



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-04HM (slot K)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+28 @ 1219.00usft (Precision 110)
Site:	Bryan Pad	MD Reference:	RKB=1191+28 @ 1219.00usft (Precision 110)
Well:	Bryan N-04HM (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_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	Bryan Pad				
Site Position:		Northing:	14,445,110.80 usft	Latitude:	39.77562900
From:	Lat/Long	Easting:	1,703,181.57 usft	Longitude:	-80.77660992
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.143 °

Well	Bryan N-04HM (slot K)					
Well Position	+N/-S	0.00 usft	Northing:	14,445,124.25 usft	Latitude:	39.77566597
	+E/-W	0.00 usft	Easting:	1,703,179.82 usft	Longitude:	-80.77661603
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	1,191.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
	IGRF2015	5/1/2019	(°) -8.697	(°) 66.801	(nT) 51,960.19015407

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:		Depth From (TVD)	+N/-S	+E/-W	Direction
		(usft)	(usft)	(usft)	(°)
		0.00	0.00	0.00	333.92

Survey Program	Date 5/14/2019				
From	To	Survey (Wellbore)	Tool Name	Description	
224.00	980.00	MWD surf (Original Hole)	MWD	MWD - Standard	
1,025.00	16,904.00	MWD (Original Hole)	MWD	MWD - Standard	
16,956.00	16,956.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey										
Measured	Inclination	Azimuth	Vertical	+N/-S	+E/-W	Map	Map	Latitude	Longitude	
Depth	(°)	(°)	Depth	(usft)	(usft)	Northing	Eastng			
(usft)			(usft)	(usft)	(usft)	(usft)	(usft)			
0.00	0.00	0.00	0.00	0.00	0.00	14,445,124.25	1,703,179.82	39.77566597	-80.77661603	
224.00	0.70	101.02	223.99	-0.26	1.34	14,445,123.99	1,703,181.17	39.77566524	-80.77661125	
MWD surveys										
240.00	0.70	110.43	239.99	-0.31	1.53	14,445,123.94	1,703,181.36	39.77566510	-80.77661059	
287.00	0.62	115.26	286.99	-0.52	2.03	14,445,123.73	1,703,181.85	39.77566452	-80.77660881	
334.00	0.57	125.11	333.99	-0.77	2.45	14,445,123.49	1,703,182.28	39.77566385	-80.77660731	
381.00	0.35	134.07	380.99	-1.00	2.75	14,445,123.25	1,703,182.57	39.77566321	-80.77660627	
428.00	0.26	118.25	427.99	-1.15	2.94	14,445,123.10	1,703,182.77	39.77566279	-80.77660557	
475.00	0.31	130.82	474.98	-1.28	3.13	14,445,122.97	1,703,182.96	39.77566242	-80.77660489	
523.00	0.31	144.88	522.98	-1.48	3.31	14,445,122.78	1,703,183.13	39.77566190	-80.77660428	



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Design:	Surveys Original Hole	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
570.00	0.40	155.60	569.98	-1.73	3.45	14,445,122.53	1,703,183.27	39.77566120	-80.77660378
617.00	0.31	141.01	616.98	-1.98	3.59	14,445,122.28	1,703,183.42	39.77566052	-80.77660326
664.00	0.18	164.13	663.98	-2.15	3.69	14,445,122.11	1,703,183.52	39.77566005	-80.77660290
711.00	0.18	175.55	710.98	-2.29	3.72	14,445,121.96	1,703,183.54	39.77565965	-80.77660281
800.00	0.22	187.60	799.98	-2.60	3.71	14,445,121.65	1,703,183.53	39.77565881	-80.77660286
890.00	0.13	135.39	889.98	-2.84	3.76	14,445,121.41	1,703,183.58	39.77565814	-80.77660268
925.00	0.04	261.16	924.98	-2.87	3.77	14,445,121.38	1,703,183.60	39.77565805	-80.77660263
980.00	0.22	214.40	979.98	-2.96	3.69	14,445,121.29	1,703,183.52	39.77565781	-80.77660291
1,025.00	0.22	212.38	1,024.98	-3.11	3.60	14,445,121.15	1,703,183.42	39.77565741	-80.77660325
1,070.00	0.22	167.29	1,069.98	-3.27	3.57	14,445,120.99	1,703,183.40	39.77565698	-80.77660335
1,160.00	0.31	197.70	1,159.98	-3.67	3.54	14,445,120.59	1,703,183.36	39.77565588	-80.77660348
1,250.00	0.62	201.39	1,249.98	-4.35	3.28	14,445,119.90	1,703,183.11	39.77565400	-80.77660438
1,339.00	0.13	181.71	1,338.97	-4.90	3.11	14,445,119.35	1,703,182.93	39.77565249	-80.77660502
1,429.00	0.53	93.55	1,428.97	-5.03	3.52	14,445,119.23	1,703,183.34	39.77565214	-80.77660355
1,519.00	2.02	93.03	1,518.95	-5.14	5.52	14,445,119.12	1,703,185.34	39.77565182	-80.77659644
1,608.00	3.38	93.55	1,607.85	-5.38	9.70	14,445,118.87	1,703,189.53	39.77565112	-80.77658154
1,698.00	4.66	93.82	1,697.62	-5.79	16.00	14,445,118.46	1,703,195.82	39.77564996	-80.77655914
1,787.00	5.63	95.13	1,786.26	-6.42	23.95	14,445,117.83	1,703,203.78	39.77564817	-80.77653083
1,877.00	5.32	93.55	1,875.85	-7.08	32.52	14,445,117.18	1,703,212.34	39.77564632	-80.77650036
1,967.00	5.10	89.33	1,965.48	-7.29	40.68	14,445,116.97	1,703,220.50	39.77564568	-80.77647131
2,056.00	4.61	77.20	2,054.16	-6.45	48.12	14,445,117.81	1,703,227.95	39.77564793	-80.77644481
2,146.00	4.43	74.21	2,143.88	-4.70	55.00	14,445,119.55	1,703,234.82	39.77565268	-80.77642034
2,236.00	5.62	79.92	2,233.54	-2.98	62.68	14,445,121.27	1,703,242.50	39.77565735	-80.77639297
2,325.00	5.71	85.11	2,322.10	-1.84	71.38	14,445,122.41	1,703,251.21	39.77566042	-80.77636199
2,415.00	4.52	89.50	2,411.74	-1.43	79.39	14,445,122.82	1,703,259.21	39.77566150	-80.77633349
2,505.00	4.04	92.06	2,501.49	-1.51	86.10	14,445,122.74	1,703,265.93	39.77566122	-80.77630959
2,595.00	4.79	91.97	2,591.23	-1.76	93.03	14,445,122.50	1,703,272.85	39.77566051	-80.77628495
2,639.00	5.10	91.36	2,635.06	-1.87	96.82	14,445,122.39	1,703,276.64	39.77566018	-80.77627146
2,714.00	5.36	93.20	2,709.75	-2.14	103.65	14,445,122.11	1,703,283.47	39.77565938	-80.77624715
2,803.00	4.97	87.22	2,798.39	-2.19	111.65	14,445,122.07	1,703,291.47	39.77565920	-80.77621867
2,893.00	4.83	99.53	2,888.06	-2.63	119.28	14,445,121.63	1,703,299.10	39.77565794	-80.77619152
2,983.00	5.32	82.57	2,977.71	-2.71	127.15	14,445,121.54	1,703,306.98	39.77565765	-80.77616349
3,072.00	5.41	94.43	3,066.33	-2.50	135.43	14,445,121.75	1,703,315.25	39.77565817	-80.77613404
3,162.00	4.09	91.71	3,156.02	-2.93	142.87	14,445,121.33	1,703,322.69	39.77565695	-80.77610757
3,252.00	6.11	87.84	3,245.65	-2.84	150.86	14,445,121.41	1,703,330.69	39.77565713	-80.77607911
3,342.00	5.89	90.56	3,335.16	-2.71	160.27	14,445,121.55	1,703,340.09	39.77565744	-80.77604564
3,431.00	5.23	89.25	3,423.74	-2.70	168.89	14,445,121.56	1,703,348.71	39.77565740	-80.77601495
3,521.00	5.36	85.73	3,513.36	-2.33	177.18	14,445,121.92	1,703,357.01	39.77565835	-80.77598543
3,611.00	4.61	82.92	3,603.02	-1.57	184.96	14,445,122.68	1,703,364.79	39.77566038	-80.77595773
3,700.00	5.14	80.54	3,691.70	-0.48	192.45	14,445,123.78	1,703,372.27	39.77566334	-80.77593109
3,790.00	4.74	110.25	3,781.38	-1.10	199.91	14,445,123.15	1,703,379.74	39.77566157	-80.77590452
3,880.00	4.74	114.03	3,871.07	-3.90	206.80	14,445,120.35	1,703,386.62	39.77565383	-80.77588004
3,969.00	4.30	91.17	3,959.80	-5.47	213.49	14,445,118.79	1,703,393.32	39.77564949	-80.77585623
4,059.00	4.86	87.66	4,049.51	-5.38	220.68	14,445,118.87	1,703,400.50	39.77564968	-80.77583067
4,148.00	6.98	91.53	4,138.03	-5.37	229.85	14,445,118.88	1,703,409.67	39.77564964	-80.77579801
4,238.00	9.40	98.39	4,227.11	-6.59	242.59	14,445,117.66	1,703,422.41	39.77564621	-80.77575268
4,328.00	10.81	89.59	4,315.72	-7.60	258.30	14,445,116.65	1,703,438.13	39.77564332	-80.77569677
4,417.00	12.13	89.16	4,402.94	-7.41	276.00	14,445,116.85	1,703,455.82	39.77564374	-80.77563378
4,507.00	12.70	100.94	4,490.85	-9.15	295.17	14,445,115.11	1,703,474.99	39.77563883	-80.77556556
4,597.00	15.34	101.42	4,578.16	-13.38	316.56	14,445,110.87	1,703,496.38	39.77562705	-80.77548949
4,686.00	15.21	100.91	4,664.01	-17.92	339.56	14,445,106.33	1,703,519.38	39.77561442	-80.77540766
4,776.00	15.55	102.73	4,750.79	-22.81	362.92	14,445,101.44	1,703,542.74	39.77560082	-80.77532456
4,866.00	15.01	100.41	4,837.61	-27.58	386.15	14,445,096.68	1,703,565.97	39.77558758	-80.77524192
4,955.00	15.08	100.17	4,923.56	-31.71	408.88	14,445,092.55	1,703,588.70	39.77557609	-80.77516106
5,045.00	15.04	101.83	5,010.47	-36.17	431.83	14,445,088.09	1,703,611.66	39.77556368	-80.77507941



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5,135.00	16.19	103.94	5,097.15	-41.58	455.44	14,445,082.67	1,703,635.26	39.77554864	-80.77499543
5,224.00	15.19	101.50	5,182.83	-46.90	478.91	14,445,077.36	1,703,658.73	39.77553389	-80.77491195
5,314.00	15.72	107.53	5,269.58	-52.92	502.09	14,445,071.33	1,703,681.92	39.77551718	-80.77482950
5,404.00	14.64	97.38	5,356.45	-58.05	525.00	14,445,066.20	1,703,704.83	39.77550293	-80.77474800
5,493.00	14.85	94.57	5,442.56	-60.40	547.37	14,445,063.86	1,703,727.20	39.77549634	-80.77466840
5,591.00	14.30	95.60	5,537.45	-62.56	571.77	14,445,061.69	1,703,751.60	39.77549022	-80.77458158
5,635.00	13.90	96.70	5,580.13	-63.71	582.43	14,445,060.54	1,703,762.25	39.77548699	-80.77454366
5,680.00	13.60	99.70	5,623.84	-65.23	593.01	14,445,059.02	1,703,772.84	39.77548274	-80.77450600
5,724.00	13.27	94.70	5,666.64	-66.52	603.15	14,445,057.74	1,703,782.97	39.77547914	-80.77446995
5,769.00	13.85	81.60	5,710.39	-66.16	613.62	14,445,058.10	1,703,793.45	39.77548007	-80.77443266
5,814.00	14.46	70.79	5,754.03	-63.52	624.26	14,445,060.74	1,703,804.08	39.77548723	-80.77439478
5,859.00	15.25	57.87	5,797.54	-58.52	634.58	14,445,065.73	1,703,814.40	39.77550089	-80.77435800
5,904.00	16.00	45.74	5,840.89	-51.04	644.04	14,445,073.21	1,703,823.86	39.77552136	-80.77432428
5,949.00	15.82	34.75	5,884.17	-41.67	651.98	14,445,082.58	1,703,831.80	39.77554704	-80.77429594
5,993.00	14.99	25.96	5,926.60	-31.63	657.89	14,445,092.63	1,703,837.71	39.77557458	-80.77427481
6,038.00	14.37	14.19	5,970.14	-20.98	661.80	14,445,103.28	1,703,841.63	39.77560380	-80.77426077
6,083.00	15.25	6.72	6,013.65	-9.69	663.87	14,445,114.57	1,703,843.69	39.77563480	-80.77425333
6,128.00	15.65	357.40	6,057.03	2.26	664.28	14,445,126.51	1,703,844.11	39.77566759	-80.77425174
6,173.00	16.66	348.70	6,100.26	14.65	662.74	14,445,138.90	1,703,842.57	39.77570163	-80.77425711
6,217.00	18.68	339.21	6,142.19	27.42	659.00	14,445,151.68	1,703,838.83	39.77573675	-80.77427030
6,262.00	22.73	335.95	6,184.28	42.11	652.90	14,445,166.36	1,703,832.73	39.77577711	-80.77429189
6,307.00	27.34	337.36	6,225.04	59.59	645.38	14,445,183.85	1,703,825.20	39.77582518	-80.77431852
6,352.00	31.38	338.15	6,264.25	80.01	637.03	14,445,204.27	1,703,816.86	39.77588132	-80.77434802
6,397.00	36.13	338.86	6,301.65	103.27	627.88	14,445,227.53	1,703,807.71	39.77594527	-80.77438038
6,441.00	40.00	339.38	6,336.29	128.62	618.22	14,445,252.87	1,703,798.05	39.77601494	-80.77441454
6,531.00	49.45	341.05	6,400.16	188.17	596.88	14,445,312.42	1,703,776.71	39.77617862	-80.77448996
6,621.00	60.84	339.82	6,451.51	257.62	572.14	14,445,381.88	1,703,751.96	39.77636953	-80.77457740
6,710.00	72.04	337.62	6,487.03	333.49	542.52	14,445,457.74	1,703,722.34	39.77657809	-80.77468215
6,800.00	83.60	336.48	6,505.99	414.35	508.26	14,445,538.61	1,703,688.08	39.77680040	-80.77480337
6,845.00	89.23	336.57	6,508.80	455.53	490.37	14,445,579.79	1,703,670.20	39.77691362	-80.77486665
6,890.00	89.80	336.39	6,509.19	496.79	472.42	14,445,621.05	1,703,652.24	39.77702705	-80.77493019
6,979.00	89.23	334.81	6,509.94	577.84	435.65	14,445,702.09	1,703,615.48	39.77724988	-80.77506032
7,069.00	88.35	332.35	6,511.84	658.41	395.62	14,445,782.67	1,703,575.44	39.77747143	-80.77520208
7,158.00	89.19	332.00	6,513.75	737.10	354.09	14,445,861.36	1,703,533.91	39.77768783	-80.777534921
7,248.00	89.41	330.86	6,514.85	816.14	311.05	14,445,940.39	1,703,490.88	39.77790517	-80.777550168
7,338.00	91.91	330.24	6,513.81	894.49	266.81	14,446,018.75	1,703,446.63	39.77812067	-80.777565845
7,427.00	91.56	329.89	6,511.12	971.59	222.42	14,446,095.84	1,703,402.24	39.77833269	-80.777581577
7,517.00	92.18	329.63	6,508.18	1,049.30	177.11	14,446,173.55	1,703,356.94	39.77854642	-80.777597632
7,607.00	92.22	329.71	6,504.73	1,126.92	131.70	14,446,251.18	1,703,311.52	39.77875991	-80.777613727
7,696.00	90.68	328.48	6,502.47	1,203.26	86.00	14,446,327.51	1,703,265.83	39.77896986	-80.777629923
7,786.00	91.03	328.31	6,501.13	1,279.90	38.84	14,446,404.15	1,703,218.67	39.77918067	-80.777646641
7,876.00	90.24	329.36	6,500.13	1,356.90	-7.73	14,446,481.16	1,703,172.10	39.77939246	-80.777663149
7,966.00	90.37	328.92	6,499.65	1,434.16	-53.89	14,446,558.42	1,703,125.93	39.77960495	-80.777679512
8,056.00	88.53	329.89	6,500.52	1,511.62	-99.69	14,446,635.88	1,703,080.13	39.77981799	-80.777695745
8,145.00	89.54	330.59	6,502.02	1,588.87	-143.86	14,446,713.13	1,703,035.96	39.78003045	-80.777711399
8,235.00	90.29	329.98	6,502.15	1,667.04	-188.47	14,446,791.29	1,702,991.35	39.78024541	-80.777727208
8,325.00	91.65	330.07	6,500.63	1,744.99	-233.43	14,446,869.24	1,702,946.39	39.78045979	-80.777743141
8,414.00	91.96	330.24	6,497.82	1,822.14	-277.70	14,446,946.40	1,702,902.12	39.78067199	-80.777758830
8,504.00	92.13	329.80	6,494.61	1,900.05	-322.65	14,447,024.31	1,702,857.18	39.78088625	-80.777774759
8,594.00	91.52	330.24	6,491.75	1,977.97	-367.60	14,447,102.23	1,702,812.23	39.78110054	-80.777790689
8,684.00	90.33	331.03	6,490.29	2,056.39	-411.72	14,447,180.65	1,702,768.10	39.78131621	-80.777806327
8,773.00	90.46	329.45	6,489.68	2,133.65	-455.90	14,447,257.91	1,702,723.93	39.78152869	-80.777821982
8,863.00	90.59	327.78	6,488.86	2,210.48	-502.76	14,447,334.73	1,702,677.06	39.78173999	-80.777838596
8,953.00	90.29	326.29	6,488.16	2,285.98	-551.73	14,447,410.24	1,702,628.09	39.78194768	-80.777855960
9,043.00	89.76	328.04	6,488.12	2,361.60	-600.53	14,447,485.86	1,702,579.29	39.78215568	-80.777873263

WV Department of Environmental Protection



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-04HM (slot K)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+28 @ 1219.00usft (Precision 110)
Site:	Bryan Pad	MD Reference:	RKB=1191+28 @ 1219.00usft (Precision 110)
Well:	Bryan N-04HM (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216d_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	
9,132.00	90.15	330.42	6,488.19	2,438.07	-646.06	14,447,562.32	1,702,533.77	39.78236599	-80.77889401	
9,222.00	90.02	330.68	6,488.06	2,516.44	-690.31	14,447,640.69	1,702,489.52	39.78258151	-80.77905083	
9,312.00	91.43	331.56	6,486.92	2,595.24	-733.77	14,447,719.49	1,702,446.05	39.78279821	-80.77920485	
9,401.00	90.99	332.18	6,485.04	2,673.71	-775.72	14,447,797.96	1,702,404.10	39.78301399	-80.77935348	
9,491.00	91.25	332.09	6,483.28	2,753.25	-817.78	14,447,877.51	1,702,362.04	39.78323274	-80.77950249	
9,581.00	91.78	332.09	6,480.90	2,832.76	-859.89	14,447,957.01	1,702,319.93	39.78345136	-80.77965169	
9,670.00	92.04	331.56	6,477.94	2,911.17	-901.89	14,448,035.42	1,702,277.93	39.78366698	-80.77980050	
9,760.00	91.96	331.65	6,474.80	2,990.29	-944.66	14,448,114.55	1,702,235.16	39.78388457	-80.77995207	
9,850.00	90.46	332.26	6,472.90	3,069.70	-986.97	14,448,193.96	1,702,192.86	39.78410294	-80.78010195	
9,939.00	90.64	332.00	6,472.04	3,148.38	-1,028.57	14,448,272.63	1,702,151.25	39.78431928	-80.78024935	
10,029.00	88.70	331.65	6,472.56	3,227.71	-1,071.06	14,448,351.96	1,702,108.76	39.78453743	-80.78039992	
10,119.00	88.26	331.47	6,474.95	3,306.82	-1,113.91	14,448,431.07	1,702,065.91	39.78475498	-80.78055174	
10,208.00	90.15	330.24	6,476.18	3,384.54	-1,157.25	14,448,508.79	1,702,022.58	39.78496871	-80.78070533	
10,298.00	90.59	329.98	6,475.60	3,462.56	-1,202.10	14,448,586.82	1,701,977.73	39.78518329	-80.78086430	
10,388.00	91.08	329.45	6,474.29	3,540.27	-1,247.48	14,448,664.53	1,701,932.35	39.78539700	-80.78102516	
10,477.00	91.69	329.89	6,472.14	3,617.07	-1,292.41	14,448,741.32	1,701,887.42	39.78560821	-80.78118443	
10,567.00	92.31	329.63	6,469.00	3,694.77	-1,337.71	14,448,819.03	1,701,842.12	39.78582191	-80.78134500	
10,657.00	90.11	329.01	6,467.10	3,772.15	-1,383.62	14,448,896.41	1,701,796.21	39.78603473	-80.78150774	
10,746.00	90.15	329.01	6,466.90	3,848.45	-1,429.44	14,448,972.71	1,701,750.38	39.78624456	-80.78167020	
10,836.00	90.46	328.66	6,466.42	3,925.46	-1,476.02	14,449,049.71	1,701,703.81	39.78645637	-80.78183533	
10,926.00	90.51	328.75	6,465.65	4,002.36	-1,522.76	14,449,126.62	1,701,657.06	39.78666787	-80.78200107	
11,015.00	90.90	327.08	6,464.56	4,077.76	-1,570.03	14,449,202.02	1,701,609.79	39.78687525	-80.78216868	
11,105.00	89.80	327.78	6,464.01	4,153.60	-1,618.48	14,449,277.86	1,701,561.34	39.78708386	-80.78234048	
11,195.00	90.37	330.07	6,463.88	4,230.68	-1,664.93	14,449,354.94	1,701,514.89	39.78729585	-80.78250517	
11,284.00	90.73	329.54	6,463.02	4,307.60	-1,709.69	14,449,431.86	1,701,470.13	39.78750740	-80.78266384	
11,374.00	91.08	329.01	6,461.60	4,384.96	-1,755.67	14,449,509.21	1,701,424.16	39.78772014	-80.78282684	
11,464.00	91.43	328.66	6,459.63	4,461.95	-1,802.23	14,449,586.21	1,701,377.59	39.78793190	-80.78299193	
11,553.00	90.81	331.12	6,457.89	4,538.92	-1,846.87	14,449,663.18	1,701,332.96	39.78814357	-80.78315016	
11,643.00	90.15	330.24	6,457.13	4,617.39	-1,890.94	14,449,741.64	1,701,288.89	39.78835936	-80.78330636	
11,733.00	89.32	329.80	6,457.55	4,695.34	-1,935.91	14,449,819.60	1,701,243.92	39.78857375	-80.78346578	
11,823.00	91.47	330.51	6,456.93	4,773.40	-1,980.69	14,449,897.66	1,701,199.13	39.78878841	-80.78362453	
11,912.00	91.82	330.59	6,454.38	4,850.87	-2,024.43	14,449,975.12	1,701,155.39	39.78900145	-80.78377957	
12,002.00	90.59	331.12	6,452.48	4,929.46	-2,068.26	14,450,053.71	1,701,111.57	39.78921756	-80.78393489	
12,091.00	91.25	330.68	6,451.05	5,007.21	-2,111.53	14,450,131.47	1,701,068.29	39.78943138	-80.78408829	
12,181.00	92.04	330.24	6,448.47	5,085.48	-2,155.89	14,450,209.73	1,701,023.94	39.78964662	-80.78424551	
12,271.00	90.55	329.89	6,446.44	5,163.45	-2,200.79	14,450,287.70	1,700,979.04	39.78986105	-80.78440467	
12,360.00	90.11	329.89	6,445.92	5,240.44	-2,245.43	14,450,364.69	1,700,934.39	39.79007277	-80.78456295	
12,450.00	89.76	329.45	6,446.03	5,318.12	-2,290.88	14,450,442.38	1,700,888.94	39.79028641	-80.78472408	
12,540.00	89.05	329.63	6,446.96	5,395.69	-2,336.50	14,450,519.95	1,700,843.32	39.79049975	-80.78488582	
12,629.00	90.37	331.47	6,447.41	5,473.19	-2,380.26	14,450,597.44	1,700,799.57	39.79071286	-80.78504092	
12,719.00	89.32	330.95	6,447.65	5,552.06	-2,423.60	14,450,676.32	1,700,756.22	39.79092975	-80.78519454	
12,809.00	91.16	332.79	6,447.28	5,631.42	-2,466.03	14,450,755.68	1,700,713.80	39.79114798	-80.78534491	
12,898.00	92.44	333.76	6,444.48	5,710.87	-2,506.03	14,450,835.13	1,700,673.79	39.79136644	-80.78548664	
12,988.00	92.48	333.76	6,440.62	5,791.52	-2,545.79	14,450,915.78	1,700,634.04	39.79158819	-80.78562748	
13,078.00	92.62	333.14	6,436.61	5,871.95	-2,585.98	14,450,996.21	1,700,593.85	39.79180933	-80.78576986	
13,167.00	91.69	331.38	6,433.27	5,950.66	-2,627.37	14,451,074.92	1,700,552.45	39.79202577	-80.78591656	
13,257.00	91.69	331.56	6,430.61	6,029.70	-2,670.34	14,451,153.96	1,700,509.49	39.79224310	-80.78606884	
13,346.00	90.77	329.71	6,428.70	6,107.24	-2,713.97	14,451,231.50	1,700,465.86	39.79245634	-80.78622351	
13,436.00	89.93	329.36	6,428.15	6,184.82	-2,759.60	14,451,309.07	1,700,420.23	39.79266968	-80.78638529	
13,526.00	89.32	329.19	6,428.74	6,262.18	-2,805.58	14,451,386.44	1,700,374.24	39.79288244	-80.78654833	
13,615.00	90.11	329.71	6,429.19	6,338.82	-2,850.82	14,451,463.08	1,700,329.01	39.79309322	-80.78670872	
13,705.00	89.67	329.45	6,429.36	6,416.43	-2,896.39	14,451,540.69	1,700,283.44	39.79330666	-80.78687030	
13,795.00	89.93	329.89	6,429.67	6,494.12	-2,941.83	14,451,618.37	1,700,237.99	39.79352029	-80.78703144	
13,884.00	90.37	330.24	6,429.44	6,571.24	-2,986.25	14,451,695.50	1,700,193.58	39.79373239	-80.78718889	
13,974.00	91.34	329.80	6,428.10	6,649.19	-3,031.21	14,451,773.44	1,700,148.61	39.79394675	-80.78734832	

WV Department of Environmental Protection



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Bryan N-04HM (slot K)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1191+28 @ 1219.00usft (Precision 110)
Site:	Bryan Pad	MD Reference:	RKB=1191+28 @ 1219.00usft (Precision 110)
Well:	Bryan N-04HM (slot K)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
14,064.00	90.90	329.80	6,426.34	6,726.96	-3,076.48	14,451,851.21	1,700,103.35	39.79416062	-80.78750880
14,153.00	90.42	329.89	6,425.31	6,803.91	-3,121.18	14,451,928.16	1,700,058.64	39.79437224	-80.78766731
14,243.00	91.16	329.71	6,424.07	6,881.69	-3,166.45	14,452,005.94	1,700,013.38	39.79458613	-80.78782781
14,333.00	90.73	330.51	6,422.59	6,959.70	-3,211.29	14,452,083.96	1,699,968.53	39.79480068	-80.78798680
14,423.00	90.37	330.15	6,421.72	7,037.90	-3,255.84	14,452,162.15	1,699,923.98	39.79501572	-80.78814473
14,513.00	91.47	330.42	6,420.28	7,116.05	-3,300.45	14,452,240.31	1,699,879.38	39.79523064	-80.78830288
14,602.00	91.25	330.07	6,418.17	7,193.30	-3,344.60	14,452,317.55	1,699,835.22	39.79544306	-80.78845943
14,692.00	90.68	330.68	6,416.65	7,271.52	-3,389.09	14,452,395.78	1,699,790.74	39.79565817	-80.78861714
14,782.00	91.21	331.03	6,415.17	7,350.12	-3,432.91	14,452,474.37	1,699,746.91	39.79587429	-80.78877251
14,871.00	90.86	331.12	6,413.56	7,428.00	-3,475.95	14,452,552.25	1,699,703.87	39.79608846	-80.78892508
14,961.00	90.11	331.38	6,412.80	7,506.90	-3,519.24	14,452,631.16	1,699,660.59	39.79630543	-80.78907853
15,051.00	91.69	330.33	6,411.38	7,585.49	-3,563.06	14,452,709.75	1,699,616.76	39.79652155	-80.78923389
15,140.00	91.34	330.07	6,409.03	7,662.70	-3,607.28	14,452,786.95	1,699,572.55	39.79673386	-80.78939066
15,230.00	90.95	329.89	6,407.23	7,740.61	-3,652.29	14,452,864.86	1,699,527.53	39.79694811	-80.78955028
15,320.00	91.34	330.59	6,405.43	7,818.72	-3,696.96	14,452,942.98	1,699,482.87	39.79716292	-80.78970864
15,409.00	92.13	330.51	6,402.74	7,896.19	-3,740.70	14,453,020.44	1,699,439.13	39.79737594	-80.78986371
15,499.00	90.64	329.19	6,400.56	7,973.98	-3,785.89	14,453,098.24	1,699,393.94	39.79758989	-80.79002395
15,589.00	90.51	329.28	6,399.66	8,051.31	-3,831.92	14,453,175.57	1,699,347.91	39.79780255	-80.79018719
15,678.00	90.02	328.75	6,399.25	8,127.61	-3,877.74	14,453,251.87	1,699,302.09	39.79801238	-80.79034968
15,768.00	90.15	329.98	6,399.11	8,205.05	-3,923.60	14,453,329.30	1,699,256.23	39.79822534	-80.79051231
15,858.00	89.32	329.19	6,399.53	8,282.66	-3,969.16	14,453,406.92	1,699,210.67	39.79843878	-80.79067388
15,947.00	91.16	329.10	6,399.16	8,359.06	-4,014.80	14,453,483.32	1,699,165.02	39.79864889	-80.79083575
16,037.00	90.68	329.63	6,397.71	8,436.49	-4,060.66	14,453,560.74	1,699,119.17	39.79886182	-80.79099836
16,126.00	90.55	329.45	6,396.76	8,513.20	-4,105.77	14,453,637.46	1,699,074.05	39.79907278	-80.79115835
16,216.00	90.37	328.84	6,396.03	8,590.46	-4,151.93	14,453,714.72	1,699,027.90	39.79928525	-80.79132204
16,306.00	90.95	329.28	6,395.00	8,667.65	-4,198.20	14,453,791.90	1,698,981.63	39.79949753	-80.79148613
16,395.00	90.59	329.10	6,393.80	8,744.08	-4,243.78	14,453,868.34	1,698,936.05	39.79970772	-80.79164778
16,485.00	90.20	328.57	6,393.18	8,821.09	-4,290.35	14,453,945.35	1,698,889.47	39.79991951	-80.79181297
16,575.00	90.95	329.28	6,392.28	8,898.17	-4,336.80	14,454,022.42	1,698,843.02	39.80013148	-80.79197772
16,664.00	90.55	328.57	6,391.11	8,974.39	-4,382.74	14,454,098.65	1,698,797.09	39.80034110	-80.79214063
16,754.00	90.07	328.31	6,390.63	9,051.08	-4,429.84	14,454,175.33	1,698,749.98	39.80055200	-80.79230771
16,844.00	89.85	328.22	6,390.69	9,127.62	-4,477.18	14,454,251.88	1,698,702.64	39.80076252	-80.79247562
16,904.00	89.71	328.40	6,390.92	9,178.68	-4,508.70	14,454,302.93	1,698,671.12	39.80090292	-80.79258742
Survey @ 16904.00 MD 6390.92 TVD									
16,956.00	89.71	328.40	6,391.18	9,222.96	-4,535.95	14,454,347.22	1,698,643.88	39.80102473	-80.79268407
Survey projected to 16956.00 MD 6391.18 TVD									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
224.00	223.99	-0.26	1.34	MWD surveys
16,904.00	6,390.92	9,178.68	-4,508.70	Survey @ 16904.00 MD 6390.92 TVD
16,956.00	6,391.18	9,222.96	-4,535.95	Survey projected to 16956.00 MD 6391.18 TVD

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