



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Heaven Hill 3-1 HM (L)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1326+26 @ 1352.00usft (Nabors B-28)
Site:	Heaven Hill 3	MD Reference:	RKB=1326+26 @ 1352.00usft (Nabors B-28)
Well:	Heaven Hill 3-1 HM (L)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug0116_LT_v14

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

Site	Heaven Hill 3				
Site Position:		Northing:	14,457,178.77 usft	Latitude:	39.80858060
From:	Lat/Long	Easting:	1,726,571.98 usft	Longitude:	-80.69321360
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.20 °

Well	Heaven Hill 3-1 HM (L)					
Well Position	+N/-S	0.00 usft	Northing:	14,457,185.62 usft	Latitude:	39.80859972
	+E/-W	0.00 usft	Easting:	1,726,541.76 usft	Longitude:	-80.69332114
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	1,326.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	2/10/2018	-8.72	66.92	52,107.41472264
	IGRF2015	8/6/2018	-8.74	66.88	52,051.25684731

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	159.58	

Survey Program	Date	8/15/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
157.00	1,147.00	MWD surf (Original Hole)	MWD	MWD - Standard	
1,223.00	19,504.00	MWD (Original Hole)	MWD	MWD - Standard	
19,555.00	19,555.00	Projection (Original Hole)	MWD	MWD - Standard	

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Survey	WV Department of Environmental Protection									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.00	0.00	0.00	0.00	14,457,185.62	1,726,541.76	39.80859972	-80.69332114	
157.00	0.78	128.65	157.00	-0.67	0.83	14,457,184.96	1,726,542.59	39.80859788	-80.69331818	
MWD surveys										
187.00	0.68	92.10	186.99	-0.80	1.17	14,457,184.82	1,726,542.93	39.80859751	-80.69331698	
217.00	0.47	82.95	216.99	-0.79	1.47	14,457,184.83	1,726,543.23	39.80859753	-80.69331591	
247.00	0.58	119.58	246.99	-0.85	1.73	14,457,184.77	1,726,543.48	39.80859736	-80.69331500	
277.00	0.50	73.03	276.99	-0.89	1.98	14,457,184.74	1,726,543.74	39.80859726	-80.69331409	
307.00	0.32	118.32	306.99	-0.89	2.18	14,457,184.73	1,726,543.94	39.80859725	-80.69331338	
337.00	0.62	90.51	336.99	-0.93	2.42	14,457,184.69	1,726,544.18	39.80859714	-80.69331254	



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Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug0116_LT_v14

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Survey								WV Department of Environmental Protection	
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
367.00	0.39	110.93	366.99	-0.97	2.68	14,457,184.65	1,726,544.43	39.80859703	-80.69331162
397.00	0.24	89.75	396.99	-1.01	2.83	14,457,184.62	1,726,544.59	39.80859693	-80.69331106
427.00	0.42	65.45	426.99	-0.96	3.00	14,457,184.66	1,726,544.76	39.80859706	-80.69331048
457.00	0.42	116.70	456.98	-0.96	3.20	14,457,184.66	1,726,544.95	39.80859704	-80.69330977
487.00	0.30	55.24	486.98	-0.97	3.36	14,457,184.66	1,726,545.12	39.80859703	-80.69330919
517.00	0.22	14.51	516.98	-0.87	3.44	14,457,184.76	1,726,545.20	39.80859731	-80.69330891
547.00	0.26	81.16	546.98	-0.80	3.52	14,457,184.82	1,726,545.28	39.80859749	-80.69330862
577.00	0.38	106.54	576.98	-0.82	3.68	14,457,184.80	1,726,545.44	39.80859744	-80.69330804
607.00	0.37	114.64	606.98	-0.89	3.86	14,457,184.74	1,726,545.62	39.80859725	-80.69330739
637.00	0.26	111.70	636.98	-0.95	4.02	14,457,184.67	1,726,545.77	39.80859706	-80.69330685
667.00	0.28	52.88	666.98	-0.94	4.14	14,457,184.69	1,726,545.90	39.80859712	-80.69330642
697.00	0.45	20.02	696.98	-0.78	4.24	14,457,184.84	1,726,546.00	39.80859754	-80.69330606
727.00	0.38	81.24	726.98	-0.65	4.38	14,457,184.97	1,726,546.13	39.80859788	-80.69330557
757.00	0.36	49.50	756.98	-0.58	4.55	14,457,185.05	1,726,546.30	39.80859809	-80.69330496
787.00	0.24	79.00	786.98	-0.50	4.68	14,457,185.12	1,726,546.44	39.80859829	-80.69330449
817.00	0.38	43.41	816.98	-0.42	4.81	14,457,185.20	1,726,546.57	39.80859852	-80.69330402
847.00	0.45	194.68	846.98	-0.46	4.85	14,457,185.16	1,726,546.61	39.80859841	-80.69330389
877.00	0.15	75.25	876.98	-0.57	4.86	14,457,185.06	1,726,546.61	39.80859812	-80.69330386
907.00	0.42	88.53	906.98	-0.55	5.00	14,457,185.07	1,726,546.76	39.80859816	-80.69330333
937.00	0.35	102.67	936.98	-0.57	5.20	14,457,185.05	1,726,546.96	39.80859811	-80.69330262
967.00	0.44	106.07	966.98	-0.62	5.40	14,457,185.00	1,726,547.16	39.80859796	-80.69330191
982.00	0.38	294.91	981.98	-0.62	5.41	14,457,185.01	1,726,547.17	39.80859798	-80.69330187
1,083.00	0.42	148.24	1,082.98	-0.79	5.30	14,457,184.83	1,726,547.06	39.80859750	-80.69330226
1,147.00	0.34	111.57	1,146.97	-1.06	5.60	14,457,184.56	1,726,547.36	39.80859676	-80.69330120
1,223.00	0.12	251.54	1,222.97	-1.17	5.74	14,457,184.46	1,726,547.50	39.80859646	-80.69330072
1,287.00	0.31	147.84	1,286.97	-1.34	5.77	14,457,184.29	1,726,547.53	39.80859600	-80.69330062
1,381.00	0.47	180.36	1,380.97	-1.94	5.90	14,457,183.69	1,726,547.66	39.80859435	-80.69330016
1,476.00	0.84	196.37	1,475.97	-2.99	5.70	14,457,182.63	1,726,547.66	39.80859144	-80.69330088
1,571.00	1.58	194.14	1,570.94	-4.93	5.18	14,457,180.69	1,726,546.94	39.80858613	-80.69330274
1,665.00	2.01	178.75	1,664.90	-7.84	4.90	14,457,177.79	1,726,546.66	39.80857815	-80.69330377
1,759.00	2.81	184.39	1,758.81	-11.78	4.76	14,457,173.84	1,726,546.52	39.80856732	-80.69330432
1,853.00	3.46	183.01	1,852.67	-16.91	4.44	14,457,168.71	1,726,546.20	39.80855323	-80.69330554
1,946.00	3.61	186.69	1,945.50	-22.62	3.95	14,457,163.00	1,726,545.71	39.80853755	-80.69330735
2,040.00	3.76	203.50	2,039.30	-28.39	2.38	14,457,157.24	1,726,544.13	39.80852173	-80.69331303
2,133.00	4.87	213.96	2,132.04	-34.46	-1.05	14,457,151.16	1,726,540.71	39.80850509	-80.69332528
2,227.00	5.93	213.77	2,225.62	-41.81	-5.97	14,457,143.82	1,726,535.79	39.80848497	-80.69334292
2,322.00	6.88	210.99	2,320.03	-50.76	-11.63	14,457,134.86	1,726,530.13	39.80846042	-80.69336318
2,417.00	6.15	204.64	2,414.42	-60.27	-16.68	14,457,125.36	1,726,525.08	39.80843437	-80.69338128
2,510.00	5.06	192.66	2,506.97	-68.80	-19.66	14,457,116.83	1,726,522.10	39.80841097	-80.69339198
2,605.00	3.88	191.49	2,601.68	-76.04	-21.22	14,457,109.59	1,726,520.54	39.80839111	-80.69339762
2,700.00	3.78	209.68	2,696.47	-81.91	-23.41	14,457,103.72	1,726,518.35	39.80837501	-80.69340549
2,788.00	4.44	218.95	2,784.25	-87.08	-26.99	14,457,098.55	1,726,514.77	39.80836085	-80.69341829
2,839.00	4.84	219.86	2,835.08	-90.26	-29.61	14,457,095.36	1,726,512.15	39.80835212	-80.69342766
2,873.00	4.79	217.98	2,868.96	-92.48	-31.40	14,457,093.14	1,726,510.36	39.80834604	-80.69343407
2,967.00	8.01	198.36	2,962.37	-101.80	-35.88	14,457,083.83	1,726,505.88	39.80832051	-80.69345014
3,063.00	10.22	197.48	3,057.15	-116.27	-40.54	14,457,069.36	1,726,501.22	39.80828080	-80.69346693
3,157.00	13.12	202.99	3,149.20	-134.05	-47.22	14,457,051.58	1,726,494.54	39.80823204	-80.69349091
3,252.00	16.58	203.29	3,241.02	-156.43	-56.79	14,457,029.19	1,726,484.97	39.80817066	-80.69352527
3,346.00	17.86	202.79	3,330.80	-182.04	-67.68	14,457,003.59	1,726,474.08	39.80810043	-80.69356434
3,440.00	20.53	201.49	3,419.57	-210.67	-79.30	14,456,974.95	1,726,462.46	39.80802191	-80.69360608
3,534.00	22.97	196.75	3,506.88	-243.58	-90.63	14,456,942.05	1,726,451.13	39.80793165	-80.69364682
3,630.00	26.03	196.00	3,594.22	-281.77	-101.84	14,456,903.85	1,726,439.92	39.80782686	-80.69368719
3,725.00	29.21	197.62	3,678.39	-323.92	-114.60	14,456,861.71	1,726,427.16	39.80771125	-80.69373316
3,819.00	33.48	198.77	3,758.65	-370.35	-129.89	14,456,815.28	1,726,411.86	39.80758388	-80.69378818
3,913.00	36.97	200.11	3,835.43	-421.45	-147.96	14,456,764.17	1,726,393.80	39.80744370	-80.69385313



Survey Report - Geographic



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4,008.00	38.98	201.46	3,910.31	-476.09	-168.72	14,456,709.53	1,726,373.04	39.80729384	-80.69392771	
4,103.00	39.71	200.64	3,983.78	-532.30	-190.35	14,456,653.32	1,726,351.41	39.80713968	-80.69400541	
4,197.00	39.05	198.85	4,056.44	-588.43	-210.50	14,456,597.20	1,726,331.26	39.80698573	-80.69407785	
4,292.00	39.07	200.01	4,130.21	-644.88	-230.41	14,456,540.75	1,726,311.35	39.80683089	-80.69414944	
4,387.00	39.34	199.94	4,203.82	-701.32	-250.93	14,456,484.31	1,726,290.83	39.80667609	-80.69422317	
4,482.00	38.95	201.46	4,277.50	-757.41	-272.12	14,456,428.21	1,726,269.64	39.80652223	-80.69429932	
4,577.00	39.00	200.55	4,351.35	-813.20	-293.54	14,456,372.43	1,726,248.22	39.80636924	-80.69437626	
4,671.00	38.53	198.87	4,424.65	-868.60	-313.39	14,456,317.03	1,726,228.37	39.80621728	-80.69444762	
4,765.00	38.03	201.57	4,498.44	-923.23	-333.50	14,456,262.39	1,726,208.25	39.80606743	-80.69451991	
4,859.00	37.18	203.07	4,572.92	-976.29	-355.28	14,456,209.33	1,726,186.48	39.80592191	-80.69459809	
4,954.00	38.92	200.46	4,647.73	-1,030.67	-376.96	14,456,154.95	1,726,164.80	39.80577279	-80.69467595	
5,049.00	39.15	197.97	4,721.52	-1,087.16	-396.65	14,456,098.47	1,726,145.11	39.80561784	-80.69474673	
5,144.00	39.87	200.51	4,794.82	-1,144.21	-416.57	14,456,041.42	1,726,125.19	39.80546135	-80.69481836	
5,239.00	39.91	200.29	4,867.71	-1,201.31	-437.81	14,455,984.31	1,726,103.95	39.80530473	-80.69489467	
5,334.00	39.65	199.66	4,940.72	-1,258.44	-458.57	14,455,927.18	1,726,083.19	39.80514804	-80.69496930	
5,429.00	39.81	198.30	5,013.79	-1,315.86	-478.32	14,455,869.77	1,726,063.44	39.80499054	-80.69504031	
5,523.00	39.16	200.07	5,086.34	-1,372.31	-497.95	14,455,813.32	1,726,043.81	39.80483570	-80.69511090	
5,617.00	39.25	199.88	5,159.18	-1,428.15	-518.25	14,455,757.47	1,726,023.51	39.80468253	-80.69518385	
5,712.00	38.13	201.96	5,233.33	-1,483.62	-539.44	14,455,702.01	1,726,003.32	39.80453040	-80.69525997	
5,806.00	37.47	202.17	5,307.60	-1,537.01	-561.08	14,455,648.61	1,725,980.68	39.80438397	-80.69533768	
5,900.00	37.73	200.96	5,382.08	-1,590.35	-582.16	14,455,595.28	1,725,959.60	39.80423769	-80.69541337	
5,994.00	37.66	199.78	5,456.46	-1,644.23	-602.17	14,455,541.40	1,725,939.59	39.80408991	-80.69548526	
6,087.00	37.82	198.64	5,530.00	-1,697.98	-620.89	14,455,487.64	1,725,920.86	39.80394247	-80.69555259	
6,180.00	40.82	198.62	5,601.94	-1,753.82	-639.72	14,455,431.81	1,725,902.04	39.80378931	-80.69562029	
6,275.00	40.74	200.96	5,673.88	-1,812.19	-660.72	14,455,373.43	1,725,881.04	39.80362919	-80.69569578	
6,369.00	40.40	202.32	5,745.29	-1,869.02	-683.26	14,455,316.61	1,725,858.50	39.80347334	-80.69577673	
6,464.00	38.86	203.87	5,818.46	-1,924.76	-707.02	14,455,260.87	1,725,834.74	39.80332050	-80.69586198	
6,559.00	38.03	204.71	5,892.86	-1,978.59	-731.31	14,455,207.03	1,725,810.45	39.80317287	-80.69594913	
6,653.00	38.30	201.19	5,966.77	-2,032.06	-753.95	14,455,153.56	1,725,787.81	39.80302624	-80.69603037	
6,748.00	37.79	198.95	6,041.59	-2,087.05	-774.04	14,455,098.58	1,725,767.72	39.80287543	-80.69610259	
6,843.00	38.93	197.99	6,116.08	-2,142.97	-792.71	14,455,042.66	1,725,749.05	39.80272204	-80.69616974	
6,937.00	39.88	200.01	6,188.72	-2,199.37	-812.15	14,454,986.25	1,725,729.61	39.80256730	-80.69623962	
7,031.00	39.65	203.96	6,260.99	-2,255.11	-834.64	14,454,930.52	1,725,707.12	39.80241446	-80.69632038	
7,125.00	38.87	202.79	6,333.77	-2,309.71	-858.25	14,454,875.92	1,725,683.51	39.80226473	-80.69640509	
7,180.00	38.49	202.35	6,376.70	-2,341.45	-871.44	14,454,844.18	1,725,670.32	39.80217769	-80.69645245	
7,245.00	38.20	200.50	6,427.68	-2,378.98	-886.17	14,454,806.64	1,725,655.59	39.80207475	-80.69650535	
7,340.00	37.30	199.90	6,502.80	-2,433.56	-906.26	14,454,752.06	1,725,635.50	39.80192504	-80.69657752	
7,385.00	39.60	196.80	6,538.04	-2,460.12	-915.04	14,454,725.51	1,725,626.71	39.80185219	-80.69660913	
7,434.00	43.00	193.40	6,574.85	-2,491.34	-923.43	14,454,694.29	1,725,618.32	39.80176654	-80.69663938	
7,529.00	50.00	188.20	6,640.23	-2,558.97	-936.15	14,454,626.65	1,725,605.61	39.80158091	-80.69668548	
7,624.00	57.50	185.40	6,696.37	-2,634.99	-945.13	14,454,550.63	1,725,596.63	39.80137223	-80.69671834	
7,719.00	64.10	181.00	6,742.71	-2,717.72	-949.65	14,454,467.91	1,725,592.11	39.80114508	-80.69673544	
7,813.00	70.50	173.60	6,779.01	-2,804.21	-945.44	14,454,381.41	1,725,596.32	39.80090751	-80.69672150	
7,907.00	77.20	163.70	6,805.20	-2,892.53	-927.57	14,454,293.09	1,725,614.18	39.80066479	-80.69665896	
8,002.00	82.20	157.60	6,822.20	-2,980.64	-896.59	14,454,204.99	1,725,645.17	39.80042255	-80.69654972	
8,097.00	83.60	152.80	6,833.95	-3,066.18	-857.06	14,454,119.44	1,725,684.70	39.80018725	-80.69640999	
8,192.00	83.30	149.70	6,844.79	-3,148.92	-811.67	14,454,036.71	1,725,730.09	39.79995961	-80.69624939	
8,286.00	83.00	147.00	6,856.00	-3,228.36	-762.70	14,453,957.26	1,725,779.06	39.79974099	-80.69607601	
8,381.00	83.60	147.00	6,867.08	-3,307.49	-711.31	14,453,878.14	1,725,830.44	39.79952320	-80.69589401	
8,476.00	89.00	149.50	6,873.21	-3,388.07	-661.46	14,453,797.55	1,725,880.30	39.79930144	-80.69571747	
8,570.00	91.30	149.80	6,872.97	-3,469.18	-613.96	14,453,716.44	1,725,927.80	39.79907824	-80.69554936	
8,665.00	91.00	149.60	6,871.06	-3,551.19	-566.04	14,453,634.44	1,725,975.72	39.79885259	-80.69537975	
8,759.00	91.00	149.10	6,869.42	-3,632.04	-518.13	14,453,553.58	1,726,023.63	39.79863009	-80.69521014	
8,854.00	90.50	149.70	6,868.17	-3,713.81	-469.78	14,453,471.82	1,726,071.98	39.79840510	-80.69503898	
8,948.00	90.60	148.60	6,867.27	-3,794.50	-421.58	14,453,391.12	1,726,120.18	39.79818304	-80.69486835	



Company: Tug Hill Operating LLC
 Project: Marshall County, West Virginia
 Site: Heaven Hill 3
 Well: Heaven Hill 3-1 HM (L)
 Wellbore: Original Hole
 Design: Surveys Original Hole

Local Co-ordinate Reference: Well Heaven Hill 3-1 HM (L)
 TVD Reference: RKB=1326+26 @ 1352.00usft (Nabors B-28)
 MD Reference: RKB=1326+26 @ 1352.00usft (Nabors B-28)
 North Reference: Grid
 Survey Calculation Method: Minimum Curvature
 Database: DB_Aug0116_LT_v14

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Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
9,043.00	88.30	147.90	6,868.18	-3,875.28	-371.59	14,453,310.35	1,726,170.17	39.79796074	-80.69469138
9,137.00	90.40	150.60	6,869.25	-3,956.04	-323.54	14,453,229.58	1,726,218.22	39.79773848	-80.69452128
9,231.00	86.70	151.50	6,871.63	-4,038.26	-278.06	14,453,147.37	1,726,263.70	39.79751228	-80.69436037
9,325.00	87.50	151.60	6,876.38	-4,120.80	-233.34	14,453,064.83	1,726,308.42	39.79728518	-80.69420215
9,420.00	90.50	152.80	6,878.04	-4,204.81	-189.05	14,452,980.82	1,726,352.71	39.79705405	-80.69404548
9,513.00	89.60	149.50	6,877.96	-4,286.25	-144.18	14,452,899.37	1,726,397.58	39.79682996	-80.69388673
9,607.00	90.90	149.00	6,877.55	-4,367.04	-96.12	14,452,818.59	1,726,445.64	39.79660766	-80.69371661
9,701.00	89.10	148.40	6,877.55	-4,447.35	-47.29	14,452,738.27	1,726,494.47	39.79638664	-80.69354374
9,796.00	90.40	148.50	6,877.97	-4,528.31	2.42	14,452,657.32	1,726,544.18	39.79616385	-80.69336776
9,891.00	88.90	148.20	6,878.55	-4,609.17	52.27	14,452,576.45	1,726,594.03	39.79594130	-80.69319129
9,986.00	89.20	150.40	6,880.12	-4,690.84	100.76	14,452,494.78	1,726,642.52	39.79571656	-80.69301964
10,079.00	89.50	150.10	6,881.18	-4,771.58	146.90	14,452,414.05	1,726,688.66	39.79549440	-80.69285635
10,174.00	89.20	153.40	6,882.25	-4,855.25	191.86	14,452,330.38	1,726,733.62	39.79526420	-80.69269732
10,269.00	90.90	153.40	6,882.17	-4,940.19	234.40	14,452,245.44	1,726,776.15	39.79503053	-80.69254693
10,364.00	92.00	151.90	6,879.77	-5,024.54	278.03	14,452,161.09	1,726,819.78	39.79479847	-80.69239263
10,458.00	90.70	150.80	6,877.55	-5,107.00	323.08	14,452,078.62	1,726,864.84	39.79457158	-80.69223324
10,552.00	89.80	150.90	6,877.14	-5,189.10	368.87	14,451,996.53	1,726,910.63	39.79434570	-80.69207125
10,646.00	88.40	150.50	6,878.62	-5,271.06	414.86	14,451,914.57	1,726,956.62	39.79412017	-80.69190850
10,741.00	89.60	150.30	6,880.28	-5,353.65	461.78	14,451,831.98	1,727,003.54	39.79389292	-80.69174249
10,836.00	88.50	147.70	6,881.85	-5,435.06	510.69	14,451,750.57	1,727,052.45	39.79366888	-80.69156934
10,931.00	88.90	149.30	6,884.01	-5,516.04	560.32	14,451,669.59	1,727,102.08	39.79344603	-80.69139368
11,025.00	90.90	149.40	6,884.17	-5,596.90	608.24	14,451,588.73	1,727,149.99	39.79322350	-80.69122408
11,121.00	89.30	149.50	6,884.00	-5,679.57	657.03	14,451,506.05	1,727,198.79	39.79299601	-80.69105139
11,216.00	89.20	149.30	6,885.25	-5,761.33	705.38	14,451,424.29	1,727,247.14	39.79277101	-80.69088025
11,311.00	90.50	149.20	6,885.50	-5,842.98	753.96	14,451,342.65	1,727,295.71	39.79254634	-80.69070834
11,405.00	90.00	150.70	6,885.09	-5,924.34	801.03	14,451,261.29	1,727,342.78	39.79232245	-80.69054178
11,499.00	92.00	150.80	6,883.45	-6,006.34	846.95	14,451,179.29	1,727,388.71	39.79209683	-80.69037931
11,594.00	88.50	150.50	6,883.03	-6,089.13	893.50	14,451,096.50	1,727,435.26	39.79186902	-80.69021459
11,689.00	89.50	150.40	6,884.69	-6,171.76	940.35	14,451,013.87	1,727,482.11	39.79164165	-80.69004885
11,784.00	88.00	150.20	6,886.76	-6,254.25	987.40	14,450,931.37	1,727,529.16	39.79141464	-80.68988235
11,878.00	89.50	150.70	6,888.81	-6,336.01	1,033.75	14,450,849.62	1,727,575.51	39.79118969	-80.68971837
11,973.00	88.10	150.00	6,890.80	-6,418.55	1,080.73	14,450,767.08	1,727,622.49	39.79096257	-80.68955213
12,066.00	89.50	150.60	6,892.75	-6,499.31	1,126.80	14,450,686.32	1,727,668.56	39.79074033	-80.68938913
12,161.00	89.20	150.40	6,893.83	-6,581.99	1,173.58	14,450,603.64	1,727,715.34	39.79051283	-80.68922363
12,254.00	90.00	148.90	6,894.48	-6,662.24	1,220.57	14,450,523.39	1,727,762.32	39.79029200	-80.68905735
12,348.00	90.40	147.30	6,894.15	-6,742.04	1,270.24	14,450,443.59	1,727,812.00	39.79007237	-80.68888152
12,443.00	91.30	150.10	6,892.74	-6,823.19	1,319.58	14,450,362.43	1,727,861.34	39.78984903	-80.68870687
12,537.00	91.20	151.70	6,890.69	-6,905.31	1,365.28	14,450,280.32	1,727,907.04	39.78962309	-80.68854519
12,632.00	90.00	152.70	6,889.69	-6,989.33	1,409.59	14,450,196.29	1,727,951.35	39.78939190	-80.68838852
12,726.00	91.30	152.30	6,888.63	-7,072.70	1,452.99	14,450,112.92	1,727,994.75	39.78916253	-80.68823506
12,821.00	89.90	150.70	6,887.63	-7,156.18	1,498.31	14,450,029.44	1,728,040.07	39.78893284	-80.68807474
12,916.00	89.00	150.50	6,888.54	-7,238.94	1,544.95	14,449,946.68	1,728,086.70	39.78870512	-80.68790976
13,011.00	89.50	150.00	6,889.79	-7,321.41	1,592.08	14,449,864.21	1,728,133.84	39.78847818	-80.68774299
13,106.00	90.40	150.60	6,889.87	-7,403.93	1,639.15	14,449,781.69	1,728,180.91	39.78825111	-80.68757647
13,200.00	88.40	148.70	6,890.85	-7,485.04	1,686.64	14,449,700.59	1,728,228.40	39.78802792	-80.68740843
13,295.00	89.60	148.70	6,892.51	-7,566.20	1,735.98	14,449,619.43	1,728,277.74	39.78780456	-80.68723378
13,389.00	89.00	150.20	6,893.66	-7,647.14	1,783.76	14,449,538.48	1,728,325.52	39.78758181	-80.68706472
13,484.00	90.30	149.80	6,894.24	-7,729.41	1,831.26	14,449,456.21	1,728,373.02	39.78735542	-80.68689667
13,578.00	90.20	151.60	6,893.83	-7,811.38	1,877.26	14,449,374.24	1,728,419.01	39.78712987	-80.68673394
13,673.00	89.10	151.30	6,894.41	-7,894.83	1,922.66	14,449,290.80	1,728,464.42	39.78690027	-80.68657337
13,768.00	90.20	151.60	6,894.99	-7,978.27	1,968.06	14,449,207.35	1,728,509.82	39.78667068	-80.68641279
13,863.00	88.50	149.40	6,896.07	-8,060.94	2,014.83	14,449,124.68	1,728,556.59	39.78644319	-80.68624733
13,958.00	89.90	149.10	6,897.40	-8,142.58	2,063.40	14,449,043.05	1,728,605.16	39.78621854	-80.68607547
14,052.00	89.50	150.40	6,897.89	-8,223.77	2,110.75	14,448,961.85	1,728,652.51	39.78599509	-80.68590792
14,147.00	90.30	150.70	6,898.05	-8,306.50	2,157.46	14,448,879.13	1,728,699.22	39.78576746	-80.68574269

JUL 10 2020

WV Department of Environmental Protection

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Heaven Hill 3-1 HM (L)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1326+26 @ 1352.00usft (Nabors B-28)
Site:	Heaven Hill 3	MD Reference:	RKB=1326+26 @ 1352.00usft (Nabors B-28)
Well:	Heaven Hill 3-1 HM (L)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug0116_LT_v14

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JUL 10 2020

Survey									WV Department of Environmental Protection	
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
14,242.00	89.40	149.90	6,898.30	-8,389.01	2,204.53	14,448,796.61	1,728,746.28	39.78554039	-80.68557618	
14,336.00	90.40	150.30	6,898.47	-8,470.50	2,251.38	14,448,715.12	1,728,793.14	39.78531616	-80.68541041	
14,431.00	89.30	148.90	6,898.72	-8,552.44	2,299.45	14,448,633.19	1,728,841.21	39.78509068	-80.68524032	
14,526.00	90.50	149.00	6,898.88	-8,633.82	2,348.45	14,448,551.80	1,728,890.21	39.78486670	-80.68506692	
14,620.00	89.80	149.20	6,898.64	-8,714.48	2,396.73	14,448,471.14	1,728,938.48	39.78464472	-80.68489610	
14,714.00	89.70	150.10	6,899.05	-8,795.60	2,444.22	14,448,390.03	1,728,985.98	39.78442150	-80.68472806	
14,809.00	90.20	149.30	6,899.13	-8,877.62	2,492.15	14,448,308.01	1,729,033.91	39.78419578	-80.68455848	
14,904.00	88.60	149.40	6,900.12	-8,959.34	2,540.58	14,448,226.29	1,729,082.34	39.78397089	-80.68438713	
14,998.00	89.00	150.90	6,902.09	-9,040.85	2,587.35	14,448,144.78	1,729,129.11	39.78374659	-80.68422165	
15,093.00	87.50	153.60	6,904.99	-9,124.87	2,631.56	14,448,060.75	1,729,173.32	39.78351541	-80.68406535	
15,188.00	88.80	151.90	6,908.06	-9,209.28	2,675.03	14,447,976.34	1,729,216.79	39.78328319	-80.68391167	
15,282.00	89.60	151.20	6,909.37	-9,291.92	2,719.81	14,447,893.71	1,729,261.57	39.78305580	-80.68375333	
15,375.00	90.30	150.50	6,909.45	-9,373.14	2,765.11	14,447,812.49	1,729,306.87	39.78283231	-80.68359311	
15,469.00	91.30	150.90	6,908.14	-9,455.10	2,811.11	14,447,730.52	1,729,352.86	39.78260677	-80.68343041	
15,563.00	89.90	150.70	6,907.16	-9,537.15	2,856.96	14,447,648.47	1,729,398.72	39.78238100	-80.68326823	
15,658.00	91.20	150.90	6,906.25	-9,620.07	2,903.30	14,447,565.55	1,729,445.06	39.78215282	-80.68310431	
15,752.00	89.80	149.90	6,905.43	-9,701.80	2,949.73	14,447,483.82	1,729,491.49	39.78192793	-80.68294009	
15,846.00	88.40	149.20	6,906.90	-9,782.82	2,997.36	14,447,402.80	1,729,539.12	39.78170496	-80.68277157	
15,942.00	89.30	149.10	6,908.83	-9,865.22	3,046.58	14,447,320.40	1,729,588.34	39.78147819	-80.68259743	
16,037.00	87.70	149.30	6,911.31	-9,946.79	3,095.20	14,447,238.83	1,729,636.96	39.78125370	-80.68242538	
16,131.00	88.70	149.40	6,914.27	-10,027.62	3,143.10	14,447,158.00	1,729,684.86	39.78103127	-80.68225592	
16,225.00	90.10	150.30	6,915.25	-10,108.90	3,190.31	14,447,076.73	1,729,732.07	39.78080760	-80.68208891	
16,320.00	90.50	150.20	6,914.75	-10,191.37	3,237.45	14,446,994.25	1,729,779.21	39.78058064	-80.68192217	
16,415.00	88.70	150.50	6,915.42	-10,273.93	3,284.44	14,446,911.70	1,729,826.20	39.78035346	-80.68175594	
16,510.00	89.90	150.30	6,916.58	-10,356.52	3,331.36	14,446,829.10	1,729,873.12	39.78012618	-80.68158998	
16,603.00	89.40	150.00	6,917.15	-10,437.18	3,377.65	14,446,748.44	1,729,919.41	39.77990421	-80.68142625	
16,699.00	88.90	151.60	6,918.57	-10,520.97	3,424.48	14,446,664.65	1,729,966.24	39.77967365	-80.68126064	
16,793.00	89.40	150.10	6,919.97	-10,603.05	3,470.26	14,446,582.57	1,730,012.02	39.77944778	-80.68109873	
16,888.00	90.20	149.50	6,920.30	-10,685.16	3,518.05	14,446,500.47	1,730,059.80	39.77922183	-80.68092969	
16,982.00	89.20	149.50	6,920.79	-10,766.15	3,565.75	14,446,419.47	1,730,107.51	39.77899895	-80.68076091	
17,077.00	90.00	148.70	6,921.45	-10,847.66	3,614.54	14,446,337.96	1,730,156.30	39.77877461	-80.68058831	
17,171.00	88.70	150.50	6,922.52	-10,928.73	3,662.10	14,446,256.90	1,730,203.86	39.77855152	-80.68042005	
17,266.00	87.70	151.10	6,925.50	-11,011.61	3,708.42	14,446,174.01	1,730,250.18	39.77832344	-80.68025623	
17,361.00	88.50	150.20	6,928.65	-11,094.37	3,754.96	14,446,091.25	1,730,296.72	39.77809571	-80.68009165	
17,455.00	86.80	150.10	6,932.51	-11,175.83	3,801.70	14,446,009.79	1,730,343.46	39.77787155	-80.67992630	
17,550.00	87.90	150.00	6,936.90	-11,258.05	3,849.08	14,445,927.57	1,730,390.84	39.77764527	-80.67975873	
17,645.00	89.30	151.10	6,939.22	-11,340.75	3,895.77	14,445,844.87	1,730,437.53	39.77741771	-80.67959359	
17,739.00	90.50	151.60	6,939.38	-11,423.24	3,940.84	14,445,762.38	1,730,482.60	39.77719073	-80.67943424	
17,834.00	89.80	150.90	6,939.14	-11,506.53	3,986.53	14,445,679.10	1,730,528.29	39.77696155	-80.67927267	
17,928.00	88.40	150.90	6,940.61	-11,588.65	4,032.24	14,445,596.97	1,730,574.00	39.77673557	-80.67911103	
18,023.00	89.10	150.40	6,942.68	-11,671.44	4,078.80	14,445,514.19	1,730,620.55	39.77650776	-80.67894640	
18,118.00	90.20	150.30	6,943.26	-11,753.99	4,125.79	14,445,431.63	1,730,667.55	39.77628057	-80.67878019	
18,213.00	88.90	150.30	6,944.01	-11,836.51	4,172.86	14,445,349.11	1,730,714.62	39.77605350	-80.67861373	
18,307.00	89.50	150.20	6,945.32	-11,918.11	4,219.50	14,445,267.51	1,730,761.25	39.77582894	-80.67844878	
18,402.00	87.90	149.70	6,947.48	-12,000.32	4,267.05	14,445,185.31	1,730,808.81	39.77560271	-80.67828057	
18,497.00	89.20	149.80	6,949.88	-12,082.36	4,314.90	14,445,103.27	1,730,856.65	39.77537694	-80.67811134	
18,591.00	87.70	149.40	6,952.42	-12,163.40	4,362.44	14,445,022.22	1,730,904.20	39.77515390	-80.67794315	
18,686.00	89.00	149.80	6,955.16	-12,245.30	4,410.50	14,444,940.32	1,730,952.26	39.77492850	-80.67777318	
18,780.00	87.90	150.20	6,957.70	-12,326.68	4,457.48	14,444,858.95	1,730,999.24	39.77470456	-80.67760701	
18,874.00	88.70	150.00	6,960.49	-12,408.13	4,504.32	14,444,777.49	1,731,046.07	39.77448041	-80.67744136	
18,969.00	89.20	149.20	6,962.23	-12,490.05	4,552.38	14,444,695.57	1,731,094.14	39.77425495	-80.67727135	
19,064.00	89.10	150.20	6,963.64	-12,572.07	4,600.30	14,444,613.56	1,731,142.06	39.77402925	-80.67710183	
19,158.00	89.80	150.50	6,964.54	-12,653.75	4,646.80	14,444,531.87	1,731,188.56	39.77380445	-80.67693739	
19,253.00	88.40	151.60	6,966.04	-12,736.87	4,692.78	14,444,448.76	1,731,234.54	39.77357574	-80.67677483	
19,348.00	88.90	151.20	6,968.27	-12,820.25	4,738.24	14,444,365.37	1,731,280.00	39.77334630	-80.67661410	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Heaven Hill 3-1 HM (L)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1326+26 @ 1352.00usft (Nabors B-28)
Site:	Heaven Hill 3	MD Reference:	RKB=1326+26 @ 1352.00usft (Nabors B-28)
Well:	Heaven Hill 3-1 HM (L)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug0116_LT_v14

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Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
19,442.00	90.20	152.30	6,969.01	-12,903.05	4,782.73	14,444,282.57	1,731,324.49	39.77311847	-80.67645682
19,504.00	90.80	152.40	6,968.47	-12,957.97	4,811.50	14,444,227.66	1,731,353.26	39.77296737	-80.67635514
Survey @ 19504.00 MD 6968.47 TVD									
19,555.00	90.80	152.40	6,967.76	-13,003.16	4,835.13	14,444,182.46	1,731,376.89	39.77284302	-80.67627163
Survey Projected to 19555.00 MD 6967.76 TVD									

WV Department of
 Environmental Protection

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
157.00	157.00	-0.67	0.83	MWD surveys
19,504.00	6,968.47	-12,957.97	4,811.50	Survey @ 19504.00 MD 6968.47 TVD
19,555.00	6,967.76	-13,003.16	4,835.13	Survey Projected to 19555.00 MD 6967.76 TVD