	150.260	11,169.88	-10,105.32	2,688.10	14,437,187.381	1,719,801.271	39.753740226	-80.717547372	
21,966.00	89.57	151.670	11,170.70	-10,187.50	2,733.72	14,437,105.200	1,719,846.890	39.753514139	-80.717385982	
22,060.00	89.57	151.360	11,171.40	-10,270.12	2,778.55	14,437,022.582	1,719,891.720	39.753286859	-80.717227406	
22,154.00	89.75	150.870	11,171.96	-10,352.42	2,823.96	14,436,940.278	1,719,937.126	39.753060437	-80.717066778	
22,249.00	90.32	149.990	11,171.90	-10,435.04	2,870.84	14,436,857.653	1,719,984.006	39.752833118	-80.716900908	
22,343.00	90.19	150.480	11,171.48	-10,516.64	2,917.50	14,436,776.056	1,720,030.671	39.752608624	-80.716735795	
22,437.00	88.11	151.010	11,172.88	-10,598.64	2,963.43	14,436,694.059	1,720,076.601	39.752383040	-80.716573303	
22,531.00	88.25	152.020	11,175.86	-10,681.22	3,008.24	14,436,611.482	1,720,121.409	39.752155870	-80.716414809	
22,625.00	88.20	150.830	11,178.78	-10,763.73	3,053.18	14,436,528.973	1,720,166.348	39.751928887	-80.716255852	
22,719.00	88.20	152.020	11,181.73	-10,846.23	3,098.12	14,436,446.465	1,720,211.286	39.751701907	-80.716096898	
22,813.00	89.84	152.500	11,183.34	-10,929.41	3,141.86	14,436,363.284	1,720,255.031	39.751473088	-80.715942196	
22,908.00	90.28	150.080	11,183.24	-11,012.73	3,187.49	14,436,279.970	1,720,300.663	39.751243886	-80.715780783	
23,007.00	90.50	149.160	11,182.56	-11,098.13	3,237.56	14,436,194.567	1,720,350.729	39.751008909	-80.715603621	
23,101.00	90.23	146.730	11,181.96	-11,177.79	3,287.44	14,436,114.906	1,720,400.613	39.750789703	-80.715427042	
23,195.00	90.23	148.100	11,181.59	-11,256.99	3,338.07	14,436,035.705	1,720,451.235	39.750571754	-80.715247832	
23,288.00	90.32	148.270	11,181.14	-11,336.02	3,387.09	14,435,956.679	1,720,500.262	39.750354298	-80.715074297	
23,381.00	90.28	149.730	11,180.65	-11,415.73	3,434.99	14,435,876.965	1,720,548.158	39.750134965	-80.714904793	
23,474.00	90.19	149.950	11,180.27	-11,496.14	3,481.71	14,435,796.556	1,720,594.882	39.749913730	-80.714739468	
23,568.00	90.28	149.900	11,179.89	-11,577.49	3,528.82	14,435,715.212	1,720,641.988	39.749689925	-80.714572797	
23,662.00	89.17	149.900	11,180.34	-11,658.81	3,575.96	14,435,633.890	1,720,689.129	39.749466180	-80.714406003	
23,756.00	89.22	150.920	11,181.66	-11,740.54	3,622.37	14,435,552.159	1,720,735.540	39.749241317	-80.714241811	
23,849.00	89.22	149.510	11,182.92	-11,821.25	3,668.56	14,435,471.454	1,720,781.732	39.749019275	-80.714078388	
23,942.00	89.26	149.460	11,184.16	-11,901.36	3,715.78	14,435,391.343	1,720,828.950	39.748798851	-80.713911309	
24,035.00	89.04	149.380	11,185.54	-11,981.41	3,763.09	14,435,311.286	1,720,876.257	39.748578579	-80.713743911	
24,129.00	89.04	149.330	11,187.11	-12,062.28	3,811.00	14,435,230.425	1,720,924.164	39.748356093	-80.713574393	
24,223.00	89.26	149.330	11,188.51	-12,143.12	3,858.94	14,435,149.583	1,720,972.107	39.748133657	-80.713404744	
24,316.00	89.17	149.820	11,189.78	-12,223.30	3,906.03	14,435,069.398	1,721,019.198	39.747913032	-80.713238120	
24,409.00	89.26	149.680	11,191.05	-12,303.63	3,952.88	14,434,989.069	1,721,066.045	39.747692014	-80.713072370	
24,503.00	89.17	150.430	11,192.34	-12,385.08	3,999.79	14,434,907.626	1,721,112.962	39.747467936	-80.712906383	
24,597.00	88.95	150.790	11,193.88	-12,466.97	4,045.92	14,434,825.735	1,721,159.086	39.747242635	-80.712743222	
24,691.00	89.17	150.740	11,195.43	-12,548.98	4,091.82	14,434,743.720	1,721,204.989	39.747016994	-80.712580853	
24,786.00	89.31	150.520	11,196.69	-12,631.76	4,138.41	14,434,660.938	1,721,251.577	39.746789241	-80.712416053	
24,879.00	89.31	150.520	11,197.81	-12,712.72	4,184.17	14,434,579.985	1,721,297.341	39.746566517	-80.712254168	
24,972.00	89.31	150.790	11,198.93	-12,793.78	4,229.75	14,434,498.924	1,721,342.914	39.746343501	-80.712092964	
25,066.00	89.22	150.960	11,200.13	-12,875.89	4,275.49	14,434,416.816	1,721,388.661	39.746117606	-80.711931151	
25,160.00	88.64	150.390	11,201.89	-12,957.83	4,321.52	14,434,334.877	1,721,434.690	39.745892171	-80.711768336	
25,252.00	88.82	150.040	11,203.93	-13,037.65	4,367.21	14,434,255.051	1,721,480.380	39.745672542	-80.711606707	
25,346.00	88.60	151.530	11,206.04	-13,119.67	4,413.08	14,434,173.031	1,721,526.247	39.745446889	-80.711444470	
25,440.00	88.73	150.870	11,208.23	-13,202.02	4,458.35	14,434,090.681	1,721,571.519	39.745220332	-80.711284355	
25,533.00	87.72	150.350	11,211.11	-13,283.01	4,503.97	14,434,009.691	1,721,617.136	39.744997506	-80.711122999	
25,627.00	87.80	150.740	11,214.79	-13,364.80	4,550.16	14,433,927.904	1,721,663.324	39.744772487	-80.710959622	
25,721.00	87.80	149.770	11,218.40	-13,446.35	4,596.76	14,433,846.351	1,721,709.926	39.744548106	-80.710794770	
25,814.00	87.67	149.510	11,222.07	-13,526.54	4,643.73	14,433,766.167	1,721,756.895	39.744327483	-80.710628601	
25,909.00	87.67	149.640	11,225.93	-13,608.39	4,691.80	14,433,684.317	1,721,804.964	39.744102273	-80.710458536	
26,005.00	87.45	149.460	11,230.02	-13,691.07	4,740.40	14,433,601.633	1,721,853.571	39.743874770	-80.710286567	
26,101.00	88.64	150.480	11,233.30	-13,774.13	4,788.42	14,433,518.571	1,721,901.585	39.743646231	-80.710116716	
26,196.00	88.64	150.260	11,235.55	-13,856.69	4,835.37	14,433,436.017	1,721,948.539	39.743419097	-80.709950628	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Van Winkle S-20 HU (slot A)
Project:	Marshall County, West Virginia NAD83 UTM 17N	TVD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Site:	Van Winkle	MD Reference:	RKB=753+26 @ 779.00ft (Nabors B28)
Well:	Van Winkle S-20 HU (slot A)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Feb2822

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
26,292.00	88.60	150.650	11,237.86	-13,940.18	4,882.70	14,433,352.525	1,721,995.863	39.743189383	-80.709783235
26,387.00	88.64	150.790	11,240.15	-14,023.02	4,929.15	14,433,269.686	1,722,042.312	39.742961472	-80.709618951
26,483.00	88.69	149.860	11,242.39	-14,106.40	4,976.66	14,433,186.301	1,722,089.826	39.742732048	-80.709450885
26,578.00	88.64	150.960	11,244.60	-14,188.99	5,023.56	14,433,103.714	1,722,136.723	39.742504826	-80.709285007
26,674.00	88.91	150.570	11,246.65	-14,272.74	5,070.43	14,433,019.962	1,722,183.598	39.742274400	-80.709119222
26,753.00	88.64	150.300	11,248.34	-14,341.44	5,109.40	14,432,951.264	1,722,222.568	39.742085389	-80.708981382
Survey @ 26753.00 MD 11248.34 TVD									
26,787.00	88.64	150.300	11,249.15	-14,370.97	5,126.24	14,432,921.739	1,722,239.409	39.742004155	-80.708921814
Survey Proj. to 26787.00 MD 11249.15 TVD									

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
180.00	180.00	-0.04	0.02	MWD surveys
26,753.00	11,248.34	-14,341.44	5,109.40	Survey @ 26753.00 MD 11248.34 TVD
26,787.00	11,249.15	-14,370.97	5,126.24	Survey Proj. to 26787.00 MD 11249.15 TVD

Checked By: _____ Approved By: _____ Date: _____