



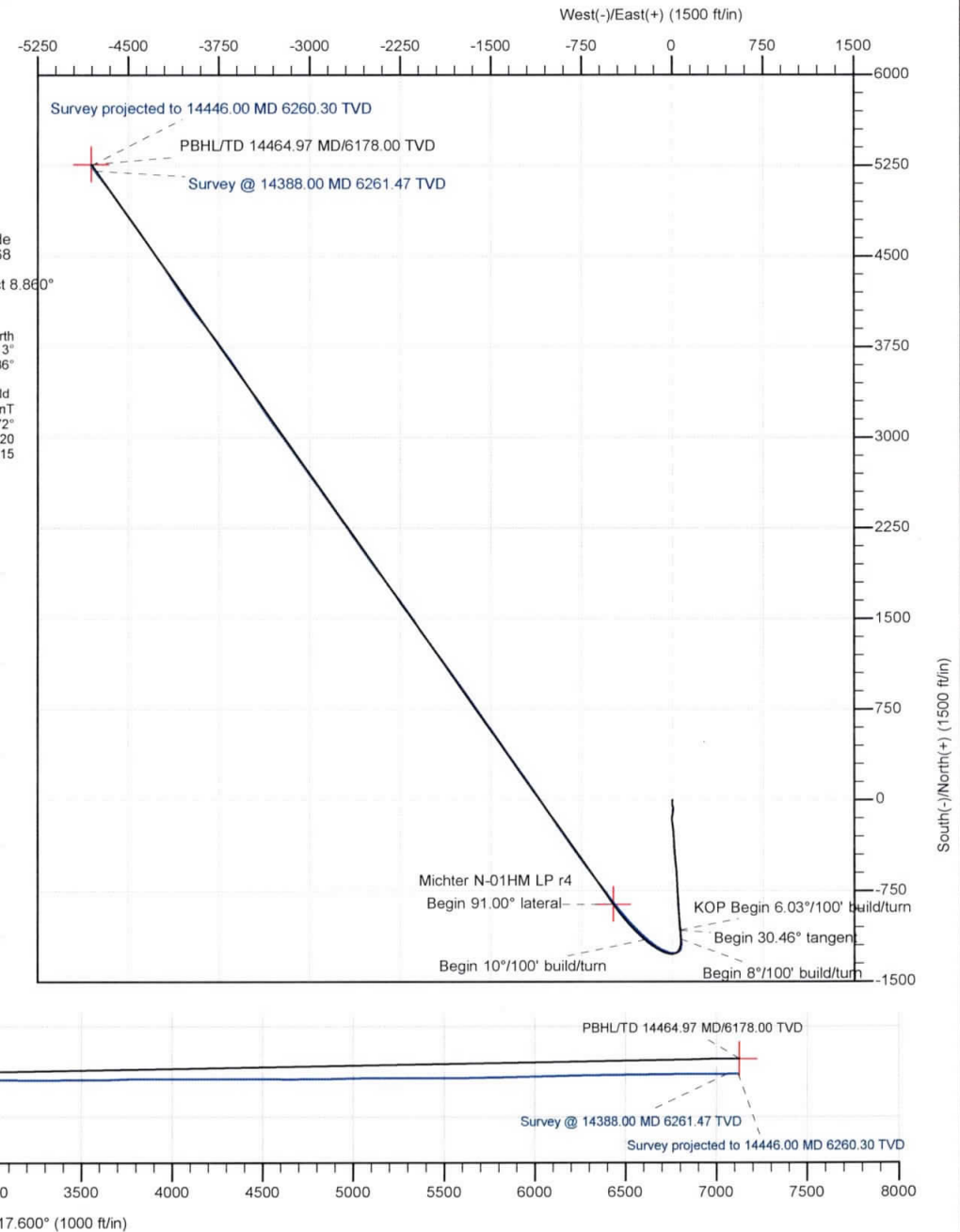
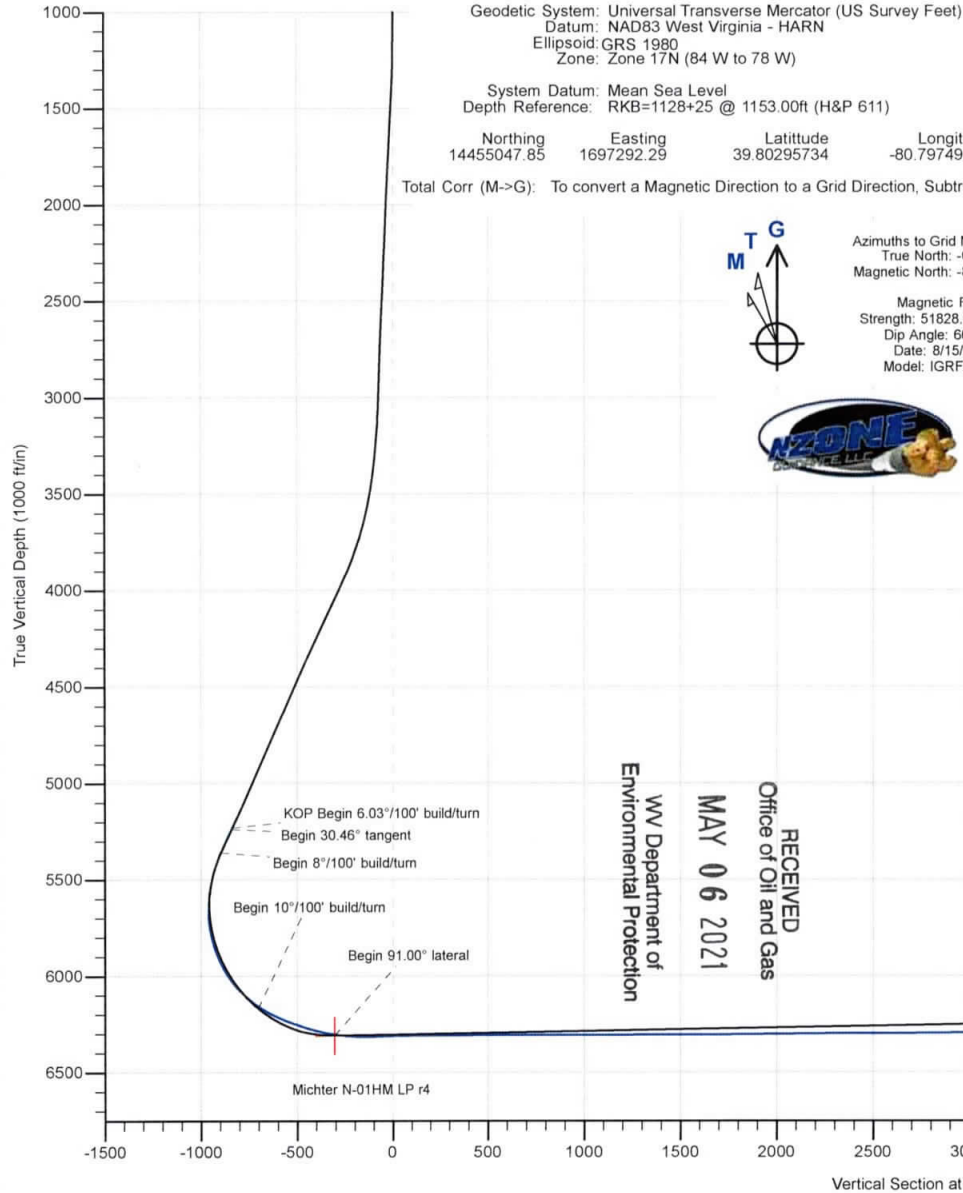
Well: Michter N-01HM (E)
 Site: Michter
 Project: Marshall County, West Virginia
 Design: rev4
 Rig: H&P 611

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
1	5369.00	29.92	175.190	5142.85	-1023.41	60.12	0.00	0.000	-796.28	Survey @ 5369.00 MD 5142.85 TVD
2	5469.00	29.92	175.190	5229.52	-1073.11	64.31	0.00	0.000	-835.81	KOP Begin 6.03°/100' build/turn
3	5478.67	30.46	175.626	5237.88	-1077.96	64.70	6.03	22.244	-839.65	Begin 30.46° tangent
4	5621.22	30.46	175.626	5360.75	-1150.01	70.21	0.00	0.000	-896.57	Begin 8°/100' build/turn
5	6541.54	50.00	310.118	6167.36	-1156.37	-223.08	8.00	145.281	-703.50	Begin 10°/100' build/turn
6	6972.94	91.00	324.800	6309.00	-859.50	-486.31	10.00	21.753	-306.78	Begin 91.00° lateral
7	14464.97	91.00	324.800	6178.00	5261.64	-4804.28	0.00	0.000	7125.03	PBHL/TD 14464.97 MD/6178.00 TVD

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSect	Annotation
235.00	0.04	261.150	235.00	-0.01	-0.08	0.05	MWD surveys
14388.00	91.16	322.050	6261.47	5204.85	-4772.92	7061.94	Survey @ 14388.00 MD 6261.47 TVD
14446.00	91.16	322.050	6260.30	5250.58	-4808.58	7119.75	Survey projected to 14446.00 MD 6260.30 TVD





Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Michter N-01HM (E)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Site:	Michter	MD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Well:	Michter N-01HM (E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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

Site	Michter				
Site Position:		Northing:	14,454,962.42 usft	Latitude:	39.80272253
From:	Lat/Long	Easting:	1,697,325.45 usft	Longitude:	-80.79737330
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.130 °

Well	Michter N-01HM (E)					
Well Position	+N/-S	0.00 ft	Northing:	14,455,047.85 usft	Latitude:	39.80295734
	+E/-W	0.00 ft	Easting:	1,697,292.29 usft	Longitude:	-80.79749068
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,130.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	6/4/2020	-8.724	66.733	51,850.85598107
	IGRF2015	8/15/2020	-8.730	66.716	51,828.00897484

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	317.600	

Survey Program	Date 8/19/2020				
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
235.00	834.00	MWD surf (Original Hole)	MWD	MWD - Standard	
872.00	2,672.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,765.00	14,388.00	MWD (Original Hole)	MWD	MWD - Standard	
14,446.00	14,446.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
235.00	0.04	261.150	235.00	-0.01	-0.08	0.05	0.02	0.02	0.00	0.00
MWD surveys										
282.00	0.13	227.480	282.00	-0.05	-0.14	0.05	0.21	0.19	-71.64	
326.00	0.08	295.330	326.00	-0.07	-0.20	0.08	0.28	-0.11	154.20	
373.00	0.00	261.150	373.00	-0.06	-0.23	0.11	0.17	-0.17	0.00	



Survey Report



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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)
416.00	0.13	176.780	416.00	-0.11	-0.23	0.08	0.30	0.30	0.00
463.00	0.04	261.150	463.00	-0.16	-0.24	0.04	0.28	-0.19	179.51
506.00	0.22	318.630	506.00	-0.10	-0.31	0.13	0.47	0.42	133.67
553.00	0.18	314.680	553.00	0.02	-0.42	0.30	0.09	-0.09	-8.40
597.00	0.04	81.150	597.00	0.07	-0.46	0.36	0.47	-0.32	287.43
623.00	0.04	261.150	623.00	0.07	-0.46	0.36	0.31	0.00	-692.31
688.00	0.09	294.900	688.00	0.09	-0.53	0.42	0.09	0.08	51.92
735.00	0.13	299.380	735.00	0.13	-0.61	0.50	0.09	0.09	9.53
777.00	0.13	313.010	777.00	0.18	-0.68	0.60	0.07	0.00	32.45
834.00	0.04	81.150	834.00	0.23	-0.71	0.65	0.28	-0.16	224.81
872.00	0.04	81.150	872.00	0.23	-0.68	0.63	0.00	0.00	0.00
966.00	0.13	49.250	966.00	0.31	-0.57	0.61	0.10	0.10	-33.94
1,061.00	0.13	285.410	1,061.00	0.41	-0.59	0.70	0.24	0.00	-130.36
1,156.00	0.79	188.030	1,156.00	-0.21	-0.79	0.38	0.86	0.69	-102.51
1,251.00	1.71	191.800	1,250.97	-2.25	-1.17	-0.87	0.97	0.97	3.97
1,345.00	3.12	192.770	1,344.89	-6.12	-2.02	-3.15	1.50	1.50	1.03
1,440.00	3.69	184.330	1,439.72	-11.68	-2.82	-6.72	0.80	0.60	-8.88
1,535.00	4.08	176.950	1,534.50	-18.11	-2.87	-11.43	0.67	0.41	-7.77
1,629.00	3.86	173.780	1,628.28	-24.59	-2.35	-16.57	0.33	-0.23	-3.37
1,724.00	3.64	177.030	1,723.07	-30.78	-1.85	-21.48	0.32	-0.23	3.42
1,819.00	3.73	171.670	1,817.88	-36.85	-1.25	-26.37	0.37	0.09	-5.64
1,914.00	3.07	164.380	1,912.71	-42.36	-0.11	-31.20	0.83	-0.69	-7.67
2,009.00	2.37	159.810	2,007.60	-46.65	1.25	-35.29	0.77	-0.74	-4.81
2,103.00	2.28	155.680	2,101.52	-50.18	2.69	-38.87	0.20	-0.10	-4.39
2,198.00	2.99	167.370	2,196.42	-54.32	4.01	-42.82	0.93	0.75	12.31
2,293.00	3.38	167.990	2,291.28	-59.48	5.13	-47.38	0.41	0.41	0.65
2,387.00	3.16	172.640	2,385.12	-64.76	6.04	-51.90	0.37	-0.23	4.95
2,482.00	3.12	181.260	2,479.98	-69.94	6.32	-55.91	0.50	-0.04	9.07
2,577.00	3.12	187.850	2,574.84	-75.09	5.91	-59.43	0.38	0.00	6.94
2,672.00	3.60	182.660	2,669.68	-80.63	5.42	-63.19	0.60	0.51	-5.46
2,765.00	4.26	179.410	2,762.46	-87.00	5.32	-67.83	0.75	0.71	-3.49
2,860.00	2.85	191.270	2,857.27	-92.84	4.89	-71.86	1.67	-1.48	12.48
2,955.00	2.94	187.230	2,952.15	-97.57	4.13	-74.84	0.23	0.09	-4.25
3,049.00	2.41	177.910	3,046.05	-101.94	3.89	-77.91	0.73	-0.56	-9.91
3,144.00	5.36	196.290	3,140.83	-108.20	2.72	-81.74	3.33	3.11	19.35
3,239.00	8.21	193.820	3,235.15	-119.05	-0.14	-87.81	3.01	3.00	-2.60
3,334.00	9.98	185.390	3,328.96	-133.83	-2.54	-97.12	2.33	1.86	-8.87
3,428.00	10.55	181.260	3,421.45	-150.54	-3.49	-108.82	0.99	0.61	-4.39
3,523.00	11.47	171.680	3,514.71	-168.59	-2.32	-122.93	2.15	0.97	-10.08
3,618.00	16.04	172.560	3,606.96	-190.96	0.75	-141.52	4.82	4.81	0.93
3,712.00	19.95	172.560	3,696.35	-219.75	4.51	-165.32	4.16	4.16	0.00
3,807.00	23.59	174.310	3,784.56	-254.75	8.50	-193.85	3.89	3.83	1.84
3,902.00	27.59	177.390	3,870.23	-295.66	11.38	-226.01	4.44	4.21	3.24
3,997.00	30.54	177.390	3,953.25	-341.75	13.49	-261.46	3.11	3.11	0.00

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WV Department of Environmental Protection									
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4,091.00	30.98	177.560	4,034.03	-389.78	15.60	-298.36	0.48	0.47	0.18
4,186.00	31.64	175.450	4,115.20	-439.05	18.62	-336.78	1.35	0.69	-2.22
4,281.00	29.53	173.960	4,196.98	-487.18	23.06	-375.31	2.36	-2.22	-1.57
4,375.00	30.76	175.020	4,278.26	-534.16	27.59	-413.06	1.43	1.31	1.13
4,470.00	29.97	174.490	4,360.23	-581.99	31.97	-451.33	0.88	-0.83	-0.56
4,565.00	29.75	176.250	4,442.62	-629.13	35.79	-488.72	0.95	-0.23	1.85
4,660.00	29.53	177.830	4,525.19	-676.04	38.22	-525.00	0.85	-0.23	1.66
4,755.00	29.49	175.720	4,607.87	-722.76	40.85	-561.27	1.09	-0.04	-2.22
4,849.00	29.44	176.160	4,689.71	-768.88	44.13	-597.54	0.24	-0.05	0.47
4,944.00	29.70	177.830	4,772.34	-815.69	46.58	-633.76	0.91	0.27	1.76
5,039.00	28.74	175.890	4,855.25	-861.99	49.11	-669.66	1.42	-1.01	-2.04
5,134.00	29.13	176.680	4,938.39	-907.86	52.09	-705.53	0.57	0.41	0.83
5,228.00	29.09	176.070	5,020.52	-953.49	54.98	-741.18	0.32	-0.04	-0.65
5,323.00	30.27	175.800	5,103.05	-1,000.41	58.31	-778.08	1.25	1.24	-0.28
5,369.00	29.92	175.190	5,142.85	-1,023.41	60.12	-796.28	1.01	-0.76	-1.33
5,375.00	29.89	175.620	5,148.05	-1,026.39	60.36	-798.65	3.61	-0.50	7.17
5,422.00	29.45	174.570	5,188.89	-1,049.57	62.35	-817.10	1.45	-0.94	-2.23
5,470.00	30.29	174.220	5,230.51	-1,073.36	64.69	-836.25	1.79	1.75	-0.73
5,517.00	30.73	174.220	5,271.01	-1,097.10	67.09	-855.40	0.94	0.94	0.00
5,565.00	30.81	173.250	5,312.25	-1,121.51	69.77	-875.23	1.05	0.17	-2.02
5,612.00	28.40	175.360	5,353.11	-1,144.61	72.09	-893.85	5.59	-5.13	4.49
5,659.00	25.54	177.470	5,395.00	-1,165.87	73.44	-910.47	6.42	-6.09	4.49
5,706.00	22.90	180.370	5,437.86	-1,185.14	73.83	-924.96	6.16	-5.62	6.17
5,754.00	19.78	186.780	5,482.57	-1,202.55	72.81	-937.13	8.11	-6.50	13.35
5,801.00	18.42	189.510	5,526.98	-1,217.78	70.64	-946.91	3.46	-2.89	5.81
5,848.00	16.66	201.460	5,571.81	-1,231.38	66.95	-954.46	8.51	-3.74	25.43
5,895.00	16.13	216.230	5,616.92	-1,242.92	60.63	-958.72	8.92	-1.13	31.43
5,943.00	15.30	229.760	5,663.14	-1,252.39	51.85	-959.79	7.81	-1.73	28.19
5,990.00	16.18	244.180	5,708.39	-1,259.25	41.21	-957.69	8.51	1.87	30.68
6,038.00	17.80	256.750	5,754.31	-1,263.85	28.05	-952.21	8.34	3.38	26.19
6,085.00	20.40	270.280	5,798.74	-1,265.45	12.85	-943.15	10.89	5.53	28.79
6,132.00	22.24	278.370	5,842.53	-1,264.12	-4.14	-930.70	7.37	3.91	17.21
6,179.00	24.70	284.170	5,885.65	-1,260.42	-22.47	-915.61	7.17	5.23	12.34
6,227.00	28.00	289.350	5,928.66	-1,254.23	-42.83	-897.31	8.37	6.88	10.79
6,264.00	31.60	292.690	5,960.76	-1,247.61	-59.98	-880.86	10.71	9.73	9.03
6,321.00	36.04	297.260	6,008.11	-1,234.16	-88.68	-851.58	8.97	7.79	8.02
6,368.00	40.26	301.480	6,045.07	-1,219.89	-113.94	-824.00	10.55	8.98	8.98
6,416.00	44.04	305.440	6,080.66	-1,202.10	-140.77	-792.78	9.62	7.88	8.25
6,463.00	48.57	308.160	6,113.12	-1,181.73	-167.95	-759.41	10.51	9.64	5.79
6,511.00	53.05	310.360	6,143.45	-1,158.18	-196.73	-722.61	9.99	9.33	4.58
6,558.00	58.46	311.770	6,169.89	-1,132.66	-226.00	-684.02	11.77	11.51	3.00
6,605.00	63.08	313.430	6,192.83	-1,104.89	-256.18	-643.17	10.30	9.83	3.53
6,652.00	65.27	314.310	6,213.31	-1,075.57	-286.67	-600.96	4.95	4.66	1.87



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									Build Rate (°/100ft)	Turn Rate (°/100ft)
	6,700.00	68.79	315.540	6,232.04	-1,044.37	-317.95	-556.82	7.70	7.33	2.56
	6,748.00	71.08	318.440	6,248.51	-1,011.40	-348.69	-511.75	7.41	4.77	6.04
	6,796.00	72.35	319.320	6,263.57	-977.06	-378.66	-466.18	3.17	2.65	1.83
	6,843.00	74.55	319.590	6,276.95	-942.83	-407.95	-421.16	4.71	4.68	0.57
	6,891.00	75.78	321.080	6,289.24	-907.11	-437.56	-374.81	3.95	2.56	3.10
	6,938.00	79.21	321.780	6,299.42	-871.24	-466.16	-329.04	7.44	7.30	1.49
	6,985.00	84.09	322.490	6,306.24	-834.54	-494.70	-282.70	10.49	10.38	1.51
	7,032.00	87.21	323.190	6,309.81	-797.20	-523.00	-236.03	6.80	6.64	1.49
	7,080.00	87.60	322.750	6,311.98	-758.92	-551.88	-188.29	1.22	0.81	-0.92
	7,127.00	90.20	322.840	6,312.88	-721.49	-580.29	-141.50	5.54	5.53	0.19
	7,175.00	90.59	322.660	6,312.55	-683.29	-609.34	-93.69	0.89	0.81	-0.38
	7,269.00	91.43	323.810	6,310.89	-608.00	-665.60	-0.16	1.51	0.89	1.22
	7,364.00	90.99	325.210	6,308.89	-530.67	-720.74	94.12	1.54	-0.46	1.47
	7,459.00	89.41	324.860	6,308.56	-452.82	-775.18	188.32	1.70	-1.66	-0.37
	7,554.00	90.20	324.420	6,308.88	-375.34	-830.15	282.60	0.95	0.83	-0.46
	7,648.00	90.99	323.450	6,307.90	-299.36	-885.49	376.02	1.33	0.84	-1.03
	7,743.00	90.24	326.270	6,306.88	-221.69	-940.16	470.24	3.07	-0.79	2.97
	7,838.00	90.90	326.090	6,305.94	-142.77	-993.03	564.17	0.72	0.69	-0.19
	7,933.00	89.67	326.180	6,305.47	-63.89	-1,045.97	658.12	1.30	-1.29	0.09
	8,028.00	90.51	325.560	6,305.32	14.75	-1,099.27	752.13	1.10	0.88	-0.65
	8,122.00	89.67	325.650	6,305.17	92.31	-1,152.37	845.21	0.90	-0.89	0.10
	8,217.00	90.11	325.120	6,305.35	170.50	-1,206.33	939.34	0.73	0.46	-0.56
	8,312.00	89.19	323.810	6,305.93	247.80	-1,261.54	1,033.65	1.68	-0.97	-1.38
	8,406.00	89.98	323.190	6,306.61	323.36	-1,317.45	1,127.15	1.07	0.84	-0.66
	8,501.00	89.76	325.390	6,306.83	400.49	-1,372.90	1,221.50	2.33	-0.23	2.32
	8,596.00	90.81	325.300	6,306.36	478.64	-1,426.92	1,315.63	1.11	1.11	-0.09
	8,690.00	89.98	325.560	6,305.71	556.04	-1,480.25	1,408.75	0.93	-0.88	0.28
	8,785.00	90.64	325.210	6,305.19	634.22	-1,534.22	1,502.87	0.79	0.69	-0.37
	8,880.00	90.07	325.390	6,304.61	712.32	-1,588.30	1,597.01	0.63	-0.60	0.19
	8,975.00	91.03	325.210	6,303.69	790.42	-1,642.38	1,691.15	1.03	1.01	-0.19
	9,069.00	89.93	324.600	6,302.91	867.33	-1,696.42	1,784.38	1.34	-1.17	-0.65
	9,164.00	90.81	323.980	6,302.29	944.46	-1,751.87	1,878.73	1.13	0.93	-0.65
	9,259.00	89.89	324.420	6,301.71	1,021.51	-1,807.44	1,973.10	1.07	-0.97	0.46
	9,354.00	90.11	324.510	6,301.71	1,098.82	-1,862.65	2,067.42	0.25	0.23	0.09
	9,449.00	91.21	324.160	6,300.62	1,175.99	-1,918.03	2,161.75	1.22	1.16	-0.37
	9,543.00	91.03	324.070	6,298.78	1,252.14	-1,973.12	2,255.13	0.21	-0.19	-0.10
	9,638.00	90.29	324.250	6,297.69	1,329.14	-2,028.74	2,349.50	0.80	-0.78	0.19
	9,732.00	89.41	325.650	6,297.93	1,406.09	-2,082.72	2,442.72	1.76	-0.94	1.49
	9,827.00	89.80	326.270	6,298.59	1,484.81	-2,135.90	2,536.71	0.77	0.41	0.65
	9,921.00	90.99	324.860	6,297.94	1,562.34	-2,189.05	2,629.80	1.96	1.27	-1.50
	10,016.00	90.20	324.680	6,296.95	1,639.93	-2,243.85	2,724.05	0.85	-0.83	-0.19
	10,110.00	91.21	323.450	6,295.80	1,716.03	-2,299.01	2,817.44	1.69	1.07	-1.31
	10,205.00	90.07	323.190	6,294.74	1,792.22	-2,355.75	2,911.96	1.23	-1.20	-0.27



Survey Report



Company: Tug Hill Operating LLC
 Project: Marshall County, West Virginia
 Site: Michter
 Well: Michter N-01HM (E)
 Wellbore: Original Hole
 Design: Surveys Original Hole

Local Co-ordinate Reference: Well Michter N-01HM (E)
 TVD Reference: RKB=1128+25 @ 1153.00ft (H&P 611)
 MD Reference: RKB=1128+25 @ 1153.00ft (H&P 611)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Database: DB_Aug1919_v14

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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)
10,299.00	89.32	324.510	6,295.24	1,868.12	-2,411.20	3,005.40	1.62	-0.80	1.40
10,394.00	90.42	324.420	6,295.45	1,945.42	-2,466.41	3,099.72	1.16	1.16	-0.09
10,488.00	89.80	324.330	6,295.27	2,021.83	-2,521.17	3,193.06	0.67	-0.66	-0.10
10,583.00	90.02	323.890	6,295.42	2,098.79	-2,576.86	3,287.45	0.52	0.23	-0.46
10,678.00	89.93	325.040	6,295.46	2,176.10	-2,632.07	3,381.76	1.21	-0.09	1.21
10,772.00	90.46	325.300	6,295.14	2,253.26	-2,685.76	3,474.94	0.63	0.56	0.28
10,867.00	90.95	324.860	6,293.97	2,331.15	-2,740.13	3,569.13	0.69	0.52	-0.46
10,962.00	90.59	324.600	6,292.70	2,408.70	-2,794.99	3,663.38	0.47	-0.38	-0.27
11,056.00	91.69	324.420	6,290.83	2,485.22	-2,849.55	3,756.68	1.19	1.17	-0.19
11,151.00	90.81	324.770	6,288.75	2,562.63	-2,904.57	3,850.95	1.00	-0.93	0.37
11,246.00	89.10	324.680	6,288.83	2,640.19	-2,959.43	3,945.21	1.80	-1.80	-0.09
11,340.00	89.85	324.070	6,289.69	2,716.59	-3,014.18	4,038.55	1.03	0.80	-0.65
11,435.00	90.20	324.250	6,289.65	2,793.60	-3,069.81	4,132.93	0.41	0.37	0.19
11,530.00	89.93	325.120	6,289.54	2,871.12	-3,124.72	4,227.20	0.96	-0.28	0.92
11,625.00	91.21	324.420	6,288.60	2,948.72	-3,179.52	4,321.45	1.54	1.35	-0.74
11,719.00	90.11	324.860	6,287.51	3,025.37	-3,233.91	4,414.74	1.26	-1.17	0.47
11,814.00	89.05	324.250	6,288.21	3,102.76	-3,289.00	4,509.03	1.29	-1.12	-0.64
11,909.00	89.67	324.160	6,289.27	3,179.81	-3,344.56	4,603.40	0.66	0.65	-0.09
12,003.00	90.33	326.350	6,289.27	3,257.05	-3,398.13	4,696.55	2.43	0.70	2.33
12,098.00	90.51	327.150	6,288.57	3,336.49	-3,450.22	4,790.34	0.86	0.19	0.84
12,193.00	91.16	327.670	6,287.19	3,416.52	-3,501.38	4,883.94	0.88	0.68	0.55
12,288.00	90.68	325.740	6,285.66	3,495.91	-3,553.52	4,977.73	2.09	-0.51	-2.03
12,383.00	91.12	325.740	6,284.17	3,574.42	-3,607.00	5,071.76	0.46	0.46	0.00
12,477.00	90.02	323.720	6,283.24	3,651.16	-3,661.27	5,165.02	2.45	-1.17	-2.15
12,572.00	90.46	323.720	6,282.84	3,727.74	-3,717.48	5,259.48	0.46	0.46	0.00
12,667.00	89.10	323.450	6,283.20	3,804.19	-3,773.88	5,353.96	1.46	-1.43	-0.28
12,761.00	90.07	323.720	6,283.88	3,879.83	-3,829.68	5,447.44	1.07	1.03	0.29
12,856.00	90.95	322.310	6,283.04	3,955.71	-3,886.82	5,542.01	1.75	0.93	-1.48
12,951.00	90.02	323.630	6,282.23	4,031.54	-3,944.03	5,636.59	1.70	-0.98	1.39
13,045.00	91.03	324.420	6,281.37	4,107.61	-3,999.25	5,729.99	1.36	1.07	0.84
13,140.00	91.25	325.920	6,279.48	4,185.57	-4,053.49	5,824.14	1.60	0.23	1.58
13,235.00	91.21	326.440	6,277.44	4,264.48	-4,106.36	5,918.06	0.55	-0.04	0.55
13,330.00	91.87	326.180	6,274.89	4,343.50	-4,159.03	6,011.93	0.75	0.69	-0.27
13,424.00	91.21	325.560	6,272.36	4,421.28	-4,211.76	6,104.91	0.96	-0.70	-0.66
13,519.00	90.55	324.950	6,270.90	4,499.33	-4,265.89	6,199.05	0.95	-0.69	-0.64
13,614.00	90.73	325.040	6,269.84	4,577.14	-4,320.38	6,293.26	0.21	0.19	0.09
13,708.00	91.25	324.070	6,268.22	4,653.71	-4,374.89	6,386.55	1.17	0.55	-1.03
13,803.00	90.51	325.830	6,266.76	4,731.46	-4,429.44	6,480.76	2.01	-0.78	1.85
13,897.00	91.08	325.480	6,265.46	4,809.07	-4,482.46	6,573.82	0.71	0.61	-0.37
13,992.00	89.98	324.250	6,264.58	4,886.75	-4,537.13	6,668.05	1.74	-1.16	-1.29
14,087.00	91.03	323.980	6,263.74	4,963.72	-4,592.82	6,762.43	1.14	1.11	-0.28
14,182.00	89.93	323.810	6,262.94	5,040.47	-4,648.79	6,856.85	1.17	-1.16	-0.18
14,276.00	90.29	323.020	6,262.76	5,115.95	-4,704.82	6,950.37	0.92	0.38	-0.84
14,371.00	90.90	322.220	6,261.78	5,191.43	-4,762.49	7,045.00	1.06	0.64	-0.84

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Michter N-01HM (E)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Site:	Michter	MD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Well:	Michter N-01HM (E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
14,388.00	91.16	322.050	6,261.47	5,204.85	-4,772.92	7,061.94	1.83	1.53	-1.00	
Survey @ 14388.00 MD 6261.47 TVD										
14,446.00	91.16	322.050	6,260.30	5,250.58	-4,808.58	7,119.75	0.00	0.00	0.00	
Survey projected to 14446.00 MD 6260.30 TVD										

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
235.00	235.00	-0.01	-0.08	MWD surveys	
14,388.00	6,261.47	5,204.85	-4,772.92	Survey @ 14388.00 MD 6261.47 TVD	

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Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Michter N-01HM (E)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Site:	Michter	MD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Well:	Michter N-01HM (E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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

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Site	Michter		
Site Position:		Northing:	14,454,962.42 usft
From:	Lat/Long	Easting:	1,697,325.45 usft
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "
		Latitude:	39.80272253
		Longitude:	-80.79737330
		Grid Convergence:	0.130 °

WV Department of
Environmental Protection

Well	Michter N-01HM (E)					
Well Position	+N/-S	0.00 ft	Northing:	14,455,047.85 usft	Latitude:	39.80295734
	+E/-W	0.00 ft	Easting:	1,697,292.29 usft	Longitude:	-80.79749068
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,130.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	6/4/2020	-8.724	66.733	51,850.85598107
	IGRF2015	8/15/2020	-8.730	66.716	51,828.00897484

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	317.600	

Survey Program	Date	8/19/2020			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
235.00	834.00	MWD surf (Original Hole)	MWD	MWD - Standard	
872.00	2,672.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,765.00	14,388.00	MWD (Original Hole)	MWD	MWD - Standard	
14,446.00	14,446.00	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	14,455,047.85	1,697,292.29	39.80295734	-80.79749068	
235.00	0.04	261.150	235.00	-0.01	-0.08	14,455,047.84	1,697,292.21	39.80295731	-80.79749097	
MWD surveys										
282.00	0.13	227.480	282.00	-0.05	-0.14	14,455,047.80	1,697,292.15	39.80295720	-80.79749117	
326.00	0.08	295.330	326.00	-0.07	-0.20	14,455,047.78	1,697,292.09	39.80295715	-80.79749140	
373.00	0.00	261.150	373.00	-0.06	-0.23	14,455,047.79	1,697,292.06	39.80295718	-80.79749150	
416.00	0.13	176.780	416.00	-0.11	-0.23	14,455,047.74	1,697,292.06	39.80295705	-80.79749149	
463.00	0.04	261.150	463.00	-0.16	-0.24	14,455,047.69	1,697,292.05	39.80295690	-80.79749154	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Michter N-01HM (E)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Site:	Michter	MD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Well:	Michter N-01HM (E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
506.00	0.22	318.630	506.00	-0.10	-0.31	14,455,047.75	1,697,291.98	39.80295706	-80.79749179
553.00	0.18	314.680	553.00	0.02	-0.42	14,455,047.87	1,697,291.86	39.80295739	-80.79749219
597.00	0.04	81.150	597.00	0.07	-0.46	14,455,047.92	1,697,291.83	39.80295753	-80.79749231
623.00	0.04	261.150	623.00	0.07	-0.46	14,455,047.92	1,697,291.83	39.80295753	-80.79749231
688.00	0.09	294.900	688.00	0.09	-0.53	14,455,047.93	1,697,291.76	39.80295758	-80.79749255
735.00	0.13	299.380	735.00	0.13	-0.61	14,455,047.98	1,697,291.68	39.80295770	-80.79749284
777.00	0.13	313.010	777.00	0.18	-0.68	14,455,048.03	1,697,291.61	39.80295785	-80.79749311
834.00	0.04	81.150	834.00	0.23	-0.71	14,455,048.08	1,697,291.58	39.80295798	-80.79749321
872.00	0.04	81.150	872.00	0.23	-0.68	14,455,048.08	1,697,291.60	39.80295799	-80.79749311
966.00	0.13	49.250	966.00	0.31	-0.57	14,455,048.16	1,697,291.72	39.80295820	-80.79749271
1,061.00	0.13	285.410	1,061.00	0.41	-0.59	14,455,048.26	1,697,291.70	39.80295847	-80.79749279
1,156.00	0.79	188.030	1,156.00	-0.21	-0.79	14,455,047.64	1,697,291.50	39.80295677	-80.79749349
1,251.00	1.71	191.800	1,250.97	-2.25	-1.17	14,455,045.60	1,697,291.12	39.80295118	-80.79749486
1,345.00	3.12	192.770	1,344.89	-6.12	-2.02	14,455,041.73	1,697,290.27	39.80294056	-80.79749793
1,440.00	3.69	184.330	1,439.72	-11.68	-2.82	14,455,036.16	1,697,289.46	39.80292527	-80.79750083
1,535.00	4.08	176.950	1,534.50	-18.11	-2.87	14,455,029.74	1,697,289.41	39.80290763	-80.79750106
1,629.00	3.86	173.780	1,628.28	-24.59	-2.35	14,455,023.26	1,697,289.93	39.80288982	-80.79749926
1,724.00	3.64	177.030	1,723.07	-30.78	-1.85	14,455,017.07	1,697,290.44	39.80287281	-80.79749752
1,819.00	3.73	171.670	1,817.88	-36.85	-1.25	14,455,011.00	1,697,291.04	39.80285614	-80.79749542
1,914.00	3.07	164.380	1,912.71	-42.36	-0.11	14,455,005.49	1,697,292.17	39.80284101	-80.79749143
2,009.00	2.37	159.810	2,007.60	-46.65	1.25	14,455,001.20	1,697,293.54	39.80282921	-80.79748661
2,103.00	2.28	155.680	2,101.52	-50.18	2.69	14,454,997.67	1,697,294.98	39.80281951	-80.79748151
2,198.00	2.99	167.370	2,196.42	-54.32	4.01	14,454,993.53	1,697,296.30	39.80280814	-80.79747684
2,293.00	3.38	167.990	2,291.28	-59.48	5.13	14,454,988.37	1,697,297.42	39.80279397	-80.79747288
2,387.00	3.16	172.640	2,385.12	-64.76	6.04	14,454,983.09	1,697,298.33	39.80277946	-80.79746969
2,482.00	3.12	181.260	2,479.98	-69.94	6.32	14,454,977.91	1,697,298.61	39.80276523	-80.79746874
2,577.00	3.12	187.850	2,574.84	-75.09	5.91	14,454,972.76	1,697,298.20	39.80275110	-80.79747024
2,672.00	3.60	182.660	2,669.68	-80.63	5.42	14,454,967.22	1,697,297.71	39.80273589	-80.79747203
2,765.00	4.26	179.410	2,762.46	-87.00	5.32	14,454,960.85	1,697,297.61	39.80271839	-80.79747244
2,860.00	2.85	191.270	2,857.27	-92.84	4.89	14,454,955.01	1,697,297.18	39.80270234	-80.79747400
2,955.00	2.94	187.230	2,952.15	-97.57	4.13	14,454,950.27	1,697,296.41	39.80268935	-80.79747678
3,049.00	2.41	177.910	3,046.05	-101.94	3.89	14,454,945.91	1,697,296.18	39.80267736	-80.79747764
3,144.00	5.36	196.290	3,140.83	-108.20	2.72	14,454,939.65	1,697,295.01	39.80266019	-80.79748186
3,239.00	8.21	193.820	3,235.15	-119.05	-0.14	14,454,928.80	1,697,292.14	39.80263041	-80.79749215
3,334.00	9.98	185.390	3,328.96	-133.83	-2.54	14,454,914.02	1,697,289.75	39.80258983	-80.79750079
3,428.00	10.55	181.260	3,421.45	-150.54	-3.49	14,454,897.31	1,697,288.80	39.80254393	-80.79750432
3,523.00	11.47	171.680	3,514.71	-168.59	-2.32	14,454,879.26	1,697,289.97	39.80249438	-80.79750028
3,618.00	16.04	172.560	3,606.96	-190.96	0.75	14,454,856.89	1,697,293.04	39.80243292	-80.79748954
3,712.00	19.95	172.560	3,696.35	-219.75	4.51	14,454,828.10	1,697,296.80	39.80235383	-80.79747639
3,807.00	23.59	174.310	3,784.56	-254.75	8.50	14,454,793.10	1,697,300.78	39.80225769	-80.79746248
3,902.00	27.59	177.390	3,870.23	-295.66	11.38	14,454,752.19	1,697,303.67	39.80214532	-80.79745253
3,997.00	30.54	177.390	3,953.25	-341.75	13.49	14,454,706.10	1,697,305.77	39.80201871	-80.79744542
4,091.00	30.98	177.560	4,034.03	-389.78	15.60	14,454,658.07	1,697,307.89	39.80188680	-80.79743827
4,186.00	31.64	175.450	4,115.20	-439.05	18.62	14,454,608.80	1,697,310.91	39.80175147	-80.79742792
4,281.00	29.53	173.960	4,196.98	-487.18	23.06	14,454,560.67	1,697,315.35	39.80161928	-80.79741249
4,375.00	30.76	175.020	4,278.26	-534.16	27.59	14,454,513.69	1,697,319.87	39.80149021	-80.79739676
4,470.00	29.97	174.490	4,360.23	-581.99	31.97	14,454,465.86	1,697,324.26	39.80135885	-80.79738153
4,565.00	29.75	176.250	4,442.62	-629.13	35.79	14,454,418.72	1,697,328.08	39.80122937	-80.79736831
4,660.00	29.53	177.830	4,525.19	-676.04	38.22	14,454,371.81	1,697,330.51	39.80110052	-80.79736004
4,755.00	29.49	175.720	4,607.87	-722.76	40.85	14,454,325.09	1,697,333.14	39.80097221	-80.79735105
4,849.00	29.44	176.160	4,689.71	-768.88	44.13	14,454,278.97	1,697,336.41	39.80084553	-80.79733976
4,944.00	29.70	177.830	4,772.34	-815.69	46.58	14,454,232.16	1,697,338.87	39.80071695	-80.79733140
5,039.00	28.74	175.890	4,855.25	-861.99	49.11	14,454,185.86	1,697,341.40	39.80058978	-80.79732277
5,134.00	29.13	176.680	4,938.39	-907.86	52.09	14,454,140.00	1,697,344.37	39.80046381	-80.79731255
5,228.00	29.09	176.070	5,020.52	-953.49	54.98	14,454,094.36	1,697,347.26	39.80033846	-80.79730262



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Michter N-01HM (E)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Site:	Michter	MD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Well:	Michter N-01HM (E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,323.00	30.27	175.800	5,103.05	-1,000.41	58.31	14,454,047.44	1,697,350.60	39.80020958	-80.79729112
5,369.00	29.92	175.190	5,142.85	-1,023.41	60.12	14,454,024.44	1,697,352.41	39.80014642	-80.79728486
5,375.00	29.89	175.620	5,148.05	-1,026.39	60.36	14,454,021.46	1,697,352.65	39.80013823	-80.79728403
5,422.00	29.45	174.570	5,188.89	-1,049.57	62.35	14,453,998.28	1,697,354.64	39.80007456	-80.79727714
5,470.00	30.29	174.220	5,230.51	-1,073.36	64.69	14,453,974.49	1,697,356.98	39.80000921	-80.79726901
5,517.00	30.73	174.220	5,271.01	-1,097.10	67.09	14,453,950.75	1,697,359.38	39.79994400	-80.79726065
5,565.00	30.81	173.250	5,312.25	-1,121.51	69.77	14,453,926.34	1,697,362.06	39.79987695	-80.79725130
5,612.00	28.40	175.360	5,353.11	-1,144.61	72.09	14,453,903.24	1,697,364.38	39.79981350	-80.79724232
5,659.00	25.54	177.470	5,395.00	-1,165.87	73.44	14,453,881.98	1,697,365.73	39.79975509	-80.79723859
5,706.00	22.90	180.370	5,437.86	-1,185.14	73.83	14,453,862.71	1,697,366.12	39.79970216	-80.79723736
5,754.00	19.78	186.780	5,482.57	-1,202.55	72.81	14,453,845.30	1,697,365.10	39.79965436	-80.79724114
5,801.00	18.42	189.510	5,526.98	-1,217.78	70.64	14,453,830.08	1,697,362.93	39.79961257	-80.79724897
5,848.00	16.66	201.460	5,571.81	-1,231.38	66.95	14,453,816.48	1,697,359.24	39.79957524	-80.79726223
5,895.00	16.13	216.230	5,616.92	-1,242.92	60.63	14,453,804.93	1,697,352.91	39.79954358	-80.79728485
5,943.00	15.30	229.760	5,663.14	-1,252.39	51.85	14,453,795.46	1,697,344.13	39.79951762	-80.79731617
5,990.00	16.18	244.180	5,708.39	-1,259.25	41.21	14,453,788.60	1,697,333.50	39.79949885	-80.79735409
6,038.00	17.80	256.750	5,754.31	-1,263.85	28.05	14,453,784.00	1,697,320.34	39.79948631	-80.79740100
6,085.00	20.40	270.280	5,798.74	-1,265.45	12.85	14,453,782.40	1,697,305.14	39.79948199	-80.79745511
6,132.00	22.24	278.370	5,842.53	-1,264.12	-4.14	14,453,783.73	1,697,288.15	39.79948576	-80.79751561
6,179.00	24.70	284.170	5,885.65	-1,260.42	-22.47	14,453,787.43	1,697,269.82	39.79949603	-80.79758083
6,227.00	28.00	289.350	5,928.66	-1,254.23	-42.83	14,453,793.62	1,697,249.46	39.79951316	-80.79765328
6,264.00	31.60	292.690	5,960.76	-1,247.61	-59.98	14,453,800.24	1,697,232.31	39.79953145	-80.79771427
6,321.00	36.04	297.260	6,008.11	-1,234.16	-88.68	14,453,813.69	1,697,203.61	39.79956856	-80.79781635
6,368.00	40.26	301.480	6,045.07	-1,219.89	-113.94	14,453,827.96	1,697,178.35	39.79960792	-80.79790617
6,416.00	44.04	305.440	6,080.66	-1,202.10	-140.77	14,453,845.75	1,697,151.52	39.79965692	-80.79800156
6,463.00	48.57	308.160	6,113.12	-1,181.73	-167.95	14,453,866.12	1,697,124.34	39.79971303	-80.79809817
6,511.00	53.05	310.360	6,143.45	-1,158.18	-196.73	14,453,889.67	1,697,095.56	39.79977789	-80.79820045
6,558.00	58.46	311.770	6,169.89	-1,132.66	-226.00	14,453,915.19	1,697,066.28	39.79984817	-80.79830446
6,605.00	63.08	313.430	6,192.83	-1,104.89	-256.18	14,453,942.96	1,697,036.11	39.79992460	-80.79841166
6,652.00	65.27	314.310	6,213.31	-1,075.57	-286.67	14,453,972.28	1,697,005.62	39.80000531	-80.79852000
6,700.00	68.79	315.540	6,232.04	-1,044.37	-317.95	14,454,003.48	1,696,974.34	39.80009120	-80.79863112
6,748.00	71.08	318.440	6,248.51	-1,011.40	-348.69	14,454,036.45	1,696,943.59	39.80018193	-80.79874032
6,796.00	72.35	319.320	6,263.57	-977.06	-378.66	14,454,070.79	1,696,913.62	39.80027641	-80.79884675
6,843.00	74.55	319.590	6,276.95	-942.83	-407.95	14,454,105.02	1,696,884.34	39.80037060	-80.79895074
6,891.00	75.78	321.080	6,289.24	-907.11	-437.56	14,454,140.74	1,696,854.73	39.80046888	-80.79905589
6,938.00	79.21	321.780	6,299.42	-871.24	-466.16	14,454,176.61	1,696,826.12	39.80056756	-80.79915744
6,985.00	84.09	322.490	6,306.24	-834.54	-494.70	14,454,213.31	1,696,797.59	39.80066853	-80.79925873
7,032.00	87.21	323.190	6,309.81	-797.20	-523.00	14,454,250.65	1,696,769.29	39.80077126	-80.79935921
7,080.00	87.60	322.750	6,311.98	-758.92	-551.88	14,454,288.93	1,696,740.41	39.80087657	-80.79946172
7,127.00	90.20	322.840	6,312.88	-721.49	-580.29	14,454,326.36	1,696,712.00	39.80097952	-80.79956258
7,175.00	90.59	322.660	6,312.55	-683.29	-609.34	14,454,364.56	1,696,682.94	39.80108462	-80.79966572
7,269.00	91.43	323.810	6,310.89	-608.00	-665.60	14,454,439.85	1,696,626.69	39.80129173	-80.79986540
7,364.00	90.99	325.210	6,308.89	-530.67	-720.74	14,454,517.18	1,696,571.55	39.80150444	-80.80006111
7,459.00	89.41	324.860	6,308.56	-452.82	-775.18	14,454,595.03	1,696,517.11	39.80171857	-80.80025432
7,554.00	90.20	324.420	6,308.88	-375.34	-830.15	14,454,672.51	1,696,462.14	39.80193168	-80.80044945
7,648.00	90.99	323.450	6,307.90	-299.36	-885.49	14,454,748.49	1,696,406.80	39.80214067	-80.80064586
7,743.00	90.24	326.270	6,306.88	-221.69	-940.16	14,454,826.16	1,696,352.13	39.80235432	-80.80083990
7,838.00	90.90	326.090	6,305.94	-142.77	-993.03	14,454,905.08	1,696,299.26	39.80257138	-80.80102753
7,933.00	89.67	326.180	6,305.47	-63.89	-1,045.97	14,454,983.96	1,696,246.32	39.80278833	-80.80121539
8,028.00	90.51	325.560	6,305.32	14.75	-1,099.27	14,455,062.60	1,696,193.02	39.80300461	-80.80140454
8,122.00	89.67	325.650	6,305.17	92.31	-1,152.37	14,455,140.16	1,696,139.92	39.80321795	-80.80159300
8,217.00	90.11	325.120	6,305.35	170.50	-1,206.33	14,455,218.35	1,696,085.96	39.80343299	-80.80178452
8,312.00	89.19	323.810	6,305.93	247.80	-1,261.54	14,455,295.65	1,696,030.75	39.80364562	-80.80198050
8,406.00	89.98	323.190	6,306.61	323.36	-1,317.45	14,455,371.21	1,695,974.84	39.80385347	-80.80217898
8,501.00	89.76	325.390	6,306.83	400.49	-1,372.90	14,455,448.34	1,695,919.39	39.80406563	-80.80237579

WV Department of Environmental Protection



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Michter N-01HM (E)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Site:	Michter	MD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Well:	Michter N-01HM (E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
8,596.00	90.81	325.300	6,306.36	478.64	-1,426.92	14,455,526.49	1,695,865.37	39.80428056	-80.80256752
8,690.00	89.98	325.560	6,305.71	556.04	-1,480.25	14,455,603.89	1,695,812.04	39.80449345	-80.80275682
8,785.00	90.64	325.210	6,305.19	634.22	-1,534.22	14,455,682.07	1,695,758.07	39.80470848	-80.80294835
8,880.00	90.07	325.390	6,304.61	712.32	-1,588.30	14,455,760.17	1,695,703.99	39.80492330	-80.80314030
8,975.00	91.03	325.210	6,303.69	790.42	-1,642.38	14,455,838.27	1,695,649.91	39.80513811	-80.80333224
9,069.00	89.93	324.600	6,302.91	867.33	-1,696.42	14,455,915.17	1,695,595.87	39.80534964	-80.80352406
9,164.00	90.81	323.980	6,302.29	944.46	-1,751.87	14,455,992.31	1,695,540.43	39.80556181	-80.80372089
9,259.00	89.89	324.420	6,301.71	1,021.51	-1,807.44	14,456,069.36	1,695,484.86	39.80577374	-80.80391815
9,354.00	90.11	324.510	6,301.71	1,098.82	-1,862.65	14,456,146.67	1,695,429.64	39.80598637	-80.80411415
9,449.00	91.21	324.160	6,300.62	1,175.99	-1,918.03	14,456,223.84	1,695,374.26	39.80619865	-80.80431076
9,543.00	91.03	324.070	6,298.78	1,252.14	-1,973.12	14,456,299.98	1,695,319.17	39.80640809	-80.80450632
9,638.00	90.29	324.250	6,297.69	1,329.14	-2,028.74	14,456,376.99	1,695,263.55	39.80661991	-80.80470377
9,732.00	89.41	325.650	6,297.93	1,406.09	-2,082.72	14,456,453.94	1,695,209.57	39.80683155	-80.80489538
9,827.00	89.80	326.270	6,298.59	1,484.81	-2,135.90	14,456,532.66	1,695,156.39	39.80704806	-80.80508412
9,921.00	90.99	324.860	6,297.94	1,562.34	-2,189.05	14,456,610.18	1,695,103.24	39.80726127	-80.80527278
10,016.00	90.20	324.680	6,296.95	1,639.93	-2,243.85	14,456,687.78	1,695,048.44	39.80747470	-80.80546730
10,110.00	91.21	323.450	6,295.80	1,716.03	-2,299.01	14,456,763.88	1,694,993.28	39.80768402	-80.80566312
10,205.00	90.07	323.190	6,294.74	1,792.22	-2,355.75	14,456,840.06	1,694,936.54	39.80789358	-80.80586458
10,299.00	89.32	324.510	6,295.24	1,868.12	-2,411.20	14,456,915.96	1,694,881.09	39.80810235	-80.80606144
10,394.00	90.42	324.420	6,295.45	1,945.42	-2,466.41	14,456,993.27	1,694,825.88	39.80831498	-80.80625745
10,488.00	89.80	324.330	6,295.27	2,021.83	-2,521.17	14,457,069.67	1,694,771.13	39.80852514	-80.80645182
10,583.00	90.02	323.890	6,295.42	2,098.79	-2,576.86	14,457,146.64	1,694,715.43	39.80873683	-80.80664954
10,678.00	89.93	325.040	6,295.46	2,176.10	-2,632.07	14,457,223.94	1,694,660.22	39.80894946	-80.80684555
10,772.00	90.46	325.300	6,295.14	2,253.26	-2,687.76	14,457,301.10	1,694,606.53	39.80916168	-80.80703613
10,867.00	90.95	324.860	6,293.97	2,331.15	-2,740.13	14,457,378.99	1,694,552.16	39.80937590	-80.80722916
10,962.00	90.59	324.600	6,292.70	2,408.70	-2,794.99	14,457,456.55	1,694,497.31	39.80958921	-80.80742388
11,056.00	91.69	324.420	6,290.83	2,485.22	-2,849.55	14,457,533.07	1,694,442.75	39.80979968	-80.80761758
11,151.00	90.81	324.770	6,288.75	2,562.63	-2,904.57	14,457,610.48	1,694,387.72	39.81001260	-80.80781292
11,246.00	89.10	324.680	6,288.83	2,640.19	-2,959.43	14,457,688.03	1,694,332.86	39.81022591	-80.80800768
11,340.00	89.85	324.070	6,289.69	2,716.59	-3,014.18	14,457,764.44	1,694,278.11	39.81043605	-80.80820206
11,435.00	90.20	324.250	6,289.65	2,793.60	-3,069.81	14,457,841.45	1,694,222.49	39.81064788	-80.80839955
11,530.00	89.93	325.120	6,289.54	2,871.12	-3,124.72	14,457,918.96	1,694,167.57	39.81086108	-80.80859451
11,625.00	91.21	324.420	6,288.60	2,948.72	-3,179.52	14,457,996.56	1,694,112.77	39.81107450	-80.80878905
11,719.00	90.11	324.860	6,287.51	3,025.37	-3,233.91	14,458,073.21	1,694,058.38	39.81128533	-80.80898216
11,814.00	89.05	324.250	6,288.21	3,102.76	-3,289.00	14,458,150.60	1,694,003.29	39.81149819	-80.80917775
11,909.00	89.67	324.160	6,289.27	3,179.81	-3,344.56	14,458,227.65	1,693,947.73	39.81171011	-80.80937502
12,003.00	90.33	326.350	6,289.27	3,257.05	-3,398.13	14,458,304.89	1,693,894.16	39.81192253	-80.80956519
12,098.00	90.51	327.150	6,288.57	3,336.49	-3,450.22	14,458,384.33	1,693,842.07	39.81214101	-80.80975007
12,193.00	91.16	327.670	6,287.19	3,416.52	-3,501.38	14,458,464.36	1,693,790.91	39.81236110	-80.80993166
12,288.00	90.68	325.740	6,285.66	3,495.91	-3,553.52	14,458,543.76	1,693,738.77	39.81257944	-80.81011673
12,383.00	91.12	325.740	6,284.17	3,574.42	-3,607.00	14,458,622.26	1,693,685.30	39.81279535	-80.81030656
12,477.00	90.02	323.720	6,283.24	3,651.16	-3,661.27	14,458,699.00	1,693,631.02	39.81300640	-80.81049925
12,572.00	90.46	323.720	6,282.84	3,727.74	-3,717.48	14,458,775.58	1,693,574.81	39.81321704	-80.81069885
12,667.00	89.10	323.450	6,283.20	3,804.19	-3,773.88	14,458,852.03	1,693,518.42	39.81342732	-80.81089910
12,761.00	90.07	323.720	6,283.88	3,879.83	-3,829.68	14,458,927.67	1,693,462.62	39.81363537	-80.81109723
12,856.00	90.95	322.310	6,283.04	3,955.71	-3,886.82	14,459,003.55	1,693,405.47	39.81384409	-80.81130017
12,951.00	90.02	323.630	6,282.23	4,031.54	-3,944.03	14,459,079.39	1,693,348.26	39.81405268	-80.81150333
13,045.00	91.03	324.420	6,281.37	4,107.61	-3,999.25	14,459,155.45	1,693,293.05	39.81426190	-80.81169938
13,140.00	91.25	325.920	6,279.48	4,185.57	-4,053.49	14,459,233.41	1,693,238.80	39.81447632	-80.81189198
13,235.00	91.21	326.440	6,277.44	4,264.48	-4,106.36	14,459,312.32	1,693,185.94	39.81469333	-80.81207964
13,330.00	91.87	326.180	6,274.89	4,343.50	-4,159.03	14,459,391.34	1,693,133.26	39.81491063	-80.81226664
13,424.00	91.21	325.560	6,272.36	4,421.28	-4,211.76	14,459,469.12	1,693,080.54	39.81512454	-80.81245381
13,519.00	90.55	324.950	6,270.90	4,499.33	-4,265.89	14,459,547.17	1,693,026.40	39.81533920	-80.81264601
13,614.00	90.73	325.040	6,269.84	4,577.14	-4,320.38	14,459,624.98	1,692,971.91	39.81555320	-80.81283950
13,708.00	91.25	324.070	6,268.22	4,653.71	-4,374.89	14,459,701.54	1,692,917.41	39.81576378	-80.81303302

WV Department of Environmental Protection

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Michter N-01HM (E)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Site:	Michter	MD Reference:	RKB=1128+25 @ 1153.00ft (H&P 611)
Well:	Michter N-01HM (E)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
13,803.00	90.51	325.830	6,266.76	4,731.46	-4,429.44	14,459,779.30	1,692,862.86	39.81597764	-80.81322670	
13,897.00	91.08	325.480	6,265.46	4,809.07	-4,482.46	14,459,856.91	1,692,809.83	39.81619107	-80.81341497	
13,992.00	89.98	324.250	6,264.58	4,886.75	-4,537.13	14,459,934.59	1,692,755.16	39.81640472	-80.81360908	
14,087.00	91.03	323.980	6,263.74	4,963.72	-4,592.82	14,460,011.56	1,692,699.48	39.81661641	-80.81380681	
14,182.00	89.93	323.810	6,262.94	5,040.47	-4,648.79	14,460,088.31	1,692,643.50	39.81682750	-80.81400559	
14,276.00	90.29	323.020	6,262.76	5,115.95	-4,704.82	14,460,163.79	1,692,587.48	39.81703510	-80.81420455	
14,371.00	90.90	322.220	6,261.78	5,191.43	-4,762.49	14,460,239.27	1,692,529.81	39.81724273	-80.81440937	
14,388.00	91.16	322.050	6,261.47	5,204.85	-4,772.92	14,460,252.69	1,692,519.38	39.81727964	-80.81444643	
Survey @ 14388.00 MD 6261.47 TVD										
14,446.00	91.16	322.050	6,260.30	5,250.58	-4,808.58	14,460,298.41	1,692,483.72	39.81740542	-80.81457309	
Survey projected to 14446.00 MD 6260.30 TVD										

Design Annotations					
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment	
		+N/-S (ft)	+E/-W (ft)		
235.00	235.00	-0.01	-0.08	MWD surveys	
14,388.00	6,261.47	5,204.85	-4,772.92	Survey @ 14388.00 MD 6261.47 TVD	
14,446.00	6,260.30	5,250.58	-4,808.58	Survey projected to 14446.00 MD 6260.30 TVD	

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