



TUG HILL
OPERATING

Well: Burch Ridge 7 HU (slot G)
Site: Burch Ridge
Project: Marshall County, West Virginia
Design: rev5
Rig: HP 611

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	0.000	0.00	
2	725.00	0.00	0.00	725.00	0.00	0.00	0.00	0.000	0.00	KOP Begin 1"/100' build
3	925.00	2.00	8.00	924.96	3.46	0.49	1.00	8.000	-2.43	Begin 2.00° tangent
4	1300.27	2.00	8.00	1300.00	16.43	2.31	0.00	0.000	-11.56	Begin 2"/100' build/turn
5	1453.30	5.00	357.00	1452.73	25.73	2.33	2.00	-18.148	-18.89	Begin 5.00° tangent
6	2855.91	5.00	357.00	2850.00	147.81	-4.07	0.00	0.000	-119.23	Begin 2"/100' build
7	3330.91	14.50	357.00	3317.60	228.05	-8.27	2.00	0.000	-185.19	Begin 14.50° tangent
8	8167.36	14.50	357.00	8000.00	1437.34	-71.65	0.00	0.000	-1179.15	Begin 3"/100' build/turn
9	8640.49	28.68	355.19	8438.82	1610.51	-84.33	3.00	-3.540	-1323.70	Begin 28.68° tangent
10	10691.95	28.68	355.19	10238.60	2591.57	-166.85	0.00	0.000	-2149.15	Begin 8"/100' drop build/turn
11	12126.54	89.00	150.01	11240.00	2157.61	347.47	8.00	152.061	-1490.95	Begin 89.00° lateral
12	23836.88	89.00	150.01	11444.37	-7983.32	6199.97	0.00	0.000	10108.07	PBHL/TD 23836.88 MD /11444.37 TVD

ANNOTATIONS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Departure	Annotation
164.00	0.18	108.88	164.00	-0.08	0.24	0.22	0.26	MWD surveys
23700.00	89.52	149.48	11408.91	-7917.43	6152.68	10027.02	15035.47	Survey @ 23700.00 MD 11408.91 TVD
23775.00	89.52	149.48	11409.54	-7982.03	6190.76	10101.41	15110.46	Survey Proj. to 23775.00 MD 11409.54 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=1313+25 @ 1338.00ft (HP 611)

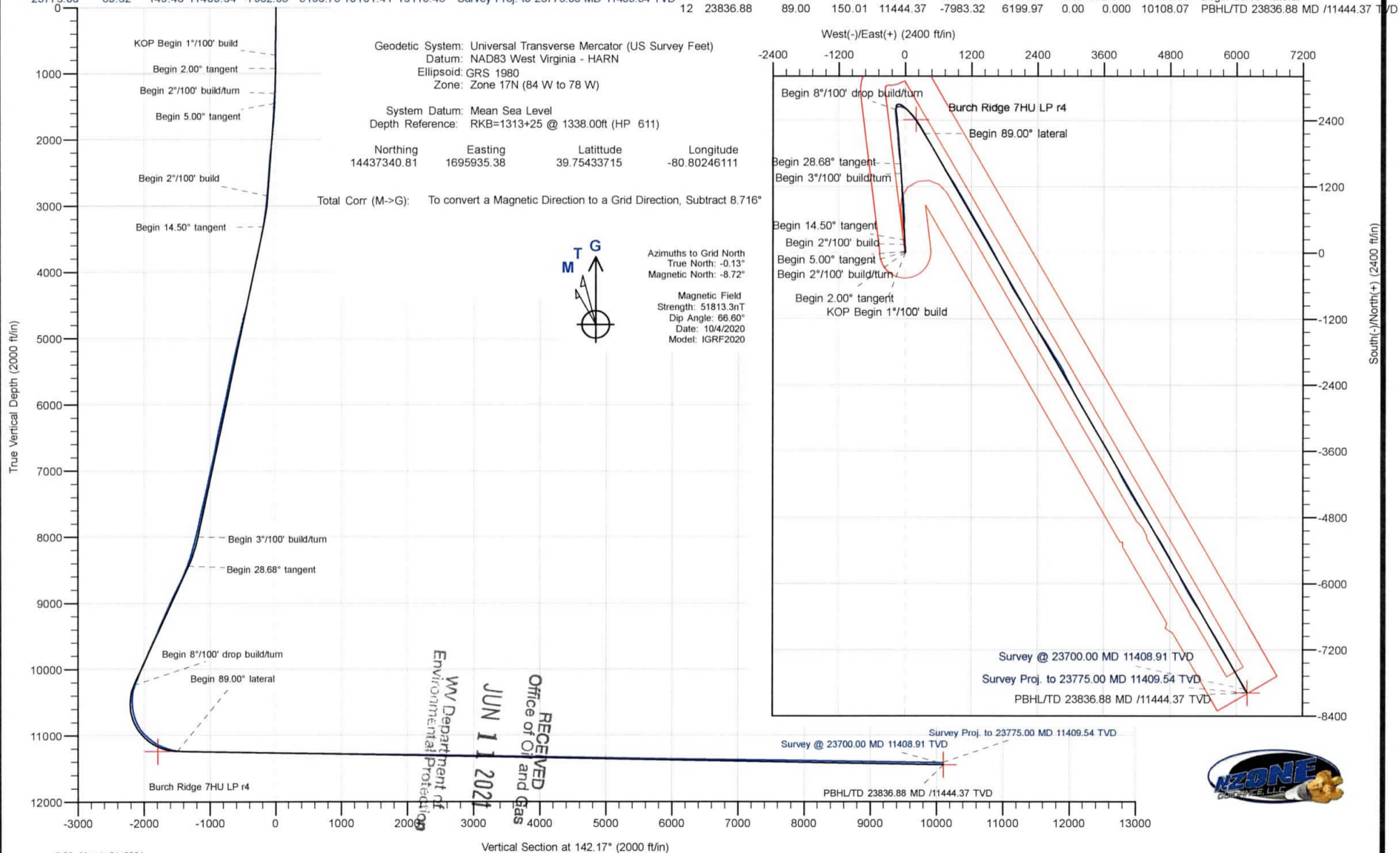
Northing 14437340.81 Easting 1695935.38 Latitude 39.75433715 Longitude -80.80246111

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.716°



Azimuths to Grid North
True North: -0.13°
Magnetic North: -8.72°

Magnetic Field
Strength: 51813.3nT
Dip Angle: 86.60°
Date: 10/4/2020
Model: IGRF2020



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Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Burch Ridge 7 HU (slot G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

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	Burch Ridge		
Site Position:	Northing:	14,437,347.35 usft	Latitude: 39.75435517
From: Lat/Long	Easting:	1,695,925.32 usft	Longitude: -80.80249684
Position Uncertainty: 0.00 ft	Slot Radius:	13-3/16 "	

Well	Burch Ridge 7 HU (slot G)			
Well Position	+N/-S	0.00 ft	Northing: 14,437,340.81 usft	Latitude: 39.75433715
	+E/-W	0.00 ft	Easting: 1,695,935.37 usft	Longitude: -80.80246111
Position Uncertainty	0.00 ft	Wellhead Elevation:	ft	Ground Level: 1,313.00 ft
Grid Convergence:	0.126 °			

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	10/4/2020	-8.590	66.595	51,813.25167370

Design	Surveys Original Hole			
Audit Notes:				
Version: 1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.00	0.00	0.00	142.17

Survey Program	Date	3/1/2021			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
164.00	1,010.00	MWD surf (Original Hole)	MWD	MWD - Standard	
1,072.00	2,758.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,813.00	6,469.00	MWD int2 (Original Hole)	MWD	MWD - Standard	
6,567.00	23,700.00	MWD (Original Hole)	MWD	MWD - Standard	
23,775.00	23,775.00	Projection (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
164.00	0.18	108.88	164.00	-0.08	0.24	0.22	0.11	0.11	0.00	
MWD surveys										
185.00	0.09	15.10	185.00	-0.08	0.28	0.23	0.98	-0.43	-446.57	
216.00	0.13	261.28	216.00	-0.06	0.25	0.20	0.60	0.13	-367.16	
245.00	0.04	261.28	245.00	-0.07	0.21	0.18	0.31	-0.31	0.00	

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Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
275.00	0.13	208.46	275.00	-0.10	0.18	0.19	0.37	0.30	-176.07
305.00	0.31	242.47	305.00	-0.17	0.09	0.19	0.72	0.60	113.37
335.00	0.22	261.26	335.00	-0.21	-0.04	0.15	0.41	-0.30	62.63
365.00	0.18	231.43	365.00	-0.25	-0.13	0.12	0.37	-0.13	-99.43
395.00	0.26	250.73	395.00	-0.30	-0.23	0.10	0.36	0.27	64.33
425.00	0.22	249.94	425.00	-0.34	-0.35	0.06	0.13	-0.13	-2.63
455.00	0.22	286.59	455.00	-0.35	-0.46	-0.01	0.46	0.00	122.17
485.00	0.26	286.50	485.00	-0.31	-0.58	-0.11	0.13	0.13	-0.30
515.00	0.31	269.81	515.00	-0.29	-0.72	-0.21	0.32	0.17	-55.63
546.00	0.22	281.67	546.00	-0.28	-0.87	-0.31	0.34	-0.29	38.26
576.00	0.09	310.41	576.00	-0.25	-0.94	-0.38	0.49	-0.43	95.80
606.00	0.09	285.89	606.00	-0.23	-0.98	-0.42	0.13	0.00	-81.73
637.00	0.13	289.84	637.00	-0.21	-1.04	-0.47	0.13	0.13	12.74
667.00	0.18	243.88	667.00	-0.22	-1.11	-0.51	0.43	0.17	-153.20
697.00	0.18	294.59	697.00	-0.22	-1.20	-0.56	0.51	0.00	169.03
728.00	0.04	81.28	728.00	-0.20	-1.23	-0.60	0.69	-0.45	473.19
758.00	0.48	69.94	758.00	-0.16	-1.10	-0.55	1.47	1.47	-37.80
788.00	0.88	65.11	787.99	-0.02	-0.78	-0.46	1.35	1.33	-16.10
819.00	1.27	66.87	818.99	0.22	-0.24	-0.32	1.26	1.26	5.68
851.00	1.67	62.82	850.98	0.57	0.50	-0.15	1.29	1.25	-12.66
882.00	1.89	59.83	881.96	1.03	1.34	0.01	0.77	0.71	-9.65
914.00	2.02	51.40	913.94	1.65	2.24	0.07	0.99	0.41	-26.34
945.00	2.11	39.00	944.92	2.44	3.02	-0.07	1.47	0.29	-40.00
977.00	2.59	31.80	976.90	3.51	3.78	-0.45	1.76	1.50	-22.50
1,010.00	2.86	30.13	1,009.86	4.85	4.58	-1.02	0.85	0.82	-5.06
1,072.00	3.08	21.60	1,071.78	7.74	5.97	-2.45	0.80	0.35	-13.76
1,119.00	2.59	20.20	1,118.72	9.91	6.80	-3.66	1.05	-1.04	-2.98
1,166.00	2.42	19.23	1,165.67	11.84	7.50	-4.76	0.37	-0.36	-2.06
1,213.00	2.11	11.67	1,212.64	13.63	8.00	-5.86	0.91	-0.66	-16.09
1,261.00	1.98	5.43	1,260.61	15.32	8.26	-7.04	0.54	-0.27	-13.00
1,308.00	2.29	358.84	1,307.57	17.07	8.31	-8.38	0.84	0.66	-14.02
1,356.00	2.55	359.98	1,355.53	19.09	8.29	-9.99	0.55	0.54	2.38
1,403.00	3.12	359.54	1,402.47	21.42	8.28	-11.84	1.21	1.21	-0.94
1,451.00	3.74	358.05	1,450.39	24.29	8.22	-14.14	1.30	1.30	-3.10
1,498.00	4.22	358.22	1,497.27	27.55	8.11	-16.78	1.02	1.02	-1.85
1,546.00	4.57	357.34	1,545.13	31.22	7.97	-19.77	0.74	0.74	-1.85
1,593.00	5.14	2.79	1,591.96	35.20	7.98	-22.90	1.56	1.56	-0.60
1,641.00	5.23	2.44	1,639.77	39.53	8.18	-26.20	0.20	0.20	-0.73
1,736.00	5.58	356.82	1,734.35	48.47	8.11	-33.31	0.67	0.67	-5.92
1,831.00	6.11	356.11	1,828.85	58.12	7.51	-41.30	0.56	0.56	-0.75
1,925.00	5.45	352.16	1,922.37	67.54	6.56	-49.32	0.82	-0.70	-4.20
2,020.00	6.68	357.34	2,016.84	77.53	5.69	-57.74	1.42	1.29	5.45
2,115.00	7.65	357.08	2,111.10	89.36	5.11	-67.44	1.02	1.02	-0.27
2,210.00	6.68	355.85	2,205.36	101.19	4.39	-77.23	1.03	-1.02	-1.29

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2,305.00	5.32	356.11	2,299.83	111.09	3.69	-85.48	1.43	-1.43	0.27
2,400.00	5.49	349.52	2,394.41	119.96	2.57	-93.17	0.68	0.18	-6.94
2,494.00	5.63	348.91	2,487.97	128.90	0.86	-101.28	0.16	0.15	-0.65
2,589.00	5.14	357.34	2,582.55	137.73	-0.23	-108.92	0.98	-0.52	8.87
2,684.00	4.35	0.95	2,677.23	145.58	-0.37	-115.21	0.89	-0.83	3.80
2,758.00	4.79	358.84	2,750.99	151.47	-0.39	-119.88	0.64	0.59	-2.85
2,813.00	4.92	359.10	2,805.79	156.13	-0.47	-123.60	0.24	0.24	0.47
2,871.00	5.27	358.22	2,863.56	161.28	-0.59	-127.74	0.62	0.60	-1.52
2,966.00	7.08	357.43	2,958.01	171.49	-0.99	-136.05	1.91	1.91	-0.83
3,061.00	8.79	356.20	3,052.09	184.58	-1.73	-146.85	1.81	1.80	-1.29
3,155.00	10.33	355.76	3,144.79	200.15	-2.83	-159.82	1.64	1.64	-0.47
3,250.00	11.87	355.41	3,238.01	218.39	-4.24	-175.09	1.62	1.62	-0.37
3,344.00	12.52	355.24	3,329.89	238.18	-5.86	-191.72	0.69	0.69	-0.18
3,439.00	13.62	356.64	3,422.42	259.61	-7.37	-209.57	1.20	1.16	1.47
3,533.00	13.32	356.55	3,513.84	281.46	-8.67	-227.63	0.32	-0.32	-0.10
3,628.00	13.36	356.73	3,606.27	303.34	-9.96	-245.70	0.06	0.04	0.19
3,723.00	14.33	357.43	3,698.51	326.05	-11.11	-264.34	1.04	1.02	0.74
3,818.00	14.46	357.61	3,790.53	349.64	-12.13	-283.60	0.14	0.14	0.19
3,913.00	14.99	356.82	3,882.41	373.76	-13.31	-303.37	0.60	0.56	-0.83
4,007.00	15.42	357.17	3,973.12	398.38	-14.60	-323.61	0.47	0.46	0.37
4,102.00	14.41	357.87	4,064.92	422.81	-15.66	-343.55	1.08	-1.06	0.74
4,197.00	14.41	357.96	4,156.93	446.43	-16.52	-362.74	0.02	0.00	0.09
4,291.00	16.30	359.28	4,247.57	471.32	-17.11	-382.75	2.04	2.01	1.40
4,386.00	16.22	359.63	4,338.77	497.91	-17.36	-403.92	0.13	-0.08	0.37
4,481.00	15.29	1.21	4,430.20	523.71	-17.18	-424.18	1.08	-0.98	1.66
4,576.00	15.29	359.98	4,521.84	548.75	-16.92	-443.80	0.34	0.00	-1.29
4,670.00	18.41	359.28	4,611.79	576.00	-17.11	-465.44	3.33	3.32	-0.74
4,765.00	17.84	1.48	4,702.08	605.55	-16.92	-488.66	0.94	-0.60	2.32
4,860.00	16.17	1.65	4,792.92	633.32	-16.17	-510.13	1.76	-1.76	0.18
4,955.00	16.00	358.66	4,884.20	659.63	-16.09	-530.87	1.32	-0.18	-3.15
5,049.00	15.82	354.18	4,974.61	685.33	-17.69	-552.15	1.32	-0.19	-4.77
5,144.00	16.35	353.48	5,065.89	711.50	-20.53	-574.55	1.59	1.56	-0.74
5,239.00	15.86	353.92	5,157.16	737.69	-23.42	-597.00	0.53	-0.52	0.46
5,333.00	14.85	355.85	5,247.80	762.48	-25.65	-617.96	1.20	-1.07	2.05
5,428.00	16.04	356.90	5,339.37	787.73	-27.24	-638.88	1.20	1.25	1.11
5,523.00	14.46	357.78	5,431.02	812.68	-28.41	-659.31	1.68	-1.66	0.93
5,618.00	13.45	359.54	5,523.22	835.59	-28.96	-677.74	1.15	-1.06	1.85
5,712.00	13.36	0.07	5,614.66	857.38	-29.03	-694.99	0.16	-0.10	0.56
5,807.00	14.19	357.87	5,706.92	879.99	-29.45	-713.11	1.03	0.87	-2.32
5,901.00	14.02	357.78	5,798.09	902.88	-30.32	-731.72	0.18	-0.18	-0.10
5,996.00	14.68	356.90	5,890.13	926.40	-31.42	-750.97	0.73	0.69	-0.93
6,090.00	14.50	354.53	5,981.09	950.01	-33.19	-770.70	0.66	-0.19	-2.52
6,185.00	15.25	355.76	6,072.91	974.31	-35.24	-791.16	0.86	0.79	1.29

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6,280.00	14.72	355.32	6,164.68	998.80	-37.15	-811.67	0.57	-0.56	-0.46
6,375.00	15.03	355.85	6,256.50	1,023.11	-39.03	-832.02	0.36	0.33	0.56
6,469.00	15.51	355.06	6,347.18	1,047.79	-40.99	-852.72	0.56	0.51	-0.84
6,567.00	14.59	355.59	6,441.81	1,073.15	-43.07	-874.03	0.95	-0.94	0.54
6,662.00	10.99	352.42	6,534.44	1,094.06	-45.18	-891.84	3.86	-3.79	-3.34
6,757.00	10.63	352.51	6,627.76	1,111.73	-47.52	-907.23	0.38	-0.38	0.09
6,851.00	13.01	353.92	6,719.76	1,130.85	-49.77	-923.71	2.55	2.53	1.50
6,946.00	14.63	354.27	6,812.00	1,153.42	-52.10	-942.97	1.71	1.71	0.37
7,041.00	15.73	355.32	6,903.69	1,178.19	-54.35	-963.91	1.19	1.16	1.11
7,135.00	15.95	355.32	6,994.12	1,203.76	-56.44	-985.39	0.23	0.23	0.00
7,230.00	14.50	351.54	7,085.78	1,228.54	-59.26	-1,006.69	1.85	-1.53	-3.98
7,325.00	14.46	354.71	7,177.77	1,252.11	-62.10	-1,027.05	0.84	-0.04	3.34
7,420.00	15.03	0.68	7,269.65	1,276.24	-63.05	-1,046.69	1.71	0.60	6.28
7,514.00	15.34	1.56	7,360.36	1,300.86	-62.57	-1,065.84	0.41	0.33	0.94
7,609.00	15.69	359.81	7,451.90	1,326.27	-62.27	-1,085.72	0.62	0.37	-1.84
7,703.00	16.52	358.22	7,542.21	1,352.33	-62.72	-1,106.59	1.00	0.88	-1.69
7,798.00	15.82	356.47	7,633.45	1,378.76	-63.94	-1,128.21	0.90	-0.74	-1.84
7,893.00	14.02	354.62	7,725.25	1,403.14	-65.82	-1,148.62	1.96	-1.89	-1.95
7,987.00	14.11	351.37	7,816.43	1,425.81	-68.61	-1,168.23	0.85	0.97	-3.46
8,082.00	15.03	353.83	7,908.38	1,449.50	-71.67	-1,188.82	1.17	0.97	2.59
8,177.00	15.47	353.92	8,000.03	1,474.35	-74.33	-1,210.08	0.46	0.46	0.09
8,272.00	16.39	352.51	8,091.38	1,500.24	-77.42	-1,232.42	1.05	0.97	-1.48
8,366.00	18.19	353.92	8,181.13	1,527.98	-80.70	-1,256.35	1.95	1.91	1.50
8,461.00	19.20	352.51	8,271.12	1,558.21	-84.31	-1,282.44	1.16	0.96	-1.48
8,556.00	20.96	355.15	8,360.34	1,590.63	-87.78	-1,310.18	2.08	1.85	2.78
8,651.00	24.79	356.47	8,447.85	1,627.46	-90.45	-1,340.89	4.07	4.03	1.39
8,745.00	28.56	355.94	8,531.84	1,669.55	-93.25	-1,375.87	4.02	4.01	-0.56
8,840.00	28.70	354.97	8,615.22	1,714.93	-96.86	-1,413.92	0.51	0.15	-1.02
8,935.00	30.67	353.30	8,697.75	1,761.72	-101.69	-1,453.84	2.25	2.07	-1.76
9,030.00	29.58	352.60	8,779.92	1,809.04	-107.54	-1,494.80	1.21	-1.15	-0.74
9,124.00	28.52	355.67	8,862.10	1,854.43	-112.22	-1,533.52	1.95	-1.13	3.27
9,221.00	28.21	355.85	8,947.45	1,900.39	-115.63	-1,571.91	0.33	-0.32	0.19
9,316.00	28.43	355.59	9,031.08	1,945.33	-118.99	-1,609.46	0.27	0.23	-0.27
9,410.00	29.36	355.32	9,113.38	1,990.60	-122.59	-1,647.44	1.00	0.99	-0.29
9,505.00	29.36	355.67	9,196.17	2,037.04	-126.25	-1,686.35	0.18	0.00	0.37
9,599.00	28.04	355.41	9,278.62	2,082.04	-129.76	-1,724.05	1.41	-1.40	-0.28
9,694.00	26.63	354.62	9,363.01	2,125.50	-133.54	-1,760.70	1.53	-1.48	-0.83
9,789.00	26.19	354.27	9,448.10	2,167.56	-137.63	-1,796.42	0.49	-0.46	-0.37
9,884.00	26.06	353.83	9,533.39	2,209.16	-141.97	-1,831.94	0.25	-0.14	-0.46
9,978.00	26.89	352.86	9,617.53	2,250.78	-146.83	-1,867.80	1.00	0.88	-1.03
10,073.00	27.86	353.74	9,701.90	2,294.17	-151.92	-1,905.18	1.11	1.02	0.93
10,168.00	28.92	354.62	9,785.47	2,339.10	-156.49	-1,943.48	1.20	1.12	0.93
10,262.00	29.09	356.29	9,867.68	2,384.53	-160.10	-1,981.58	0.88	0.18	1.78

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Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Burch Ridge 7 HU (slot G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
10,357.00	27.51	355.32	9,951.32	2,429.45	-163.39	-2,019.07	1.73	-1.66	-1.02	
10,452.00	26.28	353.04	10,036.05	2,472.20	-167.73	-2,055.49	1.69	-1.29	-2.40	
10,535.00	24.62	353.04	10,110.99	2,507.60	-172.05	-2,086.11	2.00	-2.00	0.00	
10,583.00	25.54	356.38	10,154.47	2,527.85	-173.91	-2,103.25	3.52	1.92	6.96	
10,630.00	25.63	356.11	10,196.86	2,548.10	-175.24	-2,120.06	0.31	0.19	-0.57	
10,677.00	25.10	356.11	10,239.33	2,568.19	-176.61	-2,136.76	1.13	-1.13	0.00	
10,724.00	20.88	359.89	10,282.59	2,586.52	-177.30	-2,151.67	9.51	-8.98	8.04	
10,772.00	17.27	12.90	10,327.97	2,602.03	-175.73	-2,162.95	11.58	-7.52	27.10	
10,819.00	15.91	21.34	10,373.02	2,614.84	-171.82	-2,170.67	5.88	-2.89	17.96	
10,867.00	13.93	36.02	10,419.41	2,625.64	-166.03	-2,175.65	8.86	-4.13	30.58	
10,914.00	13.85	52.28	10,465.05	2,633.66	-158.25	-2,177.21	8.28	-0.17	34.60	
10,961.00	14.20	59.22	10,510.66	2,640.06	-148.85	-2,176.50	3.65	0.74	14.77	
11,008.00	15.74	70.38	10,556.07	2,645.15	-137.89	-2,173.80	6.94	3.28	23.74	
11,056.00	17.14	81.46	10,602.12	2,648.39	-124.75	-2,168.30	7.14	2.92	23.08	
11,103.00	18.37	89.89	10,646.89	2,649.43	-110.50	-2,160.38	6.06	2.62	17.94	
11,151.00	21.10	96.05	10,692.07	2,648.53	-94.34	-2,149.76	7.14	5.69	12.83	
11,198.00	24.22	103.16	10,735.44	2,645.44	-76.53	-2,136.40	8.82	6.64	15.13	
11,245.00	26.77	107.47	10,777.87	2,640.07	-57.04	-2,120.20	6.71	5.43	9.17	
11,292.00	29.58	113.01	10,819.30	2,632.35	-36.26	-2,101.36	8.16	5.98	11.79	
11,340.00	32.48	119.34	10,860.44	2,621.40	-14.11	-2,079.13	9.09	6.04	13.19	
11,387.00	35.47	123.64	10,899.41	2,607.66	8.25	-2,054.56	8.16	6.36	9.15	
11,435.00	38.99	127.86	10,937.63	2,590.67	31.78	-2,026.71	9.06	7.33	8.79	
11,482.00	43.34	130.50	10,973.01	2,571.11	55.73	-1,996.57	9.96	9.26	5.62	
11,529.00	47.21	132.78	11,006.08	2,548.91	80.67	-1,963.74	8.93	8.23	4.85	
11,576.00	50.55	135.60	11,036.99	2,524.22	106.03	-1,928.69	8.42	7.11	6.00	
11,624.00	52.44	138.32	11,066.87	2,496.77	131.65	-1,891.29	5.93	3.94	5.67	
11,671.00	54.11	140.43	11,094.98	2,468.18	156.17	-1,853.67	5.06	3.55	4.49	
11,718.00	57.45	142.72	11,121.41	2,437.73	180.31	-1,814.81	8.17	7.11	4.87	
11,765.00	62.51	145.18	11,144.92	2,404.83	204.23	-1,774.16	11.58	10.77	5.23	
11,813.00	66.81	146.49	11,165.46	2,368.94	228.58	-1,730.88	9.29	8.96	2.73	
11,860.00	70.33	147.20	11,182.63	2,332.31	252.50	-1,687.28	7.62	7.49	1.51	
11,908.00	72.66	148.43	11,197.86	2,293.79	276.74	-1,641.99	5.43	4.85	2.56	
11,955.00	74.33	149.48	11,211.21	2,255.18	299.97	-1,597.24	4.15	3.55	2.23	
12,002.00	76.66	150.45	11,222.99	2,215.79	322.75	-1,552.16	5.34	4.96	2.06	
12,049.00	81.89	151.07	11,231.73	2,175.51	345.29	-1,506.52	11.20	11.13	1.32	
12,097.00	87.56	151.15	11,236.14	2,133.68	368.38	-1,459.32	11.81	11.81	0.17	
12,192.00	88.70	151.33	11,239.24	2,050.45	414.06	-1,365.56	1.21	1.20	0.19	
12,286.00	88.66	150.89	11,241.41	1,968.17	459.46	-1,272.73	0.47	-0.04	-0.47	
12,381.00	88.88	151.07	11,243.45	1,885.11	505.54	-1,178.87	0.30	0.23	0.19	
12,447.00	89.08	149.31	11,244.62	1,827.86	538.34	-1,113.53	2.68	0.30	-2.67	
12,542.00	88.99	145.44	11,246.22	1,747.87	589.54	-1,018.95	4.07	-0.09	-4.07	
12,637.00	88.90	149.83	11,247.97	1,667.66	640.37	-924.42	4.62	-0.09	4.62	
12,731.00	88.99	152.12	11,249.70	1,585.49	685.97	-831.55	2.44	0.10	2.44	
12,826.00	89.08	149.31	11,251.30	1,502.65	732.43	-737.63	2.96	0.09	-2.96	

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Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Burch Ridge 7 HU (slot G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
12,921.00	89.08	148.25	11,252.83	1,421.42	781.66	-643.27	1.12	0.00	-1.12
13,015.00	89.08	148.25	11,254.34	1,341.50	831.12	-549.82	0.00	0.00	0.00
13,110.00	89.08	148.08	11,255.86	1,260.80	881.23	-455.35	0.18	0.00	-0.18
13,205.00	89.08	150.19	11,257.39	1,179.27	929.95	-361.07	2.22	0.00	2.22
13,299.00	89.08	150.19	11,258.90	1,097.72	976.68	-268.00	0.00	0.00	0.00
13,394.00	89.08	150.54	11,260.42	1,015.15	1,023.65	-173.98	0.37	0.00	0.37
13,489.00	89.08	150.36	11,261.95	932.52	1,070.49	-79.98	0.19	0.00	-0.19
13,584.00	88.99	150.36	11,263.55	849.96	1,117.47	14.04	0.09	-0.09	0.00
13,679.00	88.99	150.01	11,265.22	767.55	1,164.69	108.09	0.37	0.00	-0.37
13,773.00	88.99	150.01	11,266.88	686.15	1,211.67	201.20	0.00	0.00	0.00
13,868.00	88.99	149.83	11,268.55	603.96	1,259.28	295.32	0.19	0.00	-0.19
13,963.00	89.34	150.19	11,269.94	521.68	1,306.76	389.42	0.53	0.37	0.38
14,057.00	89.43	150.01	11,270.95	440.20	1,353.62	482.52	0.21	0.10	-0.19
14,152.00	89.52	149.66	11,271.82	358.07	1,401.35	576.66	0.38	0.09	-0.37
14,247.00	89.52	149.31	11,272.61	276.23	1,449.59	670.89	0.37	0.00	-0.37
14,342.00	89.08	149.48	11,273.77	194.47	1,497.95	765.12	0.50	-0.46	0.18
14,437.00	89.08	151.77	11,275.30	111.70	1,544.54	859.07	2.41	0.00	2.41
14,532.00	88.99	151.94	11,276.90	27.94	1,589.34	952.71	0.20	-0.09	0.18
14,627.00	88.99	152.47	11,278.57	-56.08	1,633.64	1,046.24	0.56	0.00	0.56
14,721.00	89.08	152.12	11,280.16	-139.29	1,677.33	1,138.76	0.38	0.10	-0.37
14,816.00	88.99	152.47	11,281.76	-223.39	1,721.49	1,232.27	0.38	-0.09	0.37
14,911.00	89.08	151.77	11,283.36	-307.35	1,765.91	1,325.82	0.74	0.09	-0.74
15,006.00	89.52	151.77	11,284.52	-391.04	1,810.84	1,419.49	0.46	0.46	0.00
15,101.00	89.52	151.77	11,285.31	-474.74	1,855.78	1,513.15	0.00	0.00	0.00
15,195.00	89.60	151.77	11,286.04	-557.56	1,900.24	1,605.83	0.09	0.09	0.00
15,290.00	89.52	151.24	11,286.77	-641.05	1,945.56	1,699.57	0.56	-0.08	-0.56
15,385.00	89.52	149.31	11,287.56	-723.54	1,992.66	1,793.62	2.03	0.00	-2.03
15,479.00	89.52	148.08	11,288.35	-803.85	2,041.50	1,887.00	1.31	0.00	-1.31
15,574.00	89.08	147.90	11,289.51	-884.40	2,091.85	1,981.51	0.50	-0.46	-0.19
15,669.00	89.08	147.73	11,291.03	-964.79	2,142.45	2,076.03	0.18	0.00	-0.18
15,763.00	89.08	148.08	11,292.54	-1,044.41	2,192.39	2,169.55	0.37	0.00	0.37
15,858.00	89.08	148.60	11,294.07	-1,125.26	2,242.24	2,263.99	0.55	0.00	0.55
15,953.00	88.99	148.78	11,295.67	-1,206.42	2,291.61	2,358.36	0.21	-0.09	0.19
16,047.00	88.90	148.43	11,297.40	-1,286.64	2,340.57	2,451.75	0.38	-0.10	-0.37
16,142.00	88.46	148.78	11,299.59	-1,367.71	2,390.04	2,546.13	0.59	-0.46	0.37
16,237.00	88.46	148.43	11,302.14	-1,448.77	2,439.51	2,640.49	0.37	0.00	-0.37
16,331.00	88.99	148.60	11,304.23	-1,528.92	2,488.59	2,733.90	0.59	0.56	0.18
16,426.00	88.99	147.37	11,305.91	-1,609.45	2,538.95	2,828.39	1.29	0.00	-1.29
16,521.00	88.99	147.20	11,307.58	-1,689.37	2,590.28	2,923.00	0.18	0.00	-0.18
16,616.00	89.43	148.78	11,308.89	-1,769.92	2,640.63	3,017.49	1.73	0.46	1.66
16,710.00	89.52	148.43	11,309.75	-1,850.15	2,689.60	3,110.90	0.38	0.10	-0.37
16,805.00	89.43	145.79	11,310.62	-1,929.91	2,741.18	3,205.53	2.78	-0.09	-2.78
16,900.00	89.25	148.60	11,311.72	-2,009.75	2,792.64	3,300.15	2.96	-0.19	2.96

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Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Burch Ridge 7 HU (slot G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
16,995.00	89.60	152.65	11,312.67	-2,092.51	2,839.23	3,394.10	4.28	0.37	4.26
17,089.00	89.52	154.23	11,313.39	-2,176.59	2,881.26	3,486.28	1.68	-0.09	1.68
17,184.00	89.08	153.70	11,314.55	-2,261.94	2,922.95	3,579.26	0.73	-0.46	-0.56
17,279.00	88.99	154.05	11,316.15	-2,347.22	2,964.78	3,672.27	0.38	-0.09	0.37
17,373.00	88.99	153.88	11,317.81	-2,431.67	3,006.03	3,764.28	0.18	0.00	-0.18
17,468.00	89.08	152.65	11,319.41	-2,516.50	3,048.76	3,857.49	1.30	0.09	-1.29
17,563.00	88.99	150.89	11,321.01	-2,600.19	3,093.69	3,951.14	1.85	-0.09	-1.85
17,658.00	89.08	150.19	11,322.61	-2,682.89	3,140.40	4,045.11	0.74	0.09	-0.74
17,752.00	89.08	149.83	11,324.12	-2,764.29	3,187.38	4,138.22	0.38	0.00	-0.38
17,847.00	89.08	149.83	11,325.65	-2,846.42	3,235.12	4,232.36	0.00	0.00	0.00
17,942.00	89.16	149.66	11,327.11	-2,928.47	3,282.98	4,326.52	0.20	0.08	-0.18
18,036.00	89.16	149.48	11,328.48	-3,009.51	3,330.58	4,419.73	0.19	0.00	-0.19
18,131.00	89.08	149.83	11,329.94	-3,091.48	3,378.57	4,513.91	0.38	-0.08	0.37
18,226.00	88.99	149.66	11,331.54	-3,173.53	3,426.43	4,608.06	0.20	-0.09	-0.18
18,320.00	89.08	149.66	11,333.13	-3,254.65	3,473.91	4,701.25	0.10	0.10	0.00
18,415.00	88.99	149.66	11,334.73	-3,336.62	3,521.89	4,795.43	0.09	-0.09	0.00
18,510.00	89.08	149.31	11,336.33	-3,418.45	3,570.12	4,889.64	0.38	0.09	-0.37
18,604.00	88.99	149.13	11,337.91	-3,499.20	3,618.22	4,982.92	0.21	-0.10	-0.19
18,699.00	89.08	149.48	11,339.51	-3,580.88	3,666.70	5,077.17	0.38	0.09	0.37
18,793.00	88.99	151.59	11,341.09	-3,662.71	3,712.93	5,170.15	2.25	-0.10	2.24
18,888.00	89.16	151.59	11,342.63	-3,746.25	3,758.12	5,263.85	0.18	0.18	0.00
18,983.00	89.08	152.65	11,344.08	-3,830.22	3,802.54	5,357.41	1.12	-0.08	1.12
19,077.00	89.08	153.00	11,345.59	-3,913.83	3,845.47	5,449.78	0.37	0.00	0.37
19,172.00	89.08	153.00	11,347.12	-3,998.46	3,888.59	5,543.08	0.00	0.00	0.00
19,266.00	89.08	152.82	11,348.63	-4,082.14	3,931.39	5,635.42	0.19	0.00	-0.19
19,361.00	88.99	150.36	11,350.23	-4,165.68	3,976.58	5,729.12	2.59	-0.09	-2.59
19,456.00	88.90	149.13	11,351.98	-4,247.73	4,024.44	5,823.27	1.30	-0.09	-1.29
19,551.00	89.08	148.96	11,353.65	-4,329.18	4,073.29	5,917.57	0.26	0.19	-0.18
19,645.00	89.52	149.31	11,354.80	-4,409.86	4,121.51	6,010.87	0.60	0.09	0.37
19,740.00	89.43	148.78	11,355.67	-4,491.33	4,170.38	6,105.18	0.57	0.09	-0.56
19,835.00	89.52	149.13	11,356.54	-4,572.72	4,219.37	6,199.51	0.38	0.09	0.37
19,930.00	89.52	149.31	11,357.34	-4,654.33	4,267.98	6,293.79	0.19	0.00	-0.19
20,024.00	89.52	148.96	11,358.13	-4,735.02	4,316.20	6,387.09	0.37	0.00	-0.37
20,119.00	89.60	148.60	11,358.85	-4,816.26	4,365.44	6,481.46	0.39	0.08	-0.38
20,214.00	89.43	148.43	11,359.66	-4,897.27	4,415.06	6,575.87	0.25	-0.18	-0.18
20,308.00	89.16	148.43	11,360.82	-4,977.35	4,464.27	6,669.31	0.29	-0.29	0.00
20,403.00	89.08	148.60	11,362.27	-5,058.35	4,513.88	6,763.71	0.20	-0.08	0.18
20,498.00	89.08	148.78	11,363.80	-5,139.51	4,563.24	6,858.09	0.19	0.00	0.19
20,592.00	89.08	148.43	11,365.31	-5,219.74	4,612.20	6,951.48	0.37	0.00	-0.37
20,687.00	89.16	148.43	11,366.77	-5,300.67	4,661.93	7,045.91	0.08	0.08	0.00
20,782.00	89.43	149.31	11,367.94	-5,381.98	4,711.04	7,140.25	0.97	0.28	0.93
20,876.00	89.60	151.24	11,368.73	-5,463.60	4,757.64	7,233.30	2.06	0.18	2.05
20,971.00	89.60	151.94	11,369.40	-5,547.16	4,802.84	7,327.02	0.74	0.00	0.74

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Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Burch Ridge 7 HU (slot G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
21,066.00	89.43	151.94	11,370.20	-5,630.99	4,847.53	7,420.64	0.18	-0.18	0.00
21,160.00	88.99	152.30	11,371.50	-5,714.07	4,891.48	7,513.21	0.60	-0.47	0.38
21,255.00	88.99	152.30	11,373.17	-5,798.17	4,935.63	7,606.72	0.00	0.00	0.00
21,349.00	88.99	152.47	11,374.83	-5,881.45	4,979.20	7,699.21	0.18	0.00	0.18
21,444.00	89.08	152.47	11,376.43	-5,965.68	5,023.10	7,792.67	0.09	0.09	0.00
21,539.00	89.08	151.77	11,377.95	-6,049.64	5,067.52	7,886.23	0.74	0.00	-0.74
21,633.00	89.08	149.66	11,379.46	-6,131.61	5,113.49	7,979.17	2.24	0.00	-2.24
21,728.00	89.08	148.60	11,380.99	-6,213.14	5,162.23	8,073.45	1.12	0.00	-1.12
21,823.00	88.90	148.78	11,382.66	-6,294.30	5,211.59	8,167.82	0.27	-0.19	0.19
21,917.00	89.16	148.78	11,384.25	-6,374.67	5,260.30	8,261.19	0.28	0.28	0.00
22,012.00	89.52	148.25	11,385.35	-6,455.68	5,309.92	8,355.60	0.67	0.38	-0.56
22,107.00	89.60	148.78	11,386.08	-6,536.69	5,359.53	8,450.01	0.56	0.08	0.56
22,201.00	89.43	148.43	11,386.87	-6,616.93	5,408.50	8,543.42	0.41	-0.18	-0.37
22,296.00	89.52	148.43	11,387.74	-6,697.86	5,458.23	8,637.85	0.09	0.09	0.00
22,391.00	88.90	147.55	11,389.05	-6,778.41	5,508.58	8,732.35	1.13	-0.65	-0.93
22,485.00	88.90	147.20	11,390.86	-6,857.56	5,559.25	8,825.94	0.37	0.00	-0.37
22,580.00	89.08	149.66	11,392.53	-6,938.48	5,608.98	8,920.35	2.60	0.19	2.59
22,675.00	88.99	150.54	11,394.13	-7,020.83	5,656.33	9,014.43	0.93	-0.09	0.93
22,769.00	88.90	150.36	11,395.86	-7,102.59	5,702.68	9,107.43	0.21	-0.10	-0.19
22,864.00	88.81	150.36	11,397.76	-7,185.14	5,749.65	9,201.45	0.09	-0.09	0.00
22,959.00	88.90	150.71	11,399.66	-7,267.84	5,796.37	9,295.42	0.38	0.09	0.37
23,053.00	88.90	151.07	11,401.47	-7,349.95	5,842.09	9,388.31	0.38	0.00	0.38
23,148.00	88.90	151.07	11,403.29	-7,433.08	5,888.04	9,482.15	0.00	0.00	0.00
23,242.00	89.16	150.89	11,404.88	-7,515.26	5,933.63	9,575.03	0.34	0.28	-0.19
23,337.00	89.43	151.77	11,406.05	-7,598.61	5,979.21	9,668.81	0.97	0.28	0.93
23,432.00	89.52	151.77	11,406.92	-7,682.31	6,024.14	9,762.48	0.09	0.09	0.00
23,527.00	89.60	152.30	11,407.65	-7,766.21	6,068.69	9,856.07	0.56	0.08	0.56
23,621.00	89.60	150.89	11,408.31	-7,848.89	6,113.40	9,948.79	1.50	0.00	-1.50
23,700.00	89.52	149.48	11,408.91	-7,917.43	6,152.68	10,027.02	1.79	-0.10	-1.78
Survey @ 23700.00 MD 11408.91 TVD									
23,775.00	89.52	149.48	11,409.54	-7,982.03	6,190.77	10,101.41	0.00	0.00	0.00
Survey Proj. to 23775.00 MD 11409.54 TVD									

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
164.00	164.00	-0.08	0.24	MWD surveys
23,700.00	11,408.91	-7,917.43	6,152.68	Survey @ 23700.00 MD 11408.91 TVD

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Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Burch Ridge 7 HU (slot G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

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	Burch Ridge				
Site Position:		Northing:	14,437,347.35 usft	Latitude:	39.75435517
From:	Lat/Long	Easting:	1,695,925.32 usft	Longitude:	-80.80249684
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.126 °

Well	Burch Ridge 7 HU (slot G)					
Well Position	+N/-S	0.00 ft	Northing:	14,437,340.81 usft	Latitude:	39.75433715
	+E/-W	0.00 ft	Easting:	1,695,935.37 usft	Longitude:	-80.80246111
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,313.00 ft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2020	10/4/2020	-8.590	66.595	51,813.25167370

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.00	0.00	0.00	142.17	

Survey Program	Date	3/1/2021			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
164.00	1,010.00	MWD surf (Original Hole)	MWD	MWD - Standard	
1,072.00	2,758.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,813.00	6,469.00	MWD int2 (Original Hole)	MWD	MWD - Standard	
6,567.00	23,700.00	MWD (Original Hole)	MWD	MWD - Standard	
23,775.00	23,775.00	Projection (Original Hole)	MWD	MWD - Standard	

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Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.00	0.00	0.00	0.00	14,437,340.81	1,695,935.37	39.75433715	-80.80246111	
164.00	0.18	108.88	164.00	-0.08	0.24	14,437,340.73	1,695,935.62	39.75433692	-80.80246024	
MWD surveys										
185.00	0.09	15.10	185.00	-0.08	0.28	14,437,340.73	1,695,935.65	39.75433694	-80.80246012	
216.00	0.13	261.28	216.00	-0.06	0.25	14,437,340.75	1,695,935.62	39.75433699	-80.80246022	
245.00	0.04	261.28	245.00	-0.07	0.21	14,437,340.74	1,695,935.58	39.75433697	-80.80246037	
275.00	0.13	208.46	275.00	-0.10	0.18	14,437,340.71	1,695,935.56	39.75433688	-80.80246047	
305.00	0.31	242.47	305.00	-0.17	0.09	14,437,340.65	1,695,935.47	39.75433670	-80.80246078	



Survey Report - Geographic



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Project:	Marshall County, West Virginia	TVD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
335.00	0.22	261.26	335.00	-0.21	-0.04	14,437,340.60	1,695,935.34	39.75433657	-80.80246124
365.00	0.18	231.43	365.00	-0.25	-0.13	14,437,340.56	1,695,935.24	39.75433647	-80.80246157
395.00	0.26	250.73	395.00	-0.30	-0.23	14,437,340.51	1,695,935.14	39.75433632	-80.80246193
425.00	0.22	249.94	425.00	-0.34	-0.35	14,437,340.47	1,695,935.02	39.75433621	-80.80246235
455.00	0.22	286.59	455.00	-0.35	-0.46	14,437,340.46	1,695,934.92	39.75433620	-80.80246274
485.00	0.26	286.50	485.00	-0.31	-0.58	14,437,340.50	1,695,934.80	39.75433630	-80.80246317
515.00	0.31	269.81	515.00	-0.29	-0.72	14,437,340.52	1,695,934.65	39.75433635	-80.80246369
546.00	0.22	281.67	546.00	-0.28	-0.87	14,437,340.53	1,695,934.51	39.75433639	-80.80246420
576.00	0.09	310.41	576.00	-0.25	-0.94	14,437,340.56	1,695,934.43	39.75433646	-80.80246446
606.00	0.09	285.89	606.00	-0.23	-0.98	14,437,340.58	1,695,934.39	39.75433652	-80.80246461
637.00	0.13	289.84	637.00	-0.21	-1.04	14,437,340.60	1,695,934.34	39.75433657	-80.80246481
667.00	0.18	243.88	667.00	-0.22	-1.11	14,437,340.59	1,695,934.26	39.75433655	-80.80246507
697.00	0.18	294.59	697.00	-0.22	-1.20	14,437,340.59	1,695,934.18	39.75433654	-80.80246537
728.00	0.04	81.28	728.00	-0.20	-1.23	14,437,340.61	1,695,934.14	39.75433661	-80.80246549
758.00	0.48	69.94	758.00	-0.16	-1.10	14,437,340.65	1,695,934.27	39.75433673	-80.80246504
788.00	0.88	65.11	787.99	-0.02	-0.78	14,437,340.79	1,695,934.60	39.75433711	-80.80246387
819.00	1.27	66.87	818.99	0.22	-0.24	14,437,341.03	1,695,935.13	39.75433775	-80.80246198
851.00	1.67	62.82	850.98	0.57	0.50	14,437,341.38	1,695,935.87	39.75433872	-80.80245934
882.00	1.89	59.83	881.96	1.03	1.34	14,437,341.85	1,695,936.71	39.75433998	-80.80245633
914.00	2.02	51.40	913.94	1.65	2.24	14,437,342.46	1,695,937.61	39.75434167	-80.80245314
945.00	2.11	39.00	944.92	2.44	3.02	14,437,343.25	1,695,938.40	39.75434382	-80.80245033
977.00	2.59	31.80	976.90	3.51	3.78	14,437,344.32	1,695,939.15	39.75434676	-80.80244765
1,010.00	2.86	30.13	1,009.86	4.85	4.58	14,437,345.66	1,695,939.95	39.75435045	-80.80244477
1,072.00	3.08	21.60	1,071.78	7.74	5.97	14,437,348.55	1,695,941.34	39.75435837	-80.80243980
1,119.00	2.59	20.20	1,118.72	9.91	6.80	14,437,350.72	1,695,942.18	39.75436433	-80.80243683
1,166.00	2.42	19.23	1,165.67	11.84	7.50	14,437,352.66	1,695,942.87	39.75436963	-80.80243435
1,213.00	2.11	11.67	1,212.64	13.63	8.00	14,437,354.44	1,695,943.37	39.75437453	-80.80243255
1,261.00	1.98	5.43	1,260.61	15.32	8.26	14,437,356.13	1,695,943.63	39.75437917	-80.80243162
1,308.00	2.29	358.84	1,307.57	17.07	8.31	14,437,357.88	1,695,943.69	39.75438397	-80.80243140
1,356.00	2.55	359.98	1,355.53	19.09	8.29	14,437,359.90	1,695,943.67	39.75438954	-80.80243145
1,403.00	3.12	359.54	1,402.47	21.42	8.28	14,437,362.23	1,695,943.66	39.75439592	-80.80243147
1,451.00	3.74	358.05	1,450.39	24.29	8.22	14,437,365.10	1,695,943.59	39.75440285	-80.80243168
1,498.00	4.22	358.22	1,497.27	27.55	8.11	14,437,368.36	1,695,943.49	39.75441276	-80.80243203
1,546.00	4.57	357.34	1,545.13	31.22	7.97	14,437,372.04	1,695,943.34	39.75442285	-80.80243251
1,593.00	5.14	2.79	1,591.96	35.20	7.98	14,437,376.01	1,695,943.36	39.75443376	-80.80243242
1,641.00	5.23	2.44	1,639.77	39.53	8.18	14,437,380.34	1,695,943.56	39.75444566	-80.80243169
1,736.00	5.58	356.82	1,734.35	48.47	8.11	14,437,389.28	1,695,943.48	39.75447021	-80.80243187
1,831.00	6.11	356.11	1,828.85	58.12	7.51	14,437,398.94	1,695,942.89	39.75449576	-80.80243393
1,925.00	5.45	352.16	1,922.37	67.54	6.56	14,437,408.35	1,695,941.94	39.75452259	-80.80243723
2,020.00	6.68	357.34	2,016.84	77.53	5.69	14,437,418.34	1,695,941.06	39.75455003	-80.80244025
2,115.00	7.65	357.08	2,111.10	89.36	5.11	14,437,430.17	1,695,940.49	39.75458253	-80.80244222
2,210.00	6.68	355.85	2,205.36	101.19	4.39	14,437,442.00	1,695,939.76	39.75461501	-80.80244469
2,305.00	5.32	356.11	2,299.83	111.09	3.69	14,437,451.90	1,695,939.07	39.75464222	-80.80244710
2,400.00	5.49	349.52	2,394.41	119.96	2.57	14,437,460.77	1,695,937.94	39.75466657	-80.80245104
2,494.00	5.63	348.91	2,487.97	128.90	0.86	14,437,469.71	1,695,936.24	39.75469115	-80.80245703
2,589.00	5.14	357.34	2,582.55	137.73	-0.23	14,437,478.54	1,695,935.14	39.75471539	-80.80246086
2,684.00	4.35	0.95	2,677.23	145.58	-0.37	14,437,486.39	1,695,935.00	39.75473696	-80.80246128
2,758.00	4.79	358.84	2,750.99	151.47	-0.39	14,437,492.29	1,695,934.99	39.75475315	-80.80246129
2,813.00	4.92	359.10	2,805.79	156.13	-0.47	14,437,496.94	1,695,934.90	39.75476593	-80.80246156
2,871.00	5.27	358.22	2,863.56	161.28	-0.59	14,437,502.09	1,695,934.78	39.75478007	-80.80246195
2,966.00	7.08	357.43	2,958.01	171.49	-0.99	14,437,512.30	1,695,934.38	39.75480811	-80.80246328
3,061.00	8.79	356.20	3,052.09	184.58	-1.73	14,437,525.39	1,695,933.64	39.75484407	-80.80246583
3,155.00	10.33	355.76	3,144.79	200.15	-2.83	14,437,540.96	1,695,932.54	39.75488685	-80.80246962
3,250.00	11.87	355.41	3,238.01	218.39	-4.24	14,437,559.20	1,695,931.13	39.75493693	-80.80247450
3,344.00	12.52	355.24	3,329.89	238.18	-5.86	14,437,578.99	1,695,929.51	39.75499129	-80.80248010

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Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Burch Ridge 7 HU (slot G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
3,439.00	13.62	356.64	3,422.42	259.61	-7.37	14,437,600.42	1,695,928.00	39.75505015	-80.80248531	
3,533.00	13.32	356.55	3,513.84	281.46	-8.67	14,437,622.27	1,695,926.70	39.75511018	-80.80248976	
3,628.00	13.36	356.73	3,606.27	303.34	-9.96	14,437,644.16	1,695,925.42	39.75517028	-80.80249416	
3,723.00	14.33	357.43	3,698.51	326.05	-11.11	14,437,666.86	1,695,924.26	39.75523264	-80.80249809	
3,818.00	14.46	357.61	3,790.53	349.64	-12.13	14,437,690.45	1,695,923.24	39.75529745	-80.80250154	
3,913.00	14.99	356.82	3,882.41	373.76	-13.31	14,437,714.57	1,695,922.06	39.75536369	-80.80250553	
4,007.00	15.42	357.17	3,973.12	398.38	-14.60	14,437,739.19	1,695,920.77	39.75543131	-80.80250993	
4,102.00	14.41	357.87	4,064.92	422.81	-15.66	14,437,763.62	1,695,919.71	39.75549840	-80.80251353	
4,197.00	14.41	357.96	4,156.93	446.43	-16.52	14,437,787.24	1,695,918.85	39.75556329	-80.80251640	
4,291.00	16.30	359.28	4,247.57	471.32	-17.11	14,437,812.13	1,695,918.27	39.75563162	-80.80251828	
4,386.00	16.22	359.63	4,338.77	497.91	-17.36	14,437,838.72	1,695,918.01	39.75570467	-80.80251897	
4,481.00	15.29	1.21	4,430.20	523.71	-17.18	14,437,864.52	1,695,918.19	39.75577550	-80.80251813	
4,576.00	15.29	359.98	4,521.84	548.75	-16.92	14,437,889.57	1,695,918.45	39.75584429	-80.80251701	
4,670.00	18.41	359.28	4,611.79	576.00	-17.11	14,437,916.81	1,695,918.26	39.75591911	-80.80251747	
4,765.00	17.84	1.48	4,702.08	605.55	-16.92	14,437,946.36	1,695,918.45	39.75600026	-80.80251658	
4,860.00	16.17	1.65	4,792.92	633.32	-16.17	14,437,974.13	1,695,919.21	39.75607652	-80.80251366	
4,955.00	16.00	358.66	4,884.20	659.63	-16.09	14,438,000.44	1,695,919.28	39.75614878	-80.80251319	
5,049.00	15.82	354.18	4,974.61	685.33	-17.69	14,438,026.14	1,695,917.68	39.75621937	-80.80251869	
5,144.00	16.35	353.48	5,065.89	711.50	-20.53	14,438,052.31	1,695,914.85	39.75629125	-80.80252856	
5,239.00	15.86	353.92	5,157.16	737.69	-23.42	14,438,078.50	1,695,911.95	39.75636320	-80.80253865	
5,333.00	14.85	355.85	5,247.80	762.48	-25.65	14,438,103.29	1,695,909.72	39.75643129	-80.80254640	
5,428.00	16.04	356.90	5,339.37	787.73	-27.24	14,438,128.54	1,695,908.13	39.75650064	-80.80255186	
5,523.00	14.46	357.78	5,431.02	812.68	-28.41	14,438,153.49	1,695,906.96	39.75656919	-80.80255583	
5,618.00	13.45	359.54	5,523.22	835.59	-28.96	14,438,176.40	1,695,906.41	39.75663209	-80.80255760	
5,712.00	13.36	0.07	5,614.66	857.38	-29.03	14,438,198.19	1,695,906.34	39.75669193	-80.80255769	
5,807.00	14.19	357.87	5,706.92	879.99	-29.45	14,438,220.80	1,695,905.92	39.75675404	-80.80255901	
5,901.00	14.02	357.78	5,798.09	902.88	-30.32	14,438,243.69	1,695,905.05	39.75681691	-80.80256192	
5,996.00	14.68	356.90	5,890.13	926.40	-31.42	14,438,267.21	1,695,903.95	39.75688150	-80.80256564	
6,090.00	14.50	354.53	5,981.09	950.01	-33.19	14,438,290.82	1,695,902.19	39.75694635	-80.80257174	
6,185.00	15.25	355.76	6,072.91	974.31	-35.24	14,438,315.12	1,695,900.13	39.75701309	-80.80257887	
6,280.00	14.72	355.32	6,164.68	998.80	-37.15	14,438,339.61	1,695,898.22	39.75708036	-80.80258547	
6,375.00	15.03	355.85	6,256.50	1,023.11	-39.03	14,438,363.92	1,695,896.35	39.75714715	-80.80259195	
6,469.00	15.51	355.06	6,347.18	1,047.79	-40.99	14,438,388.60	1,695,894.38	39.75721493	-80.80259875	
6,567.00	14.59	355.59	6,441.81	1,073.15	-43.07	14,438,413.96	1,695,892.30	39.75728459	-80.80260594	
6,662.00	10.99	352.42	6,534.44	1,094.06	-45.18	14,438,434.87	1,695,890.19	39.75734204	-80.80261330	
6,757.00	10.63	352.51	6,627.76	1,111.73	-47.52	14,438,452.54	1,695,887.85	39.75739056	-80.80262148	
6,851.00	13.01	353.92	6,719.76	1,130.85	-49.77	14,438,471.66	1,695,885.60	39.75744308	-80.80262934	
6,946.00	14.63	354.27	6,812.00	1,153.42	-52.10	14,438,494.23	1,695,883.27	39.75750509	-80.80263745	
7,041.00	15.73	355.32	6,903.69	1,178.19	-54.35	14,438,519.00	1,695,881.02	39.75757313	-80.80264526	
7,135.00	15.95	355.32	6,994.12	1,203.76	-56.44	14,438,544.57	1,695,878.93	39.75764337	-80.80265251	
7,230.00	14.50	351.54	7,085.78	1,228.54	-59.26	14,438,569.35	1,695,876.11	39.75771448	-80.80266233	
7,325.00	14.46	354.71	7,177.77	1,252.11	-62.10	14,438,592.92	1,695,873.27	39.75777619	-80.80267226	
7,420.00	15.03	0.68	7,269.65	1,276.24	-63.05	14,438,617.05	1,695,872.32	39.75784246	-80.80267544	
7,514.00	15.34	1.56	7,360.36	1,300.86	-62.57	14,438,641.67	1,695,872.81	39.75790800	-80.80267353	
7,609.00	15.69	359.81	7,451.90	1,326.27	-62.27	14,438,667.07	1,695,873.11	39.75797984	-80.80267227	
7,703.00	16.52	358.22	7,542.21	1,352.33	-62.72	14,438,693.14	1,695,872.65	39.75805143	-80.80267369	
7,798.00	15.82	356.47	7,633.45	1,378.76	-63.94	14,438,719.57	1,695,871.43	39.75812401	-80.80267781	
7,893.00	14.02	354.62	7,725.25	1,403.14	-65.82	14,438,743.95	1,695,869.56	39.75819099	-80.80268430	
7,987.00	14.11	351.37	7,816.43	1,425.81	-68.61	14,438,766.62	1,695,866.77	39.75825325	-80.80269404	
8,082.00	15.03	353.83	7,908.38	1,449.50	-71.67	14,438,790.31	1,695,863.71	39.75831834	-80.80270475	
8,177.00	15.47	353.92	8,000.03	1,474.35	-74.33	14,438,815.16	1,695,861.04	39.75838659	-80.80271404	
8,272.00	16.39	352.51	8,091.38	1,500.24	-77.42	14,438,841.05	1,695,857.95	39.75845770	-80.80272483	
8,366.00	18.19	353.92	8,181.13	1,527.98	-80.70	14,438,868.79	1,695,854.67	39.75853391	-80.80273629	
8,461.00	19.20	352.51	8,271.12	1,558.21	-84.31	14,438,899.02	1,695,851.06	39.75861696	-80.80274889	
8,556.00	20.96	355.15	8,360.34	1,590.63	-87.78	14,438,931.44	1,695,847.59	39.75870602	-80.80276099	



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Burch Ridge 7 HU (slot G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
8,651.00	24.79	356.47	8,447.85	1,627.46	-90.45	14,438,968.26	1,695,844.92	39.75880716	-80.80277018	
8,745.00	28.56	355.94	8,531.84	1,669.55	-93.25	14,439,010.36	1,695,842.12	39.75892279	-80.80277984	
8,840.00	28.70	354.97	8,615.22	1,714.93	-96.86	14,439,055.74	1,695,838.51	39.75904743	-80.80279232	
8,935.00	30.67	353.30	8,697.75	1,761.72	-101.69	14,439,102.53	1,695,833.68	39.75917596	-80.80280913	
9,030.00	29.58	352.60	8,779.92	1,809.04	-107.54	14,439,149.85	1,695,827.84	39.75930594	-80.80282956	
9,124.00	28.52	355.67	8,862.10	1,854.43	-112.22	14,439,195.24	1,695,823.15	39.75943062	-80.80284587	
9,221.00	28.21	355.85	8,947.45	1,900.39	-115.63	14,439,241.19	1,695,819.75	39.75955685	-80.80285764	
9,316.00	28.43	355.59	9,031.08	1,945.33	-118.99	14,439,286.13	1,695,816.38	39.75968030	-80.80286925	
9,410.00	29.36	355.32	9,113.38	1,990.60	-122.59	14,439,331.41	1,695,812.78	39.75980467	-80.80288171	
9,505.00	29.36	355.67	9,196.17	2,037.04	-126.25	14,439,377.85	1,695,809.12	39.75993221	-80.80289437	
9,599.00	28.04	355.41	9,278.62	2,082.04	-129.76	14,439,422.85	1,695,805.62	39.76005582	-80.80290650	
9,694.00	26.63	354.62	9,363.01	2,125.50	-133.54	14,439,466.31	1,695,801.83	39.76017519	-80.80291962	
9,789.00	26.19	354.27	9,448.10	2,167.56	-137.63	14,439,508.36	1,695,797.74	39.76029071	-80.80293384	
9,884.00	26.06	353.83	9,533.39	2,209.16	-141.97	14,439,549.97	1,695,793.41	39.76040500	-80.80294894	
9,978.00	26.89	352.86	9,617.53	2,250.78	-146.83	14,439,591.59	1,695,788.55	39.76051933	-80.80296592	
10,073.00	27.86	353.74	9,701.90	2,294.17	-151.92	14,439,634.97	1,695,783.46	39.76063851	-80.80298369	
10,168.00	28.92	354.62	9,785.47	2,339.10	-156.49	14,439,679.91	1,695,778.88	39.76076194	-80.80299962	
10,262.00	29.09	356.29	9,867.68	2,384.53	-160.10	14,439,725.34	1,695,775.27	39.76088673	-80.80301211	
10,357.00	27.51	355.32	9,951.32	2,429.45	-163.39	14,439,770.26	1,695,771.99	39.76101010	-80.80302344	
10,452.00	26.28	353.04	10,036.05	2,472.20	-167.73	14,439,813.00	1,695,767.65	39.76112752	-80.80303855	
10,535.00	24.62	353.04	10,110.99	2,507.60	-172.05	14,439,848.40	1,695,763.33	39.76122478	-80.80305365	
10,583.00	25.54	356.38	10,154.47	2,527.85	-173.91	14,439,868.66	1,695,761.46	39.76128041	-80.80306013	
10,630.00	25.63	356.11	10,196.86	2,548.10	-175.24	14,439,888.91	1,695,760.13	39.76133604	-80.80306470	
10,677.00	25.10	356.11	10,239.33	2,568.19	-176.61	14,439,909.00	1,695,758.77	39.76139121	-80.80306940	
10,724.00	20.88	359.89	10,282.59	2,586.52	-177.30	14,439,927.33	1,695,758.07	39.76144156	-80.80307172	
10,772.00	17.27	12.90	10,327.97	2,602.03	-175.73	14,439,942.84	1,695,759.65	39.76148414	-80.80306600	
10,819.00	15.91	21.34	10,373.02	2,614.84	-171.82	14,439,955.64	1,695,763.55	39.76151928	-80.80305201	
10,867.00	13.93	36.02	10,419.41	2,625.64	-166.03	14,439,966.45	1,695,769.35	39.76154892	-80.80303131	
10,914.00	13.85	52.28	10,465.05	2,633.66	-158.25	14,439,974.47	1,695,777.12	39.76157090	-80.80300356	
10,961.00	14.20	59.22	10,510.66	2,640.06	-148.85	14,439,980.86	1,695,786.53	39.76158840	-80.80297005	
11,008.00	15.74	70.38	10,556.07	2,645.15	-137.89	14,439,985.95	1,695,797.49	39.76160232	-80.80293101	
11,056.00	17.14	81.46	10,602.12	2,648.39	-124.75	14,439,989.19	1,695,810.62	39.76161113	-80.80288426	
11,103.00	18.37	89.89	10,646.89	2,649.43	-110.50	14,439,990.23	1,695,824.88	39.76161391	-80.80283351	
11,151.00	21.10	96.05	10,692.07	2,648.53	-94.34	14,439,989.34	1,695,841.04	39.76161135	-80.80277602	
11,198.00	24.22	103.16	10,735.44	2,645.44	-76.53	14,439,986.25	1,695,858.85	39.76160276	-80.80271267	
11,245.00	26.77	107.47	10,777.87	2,640.07	-57.04	14,439,980.88	1,695,878.33	39.76158789	-80.80264337	
11,292.00	29.58	113.01	10,819.30	2,632.35	-36.26	14,439,973.16	1,695,899.12	39.76156657	-80.80256948	
11,340.00	32.48	119.34	10,860.44	2,621.40	-14.11	14,439,962.21	1,695,921.27	39.76153636	-80.80249074	
11,387.00	35.47	123.64	10,899.41	2,607.66	8.25	14,439,948.47	1,695,943.63	39.76149848	-80.80241128	
11,435.00	38.99	127.86	10,937.63	2,590.67	31.78	14,439,931.48	1,695,967.16	39.76145168	-80.80232769	
11,482.00	43.34	130.50	10,973.01	2,571.11	55.73	14,439,911.92	1,695,991.11	39.76139782	-80.80224261	
11,529.00	47.21	132.78	11,006.08	2,548.91	80.67	14,439,889.72	1,696,016.04	39.76133671	-80.80215407	
11,576.00	50.55	135.60	11,036.99	2,524.22	106.03	14,439,865.03	1,696,041.40	39.76126875	-80.80206401	
11,624.00	52.44	138.32	11,066.87	2,496.77	131.65	14,439,837.58	1,696,067.03	39.76119320	-80.80197305	
11,671.00	54.11	140.43	11,094.98	2,468.18	156.17	14,439,808.98	1,696,091.55	39.76111111	-80.80188602	
11,718.00	57.45	142.72	11,121.41	2,437.73	180.31	14,439,778.53	1,696,115.68	39.76103076	-80.80180000	
11,765.00	62.51	145.18	11,144.92	2,404.83	204.23	14,439,745.63	1,696,139.60	39.76094026	-80.80171552	
11,813.00	66.81	146.49	11,165.46	2,368.94	228.58	14,439,709.74	1,696,163.95	39.76084154	-80.80162917	
11,860.00	70.33	147.20	11,182.63	2,332.31	252.50	14,439,673.12	1,696,187.87	39.76074082	-80.80154434	
11,908.00	72.66	148.43	11,197.86	2,293.79	276.74	14,439,634.60	1,696,212.11	39.76063488	-80.80145838	
11,955.00	74.33	149.48	11,211.21	2,255.18	299.97	14,439,595.99	1,696,235.35	39.76052871	-80.80137600	
12,002.00	76.66	150.45	11,222.99	2,215.79	322.75	14,439,556.60	1,696,258.12	39.76042040	-80.80129528	
12,049.00	81.89	151.07	11,231.73	2,175.51	345.29	14,439,516.32	1,696,280.67	39.76030963	-80.80121537	
12,097.00	87.56	151.15	11,236.14	2,133.68	368.38	14,439,474.49	1,696,303.75	39.76019461	-80.80113357	
12,192.00	88.70	151.33	11,239.24	2,050.45	414.06	14,439,391.25	1,696,349.43	39.75996574	-80.80097167	

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JUN 11 2021
WV Department of Environmental Protection

08/27/2021

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Burch Ridge 7 HU (slot G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey										
Measured			Vertical			Map	Map			
Depth	Inclination	Azimuth	Depth	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	
(ft)	(°)	(°)	(ft)	(ft)	(ft)	(usft)	(usft)			
12,286.00	88.66	150.89	11,241.41	1,968.17	459.46	14,439,308.97	1,696,394.83	39.75973950	-80.80081077	
12,381.00	88.88	151.07	11,243.45	1,885.11	505.54	14,439,225.92	1,696,440.91	39.75951113	-80.80064747	
12,447.00	89.08	149.31	11,244.62	1,827.86	538.34	14,439,168.66	1,696,473.71	39.75935369	-80.80053120	
12,542.00	88.99	145.44	11,246.22	1,747.87	589.54	14,439,088.68	1,696,524.91	39.75913372	-80.80034965	
12,637.00	88.90	149.83	11,247.97	1,667.66	640.37	14,439,008.47	1,696,575.75	39.75891313	-80.80016940	
12,731.00	88.99	152.12	11,249.70	1,585.49	685.97	14,438,926.30	1,696,621.34	39.75868718	-80.80000781	
12,826.00	89.08	149.31	11,251.30	1,502.65	732.43	14,438,843.46	1,696,667.80	39.75845939	-80.79984316	
12,921.00	89.08	148.25	11,252.83	1,421.42	781.66	14,438,762.23	1,696,717.04	39.75823601	-80.79966862	
13,015.00	89.08	148.25	11,254.34	1,341.50	831.12	14,438,682.30	1,696,766.49	39.75801621	-80.79949327	
13,110.00	89.08	148.08	11,255.86	1,260.80	881.23	14,438,601.61	1,696,816.60	39.75779428	-80.79931563	
13,205.00	89.08	150.19	11,257.39	1,179.27	929.95	14,438,520.08	1,696,865.32	39.75757008	-80.79914290	
13,299.00	89.08	150.19	11,258.90	1,097.72	976.68	14,438,438.52	1,696,912.05	39.75734583	-80.79897730	
13,394.00	89.08	150.54	11,260.42	1,015.15	1,023.65	14,438,355.96	1,696,959.02	39.75711880	-80.79881084	
13,489.00	89.08	150.36	11,261.95	932.52	1,070.49	14,438,273.33	1,697,005.86	39.75689158	-80.79864481	
13,584.00	88.99	150.36	11,263.55	849.96	1,117.47	14,438,190.77	1,697,052.84	39.75666456	-80.79847832	
13,679.00	88.99	150.01	11,265.22	767.55	1,164.69	14,438,108.36	1,697,100.06	39.75643794	-80.79831094	
13,773.00	88.99	150.01	11,266.88	686.15	1,211.67	14,438,026.96	1,697,147.04	39.75621410	-80.79814444	
13,868.00	88.99	149.83	11,268.55	603.96	1,259.28	14,437,944.77	1,697,194.65	39.75598807	-80.79797571	
13,963.00	89.34	150.19	11,269.94	521.68	1,306.76	14,437,862.49	1,697,242.13	39.75576184	-80.79780743	
14,057.00	89.43	150.01	11,270.95	440.20	1,353.62	14,437,781.01	1,697,288.99	39.75553777	-80.79764137	
14,152.00	89.52	149.66	11,271.82	358.07	1,401.35	14,437,698.88	1,697,336.72	39.75531192	-80.79747218	
14,247.00	89.52	149.31	11,272.61	276.23	1,449.59	14,437,617.04	1,697,384.96	39.75508686	-80.79730121	
14,342.00	89.08	149.48	11,273.77	194.47	1,497.95	14,437,535.28	1,697,433.32	39.75486203	-80.79712980	
14,437.00	89.08	151.77	11,275.30	111.70	1,544.54	14,437,452.51	1,697,479.91	39.75463443	-80.79696469	
14,532.00	88.99	151.94	11,276.90	27.94	1,589.34	14,437,368.76	1,697,524.71	39.75440414	-80.79680595	
14,627.00	88.99	152.47	11,278.57	-56.08	1,633.64	14,437,284.73	1,697,569.01	39.75417310	-80.79664903	
14,721.00	89.08	152.12	11,280.16	-139.29	1,677.33	14,437,201.52	1,697,612.70	39.75394431	-80.79649423	
14,816.00	88.99	152.47	11,281.76	-223.39	1,721.49	14,437,117.42	1,697,656.86	39.75371308	-80.79633779	
14,911.00	89.08	151.77	11,283.36	-307.35	1,765.91	14,437,033.46	1,697,701.28	39.75348222	-80.79618043	
15,006.00	89.52	151.77	11,284.52	-391.04	1,810.84	14,436,949.77	1,697,746.21	39.75325209	-80.79602124	
15,101.00	89.52	151.77	11,285.31	-474.74	1,855.78	14,436,866.07	1,697,791.15	39.75302195	-80.79586204	
15,195.00	89.60	151.77	11,286.04	-557.56	1,900.24	14,436,783.26	1,697,835.61	39.75279427	-80.79570452	
15,290.00	89.52	151.24	11,286.77	-641.05	1,945.56	14,436,699.77	1,697,880.93	39.75256467	-80.79554395	
15,385.00	89.52	149.31	11,287.56	-723.54	1,992.66	14,436,617.27	1,697,928.03	39.75233782	-80.79537703	
15,479.00	89.52	148.08	11,288.35	-803.85	2,041.50	14,436,536.96	1,697,976.87	39.75211696	-80.79520392	
15,574.00	89.08	147.90	11,289.51	-884.40	2,091.85	14,436,456.41	1,698,027.22	39.75189543	-80.79502543	
15,669.00	89.08	147.73	11,291.03	-964.79	2,142.45	14,436,376.02	1,698,077.82	39.75167434	-80.79484607	
15,763.00	89.08	148.08	11,292.54	-1,044.41	2,192.39	14,436,296.40	1,698,127.76	39.75145535	-80.79466904	
15,858.00	89.08	148.60	11,294.07	-1,125.26	2,242.24	14,436,215.55	1,698,177.61	39.75123509	-80.79449232	
15,953.00	88.99	148.78	11,295.67	-1,206.42	2,291.61	14,436,134.40	1,698,226.97	39.75100982	-80.79431736	
16,047.00	88.90	148.43	11,297.40	-1,286.64	2,340.57	14,436,054.17	1,698,275.93	39.75078919	-80.79414382	
16,142.00	88.46	148.78	11,299.59	-1,367.71	2,390.04	14,435,973.10	1,698,325.41	39.75056621	-80.79396846	
16,237.00	88.46	148.43	11,302.14	-1,448.77	2,439.51	14,435,892.04	1,698,374.88	39.75034330	-80.79379311	
16,331.00	88.99	148.60	11,304.23	-1,528.92	2,488.59	14,435,811.90	1,698,423.96	39.75012290	-80.79361915	
16,426.00	88.99	147.37	11,305.91	-1,609.45	2,538.95	14,435,731.36	1,698,474.32	39.74990411	-80.79344066	
16,521.00	88.99	147.20	11,307.58	-1,689.37	2,590.28	14,435,651.44	1,698,525.65	39.74968160	-80.79325867	
16,616.00	89.43	148.78	11,308.89	-1,769.92	2,640.63	14,435,570.90	1,698,576.00	39.74946008	-80.79308020	
16,710.00	89.52	148.43	11,309.75	-1,850.15	2,689.60	14,435,490.66	1,698,624.97	39.74923943	-80.79290665	
16,805.00	89.43	145.79	11,310.62	-1,929.91	2,741.18	14,435,410.90	1,698,676.55	39.74902005	-80.79272379	
16,900.00	89.25	148.60	11,311.72	-2,009.75	2,792.64	14,435,331.07	1,698,728.01	39.74880047	-80.79254136	
16,995.00	89.60	152.65	11,312.67	-2,092.51	2,839.23	14,435,248.30	1,698,774.60	39.74857288	-80.79237630	
17,089.00	89.52	154.23	11,313.39	-2,176.59	2,881.26	14,435,164.23	1,698,816.62	39.74834172	-80.79222747	
17,184.00	89.08	153.70	11,314.55	-2,261.94	2,922.95	14,435,078.88	1,698,858.32	39.74810705	-80.79207984	
17,279.00	88.99	154.05	11,316.15	-2,347.22	2,964.78	14,434,993.59	1,698,900.14	39.74787257	-80.79193174	
17,373.00	88.99	153.88	11,317.81	-2,431.67	3,006.03	14,434,909.15	1,698,941.40	39.74764039	-80.79178567	

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Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Burch Ridge 7 HU (slot G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
17,468.00	89.08	152.65	11,319.41	-2,516.50	3,048.76	14,434,824.31	1,698,984.13	39.74740715	-80.79163436	
17,563.00	88.99	150.89	11,321.01	-2,600.19	3,093.69	14,434,740.63	1,699,029.05	39.74717704	-80.79147521	
17,658.00	89.08	150.19	11,322.61	-2,682.89	3,140.40	14,434,657.93	1,699,075.77	39.74694961	-80.79130970	
17,752.00	89.08	149.83	11,324.12	-2,764.29	3,187.38	14,434,576.52	1,699,122.75	39.74672575	-80.79114323	
17,847.00	89.08	149.83	11,325.65	-2,846.42	3,235.12	14,434,494.40	1,699,170.49	39.74649992	-80.79097408	
17,942.00	89.16	149.66	11,327.11	-2,928.47	3,282.98	14,434,412.35	1,699,218.35	39.74627427	-80.79080450	
18,036.00	89.16	149.48	11,328.48	-3,009.51	3,330.58	14,434,331.31	1,699,265.95	39.74605140	-80.79063581	
18,131.00	89.08	149.83	11,329.94	-3,091.48	3,378.57	14,434,249.33	1,699,313.94	39.74582597	-80.79046577	
18,226.00	88.99	149.66	11,331.54	-3,173.53	3,426.43	14,434,167.29	1,699,361.80	39.74560033	-80.79029619	
18,320.00	89.08	149.66	11,333.13	-3,254.65	3,473.91	14,434,086.17	1,699,409.27	39.74537726	-80.79012797	
18,415.00	88.99	149.66	11,334.73	-3,336.62	3,521.89	14,434,004.19	1,699,457.25	39.74515182	-80.78995796	
18,510.00	89.08	149.31	11,336.33	-3,418.45	3,570.12	14,433,922.36	1,699,505.48	39.74492678	-80.78978706	
18,604.00	88.99	149.13	11,337.91	-3,499.20	3,618.22	14,433,841.62	1,699,553.58	39.74470471	-80.78961662	
18,699.00	89.08	149.48	11,339.51	-3,580.88	3,666.70	14,433,759.94	1,699,602.07	39.74448009	-80.78944481	
18,793.00	88.99	151.59	11,341.09	-3,662.71	3,712.93	14,433,678.11	1,699,648.30	39.74425507	-80.78928103	
18,888.00	89.16	151.59	11,342.63	-3,746.25	3,758.12	14,433,594.56	1,699,693.49	39.74402533	-80.78912096	
18,983.00	89.08	152.65	11,344.08	-3,830.22	3,802.54	14,433,510.60	1,699,737.91	39.74379446	-80.78896364	
19,077.00	89.08	153.00	11,345.59	-3,913.83	3,845.47	14,433,426.99	1,699,780.83	39.74356456	-80.78881164	
19,172.00	89.08	153.00	11,347.12	-3,998.46	3,888.59	14,433,342.36	1,699,823.96	39.74333185	-80.78865894	
19,266.00	89.08	152.82	11,348.63	-4,082.14	3,931.39	14,433,258.68	1,699,866.76	39.74310177	-80.78850738	
19,361.00	88.99	150.36	11,350.23	-4,165.68	3,976.58	14,433,175.14	1,699,911.95	39.74287205	-80.78834732	
19,456.00	88.90	149.13	11,351.98	-4,247.73	4,024.44	14,433,093.09	1,699,959.80	39.74264642	-80.78817777	
19,551.00	89.08	148.96	11,353.65	-4,329.18	4,073.29	14,433,011.64	1,700,008.66	39.74242240	-80.78800465	
19,645.00	89.52	149.31	11,354.80	-4,409.86	4,121.51	14,432,930.96	1,700,056.88	39.74220051	-80.78783379	
19,740.00	89.43	148.78	11,355.67	-4,491.33	4,170.38	14,432,849.49	1,700,105.74	39.74197647	-80.78766065	
19,835.00	89.52	149.13	11,356.54	-4,572.72	4,219.37	14,432,768.10	1,700,154.73	39.74175263	-80.78748706	
19,930.00	89.52	149.31	11,357.34	-4,654.33	4,267.98	14,432,686.49	1,700,203.35	39.74152817	-80.78731481	
20,024.00	89.52	148.96	11,358.13	-4,735.02	4,316.20	14,432,605.80	1,700,251.57	39.74130628	-80.78714395	
20,119.00	89.60	148.60	11,358.85	-4,816.26	4,365.44	14,432,524.56	1,700,300.81	39.74108285	-80.78696947	
20,214.00	89.43	148.43	11,359.66	-4,897.27	4,415.06	14,432,443.55	1,700,350.42	39.74086004	-80.78679366	
20,308.00	89.16	148.43	11,360.82	-4,977.35	4,464.27	14,432,363.47	1,700,399.63	39.74063979	-80.78661929	
20,403.00	89.08	148.60	11,362.27	-5,058.35	4,513.88	14,432,282.47	1,700,449.24	39.74041301	-80.78644350	
20,498.00	89.08	148.78	11,363.80	-5,139.51	4,563.24	14,432,201.31	1,700,498.60	39.74019381	-80.78626859	
20,592.00	89.08	148.43	11,365.31	-5,219.74	4,612.20	14,432,121.09	1,700,547.56	39.73997316	-80.78609510	
20,687.00	89.16	148.43	11,366.77	-5,300.67	4,661.93	14,432,040.15	1,700,597.29	39.73975058	-80.78591888	
20,782.00	89.43	149.31	11,367.94	-5,381.98	4,711.04	14,431,958.84	1,700,646.40	39.73952694	-80.78574488	
20,876.00	89.60	151.24	11,368.73	-5,463.60	4,757.64	14,431,877.22	1,700,693.01	39.73930247	-80.78557979	
20,971.00	89.60	151.94	11,369.40	-5,547.16	4,802.84	14,431,793.66	1,700,738.21	39.73907271	-80.78541972	
21,066.00	89.43	151.94	11,370.20	-5,630.99	4,847.53	14,431,709.83	1,700,782.89	39.73884219	-80.78526147	
21,160.00	88.99	152.30	11,371.50	-5,714.07	4,891.48	14,431,626.75	1,700,826.84	39.73861374	-80.78510584	
21,255.00	88.99	152.30	11,373.17	-5,798.17	4,935.63	14,431,542.65	1,700,871.00	39.73838248	-80.78494949	
21,349.00	88.99	152.47	11,374.83	-5,881.45	4,979.20	14,431,459.37	1,700,914.56	39.73815349	-80.78479523	
21,444.00	89.08	152.47	11,376.43	-5,965.68	5,023.10	14,431,375.14	1,700,958.46	39.73792458	-80.78463978	
21,539.00	89.08	151.77	11,377.95	-6,049.64	5,067.52	14,431,291.18	1,701,002.88	39.73769100	-80.78448249	
21,633.00	89.08	149.66	11,379.46	-6,131.61	5,113.49	14,431,209.21	1,701,048.85	39.73745755	-80.78431966	
21,728.00	89.08	148.60	11,380.99	-6,213.14	5,162.23	14,431,127.68	1,701,097.59	39.73722405	-80.78415680	
21,823.00	88.90	148.78	11,382.66	-6,294.30	5,211.59	14,431,046.53	1,701,146.95	39.73699051	-80.78399211	
21,917.00	89.16	148.78	11,384.25	-6,374.67	5,260.30	14,430,966.15	1,701,195.67	39.73675701	-80.78382744	
22,012.00	89.52	148.25	11,385.35	-6,455.68	5,309.92	14,430,885.14	1,701,245.28	39.73652351	-80.78366273	
22,107.00	89.60	148.78	11,386.08	-6,536.69	5,359.53	14,430,804.13	1,701,294.89	39.73629001	-80.78349802	
22,201.00	89.43	148.43	11,386.87	-6,616.93	5,408.50	14,430,723.90	1,701,343.86	39.73605651	-80.78333331	
22,296.00	89.52	148.43	11,387.74	-6,697.86	5,458.23	14,430,642.96	1,701,393.59	39.73582301	-80.78316860	
22,391.00	88.90	147.55	11,389.05	-6,778.41	5,508.58	14,430,562.41	1,701,443.95	39.73558951	-80.78299390	
22,485.00	88.90	147.20	11,390.86	-6,857.56	5,559.25	14,430,483.26	1,701,494.61	39.73535601	-80.78281920	
22,580.00	89.08	149.66	11,392.53	-6,938.48	5,608.98	14,430,402.34	1,701,544.34	39.73512251	-80.78264450	

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Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Burch Ridge 7 HU (slot G)
Project:	Marshall County, West Virginia	TVD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Site:	Burch Ridge	MD Reference:	RKB=1313+25 @ 1338.00ft (HP 611)
Well:	Burch Ridge 7 HU (slot G)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Dec2220_v16

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
22,675.00	88.99	150.54	11,394.13	-7,020.83	5,656.33	14,430,320.00	1,701,591.69	39.73501993	-80.78239639
22,769.00	88.90	150.36	11,395.86	-7,102.59	5,702.68	14,430,238.24	1,701,638.04	39.73479509	-80.78223223
22,864.00	88.81	150.36	11,397.76	-7,185.14	5,749.65	14,430,155.69	1,701,685.01	39.73456806	-80.78206586
22,959.00	88.90	150.71	11,399.66	-7,267.84	5,796.37	14,430,072.99	1,701,731.73	39.73434064	-80.78190039
23,053.00	88.90	151.07	11,401.47	-7,349.95	5,842.09	14,429,990.88	1,701,777.45	39.73411484	-80.78173847
23,148.00	88.90	151.07	11,403.29	-7,433.08	5,888.04	14,429,907.75	1,701,823.40	39.73388623	-80.78157576
23,242.00	89.16	150.89	11,404.88	-7,515.26	5,933.63	14,429,825.56	1,701,868.99	39.73366022	-80.78141429
23,337.00	89.43	151.77	11,406.05	-7,598.61	5,979.21	14,429,742.22	1,701,914.57	39.73343102	-80.78125291
23,432.00	89.52	151.77	11,406.92	-7,682.31	6,024.14	14,429,658.52	1,701,959.50	39.73320086	-80.78109381
23,527.00	89.60	152.30	11,407.65	-7,766.21	6,068.69	14,429,574.62	1,702,004.05	39.73297014	-80.78093609
23,621.00	89.60	150.89	11,408.31	-7,848.89	6,113.40	14,429,491.94	1,702,048.76	39.73274278	-80.78077776
23,700.00	89.52	149.48	11,408.91	-7,917.43	6,152.68	14,429,423.40	1,702,088.04	39.73255428	-80.78063866
Survey @ 23700.00 MD 11408.91 TVD									
23,775.00	89.52	149.48	11,409.54	-7,982.03	6,190.77	14,429,358.79	1,702,126.13	39.73237660	-80.78050375
Survey Proj. to 23775.00 MD 11409.54 TVD									

Design Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
164.00	164.00	-0.08	0.24	MWD surveys
23,700.00	11,408.91	-7,917.43	6,152.68	Survey @ 23700.00 MD 11408.91 TVD
23,775.00	11,409.54	-7,982.03	6,190.77	Survey Proj. to 23775.00 MD 11409.54 TVD

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