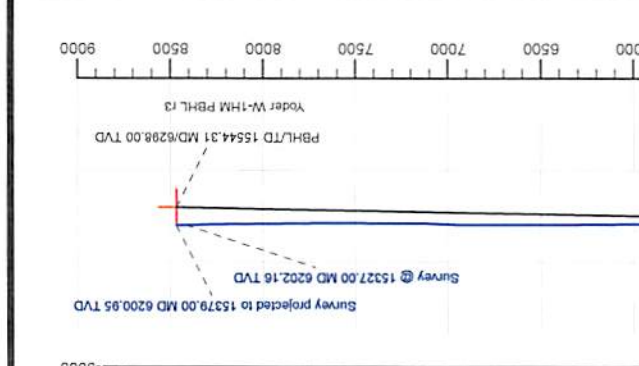
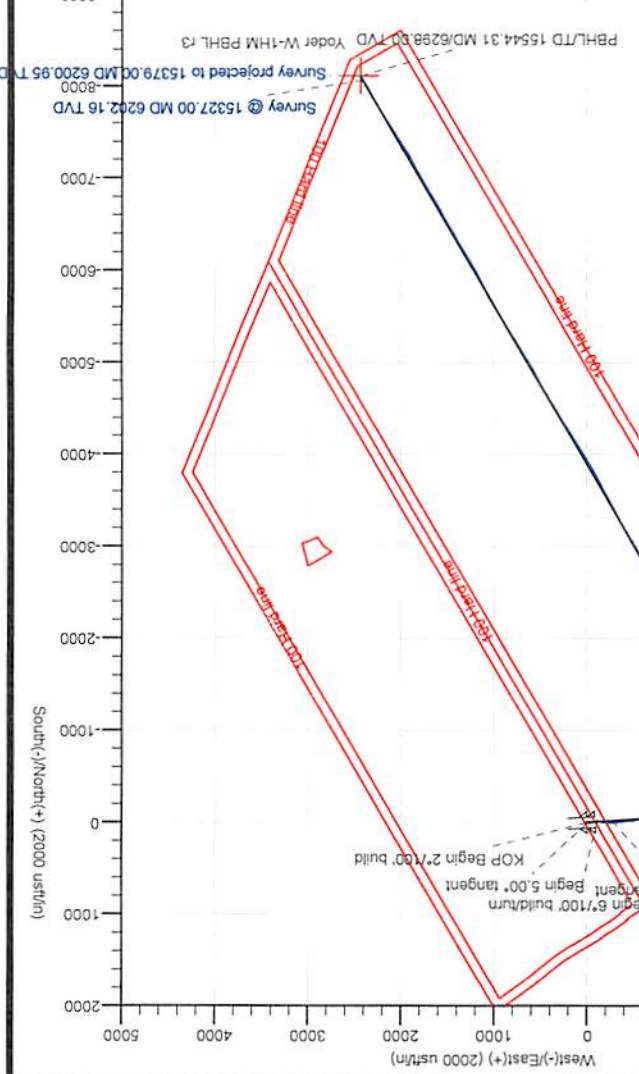


Sec	MD	Inc	Azi	TVD	+N/S	+E/W	Vsect	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	1500.00	0.00	0.00	1500.00	0.00	0.00	0.00	
3	1750.00	5.00	-7.35	1749.68	-0.72	-10.88	266.22	KOP Begin 2'7'100" build
4	2904.71	5.00	-11.30	2900.00	-7.35	-11.30	266.22	KOP Begin 5.00" tangent
5	3393.07	34.30	-18.01	3354.92	-18.01	-273.39	6.00	Begin 6'1'100" build/turn
6	6033.57	34.30	-115.59	6536.18	-115.59	-1758.23	0.00	Begin 24.30" tangent
7	7069.31	89.00	-150.00	6150.09	-772.65	-1803.65	10.00	Begin 10'10'100" build/turn
8	15544.31	89.00	150.00	6298.00	-8111.10	2433.20	0.00	Begin 34.30" tangent

MD	Inc	Azi	TVD	+N/S	+E/W	Vsect	Annotation
100.00	0.15	119.53	100.00	-0.06	0.11	0.09	
2637.00	4.58	262.84	2633.08	-7.70	-89.28	-18.28	MWD surveys
15379.00	91.34	149.78	6202.16	-8064.14	2410.54	8416.70	Survey @ 15327.00 MD 6202.16 TVD
15379.00	91.34	149.78	6200.95	-8109.06	2436.70	8467.25	Survey @ 15327.00 MD 6202.16 TVD

Surface Location: RKB=1083+26 @ 1109.00usft (Nabors B 28)
 Universal Transverse Mercator (US Survey Feet)
 NAD83 West Virginia - HARN
 Zone 17N (84 W to 78 W)
 Easting 14446864.35
 Northing 1685354.97
 UTM Easting 39 78054955 -80 84004615
 UTM Northing 14446864.35
 To convert a Magnetic Direction to a Grid Direction, Subtract 8.71°
 Longitude
 Total Correction (M =>)



Vertical Section at 163.30° (1000 usft/in)

South(-)/North(+) (2000 usft/in)

True Vertical Depth (1000 usft/in)

West(-)/East(+) (2000 usft/in)

Tug Hill Operating LLC
 Well: Yoder W-1HM
 Site: Yoder
 Project: Wetzel County, West Virginia (UTM17 NAD83)
 Design: rev3



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Azimuths to Grid North
 True North: -8.71°
 Magnetic North: -8.71°
 Magnetic Field
 Strength: 52142.85nT
 Dip Angle: 66.84°
 Date: 11/2/2017
 Model: IGRF2015





Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Yoder W-1HM
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Site:	Yoder	MD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Well:	Yoder W-1HM	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Project	Wetzel County, West Virginia (UTM17 NAD83)		
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	Yoder				
Site Position:		Northing:	14,446,864.35 usft	Latitude:	39.78054955
From:	Lat/Long	Easting:	1,685,354.97 usft	Longitude:	-80.84004615
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.10 °

Well	Yoder W-1HM					
Well Position	+N/-S	0.00 usft	Northing:	14,446,864.35 usft	Latitude:	39.78054955
	+E/-W	0.00 usft	Easting:	1,685,354.97 usft	Longitude:	-80.84004615
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	1,083.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	11/2/2017	-8.61	66.94	52,142.93689188

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:		Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
		0.00	0.00	0.00	163.30

Survey Program	Date	11/19/2017			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	2,576.00	Gyro (Original Hole)	NS-GYRO-MS	North sensing gyrocompassing m/s	
2,637.00	15,379.00	MWD TIP=2576 MD (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
100.00	0.15	119.53	100.00	-0.06	0.11	0.09	0.15	0.15	0.00	
Gyro										
200.00	0.21	344.81	200.00	0.05	0.18	0.01	0.33	0.06	-134.72	
300.00	0.12	137.82	300.00	0.15	0.20	-0.08	0.32	-0.09	153.01	
400.00	0.28	57.35	400.00	0.20	0.48	-0.06	0.29	0.16	-80.47	
500.00	0.09	208.73	500.00	0.26	0.65	-0.07	0.36	-0.19	151.38	
600.00	0.25	65.89	600.00	0.28	0.81	-0.04	0.33	0.16	-142.84	
700.00	0.22	304.99	700.00	0.48	0.85	-0.22	0.41	-0.03	-120.90	
800.00	0.18	20.96	800.00	0.74	0.75	-0.49	0.25	-0.04	75.97	

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Survey Report



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Yoder W-1HM
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Site:	Yoder	MD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Well:	Yoder W-1HM	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
900.00	0.01	168.16	900.00	0.88	0.81	-0.61	0.19	-0.17	147.20
1,000.00	0.27	80.52	1,000.00	0.91	1.04	-0.57	0.27	0.26	-87.64
1,100.00	0.36	77.16	1,100.00	1.02	1.58	-0.52	0.09	0.09	-3.36
1,200.00	0.20	329.18	1,199.99	1.24	1.80	-0.67	0.46	-0.16	-107.98
1,300.00	0.32	287.21	1,299.99	1.47	1.44	-0.99	0.22	0.12	-41.97
1,400.00	0.59	305.30	1,399.99	1.85	0.75	-1.56	0.30	0.27	18.09
1,500.00	1.30	301.04	1,499.98	2.73	-0.84	-2.80	0.71	0.71	-4.26
1,600.00	2.29	296.10	1,599.93	4.20	-3.41	-5.00	1.00	0.99	-4.94
1,700.00	3.52	276.37	1,699.80	5.42	-8.25	-7.56	1.57	1.23	-19.73
1,800.00	4.30	267.79	1,799.57	5.61	-15.05	-9.70	0.97	0.78	-8.58
1,900.00	5.64	263.37	1,899.19	4.90	-23.68	-11.50	1.39	1.34	-4.42
2,000.00	6.57	260.67	1,998.62	3.41	-34.20	-13.09	0.97	0.93	-2.70
2,100.00	6.15	256.82	2,098.00	1.26	-45.06	-14.15	0.60	-0.42	-3.85
2,200.00	5.08	255.27	2,197.52	-1.09	-54.56	-14.63	1.08	-1.07	-1.55
2,300.00	5.02	255.28	2,297.13	-3.33	-63.07	-14.94	0.06	-0.06	0.01
2,400.00	4.60	257.87	2,396.78	-5.28	-71.23	-15.41	0.47	-0.42	2.59
2,500.00	4.50	264.58	2,496.47	-6.50	-79.05	-16.49	0.54	-0.10	6.71
2,576.00	4.09	262.71	2,572.25	-7.12	-84.71	-17.52	0.57	-0.54	-2.46
2,637.00	4.58	262.94	2,633.08	-7.70	-89.28	-18.28	0.80	0.80	0.38
MWD surveys									
2,684.00	4.54	260.10	2,679.93	-8.25	-92.98	-18.82	0.49	-0.09	-6.04
2,779.00	3.87	258.11	2,774.67	-9.55	-99.82	-19.53	0.72	-0.71	-2.09
2,873.00	5.37	265.70	2,868.37	-10.54	-107.31	-20.74	1.72	1.60	8.07
2,967.00	11.38	273.05	2,961.33	-10.37	-120.97	-24.83	6.48	6.39	7.82
3,062.00	16.97	278.12	3,053.40	-7.91	-144.07	-33.82	6.02	5.88	5.34
3,157.00	22.00	279.94	3,142.93	-2.88	-175.34	-47.63	5.33	5.29	1.92
3,252.00	22.88	276.08	3,230.74	2.15	-211.24	-62.76	1.81	0.93	-4.06
3,347.00	24.05	268.43	3,317.90	3.57	-248.96	-74.96	3.43	1.23	-8.05
3,446.00	28.57	262.74	3,406.64	0.03	-292.64	-84.12	5.22	4.57	-5.75
3,540.00	31.36	261.81	3,488.07	-6.30	-339.16	-91.43	3.01	2.97	-0.99
3,635.00	30.93	261.45	3,569.37	-13.45	-387.77	-98.54	0.49	-0.45	-0.38
3,730.00	36.69	264.36	3,648.28	-19.88	-440.20	-107.46	6.30	6.06	3.06
3,824.00	39.40	264.73	3,722.30	-25.38	-497.87	-118.76	2.89	2.88	0.39
3,919.00	38.10	262.52	3,796.39	-31.96	-556.95	-129.43	2.00	-1.37	-2.33
4,013.00	38.00	260.64	3,870.42	-40.44	-614.26	-137.78	1.24	-0.11	-2.00
4,109.00	36.16	259.76	3,947.00	-50.29	-671.29	-144.74	1.99	-1.92	-0.92
4,204.00	32.88	263.30	4,025.27	-58.28	-724.50	-152.37	4.05	-3.45	3.73
4,298.00	32.64	265.51	4,104.32	-63.24	-775.12	-162.16	1.30	-0.26	2.35
4,393.00	32.64	267.64	4,184.32	-66.30	-826.26	-173.93	1.21	0.00	2.24
4,488.00	32.86	269.68	4,264.23	-67.50	-877.63	-187.54	1.18	0.23	2.15
4,583.00	33.51	270.87	4,343.73	-67.25	-929.63	-202.73	0.97	0.68	1.25
4,678.00	35.87	268.56	4,421.84	-67.55	-983.66	-217.97	2.84	2.48	-2.43
4,772.00	36.75	265.22	4,497.60	-70.58	-1,039.24	-231.03	2.30	0.94	-3.55

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Survey Report

WV Department of
Environmental Protection



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Yoder W-1HM
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Site:	Yoder	MD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Well:	Yoder W-1HM	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,867.00	37.03	263.53	4,573.58	-76.18	-1,095.99	-241.98	1.11	0.29	-1.78
4,962.00	37.31	264.76	4,649.28	-82.03	-1,153.09	-252.78	0.84	0.29	1.29
5,057.00	37.46	266.01	4,724.77	-86.67	-1,210.58	-264.86	0.81	0.16	1.32
5,150.00	35.96	264.14	4,799.32	-91.43	-1,265.96	-276.22	2.01	-1.61	-2.01
5,245.00	36.10	264.25	4,876.15	-97.08	-1,321.55	-286.78	0.16	0.15	0.12
5,339.00	34.96	266.22	4,952.65	-101.63	-1,375.98	-298.06	1.72	-1.21	2.10
5,432.00	32.43	268.69	5,030.02	-103.95	-1,427.51	-310.64	3.09	-2.72	2.66
5,527.00	31.24	268.22	5,110.73	-105.30	-1,477.60	-323.74	1.28	-1.25	-0.49
5,621.00	35.07	268.31	5,189.41	-106.86	-1,528.97	-337.02	4.07	4.07	0.10
5,714.00	34.70	267.66	5,265.70	-108.72	-1,582.13	-350.50	0.56	-0.40	-0.70
5,740.00	34.64	266.67	5,287.08	-109.46	-1,596.90	-354.05	2.18	-0.23	-3.81
5,835.00	30.68	254.54	5,367.13	-117.50	-1,647.29	-360.82	8.04	-4.17	-12.77
5,930.00	28.13	232.92	5,450.12	-137.52	-1,688.64	-353.53	11.43	-2.68	-22.76
6,024.00	25.63	227.56	5,533.97	-164.61	-1,721.33	-336.98	3.70	-2.66	-5.70
6,119.00	26.37	211.48	5,619.47	-196.51	-1,747.55	-313.96	7.44	0.78	-16.93
6,213.00	28.70	206.20	5,702.82	-234.57	-1,768.42	-283.49	3.59	2.48	-5.62
6,308.00	36.57	193.28	5,782.86	-282.72	-1,785.04	-242.16	11.03	8.28	-13.60
6,403.00	46.68	188.98	5,853.80	-344.57	-1,796.97	-186.34	11.05	10.64	-4.53
6,498.00	54.07	185.57	5,914.35	-417.10	-1,806.11	-119.50	8.25	7.78	-3.59
6,592.00	58.68	179.84	5,966.42	-495.21	-1,809.69	-45.71	7.06	4.90	-6.10
6,687.00	63.12	175.79	6,012.63	-578.11	-1,806.47	34.62	5.98	4.67	-4.26
6,782.00	65.80	174.39	6,053.58	-663.50	-1,799.12	118.52	3.12	2.82	-1.47
6,876.00	69.58	166.92	6,089.30	-749.21	-1,784.94	204.69	8.38	4.02	-7.95
6,971.00	73.14	160.50	6,119.69	-835.53	-1,759.66	294.63	7.42	3.75	-6.76
7,065.00	78.11	158.83	6,143.02	-920.87	-1,728.01	385.47	5.56	5.29	-1.78
7,159.00	84.75	151.62	6,157.04	-1,005.14	-1,689.06	477.38	10.36	7.06	-7.67
7,253.00	86.24	148.46	6,164.43	-1,086.32	-1,642.27	568.57	3.71	1.59	-3.36
7,347.00	86.29	148.46	6,170.55	-1,166.26	-1,593.20	659.25	0.05	0.05	0.00
7,443.00	86.46	148.28	6,176.62	-1,247.83	-1,542.96	751.82	0.26	0.18	-0.19
7,538.00	87.21	148.90	6,181.86	-1,328.79	-1,493.52	843.56	1.02	0.79	0.65
7,633.00	86.73	148.11	6,186.89	-1,409.68	-1,443.96	935.29	0.97	-0.51	-0.83
7,728.00	86.68	148.20	6,192.35	-1,490.25	-1,393.92	1,026.83	0.11	-0.05	0.09
7,823.00	88.04	148.55	6,196.72	-1,571.05	-1,344.16	1,118.53	1.48	1.43	0.37
7,917.00	90.55	154.88	6,197.88	-1,653.77	-1,299.65	1,210.55	7.24	2.67	6.73
8,012.00	89.45	149.08	6,197.88	-1,737.60	-1,255.04	1,303.66	6.21	-1.16	-6.11
8,106.00	88.79	144.51	6,199.32	-1,816.22	-1,203.58	1,393.76	4.91	-0.70	-4.86
8,200.00	91.12	145.56	6,199.40	-1,893.25	-1,149.72	1,483.01	2.72	2.48	1.12
8,295.00	91.12	146.97	6,197.54	-1,972.24	-1,096.97	1,573.82	1.48	0.00	1.48
8,389.00	91.38	150.39	6,195.49	-2,052.51	-1,048.13	1,664.75	3.65	0.28	3.64
8,484.00	90.64	151.71	6,193.81	-2,135.62	-1,002.15	1,757.57	1.59	-0.78	1.39
8,579.00	91.43	151.54	6,192.10	-2,219.19	-957.01	1,850.58	0.85	0.83	-0.18
8,674.00	87.25	149.52	6,193.19	-2,301.87	-910.29	1,943.20	4.89	-4.40	-2.13
8,769.00	87.47	150.57	6,197.57	-2,384.09	-862.91	2,035.57	1.13	0.23	1.11
8,864.00	89.49	149.78	6,200.09	-2,466.48	-815.68	2,128.05	2.28	2.13	-0.83

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Survey Report

WV Department of
Environmental Protection

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Yoder W-1HM
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Site:	Yoder	MD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Well:	Yoder W-1HM	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
8,959.00	89.98	150.66	6,200.53	-2,548.93	-768.50	2,220.59	1.06	0.52	0.93
9,054.00	89.76	149.08	6,200.74	-2,631.09	-720.81	2,312.99	1.68	-0.23	-1.66
9,148.00	90.68	150.66	6,200.38	-2,712.39	-673.63	2,404.41	1.95	0.98	1.68
9,242.00	90.90	151.01	6,199.09	-2,794.46	-627.82	2,496.19	0.44	0.23	0.37
9,337.00	91.52	150.75	6,197.08	-2,877.43	-581.60	2,588.94	0.71	0.65	-0.27
9,432.00	90.15	150.39	6,195.70	-2,960.16	-534.93	2,681.59	1.49	-1.44	-0.38
9,526.00	89.71	148.90	6,195.81	-3,041.28	-487.43	2,772.93	1.65	-0.47	-1.59
9,621.00	88.84	150.04	6,197.01	-3,123.10	-439.18	2,865.17	1.51	-0.92	1.20
9,715.00	89.36	152.15	6,198.49	-3,205.37	-393.75	2,957.03	2.31	0.55	2.24
9,810.00	89.54	151.89	6,199.40	-3,289.26	-349.18	3,050.19	0.33	0.19	-0.27
9,905.00	90.29	152.06	6,199.54	-3,373.12	-304.54	3,143.34	0.81	0.79	0.18
9,998.00	89.23	151.27	6,199.93	-3,454.98	-260.40	3,234.42	1.42	-1.14	-0.85
10,093.00	88.40	151.10	6,201.90	-3,538.20	-214.63	3,327.29	0.89	-0.87	-0.18
10,188.00	88.75	151.45	6,204.26	-3,621.48	-168.98	3,420.17	0.52	0.37	0.37
10,282.00	88.57	152.86	6,206.46	-3,704.57	-125.09	3,512.37	1.51	-0.19	1.50
10,376.00	90.07	150.13	6,207.57	-3,787.16	-80.24	3,604.37	3.31	1.60	-2.90
10,470.00	90.46	150.04	6,207.14	-3,868.63	-33.36	3,695.88	0.43	0.41	-0.10
10,564.00	90.90	149.69	6,206.02	-3,949.92	13.83	3,787.30	0.60	0.47	-0.37
10,659.00	89.23	148.20	6,205.91	-4,031.30	62.83	3,879.33	2.36	-1.76	-1.57
10,755.00	89.76	147.76	6,206.76	-4,112.69	113.73	3,971.91	0.72	0.55	-0.46
10,848.00	90.15	147.58	6,206.83	-4,191.28	163.47	4,061.47	0.46	0.42	-0.19
10,943.00	91.03	148.81	6,205.86	-4,272.00	213.53	4,153.18	1.59	0.93	1.29
11,036.00	89.54	150.04	6,205.39	-4,352.07	260.83	4,243.46	2.08	-1.60	1.32
11,131.00	89.89	149.87	6,205.87	-4,434.30	308.40	4,335.90	0.41	0.37	-0.18
11,225.00	90.11	149.87	6,205.87	-4,515.60	355.58	4,427.33	0.23	0.23	0.00
11,319.00	90.42	149.25	6,205.43	-4,596.64	403.20	4,518.63	0.74	0.33	-0.66
11,414.00	90.02	150.57	6,205.07	-4,678.84	450.83	4,611.05	1.45	-0.42	1.39
11,509.00	90.24	150.92	6,204.85	-4,761.72	497.26	4,703.78	0.44	0.23	0.37
11,604.00	88.31	150.57	6,206.05	-4,844.59	543.68	4,796.49	2.06	-2.03	-0.37
11,699.00	88.26	151.19	6,208.90	-4,927.55	589.89	4,889.23	0.65	-0.05	0.65
11,794.00	89.36	149.87	6,210.87	-5,010.24	636.61	4,981.85	1.81	1.16	-1.39
11,889.00	89.93	149.43	6,211.46	-5,092.22	684.61	5,074.17	0.76	0.60	-0.46
11,983.00	90.24	149.34	6,211.32	-5,173.11	732.48	5,165.41	0.34	0.33	-0.10
12,078.00	90.59	149.08	6,210.63	-5,254.72	781.11	5,257.55	0.46	0.37	-0.27
12,173.00	90.20	148.90	6,209.97	-5,336.14	830.05	5,349.60	0.45	-0.41	-0.19
12,268.00	90.20	150.13	6,209.64	-5,418.01	878.25	5,441.86	1.29	0.00	1.29
12,360.00	89.80	148.81	6,209.64	-5,497.25	924.98	5,531.19	1.50	-0.43	-1.43
12,454.00	90.11	148.81	6,209.72	-5,577.66	973.66	5,622.20	0.33	0.33	0.00
12,549.00	89.89	148.20	6,209.72	-5,658.67	1,023.29	5,714.05	0.68	-0.23	-0.64
12,643.00	90.51	152.68	6,209.39	-5,740.41	1,069.65	5,805.67	4.81	0.66	4.77
12,738.00	91.25	153.91	6,207.93	-5,825.26	1,112.34	5,899.21	1.51	0.78	1.29
12,833.00	90.24	151.98	6,206.69	-5,909.86	1,155.54	5,992.65	2.29	-1.06	-2.03
12,928.00	89.76	150.13	6,206.69	-5,992.98	1,201.52	6,085.48	2.01	-0.51	-1.95

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Survey Report

WV Department of
Environmental Protection

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Yoder W-1HM
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Site:	Yoder	MD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Well:	Yoder W-1HM	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
13,023.00	90.51	149.95	6,206.47	-6,075.29	1,248.96	6,177.95	0.81	0.79	-0.19
13,117.00	91.25	149.87	6,205.03	-6,156.61	1,296.08	6,269.38	0.79	0.79	-0.09
13,212.00	89.85	149.52	6,204.12	-6,238.62	1,344.02	6,361.71	1.52	-1.47	-0.37
13,307.00	90.64	150.22	6,203.71	-6,320.79	1,391.70	6,454.11	1.11	0.83	0.74
13,402.00	89.58	149.34	6,203.53	-6,402.87	1,439.52	6,546.48	1.45	-1.12	-0.93
13,497.00	89.93	150.22	6,203.93	-6,484.96	1,487.33	6,638.84	1.00	0.37	0.93
13,592.00	90.37	150.92	6,203.68	-6,567.70	1,534.01	6,731.51	0.87	0.46	0.74
13,686.00	90.73	150.57	6,202.78	-6,649.71	1,579.95	6,823.25	0.53	0.38	-0.37
13,781.00	88.04	149.52	6,203.80	-6,732.00	1,627.37	6,915.71	3.04	-2.83	-1.11
13,876.00	88.53	149.34	6,206.64	-6,813.76	1,675.67	7,007.90	0.55	0.52	-0.19
13,971.00	88.62	149.43	6,209.01	-6,895.50	1,724.03	7,100.08	0.13	0.09	0.09
14,066.00	88.57	150.57	6,211.34	-6,977.74	1,771.52	7,192.50	1.20	-0.05	1.20
14,161.00	90.20	152.33	6,212.36	-7,061.18	1,816.91	7,285.47	2.52	1.72	1.85
14,255.00	88.75	151.71	6,213.22	-7,144.19	1,861.01	7,377.64	1.68	-1.54	-0.66
14,350.00	90.99	151.45	6,213.43	-7,227.73	1,906.22	7,470.66	2.37	2.36	-0.27
14,445.00	90.51	148.46	6,212.19	-7,309.95	1,953.78	7,563.07	3.19	-0.51	-3.15
14,540.00	89.63	147.05	6,212.07	-7,390.30	2,004.46	7,654.59	1.75	-0.93	-1.48
14,634.00	89.27	146.79	6,212.98	-7,469.05	2,055.77	7,744.77	0.47	-0.38	-0.28
14,729.00	90.86	149.43	6,212.87	-7,549.71	2,105.95	7,836.44	3.24	1.67	2.78
14,824.00	91.08	148.99	6,211.26	-7,631.30	2,154.57	7,928.57	0.52	0.23	-0.46
14,918.00	89.89	147.93	6,210.46	-7,711.41	2,203.74	8,019.43	1.70	-1.27	-1.13
15,013.00	90.95	149.43	6,209.77	-7,792.56	2,253.12	8,111.35	1.93	1.12	1.58
15,107.00	92.22	150.39	6,207.17	-7,873.86	2,300.23	8,202.76	1.69	1.35	1.02
15,201.00	90.99	149.69	6,204.53	-7,955.27	2,347.15	8,294.21	1.51	-1.31	-0.74
15,296.00	91.08	149.87	6,202.82	-8,037.34	2,394.96	8,386.56	0.21	0.09	0.19
15,327.00	91.34	149.78	6,202.16	-8,064.14	2,410.54	8,416.70	0.89	0.84	-0.29
Survey @ 15327.00 MD 6202.16 TVD									
15,379.00	91.34	149.78	6,200.95	-8,109.06	2,436.70	8,467.25	0.00	0.00	0.00
Survey projected to 15379.00 MD 6200.95 TVD									

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
100.00	100.00	-0.06	0.11	Gyro
2,637.00	2,633.08	-7.70	-89.28	MWD surveys
15,327.00	6,202.16	-8,064.14	2,410.54	Survey @ 15327.00 MD 6202.16 TVD
15,379.00	6,200.95	-8,109.06	2,436.70	Survey projected to 15379.00 MD 6200.95 TVD

SEP 11 2018



Survey Report - Geographic

WV Department of
Environmental Protection

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Yoder W-1HM
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Site:	Yoder	MD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Well:	Yoder W-1HM	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Project	Wetzel County, West Virginia (UTM17 NAD83)		
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	Yoder				
Site Position:		Northing:	14,446,864.35 usft	Latitude:	39.78054955
From:	Lat/Long	Easting:	1,685,354.97 usft	Longitude:	-80.84004615
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.10 °

Well	Yoder W-1HM					
Well Position	+N/-S	0.00 usft	Northing:	14,446,864.35 usft	Latitude:	39.78054955
	+E/-W	0.00 usft	Easting:	1,685,354.97 usft	Longitude:	-80.84004615
Position Uncertainty		0.00 usft	Wellhead Elevation:	0.00 usft	Ground Level:	1,083.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	11/2/2017	-8.61	66.94	52,142.93689188

Design	Surveys Original Hole				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.00
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	163.30	

Survey Program	Date	11/19/2017			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
100.00	2,576.00	Gyro (Original Hole)	NS-GYRO-MS	North sensing gyrocompassing m/s	
2,637.00	15,379.00	MWD TIP=2576 MD (Original Hole)	MWD	MWD - Standard	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.00	0.00	0.00	0.00	14,446,864.35	1,685,354.97	39.78054955	-80.84004615	
100.00	0.15	119.53	100.00	-0.06	0.11	14,446,864.29	1,685,355.08	39.78054937	-80.84004575	
Gyro										
200.00	0.21	344.81	200.00	0.05	0.18	14,446,864.40	1,685,355.15	39.78054968	-80.84004551	
300.00	0.12	137.82	300.00	0.15	0.20	14,446,864.50	1,685,355.17	39.78054995	-80.84004543	
400.00	0.28	57.35	400.00	0.20	0.48	14,446,864.56	1,685,355.45	39.78055010	-80.84004445	
500.00	0.09	208.73	500.00	0.26	0.65	14,446,864.62	1,685,355.62	39.78055027	-80.84004385	
600.00	0.25	65.89	600.00	0.28	0.81	14,446,864.64	1,685,355.78	39.78055033	-80.84004328	
700.00	0.22	304.99	700.00	0.48	0.85	14,446,864.84	1,685,355.82	39.78055088	-80.84004313	
800.00	0.18	20.96	800.00	0.74	0.75	14,446,865.09	1,685,355.72	39.78055158	-80.84004348	
900.00	0.01	168.16	900.00	0.88	0.81	14,446,865.23	1,685,355.78	39.78055196	-80.84004328	

SEP 11 2018



Survey Report - Geographic

WV Department of Environmental Protection



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Yoder W-1HM
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Site:	Yoder	MD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Well:	Yoder W-1HM	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
1,000.00	0.27	80.52	1,000.00	0.91	1.04	14,446,865.26	1,685,356.01	39.78055204	-80.84004244
1,100.00	0.36	77.16	1,100.00	1.02	1.58	14,446,865.37	1,685,356.55	39.78055234	-80.84004052
1,200.00	0.20	329.18	1,199.99	1.24	1.80	14,446,865.59	1,685,356.77	39.78055294	-80.84003975
1,300.00	0.32	287.21	1,299.99	1.47	1.44	14,446,865.82	1,685,356.41	39.78055358	-80.84004102
1,400.00	0.59	305.30	1,399.99	1.85	0.75	14,446,866.20	1,685,355.72	39.78055463	-80.84004346
1,500.00	1.30	301.04	1,499.98	2.73	-0.64	14,446,867.09	1,685,354.33	39.78055706	-80.84004841
1,600.00	2.29	296.10	1,599.93	4.20	-3.41	14,446,868.55	1,685,351.57	39.78056109	-80.84005825
1,700.00	3.52	276.37	1,699.80	5.42	-8.25	14,446,869.77	1,685,346.72	39.78056447	-80.84007548
1,800.00	4.30	267.79	1,799.57	5.61	-15.05	14,446,869.97	1,685,339.92	39.78056504	-80.84009988
1,900.00	5.64	263.37	1,899.19	4.90	-23.68	14,446,869.25	1,685,331.29	39.78056312	-80.84013039
2,000.00	6.57	260.67	1,998.62	3.41	-34.20	14,446,867.76	1,685,320.77	39.78055907	-80.84016787
2,100.00	6.15	256.82	2,098.00	1.26	-45.06	14,446,865.61	1,685,309.91	39.78055322	-80.84020654
2,200.00	5.08	255.27	2,197.52	-1.09	-54.56	14,446,863.26	1,685,300.41	39.78054682	-80.84024036
2,300.00	5.02	255.28	2,297.13	-3.33	-63.07	14,446,861.03	1,685,291.90	39.78054072	-80.84027068
2,400.00	4.60	257.87	2,396.78	-5.28	-71.23	14,446,859.07	1,685,283.74	39.78053539	-80.84029971
2,500.00	4.50	264.58	2,496.47	-6.50	-79.05	14,446,857.86	1,685,275.92	39.78053210	-80.84032757
2,576.00	4.09	262.71	2,572.25	-7.12	-84.71	14,446,857.23	1,685,270.26	39.78053041	-80.84034771
2,637.00	4.58	262.94	2,633.08	-7.70	-89.28	14,446,856.66	1,685,265.69	39.78052885	-80.84036399
MWD surveys									
2,684.00	4.54	260.10	2,679.93	-8.25	-92.98	14,446,856.11	1,685,261.99	39.78052736	-80.84037715
2,779.00	3.87	258.11	2,774.67	-9.55	-99.82	14,446,854.80	1,685,255.15	39.78052380	-80.84040151
2,873.00	5.37	265.70	2,868.37	-10.54	-107.31	14,446,853.82	1,685,247.66	39.78052114	-80.84042818
2,967.00	11.38	273.05	2,961.33	-10.37	-120.97	14,446,853.98	1,685,234.00	39.78052165	-80.84047680
3,062.00	16.97	278.12	3,053.40	-7.91	-144.07	14,446,856.44	1,685,210.90	39.78052852	-80.84055901
3,157.00	22.00	279.94	3,142.93	-2.88	-175.34	14,446,861.47	1,685,179.63	39.78054250	-80.84067029
3,252.00	22.88	276.08	3,230.74	2.15	-211.24	14,446,866.50	1,685,143.73	39.78055648	-80.84079802
3,347.00	24.05	268.43	3,317.90	3.57	-248.96	14,446,867.93	1,685,106.01	39.78056058	-80.84093229
3,446.00	28.57	262.74	3,406.64	0.03	-292.64	14,446,864.38	1,685,062.33	39.78055105	-80.84108778
3,540.00	31.36	261.81	3,488.07	-6.30	-339.16	14,446,858.05	1,685,015.81	39.78053391	-80.84125339
3,635.00	30.93	261.45	3,569.37	-13.45	-387.77	14,446,850.90	1,684,967.20	39.78051450	-80.84142646
3,730.00	36.69	264.36	3,648.28	-19.88	-440.20	14,446,844.48	1,684,914.77	39.78049711	-80.84161313
3,824.00	39.40	264.73	3,722.30	-25.38	-497.87	14,446,838.98	1,684,857.11	39.78048229	-80.84181841
3,919.00	38.10	262.52	3,796.39	-31.96	-556.95	14,446,832.39	1,684,798.02	39.78046449	-80.84202877
4,013.00	38.00	260.64	3,870.42	-40.44	-614.26	14,446,823.91	1,684,740.71	39.78044147	-80.84223280
4,109.00	36.16	259.76	3,947.00	-50.29	-671.29	14,446,814.07	1,684,683.68	39.78041472	-80.84243587
4,204.00	32.88	263.30	4,025.27	-58.28	-724.50	14,446,806.07	1,684,630.47	39.78039302	-80.84262532
4,298.00	32.64	265.51	4,104.32	-63.24	-775.12	14,446,801.11	1,684,579.85	39.78037964	-80.84280551
4,393.00	32.64	267.64	4,184.32	-66.30	-826.26	14,446,798.05	1,684,528.71	39.78037148	-80.84298755
4,488.00	32.86	269.68	4,264.23	-67.50	-877.63	14,446,796.85	1,684,477.34	39.78036844	-80.84317042
4,583.00	33.51	270.87	4,343.73	-67.25	-929.63	14,446,797.11	1,684,425.34	39.78036938	-80.84335548
4,678.00	35.87	268.56	4,421.84	-67.55	-983.68	14,446,796.81	1,684,371.29	39.78036882	-80.84354789
4,772.00	36.75	265.22	4,497.60	-70.58	-1,039.24	14,446,793.77	1,684,315.73	39.78036075	-80.84374567
4,867.00	37.03	263.53	4,573.58	-76.18	-1,095.99	14,446,788.18	1,684,258.98	39.78034566	-80.84394769
4,962.00	37.31	264.76	4,649.28	-82.03	-1,153.09	14,446,782.32	1,684,201.89	39.78032986	-80.84415095
5,057.00	37.46	266.01	4,724.77	-86.67	-1,210.58	14,446,777.68	1,684,144.39	39.78031739	-80.84435561
5,150.00	35.96	264.14	4,799.32	-91.43	-1,265.96	14,446,772.93	1,684,089.01	39.78030459	-80.84455276
5,245.00	36.10	264.25	4,876.15	-97.08	-1,321.55	14,446,767.28	1,684,033.42	39.78028934	-80.84475068
5,339.00	34.96	266.22	4,952.65	-101.63	-1,375.98	14,446,762.73	1,683,978.99	39.78027710	-80.84494444
5,432.00	32.43	268.69	5,030.02	-103.95	-1,427.51	14,446,760.40	1,683,927.46	39.78027095	-80.84512786
5,527.00	31.24	268.22	5,110.73	-105.30	-1,477.60	14,446,759.05	1,683,877.37	39.78026749	-80.84530616
5,621.00	35.07	268.31	5,189.41	-106.86	-1,528.97	14,446,757.50	1,683,826.00	39.78026347	-80.84548904
5,714.00	34.70	267.66	5,265.70	-108.72	-1,582.13	14,446,755.63	1,683,772.84	39.78025859	-80.84567825
5,740.00	34.64	266.67	5,287.08	-109.46	-1,596.90	14,446,754.90	1,683,758.07	39.78025665	-80.84573083
5,835.00	30.68	254.54	5,367.13	-117.50	-1,647.29	14,446,746.86	1,683,707.68	39.78023480	-80.84591023
5,930.00	28.13	232.92	5,450.12	-137.52	-1,688.64	14,446,726.83	1,683,666.33	39.78018001	-80.84605754

SEP 11 2018



Survey Report - Geographic

WV Department of
Environmental Protection

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Yoder W-1HM
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Site:	Yoder	MD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Well:	Yoder W-1HM	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
6,024.00	25.63	227.56	5,533.97	-164.61	-1,721.33	14,446,699.75	1,683,633.64	39.78010577	-80.84617406
6,119.00	26.37	211.48	5,619.47	-196.51	-1,747.55	14,446,667.85	1,683,607.42	39.78001829	-80.84626756
6,213.00	28.70	206.20	5,702.82	-234.57	-1,768.42	14,446,629.78	1,683,586.55	39.77991385	-80.84634209
6,308.00	36.57	193.28	5,782.86	-282.72	-1,785.04	14,446,581.64	1,683,569.93	39.77978171	-80.84640153
6,403.00	46.68	188.98	5,853.80	-344.57	-1,796.97	14,446,519.78	1,683,558.01	39.77961190	-80.84644437
6,498.00	54.07	185.57	5,914.35	-417.10	-1,806.11	14,446,447.26	1,683,548.86	39.77941276	-80.84647735
6,592.00	58.68	179.84	5,966.42	-495.21	-1,809.69	14,446,369.14	1,683,545.28	39.77919825	-80.84649059
6,687.00	63.12	175.79	6,012.63	-578.11	-1,806.47	14,446,286.24	1,683,548.50	39.77897057	-80.84647961
6,782.00	65.80	174.39	6,053.58	-663.50	-1,799.12	14,446,200.85	1,683,555.85	39.77873603	-80.84645398
6,876.00	69.58	166.92	6,089.30	-749.21	-1,784.94	14,446,115.15	1,683,570.03	39.77850060	-80.84640403
6,971.00	73.14	160.50	6,119.69	-835.53	-1,759.66	14,446,028.83	1,683,595.31	39.77826342	-80.84631458
7,065.00	78.11	158.83	6,143.02	-920.87	-1,728.01	14,445,943.48	1,683,626.96	39.77802888	-80.84620246
7,159.00	84.75	151.62	6,157.04	-1,005.14	-1,689.06	14,445,859.21	1,683,665.91	39.77779727	-80.84606435
7,253.00	86.24	148.46	6,164.43	-1,086.32	-1,642.27	14,445,778.04	1,683,712.70	39.77757413	-80.84589829
7,347.00	86.29	148.46	6,170.55	-1,166.26	-1,593.20	14,445,698.09	1,683,761.77	39.77735435	-80.84572415
7,443.00	86.46	148.28	6,176.62	-1,247.83	-1,542.96	14,445,616.52	1,683,812.01	39.77713008	-80.84554581
7,538.00	87.21	148.90	6,181.86	-1,328.79	-1,493.52	14,445,535.57	1,683,861.45	39.77690752	-80.84537037
7,633.00	86.73	148.11	6,186.89	-1,409.68	-1,443.96	14,445,454.67	1,683,911.01	39.77668513	-80.84519447
7,728.00	86.68	148.20	6,192.35	-1,490.25	-1,393.92	14,445,374.11	1,683,961.05	39.77646364	-80.84501686
7,823.00	88.04	148.55	6,196.72	-1,571.05	-1,344.16	14,445,293.30	1,684,010.81	39.77624149	-80.84484025
7,917.00	90.55	154.88	6,197.88	-1,653.77	-1,299.65	14,445,210.58	1,684,055.32	39.77601409	-80.84468234
8,012.00	89.45	149.08	6,197.88	-1,737.60	-1,255.04	14,445,126.75	1,684,099.93	39.77578367	-80.84452408
8,106.00	88.79	144.51	6,199.32	-1,816.22	-1,203.58	14,445,048.13	1,684,151.39	39.77556751	-80.84434142
8,200.00	91.12	145.56	6,199.40	-1,893.25	-1,149.72	14,444,971.10	1,684,205.25	39.77535571	-80.84411509
8,295.00	91.12	146.97	6,197.54	-1,972.24	-1,096.97	14,444,892.12	1,684,258.00	39.77513854	-80.84396294
8,389.00	91.38	150.39	6,195.49	-2,052.51	-1,048.13	14,444,811.85	1,684,306.84	39.77491786	-80.84378960
8,484.00	90.64	151.71	6,193.81	-2,135.62	-1,002.15	14,444,728.73	1,684,352.82	39.77468938	-80.84362649
8,579.00	91.43	151.54	6,192.10	-2,219.19	-957.01	14,444,645.16	1,684,397.96	39.77445965	-80.84346635
8,674.00	87.25	149.52	6,193.19	-2,301.87	-910.29	14,444,562.48	1,684,444.68	39.77423237	-80.84330058
8,769.00	87.47	150.57	6,197.57	-2,384.09	-862.91	14,444,480.26	1,684,492.06	39.77400633	-80.84313245
8,864.00	89.49	149.78	6,200.09	-2,466.48	-815.68	14,444,397.88	1,684,539.29	39.77377986	-80.84296487
8,959.00	89.98	150.66	6,200.53	-2,548.93	-768.50	14,444,315.42	1,684,586.47	39.77355319	-80.84279746
9,054.00	89.76	149.08	6,200.74	-2,631.09	-720.81	14,444,233.26	1,684,634.16	39.77332732	-80.84262826
9,148.00	90.68	150.66	6,200.38	-2,712.39	-673.63	14,444,151.97	1,684,681.34	39.77310384	-80.84246085
9,242.00	90.90	151.01	6,199.09	-2,794.46	-627.82	14,444,069.89	1,684,727.15	39.77287821	-80.84229834
9,337.00	91.52	150.75	6,197.08	-2,877.43	-581.60	14,443,986.92	1,684,773.37	39.77265012	-80.84213437
9,432.00	90.15	150.39	6,195.70	-2,960.16	-534.93	14,443,904.19	1,684,820.04	39.77242269	-80.84196878
9,526.00	89.71	148.90	6,195.81	-3,041.28	-487.43	14,443,823.08	1,684,867.54	39.77219971	-80.84180023
9,621.00	88.84	150.04	6,197.01	-3,123.10	-439.18	14,443,741.26	1,684,915.79	39.77197477	-80.84162901
9,715.00	89.36	152.15	6,198.49	-3,205.37	-393.75	14,443,658.98	1,684,961.22	39.77174860	-80.84146785
9,810.00	89.54	151.89	6,199.40	-3,289.26	-349.18	14,443,575.09	1,685,005.79	39.77151799	-80.84130977
9,905.00	90.29	152.06	6,199.54	-3,373.12	-304.54	14,443,491.23	1,685,050.43	39.77128747	-80.84115144
9,998.00	89.23	151.27	6,199.93	-3,454.98	-260.40	14,443,409.38	1,685,094.57	39.77106246	-80.84099487
10,093.00	88.40	151.10	6,201.90	-3,538.20	-214.63	14,443,326.16	1,685,140.34	39.77083369	-80.84083248
10,188.00	88.75	151.45	6,204.26	-3,621.48	-168.98	14,443,242.88	1,685,185.99	39.77060475	-80.84067056
10,282.00	88.57	152.86	6,206.46	-3,704.57	-125.09	14,443,159.78	1,685,229.88	39.77037634	-80.84051488
10,376.00	90.07	150.13	6,207.57	-3,787.16	-80.24	14,443,077.20	1,685,274.73	39.77014931	-80.84035578
10,470.00	90.46	150.04	6,207.14	-3,868.63	-33.36	14,442,995.72	1,685,321.61	39.76992533	-80.84018947
10,564.00	90.90	149.69	6,206.02	-3,949.92	13.83	14,442,914.43	1,685,368.80	39.76970185	-80.84002205
10,659.00	89.23	148.20	6,205.91	-4,031.30	62.83	14,442,833.05	1,685,417.80	39.76947812	-80.83984817
10,755.00	89.76	147.76	6,206.76	-4,112.69	113.73	14,442,751.66	1,685,468.70	39.76925435	-80.83967555
10,848.00	90.15	147.58	6,206.83	-4,191.28	163.47	14,442,673.08	1,685,518.44	39.76903829	-80.83949105
10,943.00	91.03	148.81	6,205.86	-4,272.00	213.53	14,442,592.35	1,685,568.50	39.76881634	-80.83931340
11,036.00	89.54	150.04	6,205.39	-4,352.07	260.83	14,442,512.28	1,685,615.80	39.76859623	-80.83914557
11,131.00	89.89	149.87	6,205.87	-4,434.30	308.40	14,442,430.05	1,685,663.37	39.76837015	-80.83897683

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Survey Report - Geographic

WV Department of Environmental Protection



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Yoder W-1HM
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Site:	Yoder	MD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Well:	Yoder W-1HM	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
11,225.00	90.11	149.87	6,205.87	-4,515.60	355.58	14,442,348.75	1,685,710.55	39.76814665	-80.83880943	
11,319.00	90.42	149.25	6,205.43	-4,596.64	403.20	14,442,267.71	1,685,758.17	39.76792385	-80.83864047	
11,414.00	90.02	150.57	6,205.07	-4,678.84	450.83	14,442,185.51	1,685,805.80	39.76769788	-80.83847150	
11,509.00	90.24	150.92	6,204.85	-4,761.72	497.26	14,442,102.63	1,685,852.23	39.76747003	-80.83830682	
11,604.00	88.31	150.57	6,206.05	-4,844.59	543.88	14,442,019.76	1,685,898.65	39.76724221	-80.83814215	
11,699.00	88.26	151.19	6,208.90	-4,927.55	589.89	14,441,936.80	1,685,944.86	39.76701416	-80.83797824	
11,794.00	89.36	149.87	6,210.87	-5,010.24	636.61	14,441,854.12	1,685,991.58	39.76678684	-80.83781249	
11,889.00	89.93	149.43	6,211.46	-5,092.22	684.61	14,441,772.14	1,686,039.58	39.76656147	-80.83764220	
11,983.00	90.24	149.34	6,211.32	-5,173.11	732.48	14,441,691.24	1,686,087.45	39.76633906	-80.83747237	
12,078.00	90.59	149.08	6,210.63	-5,254.72	781.11	14,441,609.63	1,686,136.08	39.76611470	-80.83729984	
12,173.00	90.20	148.90	6,209.97	-5,336.14	830.05	14,441,528.21	1,686,185.02	39.76589085	-80.83712620	
12,268.00	90.20	150.13	6,209.64	-5,418.01	878.25	14,441,446.35	1,686,233.22	39.76566579	-80.83695523	
12,360.00	89.80	148.81	6,209.64	-5,497.25	924.98	14,441,367.11	1,686,279.95	39.76544793	-80.83678943	
12,454.00	90.11	148.81	6,209.72	-5,577.66	973.66	14,441,286.69	1,686,328.63	39.76522685	-80.83661672	
12,549.00	89.89	148.20	6,209.72	-5,658.67	1,023.29	14,441,205.69	1,686,378.26	39.76500414	-80.83644063	
12,643.00	90.51	152.68	6,209.39	-5,740.41	1,069.65	14,441,123.94	1,686,424.62	39.76477941	-80.83627618	
12,738.00	91.25	153.91	6,207.93	-5,825.26	1,112.34	14,441,039.09	1,686,467.31	39.76454616	-80.83612483	
12,833.00	90.24	151.98	6,206.69	-5,909.86	1,155.54	14,440,954.50	1,686,510.51	39.76431363	-80.83597164	
12,928.00	89.76	150.13	6,206.69	-5,992.98	1,201.52	14,440,871.37	1,686,556.49	39.76408510	-80.83580858	
13,023.00	90.51	149.95	6,206.47	-6,075.29	1,248.96	14,440,789.06	1,686,603.93	39.76385883	-80.83564029	
13,117.00	91.25	149.87	6,205.03	-6,156.61	1,296.08	14,440,707.74	1,686,651.05	39.76363526	-80.83547313	
13,212.00	89.85	149.52	6,204.12	-6,238.62	1,344.02	14,440,625.73	1,686,698.99	39.76340979	-80.83530310	
13,307.00	90.64	150.22	6,203.71	-6,320.79	1,391.70	14,440,543.57	1,686,746.67	39.76318390	-80.83513395	
13,402.00	89.58	149.34	6,203.53	-6,402.87	1,439.52	14,440,461.48	1,686,794.49	39.76295823	-80.83496434	
13,497.00	89.93	150.22	6,203.93	-6,484.96	1,487.33	14,440,379.39	1,686,842.30	39.76273255	-80.83479473	
13,592.00	90.37	150.92	6,203.68	-6,567.70	1,534.01	14,440,296.65	1,686,888.98	39.76250508	-80.83462917	
13,686.00	90.73	150.57	6,202.78	-6,649.71	1,579.95	14,440,214.65	1,686,934.92	39.76227964	-80.83446625	
13,781.00	88.04	149.52	6,203.80	-6,732.00	1,627.37	14,440,132.35	1,686,982.34	39.76205338	-80.83429802	
13,876.00	88.53	149.34	6,206.64	-6,813.76	1,675.67	14,440,050.59	1,687,030.64	39.76182860	-80.83412671	
13,971.00	88.62	149.43	6,209.01	-6,895.50	1,724.03	14,439,968.86	1,687,079.00	39.76160390	-80.83395514	
14,066.00	88.57	150.57	6,211.34	-6,977.74	1,771.52	14,439,886.61	1,687,126.49	39.76137778	-80.83378671	
14,161.00	90.20	152.33	6,212.36	-7,061.18	1,816.91	14,439,803.17	1,687,171.88	39.76114841	-80.83362572	
14,255.00	88.75	151.71	6,213.22	-7,144.19	1,861.01	14,439,720.17	1,687,215.98	39.76092022	-80.83346935	
14,350.00	90.99	151.45	6,213.43	-7,227.73	1,906.22	14,439,636.62	1,687,261.19	39.76069055	-80.83330903	
14,445.00	90.51	148.46	6,212.19	-7,309.95	1,953.78	14,439,554.40	1,687,308.75	39.76046451	-80.83314036	
14,540.00	89.63	147.05	6,212.07	-7,390.30	2,004.46	14,439,474.06	1,687,359.43	39.76024360	-80.83296054	
14,634.00	89.27	146.79	6,212.98	-7,469.05	2,055.77	14,439,393.30	1,687,410.74	39.76002704	-80.83277850	
14,729.00	90.86	149.43	6,212.87	-7,549.71	2,105.95	14,439,314.65	1,687,460.92	39.75980529	-80.83260048	
14,824.00	91.08	148.99	6,211.26	-7,631.30	2,154.57	14,439,233.05	1,687,509.54	39.75958095	-80.83242800	
14,918.00	89.89	147.93	6,210.46	-7,711.41	2,203.74	14,439,152.94	1,687,558.71	39.75936070	-80.83225358	
15,013.00	90.95	149.43	6,209.77	-7,792.56	2,253.12	14,439,071.79	1,687,608.09	39.75913758	-80.83207842	
15,107.00	92.22	150.39	6,207.17	-7,873.86	2,300.23	14,438,990.49	1,687,655.20	39.75891407	-80.83191134	
15,201.00	90.99	149.69	6,204.53	-7,955.27	2,347.15	14,438,909.09	1,687,702.12	39.75869026	-80.83174491	
15,296.00	91.08	149.87	6,202.82	-8,037.34	2,394.96	14,438,827.01	1,687,749.93	39.75846461	-80.83157535	
15,327.00	91.34	149.78	6,202.16	-8,064.14	2,410.54	14,438,800.22	1,687,765.51	39.75839095	-80.83152010	
Survey @ 15327.00 MD 6202.16 TVD										
15,379.00	91.34	149.78	6,200.95	-8,109.06	2,436.70	14,438,755.30	1,687,791.67	39.75826744	-80.83142729	
Survey projected to 15379.00 MD 6200.95 TVD										



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Yoder W-1HM
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Site:	Yoder	MD Reference:	RKB=1083+26 @ 1109.00usft (Nabors B 28)
Well:	Yoder W-1HM	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Jul2216dt_v14

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
100.00	100.00	-0.06	0.11	Gyro
2,637.00	2,633.08	-7.70	-89.28	MWD surveys
15,327.00	6,202.16	-8,064.14	2,410.54	Survey @ 15327.00 MD 6202.16 TVD
15,379.00	6,200.95	-8,109.06	2,436.70	Survey projected to 15379.00 MD 6200.95 TVD

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