



Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Woodford 02HM (B)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1235+33 @ 1268.00ft (Nabors X08)
<b>Site:</b>	Woodford	<b>MD Reference:</b>	RKB=1235+33 @ 1268.00ft (Nabors X08)
<b>Well:</b>	Woodford 02HM (B)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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

<b>Site</b>	Woodford
<b>Site Position:</b>	Latitude: 39.80414597
<b>From:</b>	Longitude: -80.81199526
<b>Position Uncertainty:</b>	Grid Convergence: 0.120 °
	Slot Radius: 0.00 ft
	Northing: 14,455,471.78 usft
	Eastng: 1,693,217.70 usft
	Latitude: 39.80404847
	Northing: 14,455,436.26 usft
	Eastng: 1,693,209.42 usft
	Longitude: -80.81202501
	Wellhead Elevation: 0.00 ft
	Ground Level: 1,235.00 ft

<b>Well</b>	Woodford 02HM (B)
<b>Well Position</b>	+N/-S 0.00 ft
	+E/-W 0.00 ft
<b>Position Uncertainty</b>	0.00 ft
	Wellhead Elevation: 0.00 ft
	Latitude: 39.80404847
	Longitude: -80.81202501
	Ground Level: 1,235.00 ft

<b>Wellbore</b>	Original Hole				
<b>Magnetics</b>	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	4/24/2019	-8.678	66.829	51,980,29189108

<b>Design</b>	Surveys Original Hole				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (°)</b>	
	0.00	0.00	0.00	160.19	

<b>Survey Program</b>	<b>From (ft)</b>	<b>To (ft)</b>	<b>Date</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
	157.00	900.00	9/7/2019	MWD 17 1/2 (Original Hole)	MWD	MWD - Standard
	983.00	2,685.00		MWD 12 1/4 (Original Hole)	MWD	MWD - Standard
	2,778.00	14,245.00		MWD 8 3/4 (Original Hole)	MWD	MWD - Standard
	14,308.00	14,308.00		Projection (Original Hole)	MWD	MWD - Standard

<b>Survey</b>	<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Map Northing (usft)</b>	<b>Map Easting (usft)</b>	<b>Latitude</b>	<b>Longitude</b>	
	0.00	0.00	0.00	0.00	0.00	0.00	14,455,436.26	1,693,209.42	39.80404847	-80.81202501	
	157.00	0.06	229.50	157.00	-0.05	-0.06	14,455,436.20	1,693,209.36	39.80404833	-80.81202523	
	<b>MWD surveys</b>										
	187.00	0.11	1.68	187.00	-0.03	-0.07	14,455,436.22	1,693,209.35	39.80404838	-80.81202527	
	217.00	0.21	87.36	217.00	0.00	-0.02	14,455,436.25	1,693,209.40	39.80404846	-80.81202507	
	247.00	0.06	116.51	247.00	-0.01	0.05	14,455,436.25	1,693,209.47	39.80404845	-80.81202483	
	277.00	0.17	234.73	277.00	-0.04	0.03	14,455,436.22	1,693,209.45	39.80404836	-80.81202491	
	307.00	0.12	282.10	307.00	-0.06	-0.04	14,455,436.20	1,693,209.38	39.80404831	-80.81202515	
	337.00	0.25	158.40	337.00	-0.11	-0.04	14,455,436.14	1,693,209.38	39.80404816	-80.81202517	



**TUG HILL**  
OPERATING

Survey Report - Geographic



**Company:** Tug Hill Operating LLC  
**Project:** Marshall County, West Virginia  
**Site:** Woodford  
**Well:** Woodford 02HM (B)  
**Wellbore:** Original Hole  
**Design:** Surveys Original Hole

**Local Co-ordinate Reference:**  
**TVD Reference:** Well Woodford 02HM (B)  
**MD Reference:** RKB=1235+33 @ 1268.00ft (Nabors X08)  
**North Reference:** RKB=1235+33 @ 1268.00ft (Nabors X08)  
**Survey Calculation Method:** Grid  
**Database:** Minimum Curvature  
 DB\_Aug1919\_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (ustf)	Map Easting (ustf)	Latitude	Longitude
367.00	0.10	32.94	367.00	-0.15	-0.01	14,455,436.10	1,693,209.41	39.80404805	-80.81202504
397.00	0.47	141.53	397.00	-0.23	0.08	14,455,436.03	1,693,209.50	39.80404785	-80.81202471
427.00	0.30	91.02	427.00	-0.33	0.24	14,455,435.93	1,693,209.66	39.80404758	-80.81202416
457.00	0.35	19.04	457.00	-0.24	0.35	14,455,436.02	1,693,209.77	39.80404781	-80.81202377
487.00	0.18	66.93	487.00	-0.13	0.42	14,455,436.12	1,693,209.84	39.80404810	-80.81202351
517.00	0.48	321.36	517.00	-0.02	0.39	14,455,436.24	1,693,209.81	39.80404842	-80.81202364
547.00	0.13	33.83	547.00	0.11	0.33	14,455,436.36	1,693,209.75	39.80404877	-80.81202385
577.00	0.12	218.28	577.00	0.11	0.33	14,455,436.37	1,693,209.75	39.80404878	-80.81202385
607.00	0.26	275.02	607.00	0.09	0.24	14,455,436.35	1,693,209.66	39.80404873	-80.81202416
638.00	0.17	102.22	638.00	0.09	0.21	14,455,436.35	1,693,209.63	39.80404872	-80.81202425
670.00	0.29	254.00	670.00	0.06	0.18	14,455,436.31	1,693,209.60	39.80404863	-80.81202436
701.00	0.13	261.71	701.00	0.03	0.07	14,455,436.29	1,693,209.49	39.80404856	-80.81202476
733.00	0.12	60.29	733.00	0.04	0.07	14,455,436.42	1,693,209.55	39.80404880	-80.81202454
764.00	0.27	32.93	764.00	0.12	0.13	14,455,436.38	1,693,209.64	39.80404893	-80.81202424
796.00	0.16	111.30	796.00	0.17	0.22	14,455,436.44	1,693,209.66	39.80404897	-80.81202414
827.00	0.12	337.30	827.00	0.18	0.24	14,455,436.47	1,693,209.59	39.80404907	-80.81202441
859.00	0.22	274.58	859.00	0.22	0.17	14,455,436.46	1,693,209.50	39.80404902	-80.81202472
890.00	0.13	232.88	890.00	0.20	0.08	14,455,436.46	1,693,209.48	39.80404892	-80.81202481
900.00	0.38	207.90	900.00	0.16	0.06	14,455,436.42	1,693,209.48	39.80404892	-80.81202481
983.00	0.73	262.49	982.99	-0.15	-0.60	14,455,436.11	1,693,208.82	39.80404807	-80.81202713
1,078.00	0.96	262.70	1,077.98	-0.33	-1.99	14,455,435.93	1,693,207.44	39.80404758	-80.81203208
1,173.00	1.35	269.98	1,172.96	-0.43	-3.89	14,455,435.83	1,693,205.53	39.80404731	-80.81203888
1,265.00	1.54	291.33	1,264.93	0.02	-6.13	14,455,436.27	1,693,203.29	39.80404656	-80.81205566
1,359.00	2.00	307.29	1,358.89	1.47	-8.61	14,455,437.73	1,693,200.81	39.80405256	-80.81206718
1,454.00	2.58	296.04	1,453.81	3.42	-11.85	14,455,439.67	1,693,197.57	39.80405792	-80.81208491
1,548.00	3.94	287.41	1,547.66	5.31	-16.83	14,455,441.57	1,693,192.59	39.80406687	-80.81210796
1,643.00	4.07	274.35	1,642.43	6.54	-23.01	14,455,442.80	1,693,186.11	39.80406679	-80.81212831
1,738.00	2.85	265.44	1,737.26	6.61	-33.16	14,455,443.16	1,693,176.26	39.80406673	-80.81214304
1,833.00	2.23	285.16	1,832.16	6.91	-36.76	14,455,445.69	1,693,172.66	39.80407461	-80.81215584
1,927.00	3.36	318.22	1,926.06	9.44	-40.96	14,455,451.77	1,693,168.46	39.80409131	-80.81217075
2,022.00	5.60	329.61	2,020.76	15.51	-46.43	14,455,460.28	1,693,163.00	39.80411472	-80.81219013
2,116.00	6.76	325.42	2,114.21	24.03	-53.89	14,455,468.43	1,693,155.53	39.80413714	-80.81221666
2,211.00	6.73	308.54	2,208.56	32.17	-62.48	14,455,473.89	1,693,146.94	39.80415219	-80.81224719
2,306.00	5.68	294.07	2,303.01	37.64	-70.77	14,455,476.33	1,693,138.65	39.80415895	-80.81227669
2,401.00	4.87	277.49	2,397.62	40.08	-77.32	14,455,476.81	1,693,132.10	39.80416028	-80.81230003
2,495.00	3.17	268.93	2,491.38	40.55	-81.41	14,455,477.52	1,693,128.01	39.80416227	-80.81231458
2,590.00	1.99	297.64	2,586.29	41.27	-83.88	14,455,480.65	1,693,125.54	39.80417088	-80.81232335
2,685.00	3.10	336.90	2,681.20	44.39	-85.95	14,455,486.20	1,693,123.47	39.80418613	-80.81233067
2,778.00	4.21	341.53	2,774.01	49.95	-89.31	14,455,493.01	1,693,120.11	39.80420485	-80.81234259
2,873.00	5.03	327.17	2,868.70	56.75	-89.31	14,455,500.83	1,693,114.52	39.80422634	-80.81236243
2,968.00	6.59	322.36	2,963.21	64.57	-94.90	14,455,500.83	1,693,114.52	39.80425801	-80.81239864
3,062.00	12.27	316.37	3,055.91	76.08	-105.09	14,455,512.34	1,693,104.33	39.80425801	-80.81239864
3,157.00	17.38	318.24	3,147.71	93.98	-121.52	14,455,530.24	1,693,087.90	39.80430727	-80.81245700
3,252.00	21.81	320.74	3,237.19	118.24	-142.15	14,455,554.50	1,693,067.27	39.80437402	-80.81253026
3,347.00	25.01	309.80	3,324.40	144.78	-168.77	14,455,581.04	1,693,040.66	39.80444705	-80.81262484
3,441.00	26.48	297.37	3,409.13	167.15	-202.67	14,455,603.41	1,693,006.75	39.80450869	-80.81274539
3,535.00	32.36	300.47	3,490.98	189.57	-243.00	14,455,625.82	1,692,966.42	39.80457047	-80.81288882
3,630.00	39.24	302.95	3,567.99	218.84	-290.19	14,455,655.09	1,692,919.24	39.80465113	-80.81305662
3,725.00	42.94	305.53	3,639.58	254.00	-341.75	14,455,690.25	1,692,867.67	39.80474799	-80.81333997
3,819.00	41.83	303.57	3,709.01	289.94	-393.93	14,455,726.20	1,692,815.49	39.80484699	-80.81342549
3,913.00	40.88	304.87	3,779.57	324.86	-445.29	14,455,761.12	1,692,764.13	39.80494318	-80.81360810
4,008.00	42.69	309.96	3,850.43	363.33	-495.50	14,455,799.59	1,692,713.92	39.80504913	-80.81378659
4,106.00	40.94	309.70	3,923.46	405.18	-545.67	14,455,841.44	1,692,663.75	39.80516435	-80.81396493
4,200.00	42.86	309.50	3,993.43	445.20	-594.04	14,455,881.45	1,692,615.38	39.80527451	-80.81413686
4,295.00	44.78	308.90	4,061.97	486.76	-645.02	14,455,923.02	1,692,564.40	39.80538895	-80.81431806



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Survey Report - Geographic



**Company:** Tug Hill Operating LLC  
**Project:** Marshall County, West Virginia  
 Woodford  
**Site:** Woodford O2HM (B)  
**Well:** Original Hole  
**Wellbore:** Surveys Original Hole  
**Design:**

**Local Co-ordinate Reference:**  
**TVD Reference:** Well Woodford O2HM (B)  
**MD Reference:** RKB=1235+33 @ 1268.00ft (Nabors X08)  
**North Reference:** RKB=1235+33 @ 1268.00ft (Nabors X08)  
**Survey Calculation Method:** Grid  
**Database:** Minimum Curvature  
 DB\_Aug1919\_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Map Northing (ustf)	Map Easting (ustf)	Latitude	Longitude
4,389.00	42.37	306.08	4,130.07	526.21	-696.39	14,455,962.47	1,692,513.03	39.80549759	-80.81450070
4,484.00	43.02	308.05	4,199.89	565.04	-747.79	14,456,001.30	1,692,461.64	39.80560451	-80.81466341
4,579.00	42.09	311.41	4,269.88	606.08	-797.19	14,456,042.34	1,692,412.23	39.80571750	-80.81485903
4,673.00	41.55	310.43	4,339.94	647.14	-844.55	14,456,083.39	1,692,364.87	39.80583052	-80.81502736
4,768.00	40.75	309.60	4,411.47	687.34	-892.43	14,456,123.59	1,692,317.00	39.80594118	-80.81519752
4,862.00	40.92	308.30	4,482.59	725.97	-940.22	14,456,162.23	1,692,269.20	39.80604756	-80.81536744
4,957.00	41.59	311.50	4,554.02	766.15	-988.26	14,456,202.41	1,692,221.16	39.80615819	-80.81553819
5,051.00	41.99	310.65	4,624.10	807.31	-1,035.48	14,456,243.56	1,692,173.94	39.80627147	-80.81570604
5,145.00	42.00	306.61	4,693.98	846.55	-1,084.59	14,456,282.81	1,692,124.83	39.80637953	-80.81588061
5,240.00	42.10	305.37	4,764.52	883.94	-1,136.08	14,456,320.20	1,692,073.35	39.80648250	-80.81606365
5,335.00	40.85	307.56	4,835.70	921.32	-1,186.68	14,456,357.57	1,692,022.75	39.80658543	-80.81624355
5,429.00	39.04	307.36	4,907.77	958.03	-1,234.58	14,456,394.28	1,691,974.84	39.80668651	-80.81641386
5,524.00	38.94	307.65	4,981.61	994.42	-1,282.00	14,456,430.67	1,691,927.42	39.80678671	-80.81658243
5,618.00	40.68	306.71	5,053.81	1,030.78	-1,329.95	14,456,467.03	1,691,879.47	39.80688684	-80.81675292
5,713.00	39.77	305.61	5,126.35	1,066.98	-1,379.48	14,456,503.23	1,691,829.95	39.80698654	-80.81692900
5,824.00	36.62	302.16	5,219.08	1,107.71	-1,438.98	14,456,543.96	1,691,769.44	39.80709872	-80.81714414
5,971.00	35.25	300.22	5,332.26	1,150.69	-1,510.28	14,456,586.95	1,691,699.15	39.80721717	-80.81739414
6,019.00	31.74	296.44	5,372.28	1,163.29	-1,533.56	14,456,599.55	1,691,675.86	39.80725190	-80.81747696
6,066.00	28.04	292.31	5,413.03	1,173.00	-1,554.86	14,456,609.25	1,691,654.56	39.80727867	-80.81755273
6,113.00	24.53	285.81	5,455.17	1,179.85	-1,574.48	14,456,616.10	1,691,634.94	39.80729760	-80.81762254
6,160.00	21.63	280.89	5,498.41	1,184.15	-1,592.38	14,456,620.40	1,691,617.05	39.80730950	-80.81768624
6,207.00	18.86	273.68	5,542.51	1,186.27	-1,608.47	14,456,622.53	1,691,600.95	39.80731543	-80.81774353
6,254.00	16.48	265.68	5,587.29	1,186.26	-1,622.70	14,456,622.51	1,691,586.72	39.80731543	-80.81774353
6,302.00	15.03	263.31	5,633.49	1,185.02	-1,635.68	14,456,621.27	1,691,573.75	39.80731214	-80.81784040
6,349.00	14.20	249.33	5,678.98	1,182.27	-1,647.13	14,456,618.53	1,691,562.30	39.80730466	-80.81788119
6,397.00	15.65	233.69	5,725.38	1,176.36	-1,657.86	14,456,612.61	1,691,551.57	39.80728848	-80.81791944
6,444.00	17.98	223.58	5,770.38	1,167.35	-1,667.97	14,456,603.60	1,691,541.46	39.80726379	-80.81795552
6,492.00	20.31	217.43	5,815.73	1,155.36	-1,678.14	14,456,591.62	1,691,531.28	39.80723983	-80.81799183
6,539.00	22.81	209.78	5,859.44	1,140.97	-1,687.63	14,456,577.23	1,691,521.80	39.80719147	-80.81802571
6,587.00	25.45	201.08	5,903.26	1,123.27	-1,695.96	14,456,559.52	1,691,513.46	39.80714288	-80.81805552
6,634.00	28.66	195.28	5,945.12	1,102.96	-1,702.57	14,456,539.21	1,691,506.86	39.80708716	-80.81807918
6,681.00	31.43	190.71	5,985.80	1,080.04	-1,707.82	14,456,516.29	1,691,501.61	39.80702424	-80.81809804
6,728.00	34.15	185.97	6,025.32	1,054.87	-1,711.47	14,456,491.12	1,691,497.96	39.80695514	-80.81811122
6,776.00	37.41	182.19	6,064.26	1,026.89	-1,713.43	14,456,463.14	1,691,496.00	39.80687831	-80.81811840
6,823.00	39.82	178.32	6,100.98	997.57	-1,713.53	14,456,433.83	1,691,495.89	39.80679780	-80.81811898
6,871.00	42.51	175.24	6,137.12	966.04	-1,711.73	14,456,402.29	1,691,487.69	39.80671119	-80.81811281
6,918.00	45.71	171.46	6,170.87	933.57	-1,707.92	14,456,369.82	1,691,501.51	39.80662199	-80.81809946
6,965.00	50.64	167.95	6,202.21	899.13	-1,701.62	14,456,335.39	1,691,507.80	39.80652739	-80.81807729
7,012.00	54.86	165.22	6,230.65	862.76	-1,692.92	14,456,299.02	1,691,516.50	39.80642746	-80.81804657
7,059.00	58.07	161.44	6,256.62	825.26	-1,681.66	14,456,261.51	1,691,527.76	39.80632439	-80.81800676
7,106.00	61.54	160.21	6,280.25	786.90	-1,668.32	14,456,223.15	1,691,541.11	39.80621897	-80.81795951
7,154.00	66.68	157.66	6,301.21	746.62	-1,652.78	14,456,182.88	1,691,556.64	39.80610829	-80.81790449
7,201.00	70.77	155.82	6,318.26	706.40	-1,635.48	14,456,142.66	1,691,573.94	39.80599773	-80.81784318
7,248.00	72.70	153.97	6,332.99	665.99	-1,616.54	14,456,102.25	1,691,592.88	39.80588665	-80.81777604
7,295.00	74.33	153.27	6,346.33	625.62	-1,596.52	14,456,061.87	1,691,612.90	39.80577566	-80.81770503
7,343.00	76.44	152.74	6,358.44	584.24	-1,575.44	14,456,020.49	1,691,633.99	39.80566189	-80.81763027
7,390.00	80.92	151.25	6,367.66	543.56	-1,553.80	14,455,979.82	1,691,655.62	39.80555006	-80.81755352
7,437.00	84.88	150.19	6,373.47	502.89	-1,530.99	14,455,939.14	1,691,678.43	39.80543824	-80.81747280
7,484.00	87.34	148.52	6,376.66	462.55	-1,507.09	14,455,898.81	1,691,702.33	39.80532733	-80.81738780
7,532.00	87.25	147.73	6,378.92	421.84	-1,481.77	14,455,858.09	1,691,727.65	39.80521537	-80.81729794
7,626.00	88.62	148.96	6,382.31	341.88	-1,432.48	14,455,778.13	1,691,776.95	39.80499550	-80.81712299
7,721.00	88.97	149.32	6,384.31	260.34	-1,383.76	14,455,696.60	1,691,825.67	39.80477132	-80.81695012
7,815.00	92.31	152.39	6,383.26	178.27	-1,337.99	14,455,614.53	1,691,871.43	39.80454567	-80.81678776
7,910.00	91.96	152.48	6,379.72	94.11	-1,294.06	14,455,530.37	1,691,915.36	39.80431431	-80.81663195



Survey Report - Geographic



**Company:** Tug Hill Operating LLC  
**Project:** Marshall County, West Virginia  
**Site:** Woodford  
**Well:** Woodford 02HM (B)  
**Wellbore:** Original Hole  
**Design:** Surveys Original Hole

**Local Co-ordinate Reference:**  
**TVD Reference:** Well Woodford 02HM (B)  
**MD Reference:** RKB=1235+33 @ 1268.00ft (Nabors X08)  
**North Reference:** RKB=1235+33 @ 1268.00ft (Nabors X08)  
**Survey Calculation Method:** Grid  
**Database:** Minimum Curvature  
 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
8,004.00	91.91	152.39	6,376.55	10.83	-1,250.59	14,455,447.09	1,691,958.84	39.80408535	-80.81647777
8,099.00	90.68	151.34	6,374.40	-72.92	-1,205.80	14,455,363.34	1,692,003.62	39.80385509	-80.81631892
8,194.00	88.62	149.84	6,374.98	-155.67	-1,159.16	14,455,280.59	1,692,050.27	39.80362758	-80.81615344
8,289.00	87.96	149.75	6,377.81	-237.73	-1,111.38	14,455,198.52	1,692,098.04	39.80340194	-80.81598394
8,383.00	88.18	151.95	6,380.98	-319.78	-1,065.63	14,455,116.48	1,692,143.80	39.80317637	-80.81582162
8,478.00	87.30	149.14	6,384.73	-402.42	-1,018.95	14,455,033.83	1,692,190.47	39.80294913	-80.81565604
8,572.00	88.31	147.21	6,388.33	-482.23	-969.42	14,454,954.06	1,692,240.00	39.80272969	-80.81548027
8,667.00	89.41	146.41	6,390.22	-561.71	-917.43	14,454,874.55	1,692,291.99	39.80251111	-80.81529574
8,761.00	89.49	146.94	6,391.12	-640.25	-865.79	14,454,796.01	1,692,343.63	39.80229513	-80.81511245
8,855.00	89.23	146.15	6,392.17	-718.67	-813.97	14,454,717.59	1,692,395.45	39.80207947	-80.81492853
8,950.00	90.07	145.62	6,392.75	-797.32	-760.69	14,454,638.94	1,692,448.73	39.801866317	-80.81473941
9,045.00	89.36	146.41	6,393.22	-876.09	-707.59	14,454,560.17	1,692,501.83	39.80164655	-80.81455092
9,139.00	90.64	147.29	6,393.22	-954.79	-656.19	14,454,481.47	1,692,553.23	39.80143013	-80.81436849
9,234.00	91.43	147.73	6,391.51	-1,034.91	-605.17	14,454,401.35	1,692,604.25	39.80120981	-80.81418743
9,328.00	91.56	148.35	6,389.06	-1,114.63	-555.43	14,454,321.63	1,692,653.99	39.80099059	-80.81401092
9,422.00	91.25	148.26	6,386.76	-1,194.59	-506.06	14,454,241.67	1,692,703.36	39.80077072	-80.81383573
9,517.00	88.62	149.67	6,386.85	-1,275.98	-457.09	14,454,160.28	1,692,752.34	39.80054692	-80.81366197
9,611.00	87.65	150.28	6,389.92	-1,357.32	-410.08	14,454,078.94	1,692,799.35	39.80032327	-80.81349520
9,706.00	88.53	150.90	6,393.08	-1,440.03	-363.45	14,453,996.23	1,692,845.97	39.80009586	-80.81332981
9,800.00	88.48	151.07	6,395.54	-1,522.20	-317.87	14,453,914.06	1,692,891.55	39.79986992	-80.81316815
9,895.00	89.36	150.90	6,397.33	-1,605.26	-271.80	14,453,830.99	1,692,937.62	39.79964155	-80.81300474
9,989.00	88.97	151.78	6,398.70	-1,687.74	-226.73	14,453,748.52	1,692,982.69	39.79941480	-80.81284486
10,083.00	88.92	151.16	6,400.43	-1,770.31	-181.84	14,453,665.95	1,693,027.58	39.79918778	-80.81268565
10,177.00	89.71	151.25	6,401.55	-1,852.68	-136.56	14,453,583.58	1,693,072.86	39.79896131	-80.81252508
10,272.00	90.29	155.91	6,401.55	-1,937.73	-94.31	14,453,498.53	1,693,115.12	39.79872748	-80.81224069
10,367.00	90.42	156.96	6,400.96	-2,024.81	-56.33	14,453,411.45	1,693,153.09	39.79848813	-80.81224069
10,461.00	90.95	153.09	6,399.84	-2,110.00	-16.65	14,453,326.26	1,693,192.77	39.79825395	-80.81210006
10,556.00	89.05	151.51	6,399.84	-2,194.10	27.51	14,453,242.16	1,693,236.93	39.79802272	-80.81194348
10,650.00	88.40	151.60	6,401.93	-2,276.73	72.27	14,453,159.53	1,693,281.69	39.79779554	-80.81178473
10,745.00	88.57	151.16	6,404.44	-2,360.10	117.76	14,453,076.16	1,693,327.18	39.79756634	-80.81162340
10,840.00	90.95	151.60	6,404.84	-2,443.48	163.26	14,452,992.78	1,693,372.68	39.79733707	-80.81146203
10,935.00	90.33	151.51	6,403.79	-2,527.01	208.51	14,452,909.25	1,693,417.93	39.79710743	-80.81130157
11,029.00	89.54	149.05	6,403.88	-2,608.64	255.10	14,452,827.63	1,693,464.52	39.79688299	-80.81113629
11,124.00	88.97	149.40	6,405.12	-2,690.25	303.71	14,452,746.01	1,693,513.13	39.79665857	-80.81096386
11,218.00	90.77	148.61	6,405.33	-2,770.82	352.11	14,452,665.44	1,693,561.53	39.79643701	-80.81079213
11,313.00	90.15	148.26	6,404.57	-2,851.77	401.84	14,452,584.50	1,693,611.26	39.79621443	-80.81061571
11,405.00	88.92	147.29	6,405.32	-2,929.59	450.90	14,452,506.67	1,693,660.32	39.79600042	-80.81044165
11,500.00	90.11	148.08	6,406.12	-3,009.87	501.68	14,452,426.39	1,693,711.10	39.79577965	-80.81026146
11,595.00	90.51	148.26	6,405.61	-3,090.58	551.78	14,452,345.68	1,693,761.20	39.79555771	-80.81008370
11,690.00	89.80	147.47	6,405.35	-3,171.03	602.31	14,452,265.24	1,693,811.73	39.79533649	-80.80990441
11,784.00	90.81	147.56	6,404.85	-3,250.32	652.79	14,452,185.95	1,693,862.21	39.79511844	-80.80972528
11,879.00	89.89	147.03	6,404.27	-3,330.25	704.12	14,452,106.01	1,693,913.54	39.79489862	-80.80954315
11,974.00	89.85	148.70	6,404.49	-3,410.70	754.65	14,452,025.57	1,693,964.07	39.79467740	-80.80936366
12,068.00	91.12	151.42	6,403.69	-3,492.14	801.56	14,451,944.12	1,694,010.98	39.79445346	-80.80919748
12,163.00	91.08	151.34	6,401.87	-3,575.52	847.06	14,451,860.75	1,694,056.48	39.79422422	-80.80903615
12,258.00	89.19	151.42	6,401.64	-3,658.90	892.56	14,451,777.36	1,694,101.98	39.79399495	-80.80887479
12,352.00	88.79	151.07	6,403.30	-3,741.30	937.77	14,451,694.96	1,694,147.19	39.79376840	-80.80871445
12,446.00	89.49	150.63	6,404.71	-3,823.38	983.55	14,451,612.88	1,694,192.97	39.79354271	-80.80855209
12,541.00	88.19	150.63	6,405.80	-3,906.10	1,030.27	14,451,530.16	1,694,239.68	39.79331527	-80.80838642
12,635.00	89.23	150.19	6,407.10	-3,987.76	1,076.80	14,451,448.50	1,694,286.22	39.79309073	-80.80822139
12,730.00	90.55	149.75	6,407.28	-4,070.01	1,124.34	14,451,366.26	1,694,333.76	39.79286458	-80.80805276
12,824.00	90.73	148.96	6,406.23	-4,150.88	1,172.25	14,451,285.39	1,694,381.67	39.79264222	-80.80788282
12,919.00	90.29	149.40	6,405.39	-4,232.46	1,220.92	14,451,203.81	1,694,430.34	39.79241789	-80.80771018
13,014.00	89.54	149.05	6,405.53	-4,314.08	1,269.53	14,451,122.19	1,694,478.95	39.79219345	-80.80753776
13,109.00	88.48	149.23	6,407.17	-4,395.61	1,318.25	14,451,040.65	1,694,527.67	39.79196924	-80.80736494



**TUG HILL**  
LOGGING

Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Woodford 02HM (B)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1235+33 @ 1268.00ft (Nabors X08)
<b>Site:</b>	Woodford	<b>MD Reference:</b>	RKB=1235+33 @ 1268.00ft (Nabors X08)
<b>Well:</b>	Woodford 02HM (B)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
13,204.00	89.41	149.84	6,408.92	-4,477.48	1,366.41	14,450,958.78	1,694,575.83	39.79174412	-80.80719413
13,298.00	89.58	149.40	6,409.75	-4,558.57	1,413.94	14,450,877.69	1,694,623.36	39.79152114	-80.80702552
13,393.00	90.99	150.37	6,409.27	-4,640.75	1,461.61	14,450,795.52	1,694,671.03	39.79129519	-80.80685647
13,487.00	90.90	150.02	6,407.72	-4,722.30	1,508.32	14,450,713.97	1,694,717.74	39.79107094	-80.806689079
13,582.00	90.07	149.49	6,406.92	-4,804.36	1,556.17	14,450,631.90	1,694,765.59	39.79084529	-80.80652108
13,677.00	89.23	149.14	6,407.50	-4,886.06	1,604.65	14,450,550.20	1,694,814.07	39.79062064	-80.80634913
13,771.00	89.19	150.46	6,408.80	-4,967.29	1,651.93	14,450,468.97	1,694,861.35	39.79039727	-80.80618145
13,866.00	88.62	149.67	6,410.61	-5,048.60	1,699.33	14,450,386.66	1,694,908.74	39.79017095	-80.80601336
13,961.00	89.98	149.93	6,411.77	-5,131.70	1,747.11	14,450,304.56	1,694,956.53	39.78994520	-80.80584389
14,055.00	89.14	148.44	6,412.49	-5,212.43	1,795.26	14,450,223.84	1,695,004.68	39.78972322	-80.80567311
14,150.00	89.80	149.84	6,413.37	-5,293.97	1,843.99	14,450,142.30	1,695,053.40	39.78949899	-80.80550028
14,245.00	89.41	149.93	6,414.03	-5,376.14	1,891.65	14,450,060.12	1,695,101.07	39.78927303	-80.80533124
<b>Survey @ 14245.00 MD 6414.03 TVD</b>									
14,308.00	89.41	149.93	6,414.68	-5,430.66	1,923.21	14,450,005.60	1,695,132.63	39.78912312	-80.80521930
<b>Survey projected to 14308.00 MD 6414.68 TVD</b>									

Design Annotations	Measured Depth (ft)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Comment
	157.00	157.00	-0.05	-0.06	MWD surveys
	14,245.00	6,414.03	-5,376.14	1,891.65	Survey @ 14245.00 MD 6414.03 TVD
	14,308.00	6,414.68	-5,430.66	1,923.21	Survey projected to 14308.00 MD 6414.68 TVD