



Well: Keith Stern N-05 HM (slot R)  
 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: 14444901.09    Easting: 1726937.75    Latitude: 39.77485957    Longitude: -80.69206155

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: 51642.8nT  
 Dip Angle: 66.43°  
 Date: 6/4/2022  
 Model: IGRF2020

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	V Sect	Annotation
169.00	0.42	287.420	169.00	0.19	-0.59	0.34	MWD surveys
12908.00	88.62	326.960	6266.74	4899.21	-1341.27	5079.49	Survey @ 12908.00 MD 6266.74 TVD
12955.00	88.62	326.960	6267.87	4938.60	-1366.88	5124.26	Survey Proj. to 12955.00 MD 6267.87 TVD

SECTION DETAILS

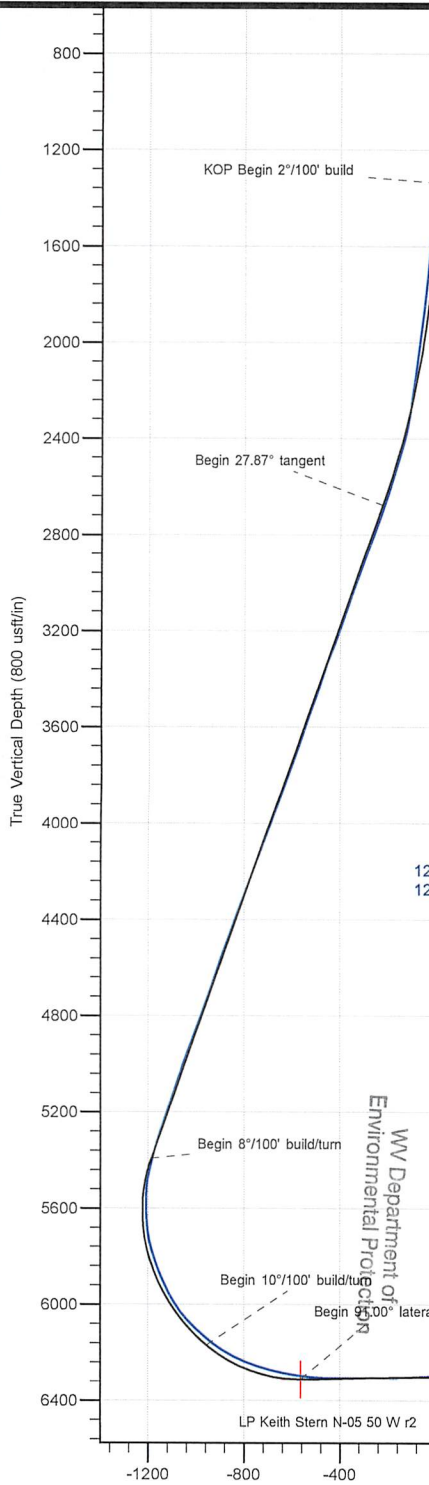
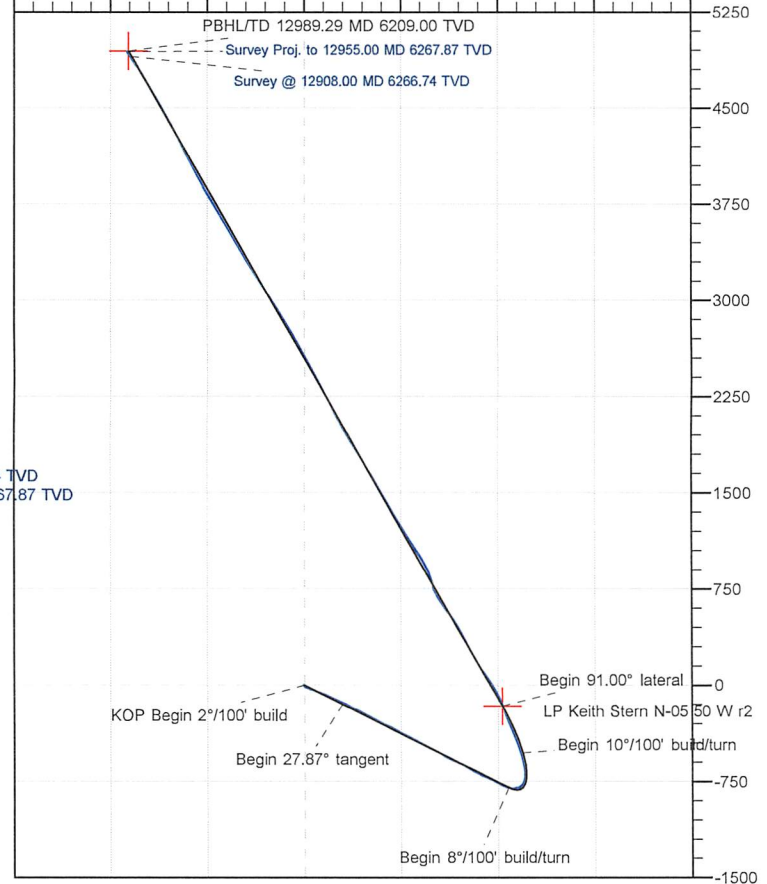
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	V Sect	Annotation
1	0.00	0.00	0.000	0.00	0.00	0.00	0.000	0.00	0.00	
2	1337.00	0.00	0.000	1337.00	0.00	0.00	0.000	0.00	0.00	KOP Begin 2°/100' build
3	2730.70	27.87	116.734	2676.37	-149.52	296.85	2.000	116.73	-222.82	Begin 27.87° tangent
4	5804.17	27.87	116.734	5393.25	-795.92	1580.18	0.000	0.00	-1186.11	Begin 8°/100' build/turn
5	6688.45	50.00	345.002	6169.51	-526.64	1691.69	8.000	-142.73	-955.99	Begin 10°/100' build/turn
6	7119.40	91.00	330.461	6311.00	-162.43	1535.31	10.000	-21.56	-563.36	Begin 91.00° lateral
7	12989.29	91.00	330.461	6209.00	4943.71	-1358.23	0.000	0.00	5126.89	PBHL/TD 12989.29 MD 6209.00 TVD

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
BHL Keith Stern N-05 r2	6209.00	4943.71	-1358.23	14444984.80	1725579.53	39.78844900	-80.69683600
- plan hits target center							
LP Keith Stern N-05 50 W r2	6311.00	-162.44	1535.30	14444738.65	1728473.05	39.77439883	-80.68659934
- plan misses target center by 0.02usft at 7119.39usft MD (6311.00 TVD, -162.43 N, 1535.32 E)							

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

-2250    -1500    -750    0    750    1500    2250    3000



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Vertical Section at 344.638° (800 usft/in)



Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern N-05 HM (slot R)
<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-05 HM (slot R)	<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-05 HM (slot R)					
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b>	14,444,901.10 usft	<b>Latitude:</b>	39.77485957
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b>	1,726,937.75 usft	<b>Longitude:</b>	-80.69206155
<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	6/4/2022	-8.67	66.43	51,642.79321022

<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	344.638	

<b>Survey Program</b>	<b>Date</b>	6/21/2022			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
169.00	553.00	MWD surf (Original Hole)	MWD	MWD - Standard	<b>RECEIVED</b> Office of Oil and Gas  <b>MAY 03 2023</b>
616.00	2,213.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,304.00	12,908.00	MWD (Original Hole)	MWD	MWD - Standard	
12,955.00	12,955.00	Projection (Original Hole)	MWD	MWD - Standard	

<b>Survey</b>	WV Department of Environmental Protection									
<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	0.000	0.00	0.00	0.00	14,444,901.10	1,726,937.75	39.77485957	-80.69206155	
169.00	0.42	287.420	169.00	0.19	-0.59	14,444,901.28	1,726,937.16	39.77486009	-80.69206365	
<b>MWD surveys</b>										
199.00	0.49	311.110	199.00	0.30	-0.79	14,444,901.40	1,726,936.96	39.77486041	-80.69206437	
229.00	0.48	285.500	229.00	0.42	-1.01	14,444,901.52	1,726,936.74	39.77486074	-80.69206514	
259.00	0.34	311.340	259.00	0.51	-1.20	14,444,901.61	1,726,936.55	39.77486099	-80.69206581	
289.00	0.44	294.040	289.00	0.62	-1.37	14,444,901.72	1,726,936.38	39.77486128	-80.69206642	
319.00	0.46	305.590	318.99	0.74	-1.57	14,444,901.83	1,726,936.18	39.77486161	-80.69206714	
349.00	0.46	302.510	348.99	0.87	-1.77	14,444,901.97	1,726,935.98	39.77486198	-80.69206785	

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern N-05 HM (slot R)
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<b>Site:</b>	Keith Stern	<b>MD Reference:</b>	RKB=748+33 @ 781.00usft (Nabors X08)
<b>Well:</b>	Keith Stern N-05 HM (slot R)	<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	
380.00	0.48	317.570	379.99	1.03	-1.97	14,444,902.13	1,726,935.79	39.77486243	-80.69206853	
410.00	0.52	313.420	409.99	1.22	-2.15	14,444,902.32	1,726,935.60	39.77486294	-80.69206918	
440.00	0.52	315.930	439.99	1.41	-2.34	14,444,902.51	1,726,935.41	39.77486347	-80.69206987	
470.00	1.30	305.990	469.99	1.71	-2.71	14,444,902.81	1,726,935.04	39.77486429	-80.69207118	
500.00	1.24	304.020	499.98	2.09	-3.26	14,444,903.19	1,726,934.49	39.77486534	-80.69207312	
530.00	0.95	304.380	529.97	2.41	-3.73	14,444,903.51	1,726,934.02	39.77486623	-80.69207480	
553.00	0.87	314.380	552.97	2.64	-4.01	14,444,903.74	1,726,933.74	39.77486687	-80.69207580	
616.00	0.20	336.390	615.97	3.08	-4.40	14,444,904.17	1,726,933.35	39.77486806	-80.69207717	
707.00	0.09	262.990	706.97	3.21	-4.53	14,444,904.31	1,726,933.22	39.77486844	-80.69207765	
801.00	1.05	123.200	800.96	2.73	-3.89	14,444,903.83	1,726,933.87	39.77486712	-80.69207535	
895.00	2.20	116.710	894.92	1.45	-1.55	14,444,902.55	1,726,936.20	39.77486357	-80.69206706	
989.00	1.32	145.890	988.88	-0.26	0.66	14,444,900.84	1,726,938.42	39.77485886	-80.69205919	
1,083.00	1.36	159.010	1,082.85	-2.19	1.67	14,444,898.90	1,726,939.42	39.77485353	-80.69205563	
1,178.00	0.79	165.000	1,177.84	-3.88	2.24	14,444,897.22	1,726,940.00	39.77484890	-80.69205361	
1,272.00	0.46	162.170	1,271.83	-4.86	2.53	14,444,896.23	1,726,940.28	39.77484619	-80.69205261	
1,365.00	1.78	132.060	1,364.81	-6.19	3.71	14,444,894.91	1,726,941.47	39.77484254	-80.69204840	
1,459.00	4.46	125.150	1,458.66	-9.27	7.79	14,444,891.83	1,726,945.54	39.77483404	-80.69203395	
1,554.00	6.61	119.830	1,553.22	-14.12	15.55	14,444,886.98	1,726,953.30	39.77482065	-80.69200637	
1,648.00	8.46	112.170	1,646.40	-19.42	26.65	14,444,881.68	1,726,964.40	39.77480599	-80.69196694	
1,743.00	10.02	112.100	1,740.17	-25.17	40.78	14,444,875.93	1,726,978.53	39.77479008	-80.69191672	
1,837.00	11.44	110.290	1,832.52	-31.47	57.10	14,444,869.62	1,726,994.85	39.77477259	-80.69185871	
1,930.00	11.56	111.080	1,923.65	-38.02	74.45	14,444,863.07	1,727,012.20	39.77475444	-80.69179705	
2,024.00	11.79	113.630	2,015.71	-45.26	92.03	14,444,855.84	1,727,029.78	39.77473440	-80.69173455	
2,119.00	12.74	112.870	2,108.54	-53.22	110.58	14,444,847.87	1,727,048.33	39.77471236	-80.69166865	
2,213.00	14.21	112.990	2,199.95	-61.76	130.75	14,444,839.34	1,727,068.50	39.77468873	-80.69159696	
2,304.00	14.56	108.150	2,288.10	-69.68	151.90	14,444,831.41	1,727,089.65	39.77466677	-80.69152178	
2,398.00	19.99	116.270	2,377.84	-80.49	177.56	14,444,820.61	1,727,115.31	39.77463686	-80.69143059	
2,492.00	24.35	117.230	2,464.87	-96.47	209.21	14,444,804.63	1,727,146.97	39.77459266	-80.69131813	
2,586.00	26.15	114.270	2,549.89	-113.85	245.33	14,444,787.24	1,727,183.08	39.77454458	-80.69118979	
2,681.00	26.50	113.170	2,635.04	-130.80	283.90	14,444,770.30	1,727,221.65	39.77449768	-80.69105273	
2,775.00	27.09	118.920	2,718.96	-149.40	321.92	14,444,751.69	1,727,259.67	39.77444622	-80.69091764	
2,869.00	27.82	119.230	2,802.37	-170.47	359.80	14,444,730.63	1,727,297.55	39.77438802	-80.69078310	
2,964.00	28.19	117.150	2,886.25	-191.53	399.11	14,444,709.57	1,727,336.86	39.77432980	-80.69064344	
3,058.00	28.74	118.640	2,968.88	-212.49	438.70	14,444,688.60	1,727,376.45	39.77427185	-80.69050279	
3,153.00	27.67	114.840	3,052.61	-232.71	478.77	14,444,668.39	1,727,416.52	39.77421596	-80.69036044	
3,247.00	27.63	118.250	3,135.88	-252.20	517.78	14,444,648.90	1,727,455.53	39.77416207	-80.69022184	
3,342.00	28.58	117.430	3,219.68	-273.09	557.35	14,444,628.01	1,727,495.11	39.77410431	-80.69008125	
3,436.00	28.45	118.560	3,302.28	-294.15	596.98	14,444,606.94	1,727,534.73	39.77404609	-80.68994050	
3,531.00	27.02	114.400	3,386.37	-313.89	636.51	14,444,587.21	1,727,574.26	39.77399152	-80.68980004	
3,625.00	27.94	116.860	3,469.76	-332.66	675.60	14,444,568.44	1,727,613.35	39.77393959	-80.68966114	
3,719.00	27.82	118.060	3,552.85	-352.93	714.60	14,444,548.17	1,727,652.36	39.77388356	-80.68952258	
3,818.00	27.67	116.610	3,640.47	-374.09	755.54	14,444,527.01	1,727,693.29	39.77382505	-80.68937714	
3,912.00	26.78	117.580	3,724.06	-393.67	793.83	14,444,507.42	1,727,731.58	39.77377091	-80.68924113	
4,006.00	27.78	117.890	3,807.60	-413.72	831.96	14,444,487.37	1,727,769.71	39.77371548	-80.68910566	
4,100.00	28.09	118.470	3,890.65	-434.52	870.78	14,444,466.58	1,727,808.53	39.77365800	-80.68896977	
4,195.00	27.76	117.340	3,974.59	-455.34	910.09	14,444,445.75	1,727,847.84	39.77360044	-80.68882811	
4,289.00	27.80	119.330	4,057.76	-476.14	948.65	14,444,424.96	1,727,886.40	39.77354297	-80.68869114	
4,383.00	27.29	118.060	4,141.10	-497.01	986.77	14,444,404.09	1,727,924.53	39.77348528	-80.68855571	
4,476.00	28.20	116.440	4,223.41	-516.82	1,025.26	14,444,384.27	1,727,963.02	39.77343050	-80.68841897	
4,571.00	28.71	118.640	4,306.93	-537.76	1,065.39	14,444,363.34	1,728,003.14	39.77337263	-80.68827642	
4,666.00	28.96	118.220	4,390.16	-559.57	1,105.68	14,444,341.53	1,728,043.43	39.77331235	-80.68813329	
4,760.00	28.61	115.610	4,472.54	-580.06	1,146.03	14,444,321.04	1,728,083.78	39.77325569	-80.68798994	
4,854.00	28.20	116.770	4,555.23	-599.79	1,186.16	14,444,301.31	1,728,123.91	39.77320112	-80.68784738	
4,948.00	25.91	114.720	4,638.94	-618.38	1,224.65	14,444,282.71	1,728,162.40	39.77314968	-80.68771063	
5,043.00	27.38	119.340	4,723.85	-637.77	1,262.55	14,444,263.33	1,728,200.30	39.77309608	-80.68757597	

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<b>Well:</b>	Keith Stern N-05 HM (slot R)	<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	
5,140.00	28.29	120.300	4,809.63	-660.30	1,301.84	14,444,240.80	1,728,239.59	39.77303384	-80.68743642	
5,235.00	28.35	117.990	4,893.26	-682.24	1,341.19	14,444,218.86	1,728,278.95	39.77297320	-80.68729663	
5,330.00	29.02	115.750	4,976.61	-702.84	1,381.87	14,444,198.26	1,728,319.62	39.77291624	-80.68715213	
5,424.00	27.60	112.230	5,059.37	-720.99	1,422.57	14,444,180.11	1,728,360.32	39.77286602	-80.68700751	
5,519.00	27.56	118.490	5,143.59	-739.80	1,462.26	14,444,161.30	1,728,400.01	39.77281397	-80.68686647	
5,644.00	25.35	120.500	5,255.50	-767.18	1,510.74	14,444,133.92	1,728,448.49	39.77273831	-80.68669428	
5,691.00	25.26	117.690	5,297.99	-776.94	1,528.29	14,444,124.15	1,728,466.04	39.77271132	-80.68663194	
5,738.00	26.41	112.150	5,340.29	-785.55	1,546.85	14,444,115.55	1,728,484.61	39.77268752	-80.68656598	
5,785.00	27.90	109.070	5,382.12	-793.08	1,566.93	14,444,108.02	1,728,504.68	39.77266664	-80.68649463	
5,832.00	24.74	106.440	5,424.24	-799.46	1,586.76	14,444,101.64	1,728,524.51	39.77264893	-80.68642413	
5,879.00	21.62	99.410	5,467.45	-803.66	1,604.74	14,444,097.44	1,728,542.50	39.77263722	-80.68636018	
5,927.00	20.08	87.720	5,512.32	-804.78	1,621.71	14,444,096.32	1,728,559.46	39.77263398	-80.68629981	
5,974.00	18.89	76.380	5,556.65	-802.66	1,637.17	14,444,098.43	1,728,574.92	39.77263964	-80.68624476	
6,021.00	17.92	69.000	5,601.25	-798.28	1,651.32	14,444,102.82	1,728,589.07	39.77265154	-80.68619435	
6,068.00	18.85	64.870	5,645.85	-792.47	1,664.94	14,444,108.63	1,728,602.70	39.77266738	-80.68614579	
6,115.00	17.31	53.880	5,690.54	-785.12	1,677.47	14,444,115.98	1,728,615.22	39.77268744	-80.68610112	
6,162.00	18.23	36.390	5,735.33	-775.07	1,687.49	14,444,126.03	1,728,625.24	39.77271494	-80.68606534	
6,209.00	20.43	23.380	5,779.70	-761.61	1,695.11	14,444,139.48	1,728,632.86	39.77275182	-80.68603805	
6,256.00	22.10	15.820	5,823.51	-745.57	1,700.78	14,444,155.52	1,728,638.53	39.77279581	-80.68601768	
6,303.00	24.65	12.930	5,866.65	-727.51	1,705.38	14,444,173.59	1,728,643.13	39.77284538	-80.68600107	
6,350.00	26.32	6.770	5,909.08	-707.61	1,708.80	14,444,193.49	1,728,646.55	39.77290001	-80.68598864	
6,398.00	28.52	0.530	5,951.69	-685.57	1,710.16	14,444,215.52	1,728,647.92	39.77296050	-80.68598352	
6,445.00	32.25	355.170	5,992.24	-661.85	1,709.21	14,444,239.25	1,728,646.96	39.77302567	-80.68598662	
6,492.00	38.14	351.040	6,030.63	-634.99	1,705.89	14,444,266.11	1,728,643.64	39.77309947	-80.68599810	
6,539.00	43.19	347.260	6,066.28	-604.94	1,700.08	14,444,296.16	1,728,637.83	39.77318204	-80.68601841	
6,587.00	46.66	344.710	6,100.26	-572.07	1,691.85	14,444,329.03	1,728,629.60	39.77327240	-80.68604728	
6,634.00	49.03	343.040	6,131.81	-538.60	1,682.17	14,444,362.50	1,728,619.92	39.77336439	-80.68608133	
6,681.00	52.91	341.280	6,161.40	-503.86	1,670.97	14,444,397.24	1,728,608.72	39.77345991	-80.68612075	
6,728.00	57.56	340.400	6,188.19	-467.40	1,658.29	14,444,433.69	1,728,596.04	39.77356015	-80.68616541	
6,742.00	58.71	340.050	6,195.58	-456.21	1,654.27	14,444,444.88	1,728,592.02	39.77359092	-80.68617959	
6,789.00	63.01	339.080	6,218.46	-417.76	1,639.93	14,444,483.34	1,728,577.69	39.77369667	-80.68623013	
6,837.00	68.20	337.590	6,238.28	-377.15	1,623.79	14,444,523.95	1,728,561.54	39.77380834	-80.68628708	
6,884.00	72.29	337.330	6,254.17	-336.31	1,606.84	14,444,564.79	1,728,544.59	39.77392067	-80.68634691	
6,932.00	76.11	337.410	6,267.23	-293.68	1,589.07	14,444,607.41	1,728,526.82	39.77403790	-80.68640961	
6,979.00	77.56	338.910	6,277.94	-251.20	1,572.05	14,444,649.89	1,728,509.80	39.77415472	-80.68646967	
7,027.00	78.96	340.490	6,287.70	-207.13	1,555.74	14,444,693.97	1,728,493.50	39.77427592	-80.68652714	
7,074.00	82.04	338.910	6,295.46	-163.66	1,539.66	14,444,737.44	1,728,477.41	39.77439545	-80.68658383	
7,121.00	85.56	336.180	6,300.54	-120.49	1,521.82	14,444,780.61	1,728,459.57	39.77451417	-80.68664681	
7,168.00	87.58	332.840	6,303.35	-78.15	1,501.63	14,444,822.95	1,728,439.38	39.77463065	-80.68671813	
7,216.00	89.51	328.890	6,304.57	-36.25	1,478.27	14,444,864.85	1,728,416.02	39.77474594	-80.68680074	
7,310.00	89.69	326.960	6,305.22	43.40	1,428.36	14,444,944.49	1,728,366.11	39.77496515	-80.68697739	
7,403.00	91.01	326.430	6,304.66	121.12	1,377.29	14,445,022.22	1,728,315.05	39.77517909	-80.68715817	
7,497.00	90.40	330.920	6,303.50	201.39	1,328.44	14,445,102.49	1,728,266.19	39.77540000	-80.68733104	
7,592.00	92.15	332.320	6,301.39	284.95	1,283.30	14,445,186.04	1,728,221.05	39.77562990	-80.68749067	
7,687.00	93.78	331.710	6,296.47	368.72	1,238.78	14,445,269.82	1,728,176.54	39.77586040	-80.68764806	
7,781.00	92.29	331.000	6,291.50	451.10	1,193.79	14,445,352.20	1,728,131.54	39.77608706	-80.68780719	
7,876.00	90.75	325.110	6,288.97	531.64	1,143.56	14,445,432.74	1,728,081.31	39.77630874	-80.68798495	
7,970.00	90.22	324.060	6,288.18	608.25	1,089.09	14,445,509.35	1,728,026.84	39.77651963	-80.68817787	
8,065.00	88.86	331.790	6,288.94	688.68	1,038.68	14,445,589.78	1,727,976.44	39.77674100	-80.68835628	
8,096.00	88.24	334.250	6,289.73	716.30	1,024.63	14,445,617.39	1,727,962.38	39.77681697	-80.68840597	
8,131.00	87.34	338.650	6,291.08	748.35	1,010.65	14,445,649.45	1,727,948.41	39.77690513	-80.68845530	
8,187.00	86.20	343.310	6,294.23	801.19	992.44	14,445,702.29	1,727,930.19	39.77705042	-80.68851948	
8,234.00	89.36	341.900	6,296.05	846.00	978.40	14,445,747.10	1,727,916.15	39.77717362	-80.68856889	
8,282.00	91.34	337.770	6,295.76	891.05	961.86	14,445,792.14	1,727,899.61	39.77729748	-80.68862721	
8,329.00	92.44	334.520	6,294.21	934.00	942.86	14,445,835.10	1,727,880.61	39.77741563	-80.68869429	

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern N-05 HM (slot R)
<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-05 HM (slot R)	<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	
8,376.00	92.88	329.160	6,292.03	975.38	920.71	14,445,876.48	1,727,858.47	39.77752947	-80.68877260	
8,423.00	92.75	326.080	6,289.72	1,015.02	895.58	14,445,916.11	1,727,833.33	39.77763857	-80.68886158	
8,470.00	92.84	325.550	6,287.43	1,053.85	869.20	14,445,954.95	1,727,806.95	39.77774547	-80.68895498	
8,564.00	93.45	327.930	6,282.27	1,132.33	817.73	14,446,033.43	1,727,755.48	39.77796148	-80.68913721	
8,657.00	93.58	328.280	6,276.57	1,211.14	768.68	14,446,112.24	1,727,706.44	39.77817838	-80.68931080	
8,751.00	91.25	328.280	6,272.61	1,291.02	719.31	14,446,192.12	1,727,657.06	39.77839823	-80.68948555	
8,845.00	89.01	329.600	6,272.39	1,371.54	670.82	14,446,272.63	1,727,608.57	39.77861981	-80.68965716	
8,939.00	88.92	330.480	6,274.09	1,452.96	623.88	14,446,354.06	1,727,561.63	39.77884387	-80.68982321	
9,034.00	88.79	330.210	6,275.99	1,535.50	576.89	14,446,436.60	1,727,514.64	39.77907099	-80.68998946	
9,128.00	88.44	329.860	6,278.26	1,616.91	529.95	14,446,518.01	1,727,467.70	39.77929501	-80.69015551	
9,223.00	88.66	329.510	6,280.66	1,698.90	482.01	14,446,599.99	1,727,419.76	39.77952062	-80.69032512	
9,318.00	88.75	329.420	6,282.81	1,780.70	433.76	14,446,681.80	1,727,371.51	39.77974573	-80.69049587	
9,412.00	88.62	329.860	6,284.97	1,861.79	386.26	14,446,762.89	1,727,324.01	39.77996887	-80.69066393	
9,506.00	90.46	330.650	6,285.72	1,943.40	339.63	14,446,844.49	1,727,277.38	39.78019343	-80.69082891	
9,599.00	91.74	331.180	6,283.94	2,024.65	294.43	14,446,925.75	1,727,232.18	39.78041701	-80.69098879	
9,693.00	91.96	330.300	6,280.90	2,106.62	248.51	14,447,007.71	1,727,186.26	39.78064253	-80.69115123	
9,787.00	90.81	331.790	6,278.63	2,188.84	203.02	14,447,089.94	1,727,140.77	39.78086877	-80.69131214	
9,880.00	90.33	331.180	6,277.71	2,270.55	158.62	14,447,171.65	1,727,096.37	39.78109360	-80.69146916	
9,974.00	91.38	331.350	6,276.30	2,352.97	113.44	14,447,254.06	1,727,051.19	39.78132035	-80.69162898	
10,067.00	90.99	331.790	6,274.38	2,434.73	69.17	14,447,335.83	1,727,006.92	39.78154532	-80.69178554	
10,162.00	90.20	331.970	6,273.39	2,518.51	24.40	14,447,419.61	1,726,962.15	39.78177583	-80.69194388	
10,256.00	90.29	332.590	6,272.99	2,601.72	-19.33	14,447,502.82	1,726,918.43	39.78200476	-80.69209849	
10,350.00	90.33	331.350	6,272.48	2,684.69	-63.50	14,447,585.79	1,726,874.25	39.78223304	-80.69225471	
10,445.00	89.19	329.770	6,272.88	2,767.42	-110.19	14,447,668.52	1,726,827.56	39.78246067	-80.69241989	
10,538.00	88.26	329.070	6,274.95	2,847.47	-157.49	14,447,748.56	1,726,780.26	39.78268094	-80.69258727	
10,632.00	89.98	328.010	6,276.39	2,927.64	-206.54	14,447,828.73	1,726,731.21	39.78290157	-80.69276089	
10,726.00	89.36	328.010	6,276.94	3,007.36	-256.34	14,447,908.46	1,726,681.41	39.78312098	-80.69293717	
10,821.00	91.16	329.250	6,276.50	3,088.47	-305.79	14,447,989.56	1,726,631.96	39.78334418	-80.69311220	
10,915.00	91.08	328.370	6,274.67	3,168.86	-354.46	14,448,069.96	1,726,583.29	39.78356543	-80.69328446	
11,009.00	90.68	328.540	6,273.22	3,248.96	-403.63	14,448,150.06	1,726,534.12	39.78378587	-80.69345851	
11,103.00	90.24	328.630	6,272.47	3,329.18	-452.62	14,448,230.28	1,726,485.13	39.78400663	-80.69363193	
11,198.00	90.95	329.950	6,271.48	3,410.85	-501.14	14,448,311.95	1,726,436.62	39.78423137	-80.69380362	
11,292.00	90.37	329.510	6,270.40	3,492.03	-548.52	14,448,393.13	1,726,389.24	39.78445475	-80.69397128	
11,385.00	89.98	329.860	6,270.12	3,572.31	-595.46	14,448,473.41	1,726,342.29	39.78467567	-80.69413739	
11,480.00	89.36	329.070	6,270.66	3,654.14	-643.72	14,448,555.23	1,726,294.03	39.78490083	-80.69430820	
11,574.00	90.20	329.420	6,271.02	3,734.91	-691.79	14,448,636.01	1,726,245.96	39.78512312	-80.69447832	
11,668.00	91.34	329.070	6,269.76	3,815.69	-739.85	14,448,716.78	1,726,197.90	39.78534539	-80.69464843	
11,762.00	91.52	333.020	6,267.41	3,897.89	-785.34	14,448,798.99	1,726,152.41	39.78557158	-80.69480934	
11,856.00	91.30	333.110	6,265.10	3,981.67	-827.90	14,448,882.77	1,726,109.85	39.78580205	-80.69495984	
11,951.00	91.16	333.200	6,263.06	4,066.41	-870.79	14,448,967.51	1,726,066.96	39.78603518	-80.69511149	
12,045.00	90.51	333.020	6,261.69	4,150.24	-913.30	14,449,051.34	1,726,024.45	39.78626579	-80.69526179	
12,140.00	89.41	332.230	6,261.76	4,234.60	-956.98	14,449,135.70	1,725,980.77	39.78649787	-80.69541626	
12,235.00	88.84	331.880	6,263.21	4,318.51	-1,001.50	14,449,219.61	1,725,936.25	39.78672873	-80.69557370	
12,328.00	90.11	331.350	6,264.06	4,400.33	-1,045.71	14,449,301.42	1,725,892.04	39.78695382	-80.69573008	
12,423.00	89.89	329.860	6,264.06	4,483.09	-1,092.33	14,449,384.19	1,725,845.42	39.78718156	-80.69589506	
12,516.00	89.19	329.420	6,264.81	4,563.34	-1,139.34	14,449,464.43	1,725,798.41	39.78740236	-80.69606140	
12,611.00	89.14	330.390	6,266.19	4,645.52	-1,186.97	14,449,546.62	1,725,750.78	39.78762850	-80.69622996	
12,704.00	91.12	329.510	6,265.98	4,726.02	-1,233.54	14,449,627.11	1,725,704.22	39.78785000	-80.69639476	
12,798.00	89.80	328.100	6,265.23	4,806.42	-1,282.22	14,449,707.51	1,725,655.53	39.78807126	-80.69656709	
12,908.00	88.62	326.960	6,266.74	4,899.21	-1,341.27	14,449,800.31	1,725,596.49	39.78832664	-80.69677616	
<b>Survey @ 12908.00 MD 6266.74 TVD</b>										
12,955.00	88.62	326.960	6,267.87	4,938.60	-1,366.88	14,449,839.69	1,725,570.87	39.78843504	-80.69686688	
<b>Survey Proj. to 12955.00 MD 6267.87 TVD</b>										

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern N-05 HM (slot R)
<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-05 HM (slot R)	<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

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
169.00	169.00	0.19	-0.59	MWD surveys
12,908.00	6,266.74	4,899.21	-1,341.27	Survey @ 12908.00 MD 6266.74 TVD
12,955.00	6,267.87	4,938.60	-1,366.88	Survey Proj. to 12955.00 MD 6267.87 TVD

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_