



Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Heaven Hill 3-2 HM (K)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1326+26 @ 1352.00usft
<b>Site:</b>	Heaven Hill 3	<b>MD Reference:</b>	RKB=1326+26 @ 1352.00usft
<b>Well:</b>	Heaven Hill 3-2 HM (K)	<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_Jul2216dt_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>	Heaven Hill 3
<b>Site Position:</b>	Northing: 14,457,178.77 usft      Latitude: 39.80859199
<b>From:</b>	Easting: 1,726,571.98 usft      Longitude: -80.69321360
<b>Position Uncertainty:</b>	Slot Radius: 0.00 usft      Grid Convergence: 0.20 °

<b>Well</b>	Heaven Hill 3-2 HM (K)
<b>Well Position</b>	+N/-S      0.00 usft      Northing: 14,457,182.85 usft      Latitude: 39.80859199
	+E/-W      0.00 usft      Easting: 1,726,553.94 usft      Longitude: -80.69327779
<b>Position Uncertainty</b>	Wellhead Elevation: 0.00 usft      Ground Level: 1,326.00 usft

<b>Wellbore</b>	Original Hole
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	2/25/2018	-8.72	66.91	52,102.45091203

<b>Design</b>	Surveys Original Hole
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<b>Audit Notes:</b>	
<b>Version:</b>	1.0      Phase: ACTUAL      Tie On Depth: 0.00
<b>Vertical Section:</b>	Depth From (TVD)      +N/-S      +E/-W      Direction
	(usft)      (usft)      (usft)      (°)
	0.00      0.00      0.00      156.68

<b>Survey Program</b>	Date 8/26/2018	<b>RECEIVED</b> Office of Oil and Gas <b>JUL 10 2020</b> WV Department of Environmental Protection	
<b>From (usft)</b>	To (usft)	Survey (Wellbore)	Description
168.00	1,132.00	MWD surf (Original Hole)	MWD - Standard
1,192.00	6,914.00	MWD int (Original Hole)	MWD - Standard
6,963.00	19,010.00	MWD lat (Original Hole)	MWD - Standard
19,057.00	19,057.00	Projection (Original Hole)	MWD - Standard

Survey	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	14,457,182.85	1,726,553.94	39.80859199	-80.69327779
	169.00	0.20	123.51	168.00	-0.16	0.24	14,457,182.69	1,726,554.19	39.80859155	-80.69327692
<b>MWD surveys</b>										
	180.00	0.31	119.14	190.00	-0.21	0.33	14,457,182.64	1,726,554.27	39.80859141	-80.69327662
	220.00	0.27	115.72	220.00	-0.28	0.46	14,457,182.57	1,726,554.41	39.80859121	-80.69327615
	251.00	0.17	111.32	251.00	-0.33	0.57	14,457,182.52	1,726,554.51	39.80859108	-80.69327576
	281.00	0.26	100.26	281.00	-0.36	0.68	14,457,182.49	1,726,554.62	39.80859100	-80.69327537
	312.00	0.21	107.93	312.00	-0.39	0.80	14,457,182.46	1,726,554.75	39.80859092	-80.69327493
	342.00	0.24	97.96	342.00	-0.41	0.92	14,457,182.44	1,726,554.86	39.80859085	-80.69327453



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<b>Site:</b> Heaven Hill 3	<b>MD Reference:</b> RKB=1326+26 @ 1352.00usft
<b>Well:</b> Heaven Hill 3-2 HM (K)	<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_Jul2216dt_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map		Map Easting (usft)	Latitude	Longitude
						Map Northing (usft)	Map Easting (usft)			
379.00	0.04	336.37	379.00	-0.41	0.89	14,457,182.44	1,726,554.93	39,80859085	-80.69327427	
409.00	0.19	137.53	409.00	-0.44	1.02	14,457,182.41	1,726,554.96	39,80859078	-80.69327417	
440.00	0.17	97.79	440.00	-0.48	1.10	14,457,182.37	1,726,555.04	39,80859065	-80.69327388	
470.00	0.33	122.50	470.00	-0.54	1.22	14,457,182.32	1,726,555.16	39,80859051	-80.69327347	
501.00	0.07	111.03	501.00	-0.59	1.31	14,457,182.26	1,726,555.25	39,80859036	-80.69327314	
531.00	0.21	89.72	531.00	-0.60	1.38	14,457,182.25	1,726,555.32	39,80859034	-80.69327288	
561.00	0.41	239.94	561.00	-0.65	1.34	14,457,182.20	1,726,555.29	39,80859019	-80.69327301	
591.00	0.29	207.30	591.00	-0.77	1.22	14,457,182.08	1,726,555.16	39,80858985	-80.69327346	
621.00	0.09	46.24	621.00	-0.83	1.20	14,457,182.03	1,726,555.14	39,80858971	-80.69327353	
652.00	0.22	73.34	652.00	-0.79	1.27	14,457,182.02	1,726,555.22	39,80858980	-80.69327326	
682.00	0.19	34.54	682.00	-0.73	1.36	14,457,182.12	1,726,555.30	39,80858996	-80.69327296	
713.00	0.49	46.11	713.00	-0.60	1.48	14,457,182.25	1,726,555.42	39,80859033	-80.69327252	
743.00	0.12	89.42	743.00	-0.51	1.61	14,457,182.34	1,726,555.55	39,80859057	-80.69327208	
774.00	0.22	91.39	773.99	-0.51	1.70	14,457,182.34	1,726,555.64	39,80859057	-80.69327175	
804.00	0.26	169.08	803.99	-0.45	1.79	14,457,182.40	1,726,555.74	39,80859073	-80.69327141	
834.00	0.20	8.03	833.99	-0.46	1.85	14,457,182.40	1,726,555.79	39,80859072	-80.69327122	
865.00	0.20	8.03	864.99	-0.47	1.87	14,457,182.38	1,726,555.81	39,80859068	-80.69327115	
895.00	0.25	302.43	894.99	-0.39	1.82	14,457,182.47	1,726,555.76	39,80859092	-80.69327132	
927.00	0.16	268.26	926.99	-0.35	1.71	14,457,182.50	1,726,555.66	39,80859102	-80.69327169	
958.00	0.10	26.17	957.99	-0.33	1.68	14,457,182.53	1,726,555.63	39,80859108	-80.69327180	
990.00	0.26	131.12	989.99	-0.35	1.75	14,457,182.50	1,726,555.69	39,80859102	-80.69327156	
1,022.00	0.26	93.16	1,021.99	-0.40	1.86	14,457,182.45	1,726,555.82	39,80859087	-80.69327119	
1,053.00	0.12	34.54	1,052.99	-0.38	1.97	14,457,182.47	1,726,555.91	39,80859094	-80.69327079	
1,085.00	0.25	18.99	1,084.99	-0.28	2.01	14,457,182.57	1,726,555.95	39,80859119	-80.69327084	
1,132.00	0.14	182.72	1,131.99	-0.24	2.04	14,457,182.61	1,726,555.98	39,80859130	-80.69327053	
1,192.00	0.31	224.86	1,191.99	-0.43	1.92	14,457,182.42	1,726,555.86	39,80859079	-80.69327096	
1,287.00	0.96	217.51	1,286.99	-1.25	1.25	14,457,181.61	1,726,555.20	39,80858856	-80.69327334	
1,382.00	1.45	206.28	1,381.97	-2.96	0.24	14,457,179.90	1,726,554.18	39,80858387	-80.69327698	
1,476.00	2.08	184.38	1,475.92	-5.72	-0.42	14,457,177.13	1,726,553.52	39,808857628	-80.69327935	
1,570.00	2.69	170.19	1,569.84	-9.60	-0.17	14,457,173.25	1,726,553.77	39,808856564	-80.69327852	
1,665.00	3.51	167.61	1,664.70	-14.63	0.83	14,457,168.22	1,726,554.77	39,808851179	-80.69327501	
1,759.00	3.88	174.15	1,758.51	-20.61	1.77	14,457,162.24	1,726,555.71	39,80885538	-80.69327173	
1,853.00	3.73	169.63	1,852.30	-26.78	2.65	14,457,156.07	1,726,556.59	39,808851643	-80.69326687	
1,947.00	2.91	153.77	1,946.14	-31.93	4.26	14,457,150.93	1,726,558.20	39,808850427	-80.69326300	
2,042.00	1.95	158.41	2,041.06	-35.59	5.92	14,457,147.26	1,726,559.87	39,80849419	-80.69325714	
2,136.00	2.40	201.08	2,134.99	-36.92	5.80	14,457,143.94	1,726,559.75	39,80848506	-80.69325760	
2,231.00	4.67	216.38	2,229.81	-43.89	2.79	14,457,138.97	1,726,556.74	39,80847144	-80.69326838	
2,324.00	6.15	213.39	2,322.39	-51.09	-2.19	14,457,131.76	1,726,551.75	39,80845170	-80.69326823	
2,418.00	7.26	211.71	2,415.75	-60.35	-6.09	14,457,122.50	1,726,545.86	39,80842633	-80.69330732	
2,512.00	5.75	201.24	2,509.14	-69.79	-12.92	14,457,113.06	1,726,541.03	39,80840044	-80.69332463	
2,606.00	4.58	185.01	2,604.76	-76.10	-14.99	14,457,104.76	1,726,538.95	39,80837766	-80.69333213	
2,702.00	4.04	174.85	2,698.49	-85.13	-15.02	14,457,097.72	1,726,538.92	39,80835634	-80.69333232	
2,788.00	3.91	174.40	2,784.28	-91.07	-14.46	14,457,091.78	1,726,539.48	39,80834203	-80.69333041	
2,872.00	4.01	178.19	2,868.08	-96.85	-14.09	14,457,086.00	1,726,539.85	39,80832614	-80.69332915	
2,967.00	4.54	193.41	2,962.82	-103.83	-14.86	14,457,079.02	1,726,539.08	39,80830699	-80.69333197	
3,062.00	4.61	193.01	3,057.52	-111.21	-16.59	14,457,071.64	1,726,537.35	39,80828674	-80.69333622	
3,156.00	6.54	193.75	3,151.07	-120.09	-18.71	14,457,062.76	1,726,535.23	39,80826237	-80.69334589	
3,251.00	9.38	196.64	3,245.15	-132.76	-22.22	14,457,050.09	1,726,531.72	39,80822760	-80.69335852	
3,345.00	11.01	197.37	3,337.66	-148.67	-27.09	14,457,034.18	1,726,526.85	39,80818396	-80.69337607	
3,440.00	13.42	191.85	3,430.50	-168.12	-32.06	14,457,014.73	1,726,521.88	39,80813059	-80.69339402	
3,533.00	15.94	192.49	3,520.46	-191.16	-37.04	14,456,991.70	1,726,516.90	39,80808738	-80.69341202	
3,630.00	18.88	190.89	3,613.01	-219.58	-42.89	14,456,963.27	1,726,511.05	39,80799938	-80.69343319	
3,724.00	21.92	193.08	3,710.10	-251.61	-49.74	14,456,931.24	1,726,504.21	39,80790147	-80.693445796	
3,819.00	25.60	193.36	3,786.04	-288.89	-58.39	14,456,893.96	1,726,495.55	39,80779918	-80.693448923	
3,913.00	28.04	193.27	3,871.92	-330.18	-68.05	14,456,852.67	1,726,485.89	39,80768587	-80.69352413	

WV Department of  
Environmental Protection



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<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1326+26 @ 1352.00usft
<b>Site:</b>	Heaven Hill 3	<b>MD Reference:</b>	RKB=1326+26 @ 1352.00usft
<b>Well:</b>	Heaven Hill 3-2 HM (K)	<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_Jul2216dt_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		
4,006.00	29.77	194.28	3,955.08	-374.78	-79.00	14,456,808.08	1,726,474.95	39.80756351	-80.69356365		
4,103.00	29.82	193.77	4,037.52	-420.57	-90.43	14,456,762.28	1,726,463.51	39.80743785	-80.69360494		
4,197.00	32.89	195.61	4,117.79	-467.87	-102.87	14,456,714.98	1,726,451.07	39.80730808	-80.69364979		
4,292.00	33.84	192.85	4,197.13	-518.50	-115.69	14,456,664.35	1,726,438.25	39.80716914	-80.69369607		
4,366.00	33.03	191.15	4,275.58	-569.16	-126.47	14,456,613.69	1,726,427.47	39.80703014	-80.69373506		
4,461.00	33.11	190.97	4,355.19	-620.03	-136.41	14,456,562.82	1,726,417.53	39.80689051	-80.69377109		
4,576.00	33.56	193.38	4,434.56	-671.05	-147.43	14,456,511.80	1,726,406.51	39.80675050	-80.69381093		
4,670.00	33.38	190.83	4,512.98	-721.73	-156.30	14,456,461.12	1,726,395.64	39.80661143	-80.69385026		
4,764.00	32.71	192.57	4,591.77	-771.92	-168.69	14,456,410.93	1,726,385.26	39.80647369	-80.69388785		
4,858.00	32.24	191.45	4,671.08	-821.28	-179.19	14,456,361.57	1,726,374.75	39.80633823	-80.69392586		
4,954.00	32.59	193.51	4,752.12	-871.52	-190.31	14,456,311.33	1,726,363.63	39.80620037	-80.69396608		
5,049.00	33.39	193.27	4,831.80	-921.84	-202.29	14,456,261.01	1,726,351.65	39.80606229	-80.69400934		
5,144.00	33.23	191.12	4,911.20	-972.83	-213.31	14,456,210.02	1,726,340.63	39.80592237	-80.69404920		
5,239.00	31.48	193.07	4,991.45	-1,022.54	-223.94	14,456,160.31	1,726,330.00	39.80578596	-80.69408766		
5,334.00	30.42	195.55	5,072.92	-1,069.87	-236.00	14,456,112.98	1,726,317.94	39.80565608	-80.69413117		
5,429.00	30.08	192.72	5,154.99	-1,116.27	-247.69	14,456,066.58	1,726,306.25	39.80552877	-80.69417336		
5,522.00	30.32	193.73	5,235.37	-1,161.81	-256.40	14,456,021.04	1,726,295.55	39.80540381	-80.69421202		
5,617.00	30.87	194.34	5,317.15	-1,208.71	-270.12	14,455,974.14	1,726,283.82	39.80527510	-80.69425435		
5,712.00	32.59	194.10	5,397.94	-1,257.14	-282.39	14,455,925.71	1,726,271.55	39.80514222	-80.69429863		
5,806.00	33.32	191.40	5,476.82	-1,307.01	-293.66	14,455,875.64	1,726,260.28	39.80500538	-80.69433937		
5,899.00	33.49	193.33	5,554.46	-1,357.02	-304.63	14,455,825.84	1,726,249.31	39.80486815	-80.69437902		
5,993.00	33.35	192.33	5,632.92	-1,407.49	-316.13	14,455,775.36	1,726,237.82	39.804742057	-80.69442057		
6,087.00	33.08	194.20	5,711.56	-1,457.61	-327.94	14,455,725.24	1,726,226.01	39.80459212	-80.69446323		
6,180.00	32.69	194.49	5,789.66	-1,506.93	-340.45	14,455,676.32	1,726,213.50	39.80445789	-80.69450837		
6,275.00	32.53	191.34	5,869.69	-1,556.41	-351.89	14,455,626.44	1,726,202.05	39.80432100	-80.69454971		
6,368.00	32.25	192.51	5,948.22	-1,605.16	-362.18	14,455,577.70	1,726,191.76	39.80418724	-80.69458695		
6,463.00	32.23	194.25	6,028.56	-1,654.45	-373.91	14,455,528.40	1,726,180.04	39.80405196	-80.69462930		
6,558.00	32.56	191.96	6,108.80	-1,704.02	-385.44	14,455,478.63	1,726,168.50	39.80391596	-80.69467097		
6,653.00	33.21	193.88	6,188.58	-1,754.29	-396.98	14,455,428.57	1,726,156.96	39.80377802	-80.69471287		
6,748.00	34.29	196.23	6,267.57	-1,805.24	-410.70	14,455,377.61	1,726,143.24	39.80363821	-80.69476214		
6,842.00	32.65	193.42	6,345.98	-1,855.34	-423.99	14,455,327.52	1,726,129.95	39.80350077	-80.69481006		
6,941.00	33.38	191.98	6,405.36	-1,893.80	-432.61	14,455,289.25	1,726,121.33	39.80339575	-80.69484121		
6,963.00	33.71	191.41	6,447.20	-1,920.12	-438.10	14,455,262.73	1,726,115.85	39.80332299	-80.69488108		
7,010.00	33.63	190.70	6,486.31	-1,945.69	-443.09	14,455,237.16	1,726,110.85	39.80325280	-80.69487918		
7,057.00	35.82	183.06	6,524.96	-1,972.23	-446.24	14,455,210.62	1,726,107.70	39.80317995	-80.69489072		
7,104.00	37.23	182.27	6,562.72	-2,000.17	-447.54	14,455,182.68	1,726,106.40	39.80310323	-80.69489568		
7,152.00	39.16	181.21	6,600.45	-2,029.84	-448.44	14,455,153.02	1,726,105.50	39.80302177	-80.69489923		
7,199.00	43.08	179.10	6,635.85	-2,060.74	-448.50	14,455,122.12	1,726,105.44	39.80293692	-80.69489982		
7,247.00	47.60	174.71	6,669.59	-2,094.80	-446.61	14,455,088.05	1,726,104.44	39.80284335	-80.69489350		
7,294.00	52.31	170.58	6,699.83	-2,130.45	-441.96	14,455,052.40	1,726,111.98	39.80274539	-80.69487738		
7,341.00	54.64	169.61	6,727.80	-2,167.96	-435.46	14,455,015.20	1,726,118.48	39.80264316	-80.69485469		
7,388.00	57.63	167.32	6,763.99	-2,205.88	-427.64	14,454,976.97	1,726,126.30	39.80253811	-80.69482732		
7,435.00	61.01	164.34	6,777.97	-2,245.06	-417.73	14,454,937.79	1,726,136.21	39.80243043	-80.69479251		
7,482.00	64.18	161.26	6,799.60	-2,284.90	-405.38	14,454,897.95	1,726,146.56	39.80232090	-80.69474903		
7,531.00	66.15	160.82	6,820.18	-2,326.95	-390.93	14,454,855.90	1,726,163.01	39.80220528	-80.69469809		
7,578.00	67.34	159.41	6,838.74	-2,367.56	-376.24	14,454,815.29	1,726,177.70	39.80209363	-80.69464629		
7,626.00	70.50	157.70	6,856.00	-2,409.23	-359.87	14,454,773.62	1,726,194.08	39.80197902	-80.69458848		
7,657.00	74.30	155.90	6,865.38	-2,436.39	-348.22	14,454,746.47	1,726,205.72	39.80190435	-80.69454735		
7,689.00	76.90	156.10	6,873.33	-2,464.70	-335.62	14,454,716.15	1,726,218.32	39.80182647	-80.69450282		
7,720.00	79.30	154.10	6,879.73	-2,492.21	-322.85	14,454,680.64	1,726,231.10	39.80175081	-80.69445768		
7,751.00	82.90	153.00	6,884.52	-2,519.62	-309.21	14,454,663.23	1,726,244.74	39.80167539	-80.69440944		
7,782.00	86.50	152.90	6,887.38	-2,547.11	-295.17	14,454,635.74	1,726,258.77	39.80159977	-80.69435981		
7,814.00	89.32	152.21	6,888.55	-2,575.49	-280.43	14,454,607.37	1,726,273.51	39.80152171	-80.69430768		
7,909.00	90.37	149.04	6,886.81	-2,658.26	-233.84	14,454,524.59	1,726,320.10	39.80129395	-80.69414280		
8,004.00	88.79	149.75	6,889.50	-2,740.02	-185.48	14,454,442.83	1,726,368.47	39.80106896	-80.69397160		



**Company:** Tug Hill Operating LLC  
**Project:** Marshall County, West Virginia  
**Site:** Heaven Hill 3  
**Well:** Heaven Hill 3-2 HM (K)  
**Wellbore:** Original Hole  
**Designer:** Surveys Original Hole

**Local Co-ordinate Reference:**  
**TVD Reference:** Well Heaven Hill 3-2 HM (K)  
 RKB=1326+26 @ 1352.00usft  
**MD Reference:** RKB=1326+26 @ 1352.00usft  
**North Reference:** Grid  
**Survey Calculation Method:** Minimum Curvature  
**Database:** DB\_Jul2216dt\_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
8,098.00	88.97	149.75	6,891.34	-2,821.21	-138.13	14,454,351.65	1,726,415.81	39.80084556	-80.68380402
8,193.00	88.88	150.80	6,893.12	-2,903.69	-91.04	14,454,279.16	1,726,462.91	39.80061860	-80.68363734
8,288.00	89.58	147.37	6,894.40	-2,985.17	-42.24	14,454,197.68	1,726,511.70	39.80039437	-80.68346480
8,383.00	90.68	148.34	6,894.19	-3,065.61	8.31	14,454,117.24	1,726,562.25	39.80017300	-80.68328563
8,477.00	89.76	147.73	6,893.82	-3,145.35	58.07	14,454,037.50	1,726,612.01	39.79995353	-80.68310943
8,572.00	90.37	150.54	6,893.72	-3,226.89	106.80	14,453,955.96	1,726,660.74	39.79972915	-80.68293692
8,666.00	91.38	148.34	6,892.28	-3,307.82	154.58	14,453,875.03	1,726,708.53	39.79950645	-80.68276778
8,760.00	91.69	148.96	6,889.76	-3,388.06	203.47	14,453,794.79	1,726,757.41	39.79928561	-80.68259471
8,855.00	91.65	151.42	6,886.99	-3,470.45	250.67	14,453,712.40	1,726,804.62	39.79905891	-80.68242766
8,950.00	89.71	151.86	6,885.87	-3,554.04	295.79	14,453,628.81	1,726,849.74	39.79882893	-80.68226804
9,044.00	90.20	151.60	6,885.94	-3,636.83	340.31	14,453,546.02	1,726,894.26	39.79860115	-80.68211054
9,138.00	90.29	151.42	6,885.54	-3,719.44	385.15	14,453,463.41	1,726,939.10	39.79837385	-80.68195192
9,232.00	90.90	151.33	6,884.56	-3,801.95	430.18	14,453,380.90	1,726,984.13	39.79814884	-80.68179281
9,326.00	90.02	148.96	6,883.81	-3,883.47	476.97	14,453,299.39	1,727,030.91	39.79792253	-80.68162703
9,421.00	90.81	148.60	6,883.12	-3,964.71	526.21	14,453,218.15	1,727,080.15	39.79769896	-80.68145272
9,515.00	91.82	149.22	6,880.96	-4,045.18	574.74	14,453,137.67	1,727,128.68	39.79747750	-80.68128095
9,608.00	89.85	149.48	6,879.61	-4,125.18	622.14	14,453,057.68	1,727,176.08	39.79725736	-80.68111316
9,703.00	87.96	149.48	6,881.42	-4,207.00	670.37	14,452,975.86	1,727,224.32	39.79703221	-80.68094244
9,798.00	88.26	148.96	6,884.56	-4,288.57	718.96	14,452,894.28	1,727,272.91	39.79680773	-80.68077046
9,893.00	88.48	149.13	6,887.26	-4,370.00	767.81	14,452,812.85	1,727,321.75	39.79658362	-80.68059757
9,987.00	88.35	149.31	6,889.86	-4,450.73	815.89	14,452,732.13	1,727,369.84	39.79636146	-80.68042737
10,081.00	91.82	151.42	6,889.72	-4,532.42	862.36	14,452,650.43	1,727,416.31	39.79613669	-80.68026293
10,176.00	91.60	150.98	6,886.88	-4,615.63	908.11	14,452,567.22	1,727,462.05	39.79591377	-80.68010109
10,271.00	91.52	150.36	6,884.30	-4,698.42	954.63	14,452,484.43	1,727,508.57	39.79567993	-80.68000650
10,365.00	89.23	150.45	6,883.68	-4,780.15	1,001.05	14,452,402.70	1,727,554.99	39.79545504	-80.68977225
10,459.00	89.49	150.71	6,884.73	-4,862.02	1,047.22	14,452,320.87	1,727,601.16	39.79522975	-80.68960889
10,553.00	89.89	150.99	6,885.24	-4,944.08	1,093.08	14,452,238.77	1,727,647.02	39.79500398	-80.68944684
10,648.00	90.20	150.63	6,885.17	-5,026.97	1,139.48	14,452,155.88	1,727,693.42	39.79477589	-80.68928246
10,742.00	90.46	150.63	6,884.62	-5,108.89	1,185.58	14,452,073.96	1,727,739.52	39.79455048	-80.68911935
10,837.00	91.12	150.89	6,883.31	-5,191.78	1,231.98	14,451,991.08	1,727,785.92	39.79432241	-80.68895519
10,932.00	90.02	150.71	6,882.37	-5,274.70	1,278.32	14,451,908.15	1,727,832.27	39.79409424	-80.68879123
11,027.00	90.15	152.03	6,882.23	-5,358.08	1,323.84	14,451,824.77	1,727,877.79	39.79386482	-80.68863022
11,122.00	90.64	153.70	6,881.57	-5,442.62	1,367.17	14,451,740.23	1,727,921.11	39.79363224	-80.68847702
11,217.00	90.55	149.93	6,880.59	-5,526.30	1,412.10	14,451,656.56	1,727,966.04	39.79340202	-80.68831810
11,312.00	90.42	149.13	6,879.78	-5,608.13	1,460.34	14,451,574.72	1,728,014.29	39.79317682	-80.68814737
11,407.00	89.71	149.04	6,879.67	-5,689.63	1,509.15	14,451,493.22	1,728,063.09	39.79295252	-80.68797482
11,501.00	90.02	148.87	6,879.90	-5,770.17	1,557.63	14,451,412.68	1,728,111.57	39.79273089	-80.68780305
11,596.00	90.55	148.78	6,879.42	-5,851.45	1,606.80	14,451,331.40	1,728,160.75	39.79250720	-80.68762899
11,691.00	91.12	148.25	6,878.04	-5,932.45	1,656.42	14,451,250.40	1,728,210.36	39.79228427	-80.68745338
11,786.00	90.02	148.25	6,877.09	-6,013.23	1,706.40	14,451,169.62	1,728,260.34	39.79206195	-80.68727644
11,880.00	89.49	149.75	6,877.50	-6,093.80	1,754.81	14,451,089.05	1,728,308.76	39.79184022	-80.68710510
11,975.00	89.41	149.40	6,878.41	-6,175.72	1,802.92	14,451,007.14	1,728,356.86	39.79161480	-80.68693486
12,068.00	89.67	151.68	6,879.15	-6,256.68	1,848.65	14,450,926.17	1,728,402.60	39.79139201	-80.68677306
12,162.00	89.58	151.59	6,879.77	-6,339.39	1,893.31	14,450,843.46	1,728,447.25	39.79116443	-80.68661511
12,256.00	90.37	151.07	6,879.81	-6,421.87	1,938.41	14,450,760.98	1,728,492.35	39.79093750	-80.68645550
12,350.00	90.95	150.80	6,878.73	-6,504.03	1,984.07	14,450,678.83	1,728,538.01	39.79071144	-80.68629407
12,445.00	89.89	152.56	6,878.07	-6,587.85	2,029.14	14,450,595.20	1,728,583.08	39.79048136	-80.68613469
12,538.00	90.55	153.79	6,877.63	-6,670.64	2,071.10	14,450,512.21	1,728,625.04	39.79021777	-80.68598633
12,633.00	88.88	150.71	6,878.15	-6,754.70	2,115.33	14,450,428.15	1,728,669.27	39.79002177	-80.68582995
12,728.00	89.10	150.71	6,879.82	-6,837.94	2,161.80	14,450,345.31	1,728,715.74	39.78979381	-80.68566556
12,823.00	89.27	150.98	6,881.17	-6,920.50	2,208.07	14,450,262.36	1,728,762.02	39.78965555	-80.68550186
12,918.00	89.71	149.66	6,882.02	-7,003.03	2,255.11	14,450,179.83	1,728,809.05	39.78953345	-80.68533545
13,012.00	90.29	150.27	6,882.02	-7,084.40	2,302.16	14,450,096.45	1,728,856.10	39.78941451	-80.68516898
13,107.00	90.81	149.40	6,881.11	-7,166.53	2,349.89	14,450,013.82	1,728,903.84	39.78888850	-80.68500008
13,202.00	91.21	149.57	6,879.43	-7,248.36	2,398.12	14,449,934.49	1,728,952.07	39.78866331	-80.68482942



Survey Report - Geographic



Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia
Site: Heaven Hill 3
Well: Heaven Hill 3-2 HM (K)
Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference:
TVD Reference:
MD Reference:
North Reference:
Survey Calculation Method:
Database:

Well Heaven Hill 3-2 HM (K)
RKB=1326+26 @ 1352.00usft
RKB=1326+26 @ 1352.00usft
Grid
Minimum Curvature
DB\_Jul2216dt\_v14

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Survey

WV Department of Environmental Protection

Table with columns: Measured Depth (usft), Inclination (°), Azimuth (°), Vertical Depth (usft), +N-S (usft), +E-W (usft), Map Northing (usft), Map Easting (usft), Latitude, Longitude. Contains 40 rows of survey data.



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Heaven Hill 3-2 HM (K)
<b>Project:</b>	Marshall County, West Virginia	<b>TVD Reference:</b>	RKB=1326+26 @ 1352.00usft
<b>Site:</b>	Heaven Hill 3	<b>MD Reference:</b>	RKB=1326+26 @ 1352.00usft
<b>Well:</b>	Heaven Hill 3-2 HM (K)	<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_Jul2216dt_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N-S (usft)	+E-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
18,499.00	88.62	151.59	6,924.55	-11,842.16	5,032.03	14,445,340.69	1,731,585.97	39.77602173	-80.67551259
18,593.00	88.44	152.38	6,926.96	-11,925.12	5,076.16	14,445,257.73	1,731,630.11	39.77579347	-80.67535657
18,686.00	90.73	151.33	6,927.65	-12,008.88	5,120.97	14,445,173.97	1,731,674.91	39.77556300	-80.67519817
18,782.00	90.86	149.92	6,926.34	-12,090.78	5,167.07	14,445,092.07	1,731,721.02	39.77533761	-80.67503515
18,876.00	90.55	149.92	6,925.18	-12,172.12	5,214.18	14,445,010.73	1,731,768.13	39.77511378	-80.67486853
18,971.00	90.46	148.96	6,924.35	-12,253.92	5,262.48	14,444,928.93	1,731,816.43	39.77488865	-80.67469788
19,010.00	90.77	149.04	6,923.93	-12,287.35	5,282.57	14,444,895.51	1,731,836.51	39.77479665	-80.67462663
<b>Survey @ 19010.00 MD 6923.93 TVD</b>									
19,057.00	90.77	149.04	6,923.30	-12,327.65	5,306.75	14,444,855.21	1,731,860.69	39.77468573	-80.67454111
<b>Survey projected to 19057.00 MD 6923.30 TVD</b>									

WV Department of  
Environmental Protection

Design Annotations	Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N-S (usft)	Local Coordinates +E-W (usft)	Comment
	168.00	168.00	-0.16	0.24	MWD surveys
	19,010.00	6,923.93	-12,287.35	5,282.57	Survey @ 19010.00 MD 6923.93 TVD
	19,057.00	6,923.30	-12,327.65	5,306.75	Survey projected to 19057.00 MD 6923.30 TVD