



**Well:** Keith Stern N-01 HM (slot G)  
**Site:** Keith Stern  
**Project:** Marshall County, West Virginia  
**Design:** rev2  
**Rig:** Nabors X08

Geodetic System: Universal Transverse Mercator (US Survey Feet)  
 Datum: NAD83 West Virginia - HARN  
 Ellipsoid: GRS 1980  
 Zone: Zone 17N (84 W to 78 W)

System Datum: Mean Sea Level  
 Depth Reference: RKB=748+33 @ 781.00usft (Nabors X08)

Northing: 14444910.34    Easting: 1726918.90    Latitude: 39.77488513    Longitude: -80.69212852

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.87°



Azimuths to Grid North  
 True North: -0.20°  
 Magnetic North: -8.87°

Magnetic Field  
 Strength: 51658.8nT  
 Dip Angle: 66.45°  
 Date: 4/11/2022  
 Model: IGRF2020

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Annotation
193.00	0.65	303.52	193.00	0.60	-0.91	1.08	MWD surveys
13665.00	89.19	331.62	6259.94	3810.89	-4157.59	5639.86	Survey @ 13665.00 MD 6259.94 TVD
13722.00	89.19	331.62	6260.75	3861.03	-4184.68	5693.78	Survey Proj. to 13722.00 MD 6260.75 TVD

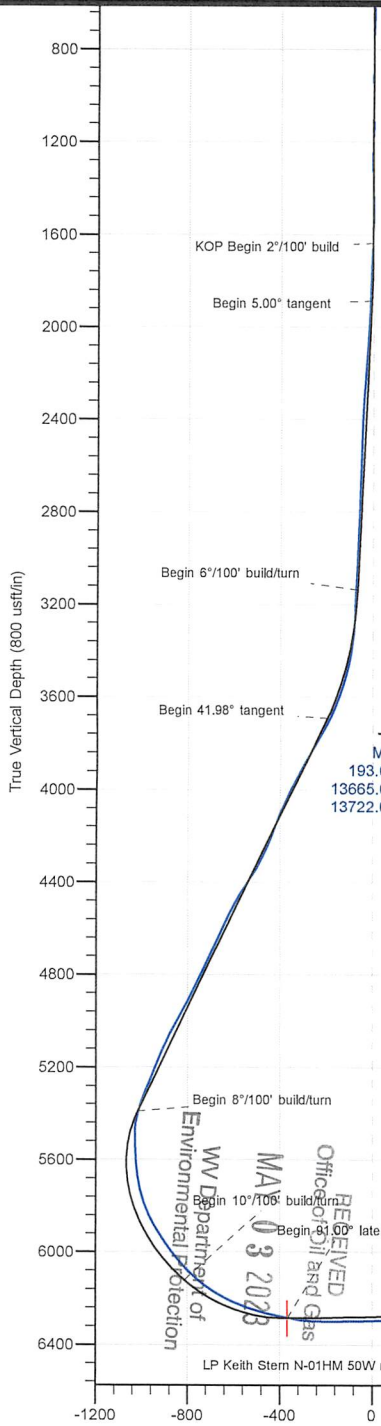
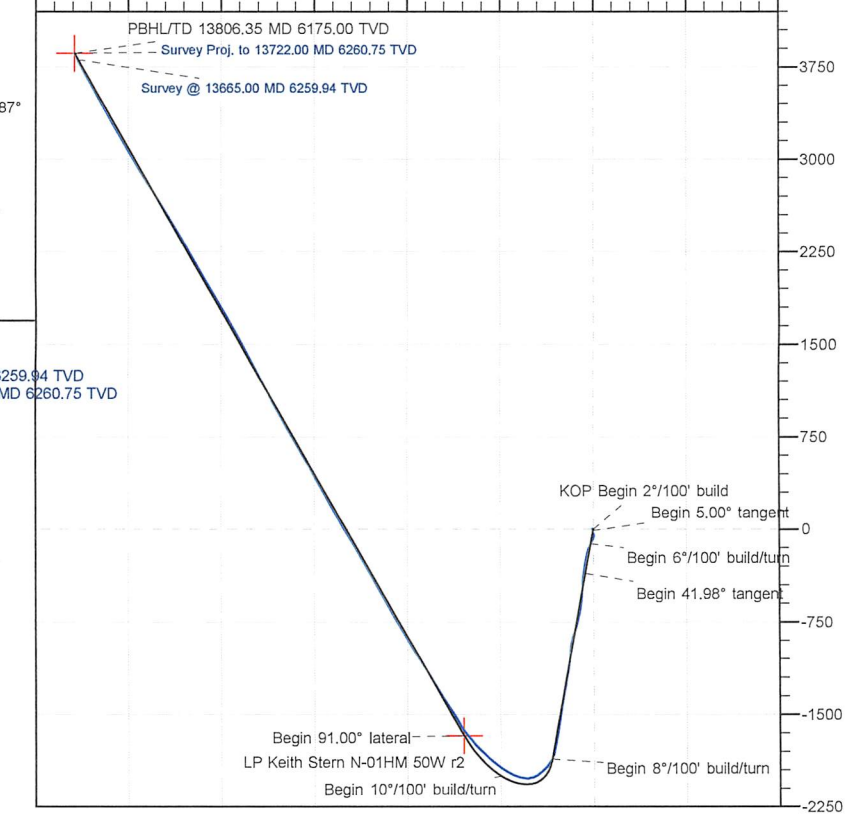
SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	1637.00	0.00	0.00	1637.00	0.00	0.00	0.00	0.00	0.00	KOP Begin 2°/100' build
3	1887.00	5.00	190.00	1886.68	-10.74	-1.89	2.00	190.00	-5.89	Begin 5.00° tangent
4	3142.09	5.00	190.00	3137.00	-118.46	-20.89	0.00	0.00	-64.98	Begin 6°/100' build/turn
5	3758.44	41.98	190.16	3692.51	-356.12	-63.40	6.00	0.18	-194.90	Begin 41.98° tangent
6	6044.66	41.98	190.16	5392.01	-1861.36	-333.13	0.00	0.00	-1017.39	Begin 8°/100' build/turn
7	6952.97	50.00	300.71	6122.13	-2002.09	-742.18	8.00	131.29	-812.19	Begin 10°/100' build/turn
8	7444.52	91.00	330.42	6286.00	-1671.70	-1044.10	10.00	40.93	-366.25	Begin 91.00° lateral
9	13806.35	91.00	330.42	6175.00	3860.28	-4183.80	0.00	0.00	5692.62	PBHL/TD 13806.35 MD 6175.00 TVD

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
BHL Keith Stern N-01HM r2	6175.00	3860.28	-4183.80	14448770.61	1722735.11	39.78552500	-80.70697400
- plan hits target center							
LP Keith Stern N-01HM 50W r2	6286.00	-1671.69	-1043.93	14443238.65	1725874.97	39.77030404	-80.69586414
- plan misses target center by 0.16usft at 7444.45usft MD (6286.00 TVD, -1671.77 N, -1044.06 E)							

West(-)/East(+) (1500 usft/in)



South(-)/North(+) (1500 usft/in)

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Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern N-01 HM (slot G)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=748+33 @ 781.00usft (Nabors X08)
<b>Site:</b>	Keith Stern	<b>MD Reference:</b>	RKB=748+33 @ 781.00usft (Nabors X08)
<b>Well:</b>	Keith Stern N-01 HM (slot G)	<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_Feb2822

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

<b>Site</b>	Keith Stern				
<b>Site Position:</b>		<b>Northing:</b>	14,444,890.33 usft	<b>Latitude:</b>	39.77483004
<b>From:</b>	Lat/Long	<b>Easting:</b>	1,726,932.47 usft	<b>Longitude:</b>	-80.69208048
<b>Position Uncertainty:</b>	0.00 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	0.20 °

<b>Well</b>	Keith Stern N-01 HM (slot G)					
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b>	14,444,910.34 usft	<b>Latitude:</b>	39.77488513
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b>	1,726,918.90 usft	<b>Longitude:</b>	-80.69212852
<b>Position Uncertainty</b>		0.00 usft	<b>Wellhead Elevation:</b>	usft	<b>Ground Level:</b>	748.00 usft

<b>Wellbore</b>	Original Hole				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2020	4/11/2022	-8.67	66.45	51,658.80035373

<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) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.00	0.00	0.00	312.70	

<b>Survey Program</b>	<b>Date</b>	4/27/2022			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
193.00	525.00	MWD surf (Original Hole)	MWD	MWD - Standard	
547.00	2,212.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,307.00	13,665.00	MWD (Original Hole)	MWD	MWD - Standard	
13,722.00	13,722.00	Projection (Original Hole)	MWD	MWD - Standard	

<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</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	14,444,910.34	1,726,918.90	39.77488513	-80.69212852	
193.00	0.65	303.52	193.00	0.60	-0.91	14,444,910.94	1,726,917.99	39.77488680	-80.69213176	
<b>MWD surveys</b>										
224.00	0.64	295.38	223.99	0.78	-1.22	14,444,911.12	1,726,917.69	39.77488727	-80.69213284	
254.00	0.70	305.08	253.99	0.95	-1.52	14,444,911.29	1,726,917.39	39.77488776	-80.69213391	
284.00	0.73	306.75	283.99	1.17	-1.82	14,444,911.51	1,726,917.08	39.77488837	-80.69213498	
314.00	0.76	299.08	313.99	1.38	-2.15	14,444,911.72	1,726,916.76	39.77488895	-80.69213615	
344.00	0.73	304.62	343.98	1.59	-2.48	14,444,911.93	1,726,916.42	39.77488952	-80.69213732	
374.00	0.66	312.85	373.98	1.82	-2.76	14,444,912.15	1,726,916.14	39.77489014	-80.69213833	

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern N-01 HM (slot G)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=748+33 @ 781.00usft (Nabors X08)
<b>Site:</b>	Keith Stern	<b>MD Reference:</b>	RKB=748+33 @ 781.00usft (Nabors X08)
<b>Well:</b>	Keith Stern N-01 HM (slot G)	<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_Feb2822

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
405.00	0.70	316.84	404.98	2.07	-3.02	14,444,912.41	1,726,915.88	39.77489086	-80.69213925	
435.00	0.73	308.05	434.98	2.33	-3.30	14,444,912.67	1,726,915.60	39.77489155	-80.69214023	
465.00	1.01	315.12	464.97	2.63	-3.64	14,444,912.97	1,726,915.27	39.77489239	-80.69214143	
495.00	0.96	318.37	494.97	3.01	-3.99	14,444,913.35	1,726,914.91	39.77489343	-80.69214268	
525.00	0.88	329.43	524.97	3.39	-4.27	14,444,913.73	1,726,914.63	39.77489449	-80.69214369	
547.00	0.68	334.16	546.96	3.66	-4.42	14,444,914.00	1,726,914.49	39.77489521	-80.69214419	
584.00	0.53	53.55	583.96	3.95	-4.37	14,444,914.29	1,726,914.53	39.77489603	-80.69214404	
614.00	1.02	89.76	613.96	4.04	-4.00	14,444,914.38	1,726,914.91	39.77489626	-80.69214269	
644.00	1.38	97.26	643.95	3.99	-3.37	14,444,914.33	1,726,915.53	39.77489613	-80.69214047	
675.00	1.62	104.42	674.94	3.84	-2.58	14,444,914.18	1,726,916.33	39.77489570	-80.69213764	
705.00	1.48	115.25	704.93	3.57	-1.81	14,444,913.91	1,726,917.09	39.77489494	-80.69213493	
736.00	1.26	143.35	735.92	3.12	-1.25	14,444,913.46	1,726,917.65	39.77489372	-80.69213293	
767.00	1.57	159.65	766.91	2.45	-0.90	14,444,912.79	1,726,918.01	39.77489187	-80.69213169	
799.00	1.50	176.99	798.90	1.62	-0.72	14,444,911.96	1,726,918.18	39.77488959	-80.69213107	
830.00	1.45	202.05	829.89	0.85	-0.85	14,444,911.19	1,726,918.05	39.77488748	-80.69213153	
861.00	1.79	209.97	860.88	0.07	-1.24	14,444,910.41	1,726,917.66	39.77488534	-80.69213293	
893.00	1.81	215.21	892.86	-0.78	-1.78	14,444,909.56	1,726,917.12	39.77488302	-80.69213486	
925.00	1.30	222.84	924.85	-1.46	-2.32	14,444,908.88	1,726,916.59	39.77488116	-80.69213679	
956.00	0.35	245.57	955.85	-1.75	-2.64	14,444,908.59	1,726,916.26	39.77488035	-80.69213795	
987.00	0.57	8.13	986.85	-1.64	-2.71	14,444,908.70	1,726,916.20	39.77488066	-80.69213818	
1,018.00	1.17	21.56	1,017.84	-1.19	-2.57	14,444,909.15	1,726,916.33	39.77488188	-80.69213768	
1,050.00	1.80	27.99	1,049.83	-0.44	-2.21	14,444,909.90	1,726,916.69	39.77488393	-80.69213640	
1,081.00	1.90	28.11	1,080.82	0.44	-1.74	14,444,910.78	1,726,917.16	39.77488635	-80.69213472	
1,113.00	1.73	38.19	1,112.80	1.29	-1.19	14,444,911.63	1,726,917.71	39.77488868	-80.69213275	
1,144.00	1.18	71.54	1,143.79	1.76	-0.60	14,444,912.10	1,726,918.30	39.77488996	-80.69213064	
1,176.00	1.17	101.53	1,175.79	1.79	0.03	14,444,912.13	1,726,918.93	39.77489006	-80.69212839	
1,207.00	1.31	131.65	1,206.78	1.50	0.61	14,444,911.84	1,726,919.51	39.77488923	-80.69212635	
1,238.00	1.20	172.21	1,237.77	0.94	0.91	14,444,911.28	1,726,919.82	39.77488770	-80.69212525	
1,270.00	1.24	204.89	1,269.77	0.29	0.81	14,444,910.63	1,726,919.72	39.77488593	-80.69212562	
1,301.00	1.89	232.90	1,300.75	-0.32	0.27	14,444,910.02	1,726,919.17	39.77488425	-80.69212758	
1,332.00	2.49	245.38	1,331.73	-0.91	-0.75	14,444,909.43	1,726,918.15	39.77488264	-80.69213122	
1,363.00	2.24	247.98	1,362.70	-1.42	-1.93	14,444,908.92	1,726,916.97	39.77488126	-80.69213540	
1,395.00	1.34	260.53	1,394.69	-1.71	-2.88	14,444,908.63	1,726,916.03	39.77488046	-80.69213878	
1,426.00	0.61	275.56	1,425.68	-1.76	-3.40	14,444,908.58	1,726,915.50	39.77488034	-80.69214064	
1,457.00	0.13	350.82	1,456.68	-1.71	-3.57	14,444,908.63	1,726,915.33	39.77488048	-80.69214124	
1,489.00	0.87	68.23	1,488.68	-1.58	-3.35	14,444,908.76	1,726,915.55	39.77488083	-80.69214046	
1,520.00	1.48	81.02	1,519.68	-1.43	-2.74	14,444,908.91	1,726,916.17	39.77488123	-80.69213827	
1,552.00	2.07	74.91	1,551.66	-1.21	-1.77	14,444,909.12	1,726,917.13	39.77488181	-80.69213483	
1,583.00	2.31	83.66	1,582.64	-1.00	-0.61	14,444,909.34	1,726,918.30	39.77488239	-80.69213069	
1,614.00	1.62	93.02	1,613.62	-0.95	0.45	14,444,909.39	1,726,919.35	39.77488251	-80.69212693	
1,646.00	1.23	137.73	1,645.61	-1.23	1.13	14,444,909.11	1,726,920.04	39.77488174	-80.69212450	
1,677.00	2.28	170.05	1,676.60	-2.09	1.46	14,444,908.25	1,726,920.37	39.77487939	-80.69212333	
1,741.00	4.07	187.58	1,740.50	-5.59	1.38	14,444,904.75	1,726,920.29	39.77486976	-80.69212366	
1,835.00	5.61	197.56	1,834.16	-13.28	-0.44	14,444,897.06	1,726,918.46	39.77484867	-80.69213026	
1,928.00	3.93	185.21	1,926.84	-20.79	-2.10	14,444,889.55	1,726,916.80	39.77482806	-80.69213626	
2,022.00	3.40	156.04	2,020.65	-26.54	-1.26	14,444,883.80	1,726,917.64	39.77481225	-80.69213334	
2,117.00	4.94	149.05	2,115.40	-32.63	1.98	14,444,877.71	1,726,920.89	39.77479551	-80.69212186	
2,212.00	5.43	162.79	2,210.01	-40.43	5.42	14,444,869.91	1,726,924.32	39.77477406	-80.69210973	
2,307.00	4.70	171.98	2,304.64	-48.58	7.29	14,444,861.76	1,726,926.19	39.77475166	-80.69210316	
2,402.00	4.48	204.78	2,399.35	-55.80	6.28	14,444,854.54	1,726,925.18	39.77473183	-80.69210686	
2,496.00	5.12	200.33	2,493.03	-63.07	3.28	14,444,847.27	1,726,922.19	39.77471191	-80.69211761	
2,590.00	6.47	198.72	2,586.54	-72.02	0.13	14,444,838.32	1,726,919.03	39.77468736	-80.69212895	
2,684.00	6.55	207.09	2,679.94	-81.80	-4.02	14,444,828.53	1,726,914.89	39.77466051	-80.69214381	
2,778.00	5.87	201.96	2,773.39	-91.04	-8.25	14,444,819.30	1,726,910.65	39.77463520	-80.69215901	
2,873.00	5.77	200.35	2,867.90	-100.02	-11.73	14,444,810.32	1,726,907.17	39.77461056	-80.69217150	



Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern N-01 HM (slot G)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=748+33 @ 781.00usft (Nabors X08)
<b>Site:</b>	Keith Stern	<b>MD Reference:</b>	RKB=748+33 @ 781.00usft (Nabors X08)
<b>Well:</b>	Keith Stern N-01 HM (slot G)	<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_Feb2822

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
2,967.00	6.35	204.44	2,961.37	-109.18	-15.53	14,444,801.16	1,726,903.38	39.77458544	-80.69218511	
3,065.00	6.62	200.77	3,058.75	-119.40	-19.77	14,444,790.94	1,726,899.13	39.77455742	-80.69220035	
3,160.00	5.98	197.79	3,153.17	-129.23	-23.23	14,444,781.11	1,726,895.68	39.77453045	-80.69221276	
3,254.00	10.13	202.15	3,246.22	-141.55	-27.84	14,444,768.79	1,726,891.06	39.77449665	-80.69222934	
3,348.00	15.07	200.68	3,337.93	-160.65	-35.28	14,444,749.68	1,726,883.63	39.77444426	-80.69225604	
3,443.00	21.41	194.73	3,428.12	-189.01	-44.06	14,444,721.33	1,726,874.85	39.77436648	-80.69228763	
3,537.00	27.74	191.03	3,513.57	-227.12	-52.61	14,444,683.22	1,726,866.29	39.77426191	-80.69231855	
3,631.00	34.28	188.98	3,594.09	-274.79	-60.94	14,444,635.55	1,726,857.96	39.77413106	-80.69234877	
3,726.00	38.53	188.82	3,670.53	-330.48	-69.66	14,444,579.86	1,726,849.25	39.77397820	-80.69238048	
3,819.00	43.97	185.98	3,740.44	-391.26	-77.47	14,444,519.08	1,726,841.43	39.77381135	-80.69240902	
3,913.00	43.31	183.81	3,808.47	-455.89	-83.01	14,444,454.45	1,726,835.89	39.77363392	-80.69242953	
4,007.00	41.47	185.25	3,877.89	-519.06	-88.00	14,444,391.28	1,726,830.90	39.77346049	-80.69244807	
4,101.00	41.47	187.17	3,948.33	-580.94	-94.73	14,444,329.40	1,726,824.17	39.77329062	-80.69247279	
4,195.00	40.95	187.55	4,019.04	-642.36	-102.67	14,444,267.98	1,726,816.24	39.77312203	-80.69250177	
4,290.00	39.25	192.07	4,091.72	-702.62	-113.04	14,444,207.72	1,726,805.86	39.77295661	-80.69253944	
4,384.00	40.03	196.09	4,164.12	-760.76	-127.64	14,444,149.58	1,726,791.26	39.77279709	-80.69259211	
4,477.00	43.75	197.22	4,233.34	-820.23	-145.46	14,444,090.11	1,726,773.44	39.77263393	-80.69265624	
4,572.00	46.49	193.99	4,300.38	-885.05	-163.52	14,444,025.28	1,726,755.39	39.77245608	-80.69272130	
4,667.00	47.89	188.36	4,364.96	-953.38	-176.97	14,443,956.96	1,726,741.93	39.77228687	-80.69277003	
4,761.00	46.43	185.18	4,428.89	-1,021.80	-185.12	14,443,888.54	1,726,733.78	39.77208074	-80.69279985	
4,855.00	43.72	186.58	4,495.26	-1,088.00	-191.92	14,443,822.34	1,726,726.98	39.77189901	-80.69282485	
4,949.00	40.94	190.54	4,564.76	-1,150.57	-201.28	14,443,759.77	1,726,717.63	39.77172726	-80.69285893	
5,044.00	40.27	189.15	4,636.89	-1,211.49	-211.85	14,443,698.85	1,726,707.05	39.77156007	-80.69289731	
5,138.00	40.29	189.79	4,708.60	-1,271.43	-221.85	14,443,638.91	1,726,697.05	39.77139554	-80.69293363	
5,233.00	41.80	190.30	4,780.25	-1,332.85	-232.74	14,443,577.49	1,726,686.17	39.77122696	-80.69297311	
5,328.00	42.52	190.27	4,850.67	-1,395.59	-244.12	14,443,514.75	1,726,674.78	39.77105477	-80.69301439	
5,425.00	43.68	189.27	4,921.49	-1,460.91	-255.36	14,443,449.43	1,726,663.54	39.77087550	-80.69305519	
5,520.00	44.98	188.14	4,989.45	-1,526.53	-265.40	14,443,383.81	1,726,653.50	39.77069540	-80.69309172	
5,613.00	42.45	188.71	5,056.66	-1,590.10	-274.81	14,443,320.24	1,726,644.09	39.77052090	-80.69312598	
5,706.00	39.67	190.54	5,126.78	-1,650.32	-285.00	14,443,260.02	1,726,633.91	39.77035561	-80.69316296	
5,822.00	36.92	190.13	5,217.81	-1,721.03	-297.90	14,443,189.31	1,726,621.01	39.77016154	-80.69320974	
5,916.00	38.06	190.96	5,292.40	-1,777.27	-308.37	14,443,133.07	1,726,610.53	39.77000719	-80.69324771	
6,010.00	38.92	197.37	5,366.00	-1,833.92	-322.70	14,443,076.42	1,726,596.20	39.76985175	-80.69329939	
6,057.00	38.99	204.68	5,402.57	-1,861.46	-333.29	14,443,048.88	1,726,585.61	39.76977621	-80.69333741	
6,104.00	37.96	211.13	5,439.38	-1,887.28	-346.94	14,443,023.06	1,726,571.96	39.76970543	-80.69338631	
6,151.00	37.49	218.95	5,476.58	-1,910.79	-363.42	14,442,999.55	1,726,555.49	39.76964102	-80.69344522	
6,198.00	36.80	226.64	5,514.06	-1,931.59	-382.65	14,442,978.75	1,726,536.25	39.76958408	-80.69351394	
6,245.00	32.73	228.31	5,552.67	-1,949.72	-402.39	14,442,960.62	1,726,516.52	39.76953449	-80.69358438	
6,292.00	29.37	226.74	5,592.93	-1,966.07	-420.27	14,442,944.27	1,726,498.63	39.76948975	-80.69364823	
6,339.00	27.64	233.74	5,634.24	-1,980.42	-437.46	14,442,929.92	1,726,481.44	39.76945050	-80.69370958	
6,387.00	26.83	238.85	5,676.92	-1,992.61	-455.71	14,442,917.73	1,726,463.19	39.76941719	-80.69377468	
6,434.00	27.49	246.51	5,718.75	-2,002.42	-474.75	14,442,907.91	1,726,444.16	39.76939042	-80.69384253	
6,481.00	29.17	254.89	5,760.14	-2,009.74	-495.76	14,442,900.60	1,726,423.14	39.76937053	-80.69391742	
6,528.00	30.96	262.98	5,800.83	-2,014.20	-518.83	14,442,896.14	1,726,400.07	39.76935849	-80.69399957	
6,576.00	32.42	271.54	5,841.69	-2,015.37	-543.96	14,442,894.97	1,726,374.94	39.76935552	-80.69408901	
6,623.00	33.48	279.75	5,881.15	-2,012.83	-569.34	14,442,897.51	1,726,349.56	39.76936273	-80.69417932	
6,670.00	35.04	285.57	5,920.01	-2,007.01	-595.13	14,442,903.33	1,726,323.78	39.76937895	-80.69427100	
6,717.00	36.96	290.03	5,958.04	-1,998.55	-621.41	14,442,911.79	1,726,297.50	39.76940244	-80.69436442	
6,764.00	38.63	294.09	5,995.18	-1,987.72	-648.08	14,442,922.62	1,726,270.82	39.76943243	-80.69445922	
6,811.00	41.52	298.01	6,031.15	-1,974.41	-675.24	14,442,935.93	1,726,243.67	39.76946923	-80.69455570	
6,859.00	44.29	301.47	6,066.31	-1,958.18	-703.59	14,442,952.16	1,726,215.32	39.76951406	-80.69465639	
6,906.00	47.79	304.67	6,098.93	-1,939.71	-731.91	14,442,970.63	1,726,186.99	39.76956507	-80.69475697	
6,954.00	51.87	306.23	6,129.89	-1,918.43	-761.77	14,442,991.91	1,726,157.13	39.76962378	-80.69486298	
7,001.00	55.69	309.47	6,157.66	-1,895.15	-791.68	14,443,015.19	1,726,127.22	39.76968799	-80.69496915	
7,049.00	59.43	310.07	6,183.41	-1,869.24	-822.81	14,443,041.10	1,726,096.09	39.76975944	-80.69507962	

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern N-01 HM (slot G)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=748+33 @ 781.00usft (Nabors X08)
<b>Site:</b>	Keith Stern	<b>MD Reference:</b>	RKB=748+33 @ 781.00usft (Nabors X08)
<b>Well:</b>	Keith Stern N-01 HM (slot G)	<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_Feb2822

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
7,096.00	63.64	312.30	6,205.80	-1,842.03	-853.89	14,443,068.31	1,726,065.02	39.76983446	-80.69518988	
7,143.00	68.33	314.29	6,224.93	-1,812.59	-885.11	14,443,097.75	1,726,033.79	39.76991561	-80.69530065	
7,190.00	71.77	316.68	6,240.96	-1,781.08	-916.07	14,443,129.26	1,726,002.83	39.77000241	-80.69541045	
7,237.00	74.66	318.20	6,254.54	-1,747.94	-946.50	14,443,162.40	1,725,972.40	39.77009371	-80.69551833	
7,284.00	76.78	320.54	6,266.13	-1,713.38	-976.15	14,443,196.96	1,725,942.75	39.77018891	-80.69562344	
7,332.00	77.03	322.02	6,277.01	-1,676.90	-1,005.40	14,443,233.44	1,725,913.51	39.77028936	-80.69572707	
7,379.00	79.42	324.71	6,286.60	-1,639.98	-1,032.84	14,443,270.36	1,725,886.06	39.77039100	-80.69582430	
7,425.00	83.31	327.89	6,293.50	-1,602.16	-1,058.06	14,443,308.18	1,725,860.84	39.77049512	-80.69591360	
7,472.00	87.18	327.76	6,297.40	-1,562.52	-1,083.00	14,443,347.82	1,725,835.90	39.77060421	-80.69600187	
7,519.00	89.49	327.43	6,298.77	-1,522.86	-1,108.18	14,443,387.48	1,725,810.73	39.77071336	-80.69609098	
7,613.00	90.54	327.22	6,298.74	-1,443.73	-1,158.92	14,443,466.61	1,725,759.98	39.77093113	-80.69627063	
7,708.00	91.66	328.84	6,296.92	-1,363.16	-1,209.21	14,443,547.18	1,725,709.69	39.77115287	-80.69644863	
7,803.00	91.76	328.66	6,294.08	-1,281.98	-1,258.47	14,443,628.36	1,725,660.43	39.77137627	-80.69662297	
7,897.00	91.22	328.48	6,291.64	-1,201.80	-1,307.47	14,443,708.54	1,725,611.43	39.77159692	-80.69679639	
7,992.00	91.78	329.35	6,289.15	-1,120.47	-1,356.50	14,443,789.87	1,725,562.40	39.77182073	-80.69696991	
8,086.00	91.48	328.84	6,286.48	-1,039.85	-1,404.76	14,443,870.49	1,725,514.14	39.77204259	-80.69714069	
8,181.00	91.29	329.35	6,284.18	-958.36	-1,453.54	14,443,951.98	1,725,465.36	39.77226683	-80.69731331	
8,275.00	91.09	329.59	6,282.23	-877.41	-1,501.28	14,444,032.93	1,725,417.62	39.77248958	-80.69748224	
8,369.00	90.57	330.16	6,280.87	-796.12	-1,548.46	14,444,114.22	1,725,370.45	39.77271327	-80.69764915	
8,463.00	90.36	330.72	6,280.10	-714.36	-1,594.83	14,444,195.98	1,725,324.07	39.77293824	-80.69781320	
8,557.00	90.29	330.22	6,279.57	-632.57	-1,641.16	14,444,277.77	1,725,277.75	39.77316328	-80.69797711	
8,650.00	89.91	330.62	6,279.41	-551.69	-1,687.07	14,444,358.65	1,725,231.84	39.77338582	-80.69813952	
8,744.00	90.62	330.84	6,278.97	-469.69	-1,733.02	14,444,440.65	1,725,185.88	39.77361143	-80.69830211	
8,838.00	90.15	330.86	6,278.34	-387.60	-1,778.81	14,444,522.74	1,725,140.09	39.77383730	-80.69846407	
8,932.00	89.34	330.85	6,278.76	-305.50	-1,824.59	14,444,604.84	1,725,094.31	39.77406319	-80.69862602	
9,027.00	89.41	330.39	6,279.80	-222.73	-1,871.19	14,444,687.61	1,725,047.71	39.77429094	-80.69879089	
9,122.00	90.47	328.86	6,279.90	-140.77	-1,919.23	14,444,769.57	1,724,999.67	39.77451646	-80.69896087	
9,216.00	90.59	327.44	6,279.03	-60.93	-1,968.83	14,444,849.41	1,724,950.07	39.77473618	-80.69913645	
9,311.00	90.64	331.62	6,278.01	20.93	-2,016.99	14,444,931.27	1,724,901.91	39.77496143	-80.69930687	
9,405.00	90.45	331.69	6,277.11	103.65	-2,061.62	14,445,013.99	1,724,857.29	39.77518903	-80.69946472	
9,499.00	90.02	329.96	6,276.73	185.73	-2,107.44	14,445,096.07	1,724,811.47	39.77541484	-80.69962682	
9,592.00	90.83	331.38	6,276.04	266.80	-2,152.99	14,445,177.14	1,724,765.91	39.77563791	-80.69978798	
9,686.00	90.53	331.27	6,274.92	349.26	-2,198.09	14,445,259.60	1,724,720.81	39.77586479	-80.69994751	
9,780.00	90.24	331.39	6,274.29	431.74	-2,243.19	14,445,342.08	1,724,675.72	39.77609170	-80.70010704	
9,873.00	89.72	330.90	6,274.32	513.19	-2,288.07	14,445,423.53	1,724,630.83	39.77631580	-80.70026580	
9,967.00	89.14	329.39	6,275.26	594.71	-2,334.86	14,445,505.05	1,724,584.04	39.77654011	-80.70043136	
10,055.00	89.19	330.39	6,276.54	670.83	-2,379.00	14,445,581.17	1,724,539.90	39.77674955	-80.70058756	
10,150.00	90.99	330.56	6,276.39	753.49	-2,425.81	14,445,663.83	1,724,493.09	39.77697698	-80.70075320	
10,244.00	90.73	329.95	6,274.98	835.09	-2,472.45	14,445,745.43	1,724,446.46	39.77720152	-80.70091820	
10,338.00	91.08	331.18	6,273.50	916.94	-2,518.63	14,445,827.28	1,724,400.27	39.77742673	-80.70108162	
10,433.00	92.70	331.79	6,270.36	1,000.37	-2,563.96	14,445,910.71	1,724,354.94	39.77765626	-80.70124195	
10,526.00	92.84	331.62	6,265.87	1,082.16	-2,607.99	14,445,992.50	1,724,310.91	39.77788129	-80.70139770	
10,620.00	90.46	331.97	6,263.16	1,164.96	-2,652.40	14,446,075.30	1,724,266.51	39.77810908	-80.70155477	
10,714.00	90.42	331.97	6,262.44	1,247.93	-2,696.57	14,446,158.27	1,724,222.33	39.77833735	-80.70171100	
10,809.00	90.33	332.06	6,261.82	1,331.82	-2,741.15	14,446,242.16	1,724,177.76	39.77856814	-80.70186867	
10,903.00	90.07	332.67	6,261.49	1,415.10	-2,784.75	14,446,325.44	1,724,134.16	39.77879723	-80.70202287	
10,997.00	90.15	331.35	6,261.31	1,498.10	-2,828.86	14,446,408.44	1,724,090.04	39.77902558	-80.70217890	
11,091.00	90.37	330.56	6,260.88	1,580.28	-2,874.50	14,446,490.62	1,724,044.41	39.77925168	-80.70234036	
11,186.00	90.02	330.12	6,260.56	1,662.83	-2,921.51	14,446,573.17	1,723,997.40	39.77947882	-80.70250671	
11,280.00	89.80	330.74	6,260.71	1,744.59	-2,967.89	14,446,654.93	1,723,951.01	39.77970377	-80.70267085	
11,373.00	89.67	330.74	6,261.14	1,825.72	-3,013.35	14,446,736.06	1,723,905.55	39.77992699	-80.70283168	
11,468.00	88.84	331.00	6,262.37	1,908.70	-3,059.59	14,446,819.04	1,723,859.31	39.78015529	-80.70299529	
11,562.00	89.71	329.42	6,263.56	1,990.27	-3,106.29	14,446,900.80	1,723,812.62	39.78037972	-80.70316053	
11,656.00	89.36	329.33	6,264.32	2,071.15	-3,154.17	14,446,981.49	1,723,764.73	39.78060229	-80.70333001	
11,750.00	90.90	332.23	6,264.11	2,153.18	-3,200.05	14,447,063.52	1,723,718.85	39.78082798	-80.70349235	

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern N-01 HM (slot G)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=748+33 @ 781.00usft (Nabors X08)
<b>Site:</b>	Keith Stern	<b>MD Reference:</b>	RKB=748+33 @ 781.00usft (Nabors X08)
<b>Well:</b>	Keith Stern N-01 HM (slot G)	<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_Feb2822

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
11,844.00	90.20	329.86	6,263.21	2,235.42	-3,245.55	14,447,145.76	1,723,673.35	39.78105424	-80.70365334
11,939.00	89.49	329.68	6,263.47	2,317.50	-3,293.38	14,447,227.84	1,723,625.52	39.78128009	-80.70382262
12,034.00	90.24	329.25	6,263.69	2,399.32	-3,341.65	14,447,309.66	1,723,577.25	39.78150524	-80.70399345
12,128.00	92.09	328.45	6,261.78	2,479.75	-3,390.26	14,447,390.09	1,723,528.64	39.78172655	-80.70416554
12,223.00	91.69	328.89	6,258.65	2,560.85	-3,439.63	14,447,471.19	1,723,479.27	39.78194973	-80.70434031
12,316.00	90.90	328.45	6,256.54	2,640.27	-3,487.97	14,447,550.61	1,723,430.93	39.78216827	-80.70451146
12,411.00	90.15	327.66	6,255.67	2,720.88	-3,538.24	14,447,631.22	1,723,380.67	39.78239010	-80.70468942
12,505.00	89.67	328.72	6,255.82	2,800.76	-3,587.78	14,447,711.10	1,723,331.12	39.78260992	-80.70486484
12,599.00	90.95	329.51	6,255.31	2,881.43	-3,636.03	14,447,791.77	1,723,282.87	39.78283189	-80.70503564
12,692.00	91.12	329.77	6,253.63	2,961.66	-3,683.03	14,447,872.00	1,723,235.87	39.78305265	-80.70520198
12,787.00	90.29	329.68	6,252.46	3,043.70	-3,730.92	14,447,954.04	1,723,187.98	39.78327838	-80.70537149
12,881.00	90.42	329.51	6,251.88	3,124.77	-3,778.49	14,448,035.11	1,723,140.41	39.78350145	-80.70553987
12,975.00	89.63	329.95	6,251.84	3,205.95	-3,825.88	14,448,116.29	1,723,093.03	39.78372483	-80.70570758
13,068.00	89.58	330.74	6,252.48	3,286.77	-3,871.89	14,448,197.11	1,723,047.01	39.78394719	-80.70587042
13,162.00	89.41	331.18	6,253.31	3,368.94	-3,917.52	14,448,279.28	1,723,001.39	39.78417328	-80.70603188
13,257.00	88.84	330.92	6,254.76	3,452.06	-3,963.50	14,448,362.40	1,722,955.41	39.78440196	-80.70619457
13,351.00	89.27	331.53	6,256.31	3,534.44	-4,008.74	14,448,444.78	1,722,910.17	39.78462861	-80.70635465
13,445.00	89.71	331.35	6,257.15	3,617.00	-4,053.68	14,448,527.34	1,722,865.23	39.78485574	-80.70651364
13,539.00	89.45	332.32	6,257.84	3,699.87	-4,098.04	14,448,610.21	1,722,820.86	39.78508371	-80.70667061
13,633.00	88.70	331.44	6,259.35	3,782.76	-4,142.34	14,448,693.10	1,722,776.56	39.78531176	-80.70682732
13,665.00	89.19	331.62	6,259.94	3,810.89	-4,157.59	14,448,721.23	1,722,761.31	39.78538913	-80.70688129
<b>Survey @ 13665.00 MD 6259.94 TVD</b>									
13,722.00	89.19	331.62	6,260.75	3,861.03	-4,184.68	14,448,771.37	1,722,734.22	39.78552709	-80.70697713
<b>Survey Proj. to 13722.00 MD 6260.75 TVD</b>									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
193.00	193.00	0.60	-0.91	MWD surveys
13,665.00	6,259.94	3,810.89	-4,157.59	Survey @ 13665.00 MD 6259.94 TVD
13,722.00	6,260.75	3,861.03	-4,184.68	Survey Proj. to 13722.00 MD 6260.75 TVD

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