



Well: Keith Stern S-09 HM (slot A)  
 Site: Keith Stern  
 Project: Marshall County, West Virginia.  
 Design: rev2  
 Rig: Nabors X08

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	1337.00	0.00	0.00	1337.00	0.00	0.00	0.00	0.00	0.00	KOP Begin 2°/100' build
3	1587.00	5.00	200.00	1586.68	-10.24	-3.73	2.00	200.00	7.80	Begin 5.00° tangent
4	3143.24	5.00	200.00	3137.00	-137.70	-50.12	0.00	0.00	104.87	Begin 3°/100' build
5	3443.24	14.00	200.00	3432.58	-184.18	-67.04	3.00	0.00	140.27	Begin 3°/100' build/turn
6	3720.76	21.53	188.11	3696.76	-266.29	-85.73	3.00	-31.50	207.41	Begin 21.53° tangent
7	6031.53	21.53	188.11	5846.24	-1105.98	-205.31	0.00	0.00	923.47	Begin 8°/100' build/turn
8	6428.65	50.00	161.89	6166.83	-1328.43	-167.33	8.00	-40.00	1141.84	Begin 10°/100' build/turn
9	6832.67	89.01	150.31	6306.00	-1665.05	-12.73	10.00	-18.03	1512.25	Begin 89.00° lateral
10	14261.07	89.01	150.31	6435.00	-8117.44	3665.73	0.00	0.00	8906.76	PBHL/TD 14261.07 MD 6435.00 TVD

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
LP Keith Stern S-09H 50 E r2	6306.00	-1665.05	-12.73	14443180.66	1726874.48	39.77013541	-80.69230777
- plan misses target center by 0.01usft at 6832.67usft MD (6306.01 TVD, -1665.05 N, -12.73 E)							
BHL Keith Stern S-09H r2	6435.00	-8117.44	3665.73	14436728.27	1730552.94	39.75238000	-80.67929900
- plan hits target center							

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Annotation
192.00	0.09	328.13	192.00	0.13	-0.08	-0.15	MWD surveys
14192.00	89.01	150.56	6471.97	-8080.81	3637.29	8861.67	Survey @ 14192.00 MD 6471.97 TVD
14250.00	89.01	150.56	6472.98	-8131.31	3665.79	8919.43	Survey Proj. to 14250.00 MD 6472.98 TVD

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)

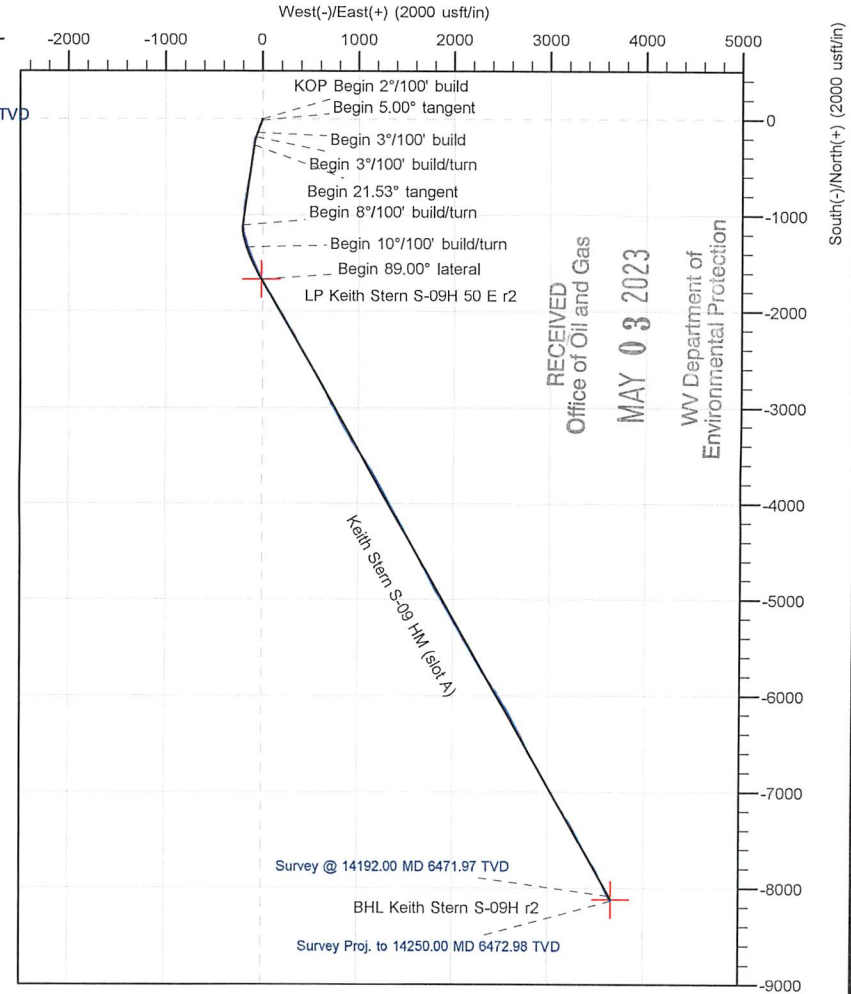
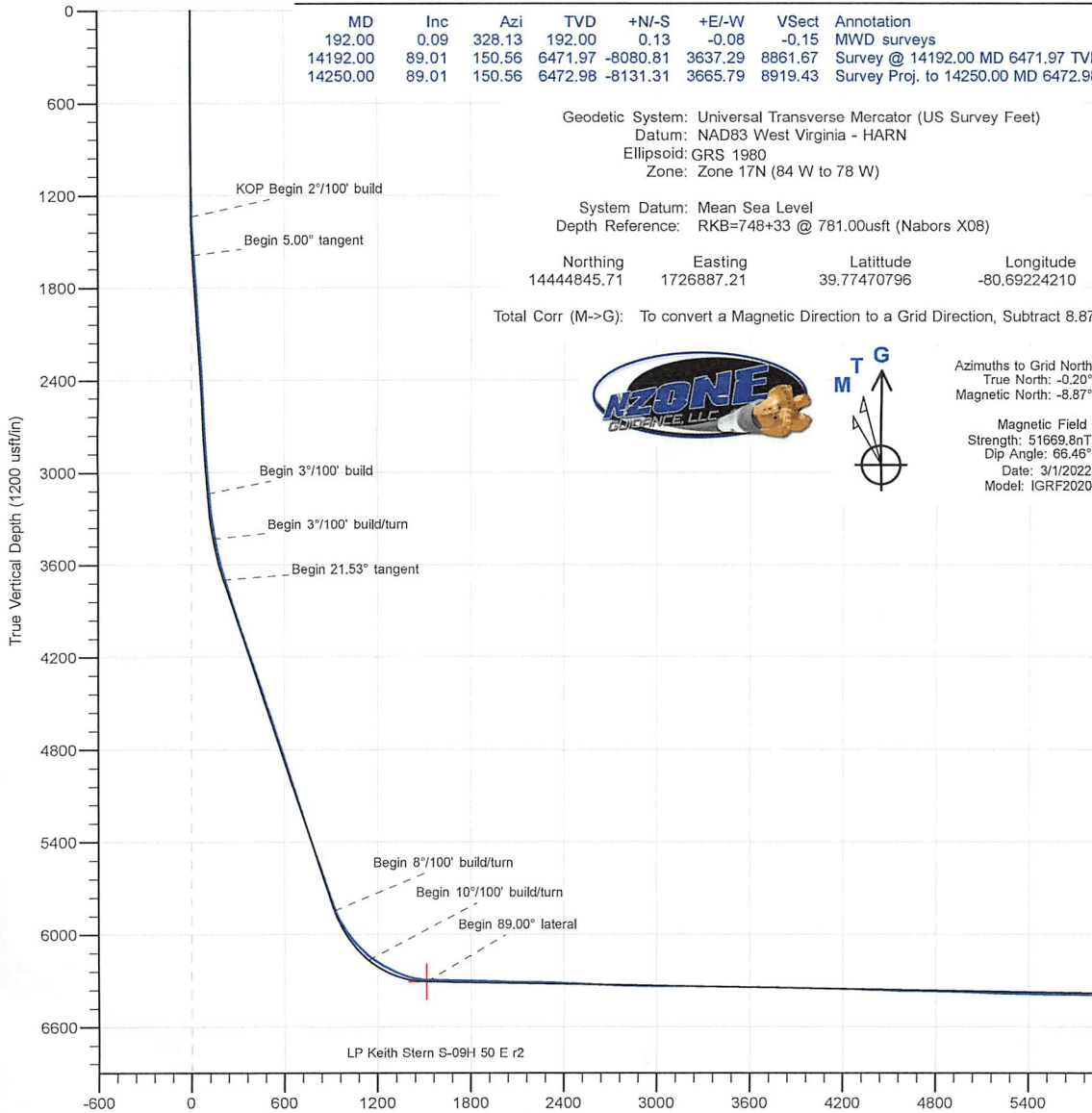
Northing	Easting	Latitude	Longitude
14444845.71	1726887.21	39.77470796	-80.69224210

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: 51669.8nT  
 Dip Angle: 66.46°  
 Date: 3/1/2022  
 Model: IGRF2020



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<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern S-09 HM (slot A)
<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 S-09 HM (slot A)	<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 S-09 HM (slot A)					
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b>	14,444,845.72 usft	<b>Latitude:</b>	39.77470796
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b>	1,726,887.21 usft	<b>Longitude:</b>	-80.69224210
<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	3/1/2022	-8.67	66.46	51,669.79106335

<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	155.70	

<b>Survey Program</b>	<b>Date</b>	3/27/2022			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
192.00	548.00	MWD surf (Original Hole)	MWD	MWD - Standard	
585.00	2,212.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,303.00	14,192.00	MWD (Original Hole)	MWD	MWD - Standard	
14,250.00	14,250.00	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	14,444,845.72	1,726,887.21	39.77470796	-80.69224210	
192.00	0.09	328.13	192.00	0.13	-0.08	14,444,845.85	1,726,887.13	39.77470831	-80.69224238	
<b>MWD surveys</b>										
222.00	0.17	334.68	222.00	0.19	-0.11	14,444,845.91	1,726,887.10	39.77470848	-80.69224249	
252.00	0.14	355.81	252.00	0.27	-0.13	14,444,845.98	1,726,887.08	39.77470869	-80.69224257	
283.00	0.17	339.14	283.00	0.35	-0.15	14,444,846.06	1,726,887.06	39.77470891	-80.69224264	
313.00	0.24	341.63	313.00	0.45	-0.19	14,444,846.16	1,726,887.02	39.77470919	-80.69224276	
343.00	0.20	349.76	343.00	0.56	-0.22	14,444,846.28	1,726,887.00	39.77470950	-80.69224286	
373.00	0.21	318.86	373.00	0.65	-0.26	14,444,846.37	1,726,886.95	39.77470975	-80.69224303	



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern S-09 HM (slot A)
<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 S-09 HM (slot A)	<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
403.00	0.15	318.33	403.00	0.72	-0.32	14,444,846.44	1,726,886.89	39.77470995	-80.69224325
433.00	0.38	328.38	433.00	0.84	-0.40	14,444,846.55	1,726,886.81	39.77471026	-80.69224352
463.00	0.81	309.12	463.00	1.05	-0.62	14,444,846.77	1,726,886.59	39.77471086	-80.69224429
493.00	0.98	312.36	492.99	1.36	-0.97	14,444,847.08	1,726,886.24	39.77471171	-80.69224555
524.00	0.93	322.43	523.99	1.74	-1.32	14,444,847.46	1,726,885.89	39.77471275	-80.69224679
548.00	0.74	318.14	547.99	2.01	-1.54	14,444,847.73	1,726,885.67	39.77471349	-80.69224757
585.00	0.62	331.97	584.98	2.36	-1.80	14,444,848.08	1,726,885.41	39.77471447	-80.69224847
615.00	0.51	322.60	614.98	2.61	-1.96	14,444,848.33	1,726,885.26	39.77471516	-80.69224903
645.00	0.41	323.93	644.98	2.81	-2.10	14,444,848.52	1,726,885.11	39.77471569	-80.69224954
676.00	0.07	224.34	675.98	2.88	-2.18	14,444,848.60	1,726,885.03	39.77471590	-80.69224982
706.00	0.35	182.61	705.98	2.78	-2.20	14,444,848.49	1,726,885.02	39.77471561	-80.69224988
737.00	0.44	203.07	736.98	2.57	-2.25	14,444,848.29	1,726,884.97	39.77471505	-80.69225006
769.00	0.55	195.11	768.98	2.31	-2.33	14,444,848.03	1,726,884.88	39.77471433	-80.69225038
800.00	0.70	170.44	799.98	1.98	-2.34	14,444,847.70	1,726,884.87	39.77471343	-80.69225041
832.00	0.82	166.05	831.97	1.57	-2.25	14,444,847.28	1,726,884.96	39.77471228	-80.69225010
863.00	0.60	159.63	862.97	1.20	-2.14	14,444,846.92	1,726,885.07	39.77471127	-80.69224972
895.00	0.82	146.89	894.97	0.85	-1.96	14,444,846.57	1,726,885.25	39.77471031	-80.69224907
926.00	0.59	152.56	925.97	0.52	-1.77	14,444,846.24	1,726,885.45	39.77470941	-80.69224838
957.00	0.54	118.21	956.97	0.31	-1.56	14,444,846.03	1,726,885.65	39.77470883	-80.69224766
989.00	0.53	95.68	988.96	0.23	-1.28	14,444,845.94	1,726,885.93	39.77470859	-80.69224667
1,020.00	0.50	73.60	1,019.96	0.25	-1.01	14,444,845.97	1,726,886.20	39.77470866	-80.69224570
1,052.00	0.40	102.73	1,051.96	0.26	-0.77	14,444,845.98	1,726,886.44	39.77470870	-80.69224483
1,083.00	0.40	88.96	1,082.96	0.24	-0.55	14,444,845.96	1,726,886.66	39.77470863	-80.69224407
1,115.00	0.64	103.12	1,114.96	0.20	-0.27	14,444,845.92	1,726,886.94	39.77470853	-80.69224306
1,146.00	0.62	137.66	1,145.96	0.04	0.01	14,444,845.76	1,726,887.22	39.77470807	-80.69224206
1,178.00	0.87	149.09	1,177.96	-0.30	0.25	14,444,845.42	1,726,887.47	39.77470715	-80.69224120
1,209.00	0.96	154.41	1,208.95	-0.73	0.49	14,444,844.99	1,726,887.70	39.77470595	-80.69224038
1,241.00	1.14	162.90	1,240.95	-1.28	0.70	14,444,844.44	1,726,887.91	39.77470445	-80.69223964
1,272.00	1.33	174.88	1,271.94	-1.93	0.82	14,444,843.79	1,726,888.03	39.77470265	-80.69223921
1,304.00	1.78	178.76	1,303.93	-2.80	0.86	14,444,842.92	1,726,888.08	39.77470027	-80.69223906
1,335.00	2.00	187.02	1,334.91	-3.82	0.81	14,444,841.90	1,726,888.02	39.77469748	-80.69223927
1,367.00	2.35	199.10	1,366.89	-4.99	0.52	14,444,840.73	1,726,887.74	39.77469425	-80.69224030
1,399.00	2.93	206.48	1,398.85	-6.34	-0.05	14,444,839.38	1,726,887.16	39.77469055	-80.69224237
1,430.00	3.37	202.97	1,429.81	-7.89	-0.76	14,444,837.83	1,726,886.45	39.77468630	-80.69224492
1,462.00	3.89	207.19	1,461.74	-9.72	-1.63	14,444,836.00	1,726,885.59	39.77468128	-80.69224801
1,507.00	4.62	202.91	1,506.62	-12.75	-3.03	14,444,832.97	1,726,884.18	39.77467298	-80.69225304
1,556.00	5.20	201.48	1,555.44	-16.63	-4.61	14,444,829.09	1,726,882.60	39.77466233	-80.69225872
1,650.00	5.71	198.38	1,649.01	-25.03	-7.65	14,444,820.68	1,726,879.57	39.77463928	-80.69226962
1,743.00	5.15	193.19	1,741.60	-33.49	-10.06	14,444,812.23	1,726,877.16	39.77461609	-80.69227830
1,838.00	4.35	191.39	1,836.27	-41.17	-11.74	14,444,804.55	1,726,875.47	39.77459500	-80.69228439
1,932.00	4.26	201.60	1,930.00	-47.91	-13.73	14,444,797.80	1,726,873.48	39.77457651	-80.69229155
2,025.00	4.93	206.31	2,022.71	-54.71	-16.77	14,444,791.01	1,726,870.44	39.77455788	-80.69230247
2,120.00	4.98	204.89	2,117.35	-62.11	-20.32	14,444,783.61	1,726,866.89	39.77453759	-80.69231517
2,212.00	5.14	196.24	2,208.99	-69.69	-23.15	14,444,776.03	1,726,864.06	39.77451681	-80.69232535
2,303.00	5.49	192.38	2,299.60	-77.85	-25.22	14,444,767.87	1,726,861.99	39.77449440	-80.69233283
2,397.00	4.47	206.26	2,393.25	-85.53	-27.81	14,444,760.19	1,726,859.40	39.77447334	-80.69234212
2,492.00	4.28	208.12	2,487.97	-91.97	-31.12	14,444,753.74	1,726,856.09	39.77445567	-80.69235398
2,586.00	5.43	204.36	2,581.63	-99.12	-34.61	14,444,746.60	1,726,852.61	39.77443608	-80.69236648
2,681.00	5.55	200.77	2,676.20	-107.51	-38.09	14,444,738.21	1,726,849.12	39.77441307	-80.69237898
2,776.00	5.26	198.46	2,770.78	-115.94	-41.10	14,444,729.78	1,726,846.12	39.77438996	-80.69238978
2,870.00	4.93	195.87	2,864.40	-123.91	-43.57	14,444,721.81	1,726,843.65	39.77436809	-80.69239867
2,964.00	4.82	190.94	2,958.06	-131.67	-45.42	14,444,714.05	1,726,841.79	39.77434679	-80.69240536
3,059.00	4.97	205.23	3,052.72	-139.31	-47.93	14,444,706.40	1,726,839.28	39.77432582	-80.69241439
3,153.00	7.02	206.34	3,146.20	-148.14	-52.22	14,444,697.57	1,726,835.00	39.77430161	-80.69242975
3,247.00	10.57	205.70	3,239.08	-161.07	-58.51	14,444,684.65	1,726,828.71	39.77426619	-80.69245229



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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 S-09 HM (slot A)	<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
3,341.00	12.93	204.01	3,331.11	-178.44	-66.52	14,444,667.27	1,726,820.69	39.77421854	-80.69248105
3,435.00	13.39	197.06	3,422.64	-198.46	-74.00	14,444,647.26	1,726,813.21	39.77416365	-80.69250789
3,529.00	14.68	194.02	3,513.84	-220.42	-80.08	14,444,625.30	1,726,807.14	39.77410339	-80.69252979
3,623.00	16.28	187.63	3,604.43	-245.04	-84.71	14,444,600.68	1,726,802.50	39.77403582	-80.69254659
3,717.00	19.46	186.74	3,693.88	-273.65	-88.30	14,444,572.06	1,726,798.91	39.77395727	-80.69255971
3,812.00	21.45	187.47	3,782.89	-306.59	-92.42	14,444,539.12	1,726,794.80	39.77386684	-80.69257476
3,905.00	20.87	186.07	3,869.62	-339.93	-96.38	14,444,505.79	1,726,790.83	39.77377534	-80.69258927
4,002.00	21.49	188.09	3,960.07	-374.70	-100.71	14,444,471.02	1,726,786.51	39.77367988	-80.69260510
4,096.00	20.77	188.42	4,047.75	-408.24	-105.57	14,444,437.48	1,726,781.64	39.77358784	-80.69262282
4,191.00	22.24	187.49	4,136.13	-442.72	-110.38	14,444,402.99	1,726,776.83	39.77349316	-80.69264036
4,285.00	22.08	186.25	4,223.19	-477.92	-114.62	14,444,367.79	1,726,772.59	39.77339654	-80.69265589
4,380.00	21.27	184.88	4,311.47	-512.84	-118.03	14,444,332.87	1,726,769.18	39.77330067	-80.69266845
4,474.00	21.31	189.55	4,399.06	-546.68	-122.32	14,444,299.04	1,726,764.90	39.77320780	-80.69268411
4,568.00	22.86	191.15	4,486.16	-581.44	-128.68	14,444,264.28	1,726,758.53	39.77311240	-80.69270719
4,663.00	22.34	189.71	4,573.87	-617.34	-135.30	14,444,228.38	1,726,751.92	39.77301386	-80.69273116
4,757.00	21.53	187.80	4,661.07	-652.04	-140.65	14,444,193.68	1,726,746.56	39.77291862	-80.69275064
4,852.00	21.88	191.72	4,749.33	-686.64	-146.61	14,444,159.07	1,726,740.60	39.77282364	-80.69277228
4,947.00	21.42	189.72	4,837.63	-721.07	-153.14	14,444,124.64	1,726,734.08	39.77272915	-80.69279592
5,041.00	21.12	187.38	4,925.23	-754.79	-158.21	14,444,090.93	1,726,729.00	39.77263661	-80.69281439
5,135.00	20.67	190.54	5,013.05	-787.89	-163.42	14,444,057.82	1,726,723.79	39.77254574	-80.69283334
5,228.00	21.32	191.80	5,099.88	-820.58	-169.88	14,444,025.14	1,726,717.33	39.77245603	-80.69285673
5,323.00	20.60	189.62	5,188.59	-853.96	-176.20	14,443,991.75	1,726,711.01	39.77236441	-80.69287964
5,417.00	21.92	187.96	5,276.19	-887.65	-181.40	14,443,958.07	1,726,705.81	39.77227196	-80.69289854
5,511.00	21.53	186.38	5,363.52	-922.16	-185.74	14,443,923.55	1,726,701.47	39.77217721	-80.69291443
5,605.00	20.41	183.22	5,451.29	-955.67	-188.58	14,443,890.04	1,726,698.63	39.77208521	-80.69292494
5,699.00	21.17	184.28	5,539.17	-988.96	-190.77	14,443,856.75	1,726,696.44	39.77199380	-80.69293313
5,773.00	21.26	182.86	5,608.16	-1,015.69	-192.44	14,443,830.03	1,726,694.78	39.77192043	-80.69293938
5,817.00	21.31	180.39	5,649.16	-1,031.65	-192.89	14,443,814.07	1,726,694.32	39.77187659	-80.69294119
5,912.00	21.74	188.23	5,737.55	-1,066.33	-195.52	14,443,779.38	1,726,691.69	39.77178137	-80.69295100
5,954.00	21.51	188.53	5,776.60	-1,081.65	-197.78	14,443,764.07	1,726,689.43	39.77173934	-80.69295921
6,006.00	21.61	186.48	5,824.96	-1,100.59	-200.27	14,443,745.13	1,726,686.94	39.77168734	-80.69296832
6,053.00	25.57	179.08	5,868.03	-1,119.34	-201.09	14,443,726.38	1,726,686.12	39.77163585	-80.69297145
6,101.00	29.11	173.07	5,910.67	-1,141.30	-199.51	14,443,704.42	1,726,687.70	39.77157553	-80.69296611
6,148.00	33.00	169.81	5,950.93	-1,165.26	-195.87	14,443,680.46	1,726,691.34	39.77150971	-80.69295342
6,195.00	36.44	168.19	5,989.56	-1,191.53	-190.75	14,443,654.19	1,726,696.47	39.77143752	-80.69293551
6,242.00	38.68	166.76	6,026.81	-1,219.49	-184.52	14,443,626.23	1,726,702.69	39.77136066	-80.69291371
6,289.00	41.48	164.05	6,062.77	-1,248.76	-176.88	14,443,596.96	1,726,710.33	39.77128021	-80.69288687
6,336.00	45.34	162.12	6,096.91	-1,279.65	-167.47	14,443,566.07	1,726,719.75	39.77119529	-80.69285375
6,384.00	48.64	160.27	6,129.65	-1,312.86	-156.14	14,443,532.86	1,726,731.07	39.77110397	-80.69281384
6,431.00	52.93	160.27	6,159.36	-1,347.13	-143.85	14,443,498.59	1,726,743.36	39.77100975	-80.69277052
6,479.00	57.72	159.79	6,186.66	-1,384.22	-130.37	14,443,461.50	1,726,756.84	39.77090776	-80.69272299
6,526.00	62.04	159.41	6,210.24	-1,422.31	-116.20	14,443,423.40	1,726,771.01	39.77080301	-80.69267303
6,573.00	63.12	160.03	6,231.88	-1,461.45	-101.74	14,443,384.27	1,726,785.47	39.77069541	-80.69262205
6,620.00	66.67	157.38	6,251.82	-1,501.08	-86.27	14,443,344.63	1,726,800.94	39.77058641	-80.69256749
6,667.00	70.98	154.81	6,268.80	-1,541.13	-68.51	14,443,304.59	1,726,818.71	39.77047626	-80.69250475
6,714.00	76.70	154.17	6,281.87	-1,581.85	-49.07	14,443,263.86	1,726,838.14	39.77036424	-80.69243608
6,761.00	82.55	153.55	6,290.33	-1,623.34	-28.71	14,443,222.38	1,726,858.50	39.77025012	-80.69236412
6,808.00	88.09	152.67	6,294.17	-1,665.10	-7.53	14,443,180.62	1,726,879.68	39.77013523	-80.69228926
6,856.00	90.33	150.39	6,294.83	-1,707.28	15.35	14,443,138.43	1,726,902.56	39.77001917	-80.69220836
6,949.00	87.91	150.21	6,296.26	-1,788.05	61.42	14,443,057.67	1,726,948.63	39.76979692	-80.69204540
7,043.00	88.53	148.63	6,299.18	-1,868.94	109.21	14,442,976.78	1,726,996.42	39.76957434	-80.69187629
7,137.00	89.27	150.30	6,300.98	-1,949.88	156.96	14,442,895.84	1,727,044.17	39.76935159	-80.69170736
7,233.00	87.21	150.30	6,303.93	-2,033.23	204.50	14,442,812.49	1,727,091.71	39.76912226	-80.69153920
7,327.00	88.40	151.00	6,307.53	-2,115.10	250.54	14,442,730.62	1,727,137.75	39.76889698	-80.69137637
7,421.00	89.54	150.92	6,309.22	-2,197.27	296.16	14,442,648.45	1,727,183.37	39.76867089	-80.69121502



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern S-09 HM (slot A)
<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 S-09 HM (slot A)	<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
7,516.00	89.05	150.56	6,310.39	-2,280.14	342.59	14,442,565.58	1,727,229.80	39.76844286	-80.69105080
7,611.00	87.82	150.83	6,312.98	-2,362.95	389.07	14,442,482.77	1,727,276.28	39.76821500	-80.69088641
7,705.00	87.96	150.83	6,316.45	-2,444.97	434.85	14,442,400.75	1,727,322.07	39.76798931	-80.69072448
7,799.00	88.53	151.00	6,319.32	-2,527.08	480.53	14,442,318.64	1,727,367.74	39.76776339	-80.69056296
7,893.00	86.99	151.09	6,323.00	-2,609.26	526.00	14,442,236.45	1,727,413.21	39.76753726	-80.69040215
7,987.00	86.55	150.48	6,328.29	-2,691.18	571.80	14,442,154.54	1,727,459.02	39.76731187	-80.69024015
8,081.00	87.60	150.21	6,333.09	-2,772.76	618.25	14,442,072.96	1,727,505.46	39.76708739	-80.69007586
8,174.00	89.71	151.88	6,335.27	-2,854.10	663.26	14,441,991.62	1,727,550.47	39.76686357	-80.68991670
8,268.00	90.51	152.85	6,335.09	-2,937.38	706.86	14,441,908.34	1,727,594.07	39.76663446	-80.68976257
8,362.00	89.27	150.04	6,335.27	-3,019.93	751.78	14,441,825.78	1,727,639.00	39.76640731	-80.68960371
8,457.00	90.07	150.74	6,335.82	-3,102.52	798.72	14,441,743.19	1,727,685.93	39.76618005	-80.68943769
8,551.00	89.36	150.56	6,336.29	-3,184.46	844.79	14,441,661.26	1,727,732.01	39.76595460	-80.68927475
8,646.00	89.45	150.21	6,337.28	-3,267.04	891.74	14,441,578.68	1,727,778.95	39.76572735	-80.68910872
8,741.00	88.92	148.89	6,338.63	-3,348.93	939.88	14,441,496.79	1,727,827.09	39.76550201	-80.68893842
8,835.00	88.09	147.75	6,341.08	-3,428.89	989.22	14,441,416.83	1,727,876.44	39.76528194	-80.68876380
8,929.00	88.97	146.61	6,343.49	-3,507.86	1,040.15	14,441,337.86	1,727,927.37	39.76506458	-80.68858354
9,023.00	88.88	146.17	6,345.25	-3,586.13	1,092.18	14,441,259.59	1,727,979.39	39.76484913	-80.68839938
9,116.00	89.93	147.93	6,346.22	-3,664.16	1,142.76	14,441,181.55	1,728,029.97	39.76463435	-80.68822036
9,210.00	89.71	150.56	6,346.52	-3,744.94	1,190.82	14,441,100.78	1,728,078.03	39.76441207	-80.68805033
9,304.00	87.69	150.74	6,348.65	-3,826.85	1,236.88	14,441,018.87	1,728,124.09	39.76418669	-80.68788744
9,397.00	88.57	151.00	6,351.68	-3,908.04	1,282.13	14,440,937.68	1,728,169.34	39.76396328	-80.68772743
9,491.00	88.75	151.88	6,353.88	-3,990.58	1,327.05	14,440,855.14	1,728,214.26	39.76373617	-80.68756859
9,585.00	88.31	151.88	6,356.29	-4,073.45	1,371.34	14,440,772.26	1,728,258.55	39.76350815	-80.68741201
9,679.00	88.31	150.56	6,359.06	-4,155.80	1,416.58	14,440,689.91	1,728,303.79	39.76328156	-80.68725207
9,773.00	87.96	151.79	6,362.12	-4,238.11	1,461.87	14,440,607.61	1,728,349.09	39.76305508	-80.68709191
9,868.00	88.57	152.41	6,365.00	-4,322.03	1,506.31	14,440,523.69	1,728,393.52	39.76282419	-80.68693484
9,962.00	88.48	151.78	6,367.42	-4,404.84	1,550.72	14,440,440.88	1,728,437.93	39.76259635	-80.68677783
10,056.00	89.14	150.21	6,369.37	-4,486.79	1,596.72	14,440,358.93	1,728,483.93	39.76237085	-80.68661517
10,150.00	89.89	151.09	6,370.17	-4,568.72	1,642.79	14,440,277.00	1,728,530.00	39.76214540	-80.68645225
10,244.00	88.31	152.50	6,371.64	-4,651.55	1,687.21	14,440,194.17	1,728,574.42	39.76191752	-80.68629522
10,338.00	87.16	152.50	6,375.36	-4,734.86	1,730.58	14,440,110.86	1,728,617.79	39.76168831	-80.68614193
10,432.00	87.74	151.71	6,379.54	-4,817.85	1,774.51	14,440,027.87	1,728,661.72	39.76145996	-80.68598663
10,526.00	88.04	150.48	6,383.00	-4,900.08	1,819.91	14,439,945.63	1,728,707.13	39.76123369	-80.68582610
10,620.00	88.79	149.60	6,385.60	-4,981.49	1,866.84	14,439,864.23	1,728,754.05	39.76100967	-80.68566014
10,715.00	88.66	149.68	6,387.72	-5,063.44	1,914.84	14,439,782.27	1,728,802.05	39.76078415	-80.68549035
10,809.00	89.49	150.56	6,389.23	-5,144.94	1,961.66	14,439,700.78	1,728,848.88	39.76055990	-80.68532476
10,903.00	90.15	150.39	6,389.53	-5,226.73	2,007.99	14,439,618.99	1,728,895.20	39.76033483	-80.68516095
10,997.00	89.45	149.25	6,389.86	-5,307.98	2,055.24	14,439,537.73	1,728,942.45	39.76011122	-80.68499382
11,091.00	88.31	149.25	6,391.70	-5,388.75	2,103.29	14,439,456.97	1,728,990.51	39.75988895	-80.68482385
11,185.00	88.35	149.68	6,394.43	-5,469.68	2,151.03	14,439,376.04	1,729,038.24	39.75966623	-80.68465500
11,279.00	87.38	150.30	6,397.94	-5,551.02	2,198.01	14,439,294.70	1,729,085.22	39.75944240	-80.68448884
11,373.00	87.56	149.68	6,402.09	-5,632.34	2,244.98	14,439,213.38	1,729,132.19	39.75921862	-80.68432274
11,468.00	88.00	149.33	6,405.77	-5,714.14	2,293.15	14,439,131.58	1,729,180.37	39.75899352	-80.68415235
11,563.00	89.27	148.28	6,408.03	-5,795.37	2,342.34	14,439,050.34	1,729,229.56	39.75876994	-80.68397834
11,658.00	88.70	148.54	6,409.71	-5,876.28	2,392.10	14,438,969.43	1,729,279.31	39.75854726	-80.68380231
11,752.00	88.66	147.22	6,411.88	-5,955.87	2,442.06	14,438,889.84	1,729,329.28	39.75832820	-80.68362553
11,845.00	88.97	148.37	6,413.80	-6,034.55	2,491.62	14,438,811.17	1,729,378.83	39.75811166	-80.68345020
11,940.00	88.97	148.89	6,415.51	-6,115.65	2,541.06	14,438,730.07	1,729,428.27	39.75788846	-80.68327528
12,034.00	88.09	151.53	6,417.92	-6,197.19	2,587.74	14,438,648.53	1,729,474.96	39.75766407	-80.68311020
12,128.00	88.70	152.41	6,420.55	-6,280.13	2,631.90	14,438,565.59	1,729,519.11	39.75743586	-80.68295414
12,221.00	88.79	152.15	6,422.59	-6,362.44	2,675.15	14,438,483.28	1,729,562.36	39.75720941	-80.68280129
12,316.00	87.56	153.11	6,425.62	-6,446.76	2,718.80	14,438,398.96	1,729,606.01	39.75697742	-80.68264703
12,410.00	87.91	152.32	6,429.33	-6,530.23	2,761.86	14,438,315.49	1,729,649.07	39.75674775	-80.68249488
12,504.00	88.88	149.33	6,431.96	-6,612.26	2,807.66	14,438,233.45	1,729,694.87	39.75652202	-80.68233295
12,597.00	88.79	148.89	6,433.85	-6,692.05	2,855.39	14,438,153.66	1,729,742.60	39.75630243	-80.68216411



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Keith Stern S-09 HM (slot A)
<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 S-09 HM (slot A)	<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
12,692.00	88.35	151.18	6,436.23	-6,774.32	2,902.82	14,438,071.39	1,729,790.04	39.75607603	-80.68199638
12,786.00	89.36	150.92	6,438.10	-6,856.56	2,948.31	14,437,989.16	1,729,835.53	39.75584975	-80.68183556
12,880.00	89.01	151.53	6,439.44	-6,938.95	2,993.56	14,437,906.77	1,729,880.77	39.75562306	-80.68167562
12,974.00	88.57	151.09	6,441.43	-7,021.39	3,038.68	14,437,824.33	1,729,925.89	39.75539621	-80.68151614
13,068.00	87.47	150.30	6,444.67	-7,103.31	3,084.66	14,437,742.41	1,729,971.87	39.75517079	-80.68135357
13,163.00	87.38	149.33	6,448.94	-7,185.34	3,132.37	14,437,660.38	1,730,019.58	39.75494503	-80.68118483
13,257.00	88.26	145.55	6,452.52	-7,264.49	3,182.92	14,437,581.22	1,730,070.13	39.75472717	-80.68100600
13,351.00	88.75	149.86	6,454.97	-7,343.91	3,233.11	14,437,501.81	1,730,120.32	39.75450858	-80.68082842
13,446.00	89.19	152.15	6,456.68	-7,426.98	3,279.15	14,437,418.74	1,730,166.36	39.75427999	-80.68066567
13,541.00	89.45	153.11	6,457.81	-7,511.34	3,322.82	14,437,334.38	1,730,210.03	39.75404789	-80.68051135
13,635.00	88.48	150.48	6,459.51	-7,594.16	3,367.23	14,437,251.56	1,730,254.45	39.75382002	-80.68035438
13,729.00	88.44	149.60	6,462.03	-7,675.56	3,414.16	14,437,170.15	1,730,301.37	39.75359599	-80.68018845
13,824.00	88.97	148.37	6,464.18	-7,756.96	3,463.10	14,437,088.76	1,730,350.31	39.75337198	-80.68001537
13,919.00	89.19	150.56	6,465.71	-7,838.77	3,511.35	14,437,006.95	1,730,398.57	39.75314683	-80.67984471
14,013.00	88.48	155.22	6,467.62	-7,922.40	3,554.17	14,436,923.32	1,730,441.38	39.75291674	-80.67969344
14,107.00	88.48	151.62	6,470.11	-8,006.42	3,596.21	14,436,839.29	1,730,483.42	39.75268558	-80.67954494
14,192.00	89.01	150.56	6,471.97	-8,080.81	3,637.29	14,436,764.91	1,730,524.50	39.75248088	-80.67939973
<b>Survey @ 14192.00 MD 6471.97 TVD</b>									
14,250.00	89.01	150.56	6,472.98	-8,131.31	3,665.79	14,436,714.40	1,730,553.00	39.75234191	-80.67929896
<b>Survey Proj. to 14250.00 MD 6472.98 TVD</b>									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
192.00	192.00	0.13	-0.08	MWD surveys
14,192.00	6,471.97	-8,080.81	3,637.29	Survey @ 14192.00 MD 6471.97 TVD
14,250.00	6,472.98	-8,131.31	3,665.79	Survey Proj. to 14250.00 MD 6472.98 TVD