



**Well: Old Crow N-18 HU (slot P)**  
**Site: Old Crow Pad**  
**Project: Marshall County, West Virginia.**  
**Design: rev8**

**SECTION DETAILS**

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
1	10370.00	19.78	74.64	10163.76	296.15	1202.51	0.00	0.000	-200.35	Survey @ 10370.00 MD 10163.76 TVD
2	10650.00	19.78	74.64	10427.24	321.25	1293.88	0.00	0.000	-213.18	KOP Begin 5.75'100' build/turn
3	10846.91	20.51	41.41	10612.70	356.06	1349.01	0.00	0.000	-202.84	Begin 20.51' tangent
4	10862.56	20.51	41.41	10627.36	360.17	1362.64	0.00	0.000	-200.48	Begin 8'100' build/turn
5	11548.68	50.00	345.58	11193.77	720.48	1367.34	0.00	-74.336	125.05	Begin 8'100' build/turn
6	12091.19	91.00	330.00	11372.00	1176.73	1170.48	8.00	-23.007	623.79	Begin 91.00' lateral
7	24991.16	91.00	330.00	11146.86	12348.67	-5278.62	0.00	0.000	3429.57	PBHL/TD 24991.16 MD/11146.86 TVD

**ANNOTATIONS SURVEYS**

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSect	Annotation
189.00	0.09	137.83	189.00	-0.11	0.10	-0.14	MWD surveys
24915.00	94.11	330.11	11144.75	12294.17	-5258.25	13371.46	Survey @ 24915.00 MD 11144.75 TVD
24961.00	94.11	330.11	11141.45	12333.95	-5281.11	13417.02	Survey projected to 24961.00 MD 11141.45 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)

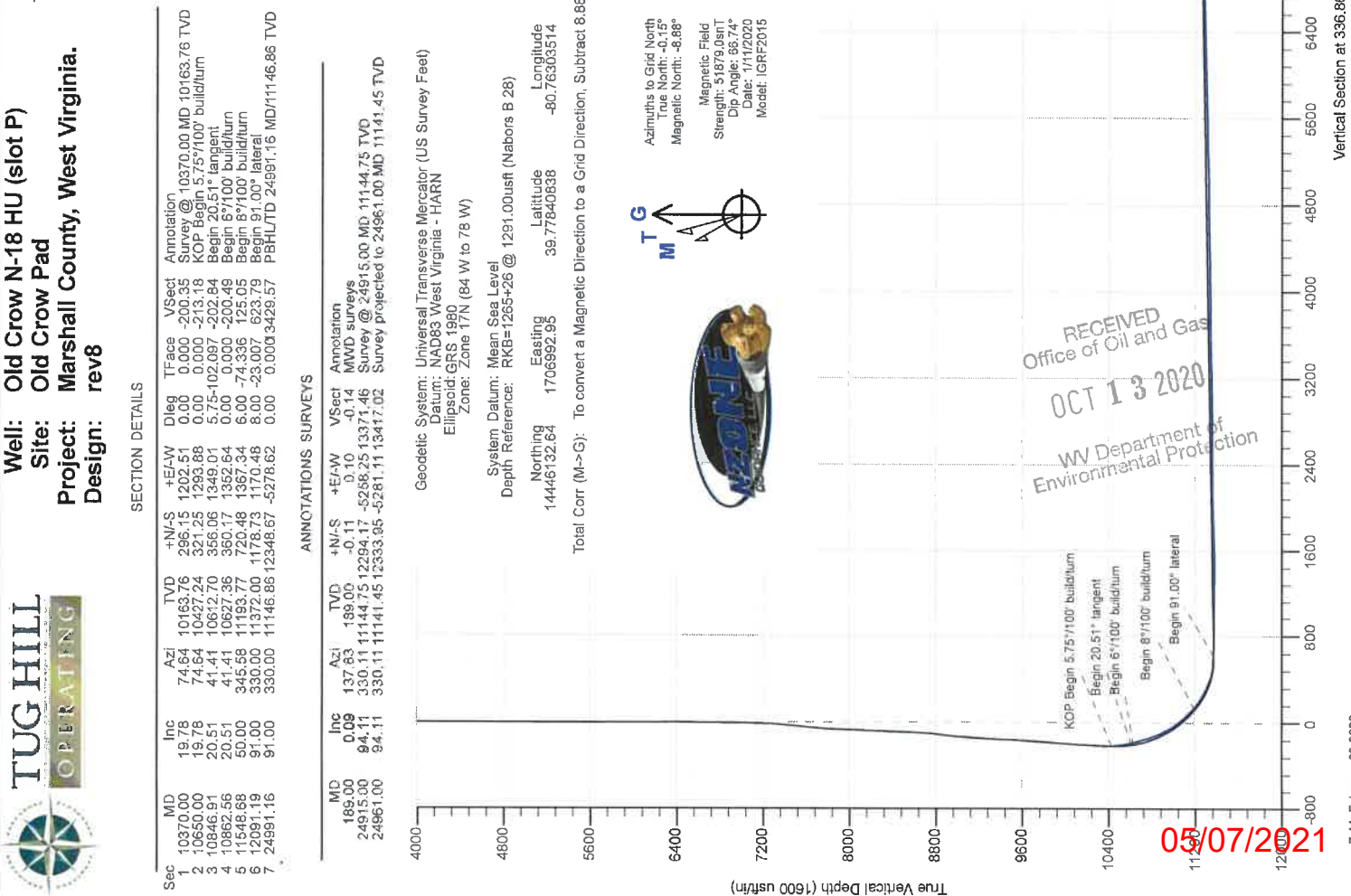
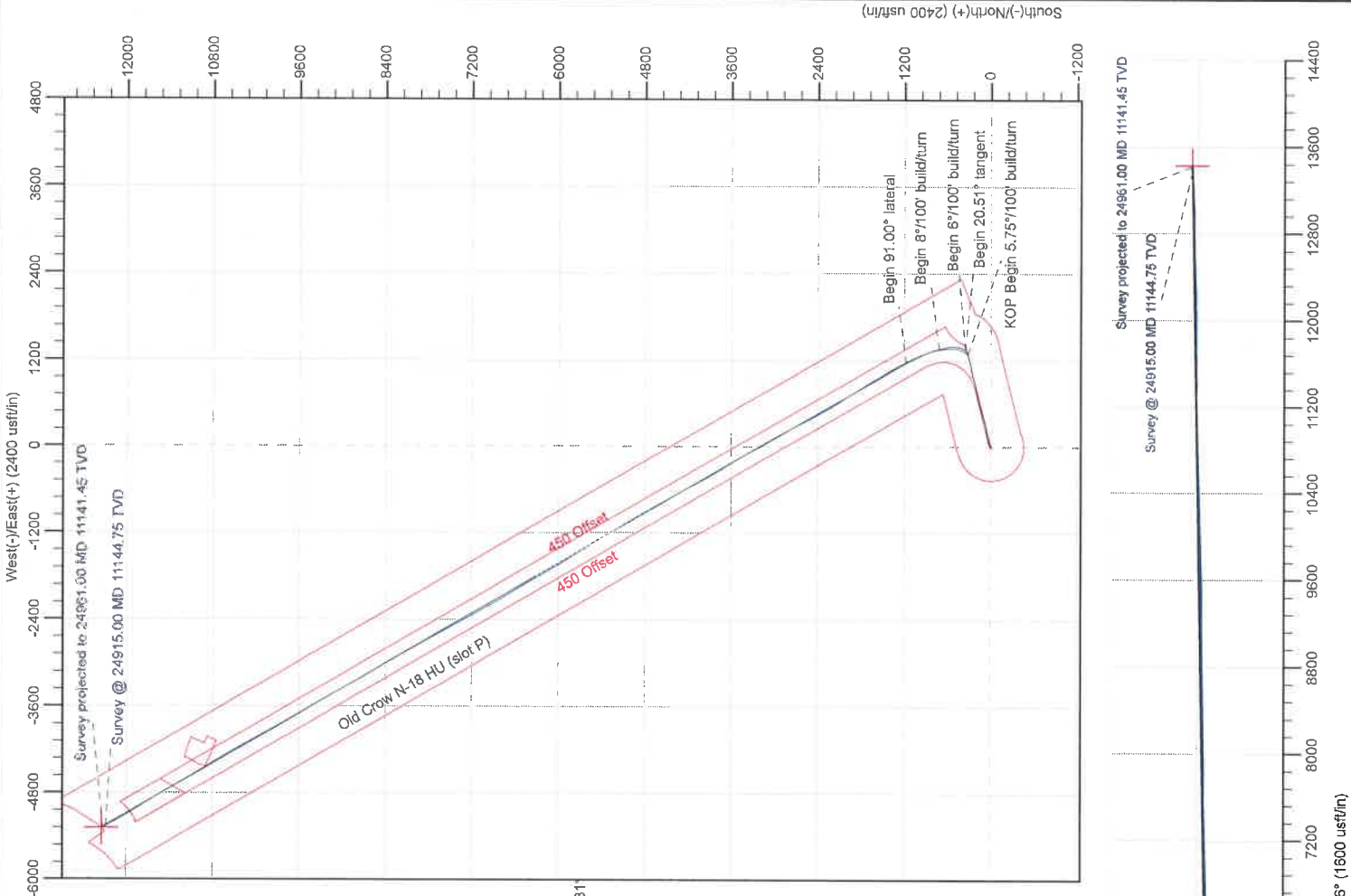
System Datum: Mean Sea Level  
 Depth Reference: RKB=1265+26 @ 1291.00usft (Nabors B 28)

Northing 14446132.64 Easting 1706992.95  
 Latitude 39.77840838 Longitude -80.76303514

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.881°



Azimuths to Grid North  
 True North: -0.15°  
 Magnetic North: -8.88°  
 Magnetic Field  
 Strength: 51879.0usT  
 Dip Angle: 86.74°  
 Date: 1/11/2020  
 Model: IGRF2015



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Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-18 HU (slot P)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow N-18 HU (slot P)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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

<b>Site</b>	Old Crow Pad				
<b>Site Position:</b>		<b>Northing:</b>	14,446,179.89 usft	<b>Latitude:</b>	39.77853828
<b>From:</b>	Lat/Long	<b>Easting:</b>	1,706,970.33 usft	<b>Longitude:</b>	-80.76311519
<b>Position Uncertainty:</b>	0.00 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	0.152 °

<b>Well</b>	Old Crow N-18 HU (slot P)					
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b>	14,446,132.65 usft	<b>Latitude:</b>	39.77840838
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b>	1,706,992.95 usft	<b>Longitude:</b>	-80.76303514
<b>Position Uncertainty</b>	0.00 usft		<b>Wellhead Elevation:</b>	usft	<b>Ground Level:</b>	1,265.00 usft

<b>Wellbore</b>	Original Hole				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2015	1/11/2020	-8.729	66.742	51,878.96589396

<b>Design</b>	Surveys Original Hole				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.00
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.00	0.00	0.00	336.86	

<b>Survey Program</b>	<b>Date</b>	2/2/2020			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
189.00	963.00	MWD surf (Original Hole)	MWD	MWD - Standard	
1,026.00	2,853.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,947.00	24,915.00	MWD (Original Hole)	MWD	MWD - Standard	
24,961.00	24,961.00	Projection (Original Hole)	MWD	MWD - Standard	

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<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Map Northing (usft)</b>	<b>Map Easting (usft)</b>	<b>Latitude</b>	<b>Longitude</b>	
0.00	0.00	0.00	0.00	0.00	0.00	14,446,132.65	1,706,992.95	39.77840838	-80.76303514	
189.00	0.09	137.83	189.00	-0.11	0.10	14,446,132.54	1,706,993.05	39.77840808	-80.76303479	
<b>MWD surveys</b>										
235.00	0.13	116.47	235.00	-0.16	0.17	14,446,132.49	1,706,993.12	39.77840794	-80.76303454	
280.00	0.04	81.14	280.00	-0.18	0.23	14,446,132.47	1,706,993.18	39.77840788	-80.76303432	
325.00	0.18	163.41	325.00	-0.25	0.27	14,446,132.40	1,706,993.21	39.77840771	-80.76303419	
355.00	0.13	136.34	355.00	-0.32	0.30	14,446,132.33	1,706,993.25	39.77840751	-80.76303406	
385.00	0.09	167.45	385.00	-0.36	0.33	14,446,132.28	1,706,993.28	39.77840738	-80.76303396	
415.00	0.09	140.64	415.00	-0.40	0.35	14,446,132.24	1,706,993.30	39.77840727	-80.76303389	



Survey Report - Geographic



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<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow N-18 HU (slot P)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
445.00	0.18	169.12	445.00	-0.47	0.38	14,446,132.18	1,706,993.32	39.77840709	-80.76303380
476.00	0.18	197.93	476.00	-0.56	0.37	14,446,132.08	1,706,993.32	39.77840683	-80.76303382
506.00	0.13	171.93	506.00	-0.64	0.36	14,446,132.01	1,706,993.31	39.77840662	-80.76303386
535.00	0.13	183.97	535.00	-0.71	0.36	14,446,131.94	1,706,993.31	39.77840644	-80.76303385
565.00	0.22	202.87	565.00	-0.79	0.34	14,446,131.85	1,706,993.28	39.77840620	-80.76303394
595.00	0.13	215.17	595.00	-0.87	0.30	14,446,131.77	1,706,993.24	39.77840598	-80.76303409
624.00	0.22	225.63	624.00	-0.94	0.24	14,446,131.71	1,706,993.18	39.77840580	-80.76303430
654.00	0.26	213.77	654.00	-1.04	0.16	14,446,131.61	1,706,993.11	39.77840553	-80.76303458
684.00	0.26	203.66	684.00	-1.16	0.09	14,446,131.49	1,706,993.04	39.77840521	-80.76303482
715.00	0.22	228.36	715.00	-1.26	0.02	14,446,131.39	1,706,992.97	39.77840492	-80.76303508
744.00	0.31	223.79	744.00	-1.35	-0.07	14,446,131.29	1,706,992.87	39.77840466	-80.76303542
775.00	0.31	220.01	775.00	-1.48	-0.19	14,446,131.17	1,706,992.76	39.77840432	-80.76303582
838.00	0.48	233.54	838.00	-1.77	-0.51	14,446,130.88	1,706,992.44	39.77840354	-80.76303697
869.00	0.53	237.94	868.99	-1.92	-0.73	14,446,130.73	1,706,992.21	39.77840312	-80.76303777
914.00	0.66	251.30	913.99	-2.11	-1.16	14,446,130.53	1,706,991.79	39.77840259	-80.76303928
963.00	0.79	251.12	962.99	-2.31	-1.74	14,446,130.33	1,706,991.20	39.77840204	-80.76304137
1,026.00	1.01	261.14	1,025.98	-2.54	-2.70	14,446,130.11	1,706,990.24	39.77840143	-80.76304478
1,057.00	1.27	256.22	1,056.97	-2.66	-3.31	14,446,129.98	1,706,989.64	39.77840109	-80.76304693
1,151.00	1.10	264.66	1,150.95	-2.99	-5.22	14,446,129.65	1,706,987.73	39.77840019	-80.76305373
1,245.00	0.88	298.41	1,244.94	-2.74	-6.75	14,446,129.91	1,706,986.20	39.77840092	-80.76305919
1,340.00	0.70	322.05	1,339.93	-1.93	-7.75	14,446,130.72	1,706,985.20	39.77840314	-80.76306274
1,434.00	0.22	103.02	1,433.93	-1.52	-7.93	14,446,131.13	1,706,985.02	39.77840427	-80.76306336
1,528.00	1.01	154.97	1,527.92	-2.31	-7.40	14,446,130.34	1,706,985.55	39.77840209	-80.76306150
1,622.00	0.92	147.94	1,621.91	-3.70	-6.65	14,446,128.95	1,706,986.30	39.77839827	-80.76305884
1,716.00	1.05	135.98	1,715.90	-4.96	-5.65	14,446,127.69	1,706,987.30	39.77839480	-80.76305529
1,811.00	1.67	84.92	1,810.87	-5.46	-3.66	14,446,127.19	1,706,989.28	39.77839341	-80.76304824
1,906.00	2.94	72.97	1,905.79	-4.63	0.04	14,446,128.02	1,706,992.99	39.77839568	-80.76303503
2,000.00	2.68	76.04	1,999.68	-3.39	4.48	14,446,129.26	1,706,997.43	39.77839904	-80.76301922
2,095.00	1.45	84.74	2,094.62	-2.74	7.83	14,446,129.90	1,707,000.78	39.77840079	-80.76300728
2,190.00	0.88	296.56	2,189.61	-2.31	8.38	14,446,130.34	1,707,001.32	39.77840198	-80.76300534
2,284.00	1.85	284.43	2,283.58	-1.61	6.26	14,446,131.04	1,706,999.21	39.77840392	-80.76301286
2,378.00	1.54	307.55	2,377.54	-0.46	3.79	14,446,132.19	1,706,996.74	39.77840709	-80.76302165
2,471.00	1.05	41.15	2,470.53	0.94	3.36	14,446,133.59	1,706,996.31	39.77841095	-80.76302317
2,566.00	1.32	122.45	2,565.51	1.01	4.86	14,446,133.66	1,706,997.80	39.77841113	-80.76301784
2,661.00	1.27	204.01	2,660.49	-0.54	5.35	14,446,132.11	1,706,998.30	39.77840687	-80.76301609
2,755.00	1.27	258.68	2,754.47	-1.69	3.91	14,446,130.96	1,706,996.85	39.77840371	-80.76302125
2,775.00	1.41	278.45	2,774.47	-1.70	3.45	14,446,130.95	1,706,996.39	39.77840369	-80.76302289
2,853.00	1.54	298.32	2,852.44	-1.06	1.58	14,446,131.59	1,706,994.52	39.77840546	-80.76302954
2,947.00	0.48	313.96	2,946.43	-0.19	0.18	14,446,132.46	1,706,993.13	39.77840786	-80.76303450
3,042.00	1.54	86.68	3,041.42	0.16	1.17	14,446,132.81	1,706,994.11	39.77840882	-80.76303098
3,134.00	2.24	88.79	3,133.37	0.27	4.20	14,446,132.92	1,706,997.15	39.77840910	-80.76302019
3,232.00	2.37	61.45	3,231.29	1.28	7.89	14,446,133.93	1,707,000.84	39.77841184	-80.76300703
3,326.00	2.59	58.38	3,325.20	3.32	11.41	14,446,135.97	1,707,004.36	39.77841742	-80.76299450
3,421.00	2.64	63.47	3,420.10	5.42	15.20	14,446,138.07	1,707,008.14	39.77842317	-80.76298101
3,514.00	4.00	67.87	3,512.95	7.60	20.12	14,446,140.25	1,707,013.06	39.77842912	-80.76296347
3,607.00	5.05	75.16	3,605.66	9.87	27.08	14,446,142.52	1,707,020.02	39.77843530	-80.76293867
3,701.00	5.36	74.11	3,699.27	12.14	35.30	14,446,144.78	1,707,028.25	39.77844145	-80.76290938
3,796.00	5.36	74.99	3,793.85	14.50	43.85	14,446,147.15	1,707,036.80	39.77844788	-80.76287892
3,891.00	4.31	76.31	3,888.51	16.49	51.61	14,446,149.14	1,707,044.55	39.77845330	-80.76285130
3,985.00	4.92	70.51	3,982.21	18.67	58.84	14,446,151.32	1,707,051.79	39.77845924	-80.76282554
4,081.00	3.34	68.92	4,077.96	21.05	65.33	14,446,153.70	1,707,058.28	39.77846573	-80.76280241
4,176.00	1.10	64.97	4,172.88	22.44	68.74	14,446,155.08	1,707,061.68	39.77846950	-80.76279027
4,269.00	0.35	56.88	4,265.87	22.97	69.79	14,446,155.62	1,707,062.73	39.77847095	-80.76278654
4,364.00	0.18	319.76	4,360.87	23.24	69.93	14,446,155.89	1,707,062.88	39.77847170	-80.76278601
4,459.00	0.70	247.60	4,455.87	23.13	69.30	14,446,155.78	1,707,062.25	39.77847141	-80.76278827

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
4,554.00	0.35	286.36	4,550.86	22.99	68.48	14,446,155.64	1,707,061.43	39.77847103	-80.76279117
4,650.00	0.97	29.55	4,646.86	23.78	68.60	14,446,156.43	1,707,061.55	39.77847320	-80.76279074
4,745.00	1.54	20.06	4,741.84	25.68	69.44	14,446,158.33	1,707,062.38	39.77847841	-80.76278775
4,840.00	1.19	50.55	4,836.81	27.51	70.64	14,446,160.16	1,707,063.58	39.77848341	-80.76278346
4,935.00	1.01	57.41	4,931.79	28.59	72.11	14,446,161.23	1,707,065.05	39.77848636	-80.76277823
5,030.00	0.66	103.29	5,026.78	28.91	73.34	14,446,161.56	1,707,066.29	39.77848725	-80.76277382
5,125.00	0.92	91.25	5,121.77	28.77	74.64	14,446,161.42	1,707,067.58	39.77848685	-80.76276921
5,220.00	1.10	96.70	5,216.76	28.65	76.31	14,446,161.29	1,707,069.25	39.77848650	-80.76276328
5,315.00	0.44	117.09	5,311.75	28.37	77.54	14,446,161.02	1,707,070.48	39.77848574	-80.76275890
5,409.00	1.45	175.18	5,405.74	27.02	77.96	14,446,159.67	1,707,070.90	39.77848203	-80.76275741
5,504.00	0.22	148.11	5,500.73	25.67	78.16	14,446,158.32	1,707,071.10	39.77847831	-80.76275672
5,599.00	1.32	264.48	5,595.72	25.41	77.16	14,446,158.06	1,707,070.11	39.77847761	-80.76276026
5,693.00	0.70	312.12	5,689.70	25.69	75.66	14,446,158.34	1,707,068.60	39.77847839	-80.76276561
5,788.00	0.97	352.90	5,784.69	26.88	75.13	14,446,159.53	1,707,068.07	39.77848165	-80.76276748
5,883.00	0.75	282.23	5,879.69	27.81	74.42	14,446,160.46	1,707,067.37	39.77848421	-80.76276999
5,978.00	1.67	283.99	5,974.66	28.28	72.47	14,446,160.92	1,707,065.42	39.77848551	-80.76277693
6,073.00	0.53	278.63	6,069.64	28.68	70.69	14,446,161.32	1,707,063.64	39.77848662	-80.76278325
6,167.00	0.26	348.68	6,163.64	28.95	70.22	14,446,161.60	1,707,063.17	39.77848738	-80.76278493
6,262.00	0.92	281.79	6,258.64	29.32	69.43	14,446,161.97	1,707,062.38	39.77848839	-80.76278773
6,356.00	1.58	102.15	6,352.63	29.20	69.96	14,446,161.85	1,707,062.91	39.77848806	-80.76278586
6,451.00	1.41	62.07	6,447.60	29.47	72.27	14,446,162.12	1,707,065.22	39.77848879	-80.76277762
6,547.00	1.49	44.93	6,543.57	30.91	74.20	14,446,163.56	1,707,067.15	39.77849272	-80.76277075
6,641.00	1.36	75.87	6,637.54	32.05	76.14	14,446,164.69	1,707,069.09	39.77849583	-80.76276382
6,735.00	2.55	88.17	6,731.49	32.38	79.32	14,446,165.03	1,707,072.26	39.77849674	-80.76275253
6,829.00	4.35	82.37	6,825.31	32.92	84.94	14,446,165.57	1,707,077.89	39.77849818	-80.76273251
6,924.00	6.90	76.22	6,919.85	34.76	94.05	14,446,167.41	1,707,087.00	39.77850316	-80.76270005
7,018.00	8.70	72.88	7,012.97	38.20	106.33	14,446,170.85	1,707,099.28	39.77851252	-80.76265631
7,113.00	10.55	71.74	7,106.63	43.04	121.46	14,446,175.69	1,707,114.41	39.77852570	-80.76260242
7,207.00	12.30	75.95	7,198.77	48.17	139.35	14,446,180.82	1,707,132.29	39.77853965	-80.76253871
7,301.00	13.62	81.32	7,290.37	52.27	160.00	14,446,184.92	1,707,152.95	39.77855076	-80.76246515
7,396.00	15.16	84.48	7,382.39	55.15	183.43	14,446,187.80	1,707,176.37	39.77855851	-80.76238176
7,491.00	16.88	83.43	7,473.70	57.93	209.49	14,446,190.57	1,707,202.44	39.77856594	-80.76228895
7,620.00	21.53	83.25	7,595.49	62.85	251.63	14,446,195.50	1,707,244.58	39.77857916	-80.76213893
7,680.00	22.06	83.43	7,651.20	65.44	273.76	14,446,198.08	1,707,266.70	39.77858610	-80.76206015
7,775.00	21.93	76.13	7,739.30	71.73	308.71	14,446,204.38	1,707,301.65	39.77860313	-80.76193568
7,869.00	21.40	72.26	7,826.66	81.17	342.09	14,446,213.81	1,707,335.03	39.77862879	-80.76181680
7,963.00	21.53	71.91	7,914.15	91.75	374.82	14,446,224.39	1,707,367.76	39.77865761	-80.76170020
8,058.00	21.18	71.21	8,002.62	102.69	407.63	14,446,235.34	1,707,400.58	39.77868742	-80.76158329
8,152.00	20.26	73.49	8,090.54	112.78	439.31	14,446,245.43	1,707,432.26	39.77871491	-80.76147043
8,247.00	20.26	74.46	8,179.67	121.86	470.93	14,446,254.51	1,707,463.88	39.77873962	-80.76135781
8,342.00	20.70	73.84	8,268.66	130.94	502.91	14,446,263.59	1,707,495.85	39.77876432	-80.76124392
8,437.00	19.95	71.38	8,357.75	140.79	534.39	14,446,273.44	1,707,527.34	39.77879114	-80.76113176
8,531.00	18.19	70.86	8,446.59	150.72	563.45	14,446,283.37	1,707,556.40	39.77881820	-80.76102823
8,625.00	18.41	71.56	8,535.83	160.23	591.39	14,446,292.88	1,707,584.34	39.77884410	-80.76092869
8,662.00	18.24	73.76	8,570.96	163.70	602.50	14,446,296.34	1,707,595.44	39.77885354	-80.76088914
8,693.00	18.28	75.25	8,600.39	166.29	611.86	14,446,298.94	1,707,604.80	39.77886080	-80.76085580
8,719.00	18.15	75.43	8,625.09	168.35	619.72	14,446,301.00	1,707,612.66	39.77886619	-80.76082779
8,756.00	18.63	76.13	8,660.20	171.21	631.03	14,446,303.86	1,707,623.98	39.77887398	-80.76078749
8,788.00	19.38	78.94	8,690.46	173.46	641.21	14,446,306.11	1,707,634.15	39.77888006	-80.76075126
8,814.00	20.52	79.11	8,714.90	175.15	649.92	14,446,307.79	1,707,642.86	39.77888464	-80.76072025
8,846.00	22.23	81.14	8,744.70	177.14	661.41	14,446,309.79	1,707,654.35	39.77889002	-80.76067933
8,877.00	23.33	81.76	8,773.28	178.92	673.28	14,446,311.57	1,707,666.22	39.77889483	-80.76063707
8,909.00	23.77	82.28	8,802.61	180.70	685.94	14,446,313.34	1,707,678.88	39.77889961	-80.76059199
8,954.00	24.30	82.81	8,843.71	183.07	704.11	14,446,315.72	1,707,697.06	39.77890601	-80.76052728
9,003.00	24.83	83.16	8,888.28	185.56	724.33	14,446,318.21	1,707,717.27	39.77891269	-80.76045529

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Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-18 HU (slot P)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow N-18 HU (slot P)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
9,050.00	23.69	81.05	8,931.12	188.21	743.45	14,446,320.85	1,707,736.40	39.77891981	-80.76038719
9,099.00	22.10	79.29	8,976.26	191.45	762.24	14,446,324.10	1,707,755.18	39.77892858	-80.76032031
9,146.00	21.62	78.50	9,019.88	194.82	779.41	14,446,327.47	1,707,772.35	39.77893771	-80.76025916
9,193.00	21.84	78.42	9,063.54	198.30	796.46	14,446,330.95	1,707,789.40	39.77894715	-80.76019844
9,240.00	22.19	78.59	9,107.12	201.81	813.72	14,446,334.46	1,707,806.67	39.77895666	-80.76013696
9,288.00	21.36	77.98	9,151.69	205.42	831.16	14,446,338.07	1,707,824.10	39.77896646	-80.76007487
9,335.00	21.05	76.39	9,195.51	209.19	847.73	14,446,341.84	1,707,840.68	39.77897668	-80.76001583
9,382.00	20.92	75.16	9,239.39	213.33	864.05	14,446,345.98	1,707,856.99	39.77898792	-80.75995772
9,430.00	20.87	73.76	9,284.24	217.91	880.54	14,446,350.56	1,707,873.49	39.77900039	-80.75989898
9,477.00	21.23	72.97	9,328.10	222.75	896.72	14,446,355.40	1,707,889.66	39.77901355	-80.75984136
9,524.00	21.58	73.14	9,371.86	227.75	913.12	14,446,360.40	1,707,906.07	39.77902716	-80.75978291
9,573.00	21.97	73.05	9,417.36	233.03	930.52	14,446,365.68	1,707,923.46	39.77904155	-80.75972096
9,620.00	20.30	73.84	9,461.20	237.87	946.76	14,446,370.51	1,707,939.70	39.77905470	-80.75966310
9,668.00	19.78	74.55	9,506.29	242.35	962.58	14,446,374.99	1,707,955.53	39.77906689	-80.75960673
9,715.00	19.95	75.34	9,550.50	246.49	978.01	14,446,379.14	1,707,970.95	39.77907816	-80.75955180
9,763.00	20.04	75.43	9,595.60	250.64	993.89	14,446,383.28	1,707,986.83	39.77908942	-80.75949523
9,810.00	20.43	76.39	9,639.70	254.59	1,009.65	14,446,387.24	1,708,002.60	39.77910017	-80.75943908
9,858.00	20.61	77.18	9,684.66	258.44	1,026.03	14,446,391.09	1,708,018.98	39.77911061	-80.75938074
9,905.00	20.74	77.45	9,728.63	262.08	1,042.22	14,446,394.73	1,708,035.17	39.77912050	-80.75932308
9,953.00	20.79	78.77	9,773.51	265.59	1,058.87	14,446,398.24	1,708,051.82	39.77913000	-80.75926378
10,000.00	21.09	79.83	9,817.41	268.71	1,075.38	14,446,401.35	1,708,068.33	39.77913844	-80.75920500
10,046.00	20.74	78.68	9,860.38	271.77	1,091.51	14,446,404.41	1,708,084.46	39.77914673	-80.75914755
10,093.00	20.83	78.42	9,904.32	275.08	1,107.86	14,446,407.72	1,708,100.80	39.77915570	-80.75908934
10,141.00	21.14	78.15	9,949.13	278.57	1,124.69	14,446,411.21	1,708,117.64	39.77916516	-80.75902940
10,188.00	21.44	78.50	9,992.93	282.02	1,141.40	14,446,414.67	1,708,134.35	39.77917452	-80.75896988
10,236.00	20.61	77.62	10,037.73	285.58	1,158.25	14,446,418.23	1,708,151.20	39.77918417	-80.75890988
10,283.00	20.04	77.71	10,081.80	289.07	1,174.20	14,446,421.72	1,708,167.15	39.77919363	-80.75885308
10,330.00	19.29	75.60	10,126.06	292.71	1,189.59	14,446,425.36	1,708,182.53	39.77920353	-80.75879827
10,370.00	19.78	74.64	10,163.76	296.15	1,202.51	14,446,428.80	1,708,195.46	39.77921287	-80.75875223
10,472.00	21.71	74.26	10,259.14	305.84	1,237.32	14,446,438.49	1,708,230.26	39.77923922	-80.75862826
10,519.00	20.62	74.79	10,302.97	310.37	1,253.67	14,446,443.02	1,708,246.62	39.77925154	-80.75857001
10,565.00	18.20	74.00	10,346.35	314.47	1,268.39	14,446,447.12	1,708,261.34	39.77926271	-80.75851757
10,612.00	17.36	71.36	10,391.11	318.74	1,282.09	14,446,451.39	1,708,275.04	39.77927432	-80.75846876
10,658.00	17.45	56.77	10,435.03	324.71	1,294.37	14,446,455.36	1,708,287.32	39.77929064	-80.75842500
10,705.00	19.08	43.24	10,479.68	334.18	1,305.54	14,446,466.82	1,708,298.48	39.77931654	-80.75838518
10,752.00	20.09	37.88	10,523.96	346.15	1,315.76	14,446,478.79	1,708,308.70	39.77934934	-80.75834869
10,799.00	20.31	33.13	10,568.07	359.35	1,325.17	14,446,492.00	1,708,318.12	39.77938553	-80.75831505
10,847.00	21.10	28.03	10,612.98	373.95	1,333.78	14,446,506.60	1,708,326.73	39.77942557	-80.75828425
10,894.00	22.20	28.83	10,656.66	389.20	1,342.04	14,446,521.85	1,708,334.99	39.77946738	-80.75825471
10,942.00	23.08	28.21	10,700.96	405.44	1,350.86	14,446,538.08	1,708,343.81	39.77951190	-80.75822316
10,989.00	23.30	23.46	10,744.17	422.08	1,358.92	14,446,554.73	1,708,351.86	39.77955756	-80.75819433
11,036.00	25.58	18.10	10,786.96	440.26	1,365.77	14,446,572.91	1,708,358.72	39.77960742	-80.75816976
11,083.00	27.16	14.67	10,829.07	460.28	1,371.64	14,446,592.93	1,708,364.59	39.77966237	-80.75814867
11,132.00	28.13	7.99	10,872.48	482.55	1,376.08	14,446,615.19	1,708,369.03	39.77972348	-80.75813266
11,179.00	30.42	3.78	10,913.48	505.40	1,378.41	14,446,638.04	1,708,371.35	39.77978622	-80.75812416
11,227.00	32.04	1.84	10,954.53	530.25	1,379.62	14,446,662.90	1,708,372.56	39.77985447	-80.75811962
11,274.00	35.03	358.06	10,993.70	556.20	1,379.56	14,446,688.85	1,708,372.51	39.77992573	-80.75811957
11,320.00	37.49	358.33	11,030.79	583.39	1,378.71	14,446,716.04	1,708,371.65	39.78000041	-80.75812235
11,367.00	40.00	356.66	11,067.45	612.77	1,377.41	14,446,745.42	1,708,370.35	39.78008111	-80.75812668
11,415.00	43.47	354.55	11,103.26	644.62	1,374.94	14,446,777.27	1,708,367.89	39.78016860	-80.75813516
11,462.00	46.20	352.09	11,136.59	677.53	1,371.07	14,446,810.17	1,708,364.02	39.78025899	-80.75814862
11,510.00	49.27	349.36	11,168.87	712.57	1,365.33	14,446,845.22	1,708,358.27	39.78035527	-80.75816873
11,557.00	52.57	345.14	11,198.51	748.13	1,357.25	14,446,880.78	1,708,350.19	39.78045298	-80.75819714
11,605.00	55.12	341.72	11,226.83	785.26	1,346.18	14,446,917.91	1,708,339.13	39.78055503	-80.75823618
11,652.00	58.95	341.10	11,252.40	822.62	1,333.61	14,446,955.27	1,708,326.55	39.78065775	-80.75828057

WV Department of Environmental Protection



Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-18 HU (slot P)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow N-18 HU (slot P)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
11,701.00	61.01	341.63	11,276.91	862.83	1,320.05	14,446,995.47	1,708,313.00	39.78076825	-80.75832843
11,748.00	65.01	340.75	11,298.24	902.46	1,306.55	14,447,035.11	1,708,299.49	39.78087719	-80.75837612
11,796.00	67.08	339.52	11,317.73	943.71	1,291.64	14,447,076.36	1,708,284.58	39.78099059	-80.75842879
11,843.00	69.54	337.50	11,335.10	984.34	1,275.64	14,447,116.99	1,708,268.58	39.78110228	-80.75848536
11,891.00	74.95	337.23	11,349.73	1,026.51	1,258.05	14,447,159.16	1,708,250.99	39.78121824	-80.75854756
11,938.00	81.19	334.86	11,359.44	1,068.51	1,239.38	14,447,201.16	1,708,232.32	39.78133371	-80.75861361
11,986.00	86.46	332.31	11,364.60	1,111.23	1,218.15	14,447,243.88	1,708,211.10	39.78145118	-80.75868875
12,033.00	88.44	332.22	11,366.70	1,152.78	1,196.30	14,447,285.43	1,708,189.25	39.78156547	-80.75876613
12,081.00	88.70	332.58	11,367.89	1,195.31	1,174.07	14,447,327.96	1,708,167.02	39.78168242	-80.75884485
12,128.00	90.33	331.17	11,368.29	1,236.76	1,151.92	14,447,369.40	1,708,144.86	39.78179641	-80.75892331
12,176.00	90.07	331.52	11,368.12	1,278.88	1,128.90	14,447,411.52	1,708,121.85	39.78191225	-80.75900483
12,271.00	89.32	330.82	11,368.63	1,362.10	1,083.09	14,447,494.75	1,708,076.04	39.78214114	-80.75916709
12,366.00	89.14	330.29	11,369.91	1,444.82	1,036.39	14,447,577.47	1,708,029.34	39.78236866	-80.75933251
12,460.00	88.09	329.15	11,372.18	1,525.97	989.01	14,447,658.62	1,707,981.96	39.78259187	-80.75950039
12,555.00	89.98	328.71	11,373.78	1,607.33	939.99	14,447,739.97	1,707,932.94	39.78281566	-80.75967410
12,650.00	89.89	328.36	11,373.89	1,688.36	890.41	14,447,821.00	1,707,883.35	39.78303856	-80.75984983
12,744.00	89.49	328.62	11,374.39	1,768.49	841.28	14,447,901.14	1,707,834.22	39.78325900	-80.76002394
12,839.00	90.81	328.09	11,374.15	1,849.37	791.44	14,447,982.01	1,707,784.38	39.78348146	-80.76020057
12,934.00	90.46	325.63	11,373.09	1,928.90	739.51	14,448,061.55	1,707,732.46	39.78370027	-80.76038466
13,029.00	91.52	325.46	11,371.45	2,007.22	685.77	14,448,139.87	1,707,678.72	39.78391576	-80.76057519
13,124.00	92.62	327.13	11,368.02	2,086.20	633.09	14,448,218.85	1,707,626.04	39.78413303	-80.76076196
13,218.00	92.35	329.59	11,363.94	2,166.15	583.83	14,448,298.79	1,707,576.78	39.78435295	-80.76093655
13,313.00	91.25	330.91	11,360.96	2,248.58	536.72	14,448,381.23	1,707,529.66	39.78457968	-80.76110347
13,407.00	90.95	330.99	11,359.15	2,330.74	491.08	14,448,463.39	1,707,484.03	39.78480565	-80.76126514
13,501.00	90.73	331.08	11,357.78	2,412.97	445.56	14,448,545.62	1,707,438.51	39.78503182	-80.76142638
13,596.00	90.81	331.17	11,356.50	2,496.16	399.69	14,448,628.80	1,707,392.64	39.78526059	-80.76158888
13,691.00	90.59	331.61	11,355.34	2,579.55	354.20	14,448,712.20	1,707,347.15	39.78548995	-80.76175000
13,784.00	90.33	331.96	11,354.59	2,661.50	310.24	14,448,794.14	1,707,303.18	39.78571532	-80.76190573
13,879.00	90.33	332.49	11,354.05	2,745.55	265.97	14,448,878.20	1,707,258.91	39.78594647	-80.76206252
13,973.00	90.46	331.52	11,353.40	2,828.55	221.85	14,448,961.19	1,707,214.79	39.78617473	-80.76221879
14,067.00	90.37	331.96	11,352.72	2,911.34	177.34	14,449,043.99	1,707,170.29	39.78640243	-80.76237643
14,162.00	89.98	330.73	11,352.43	2,994.70	131.79	14,449,127.35	1,707,124.73	39.78663170	-80.76253781
14,256.00	90.90	329.41	11,351.70	3,076.16	84.89	14,449,208.81	1,707,077.84	39.78686574	-80.76270398
14,350.00	90.55	329.59	11,350.51	3,157.15	37.19	14,449,289.80	1,707,030.13	39.78707850	-80.76287303
14,445.00	90.11	329.32	11,349.97	3,238.96	-11.09	14,449,371.61	1,706,981.85	39.78730354	-80.76304412
14,539.00	90.37	329.24	11,349.57	3,319.77	-59.11	14,449,452.42	1,706,933.83	39.78752581	-80.76321429
14,634.00	92.31	328.36	11,347.35	3,401.00	-108.31	14,449,533.65	1,706,884.64	39.78774926	-80.76338865
14,729.00	91.65	328.62	11,344.07	3,481.95	-157.93	14,449,614.60	1,706,835.02	39.78797191	-80.76356453
14,824.00	90.95	329.06	11,341.91	3,563.22	-207.07	14,449,695.87	1,706,785.87	39.78819546	-80.76373871
14,918.00	90.29	329.50	11,340.90	3,644.02	-255.09	14,449,776.67	1,706,737.86	39.78841772	-80.76390887
15,012.00	90.15	328.97	11,340.54	3,724.80	-303.17	14,449,857.44	1,706,689.77	39.78863988	-80.76407928
15,107.00	89.93	329.15	11,340.47	3,806.28	-352.01	14,449,938.92	1,706,640.93	39.78886401	-80.76425239
15,201.00	90.90	329.94	11,339.79	3,887.30	-399.66	14,450,019.95	1,706,593.29	39.78908687	-80.76442123
15,296.00	90.37	329.94	11,338.74	3,969.52	-447.24	14,450,102.17	1,706,545.71	39.78931301	-80.76458985
15,391.00	91.65	330.73	11,337.06	4,052.05	-494.25	14,450,184.70	1,706,498.70	39.78954001	-80.76475642
15,486.00	91.25	330.64	11,334.66	4,134.86	-540.75	14,450,267.51	1,706,452.20	39.78976776	-80.76492117
15,580.00	90.99	330.99	11,332.82	4,216.91	-586.58	14,450,349.56	1,706,406.37	39.78999342	-80.76508355
15,674.00	90.90	331.43	11,331.27	4,299.28	-631.84	14,450,431.93	1,706,361.10	39.79021995	-80.76524391
15,768.00	90.42	331.61	11,330.19	4,381.90	-676.66	14,450,514.55	1,706,316.28	39.79044717	-80.76540270
15,863.00	91.56	331.08	11,328.55	4,465.25	-722.21	14,450,597.90	1,706,270.74	39.79067640	-80.76556407
15,958.00	91.30	331.52	11,326.18	4,548.55	-767.82	14,450,681.20	1,706,225.13	39.79090550	-80.76572565
16,052.00	90.46	331.34	11,324.73	4,631.10	-812.76	14,450,763.75	1,706,180.18	39.79113251	-80.76588489
16,147.00	90.15	331.87	11,324.23	4,714.67	-857.94	14,450,847.31	1,706,135.00	39.79136234	-80.76604494
16,242.00	91.47	329.85	11,322.88	4,797.63	-904.19	14,450,930.28	1,706,088.75	39.79159050	-80.76620882
16,337.00	91.12	329.59	11,320.74	4,879.65	-952.08	14,451,012.29	1,706,040.86	39.79181609	-80.76637854



Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-18 HU (slot P)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B 28)
<b>Well:</b>	Old Crow N-18 HU (slot P)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
16,432.00	90.64	329.06	11,319.28	4,961.34	-1,000.54	14,451,093.99	1,705,992.40	39.79204080	-80.76655030
16,526.00	90.42	329.24	11,318.41	5,042.04	-1,048.74	14,451,174.69	1,705,944.20	39.79226276	-80.76672114
16,621.00	92.57	328.71	11,315.93	5,123.42	-1,097.69	14,451,256.07	1,705,895.26	39.79248659	-80.76689463
16,717.00	91.74	329.06	11,312.32	5,205.55	-1,147.26	14,451,338.19	1,705,845.69	39.79271250	-80.76707035
16,812.00	91.43	329.15	11,309.69	5,287.04	-1,196.02	14,451,419.68	1,705,796.93	39.79293664	-80.76724318
16,907.00	91.25	328.88	11,307.47	5,368.46	-1,244.91	14,451,501.11	1,705,748.03	39.79316059	-80.76741649
17,002.00	91.12	328.44	11,305.51	5,449.58	-1,294.31	14,451,582.23	1,705,698.63	39.79338373	-80.76759161
17,095.00	90.64	328.18	11,304.08	5,528.70	-1,343.16	14,451,661.35	1,705,649.78	39.79360137	-80.76776478
17,190.00	89.89	328.44	11,303.64	5,609.54	-1,393.07	14,451,742.19	1,705,599.88	39.79382372	-80.76794170
17,285.00	91.38	329.24	11,302.58	5,690.82	-1,442.22	14,451,823.47	1,705,550.73	39.79404730	-80.76811593
17,402.00	90.51	327.92	11,300.66	5,790.65	-1,503.20	14,451,923.30	1,705,489.74	39.79432189	-80.76833211
17,497.00	91.69	329.41	11,298.83	5,871.78	-1,552.59	14,452,004.42	1,705,440.35	39.79454503	-80.76850721
17,591.00	91.52	329.32	11,296.20	5,952.62	-1,600.48	14,452,085.27	1,705,392.47	39.79476740	-80.76867693
17,685.00	91.30	329.06	11,293.89	6,033.33	-1,648.61	14,452,165.98	1,705,344.34	39.79498939	-80.76884754
17,778.00	91.87	330.03	11,291.31	6,113.47	-1,695.73	14,452,246.12	1,705,297.22	39.79520980	-80.76901455
17,873.00	91.82	329.94	11,288.25	6,195.69	-1,743.22	14,452,328.34	1,705,249.72	39.79543593	-80.76918289
17,967.00	91.78	330.20	11,285.30	6,277.11	-1,790.10	14,452,409.76	1,705,202.85	39.79565987	-80.76934904
18,062.00	91.52	330.29	11,282.57	6,359.55	-1,837.23	14,452,492.20	1,705,155.72	39.79588661	-80.76951606
18,157.00	91.47	329.94	11,280.09	6,441.89	-1,884.55	14,452,574.54	1,705,108.40	39.79611307	-80.76968377
18,251.00	90.99	327.39	11,278.07	6,522.15	-1,933.42	14,452,654.80	1,705,059.53	39.79633384	-80.76985702
18,345.00	91.25	328.53	11,276.23	6,601.82	-1,983.27	14,452,734.47	1,705,009.67	39.79655297	-80.77003379
18,438.00	90.59	328.09	11,274.74	6,680.94	-2,032.12	14,452,813.59	1,704,960.82	39.79677061	-80.77020698
18,533.00	91.78	328.71	11,272.77	6,761.84	-2,081.89	14,452,894.49	1,704,911.06	39.79699312	-80.77038342
18,628.00	91.60	331.26	11,269.97	6,844.06	-2,129.39	14,452,976.70	1,704,863.56	39.79721925	-80.77055177
18,722.00	91.74	330.64	11,267.23	6,926.19	-2,175.01	14,453,058.84	1,704,817.94	39.79744514	-80.77071346
18,817.00	91.87	330.29	11,264.24	7,008.81	-2,221.82	14,453,141.46	1,704,771.13	39.79767235	-80.77087935
18,912.00	92.18	330.82	11,260.88	7,091.48	-2,268.49	14,453,224.13	1,704,724.46	39.79789973	-80.77104476
19,006.00	90.24	331.34	11,258.90	7,173.74	-2,313.93	14,453,306.39	1,704,679.01	39.79812595	-80.77120581
19,101.00	90.55	331.52	11,258.24	7,257.17	-2,359.36	14,453,389.82	1,704,633.58	39.79835539	-80.77136680
19,195.00	90.64	331.96	11,257.27	7,339.96	-2,403.87	14,453,472.61	1,704,589.08	39.79858307	-80.77152449
19,289.00	89.93	330.55	11,256.80	7,422.37	-2,449.07	14,453,555.02	1,704,543.87	39.79880971	-80.77168468
19,383.00	89.76	330.64	11,257.05	7,504.26	-2,495.22	14,453,638.91	1,704,497.72	39.79903492	-80.77184825
19,477.00	91.34	330.99	11,256.15	7,586.32	-2,541.06	14,453,718.97	1,704,451.89	39.79926060	-80.77201069
19,572.00	91.21	331.52	11,254.04	7,669.60	-2,586.73	14,453,802.24	1,704,406.21	39.79948961	-80.77217256
19,666.00	91.16	331.43	11,252.09	7,752.17	-2,631.61	14,453,884.82	1,704,361.33	39.79971669	-80.77233160
19,761.00	91.08	331.17	11,250.24	7,835.48	-2,677.22	14,453,968.13	1,704,315.72	39.79994581	-80.77249324
19,855.00	91.12	330.64	11,248.43	7,917.60	-2,722.92	14,454,050.25	1,704,270.02	39.80017166	-80.77265521
19,949.00	91.34	330.47	11,246.41	7,999.44	-2,769.12	14,454,132.09	1,704,223.82	39.80039673	-80.77281895
20,044.00	91.47	329.67	11,244.09	8,081.75	-2,816.51	14,454,214.40	1,704,176.44	39.80062309	-80.77298692
20,138.00	91.74	329.76	11,241.45	8,162.89	-2,863.89	14,454,295.53	1,704,129.05	39.80084625	-80.77315490
20,233.00	90.15	329.41	11,239.89	8,244.80	-2,911.98	14,454,377.45	1,704,080.97	39.80107154	-80.77332537
20,328.00	90.15	329.41	11,239.64	8,326.58	-2,960.32	14,454,459.23	1,704,032.62	39.80129646	-80.77349676
20,421.00	90.95	330.03	11,238.74	8,406.89	-3,007.21	14,454,539.53	1,703,985.73	39.80151733	-80.77366299
20,515.00	91.12	329.94	11,237.05	8,488.27	-3,054.23	14,454,620.91	1,703,938.72	39.80174115	-80.77382965
20,610.00	91.08	329.76	11,235.22	8,570.40	-3,101.93	14,454,703.05	1,703,891.01	39.80196704	-80.77399877
20,703.00	89.89	330.11	11,234.44	8,650.88	-3,148.52	14,454,783.53	1,703,844.42	39.80218839	-80.77416392
20,798.00	89.49	330.03	11,234.95	8,733.21	-3,195.92	14,454,865.86	1,703,797.02	39.80241482	-80.77433194
20,892.00	90.42	330.55	11,235.02	8,814.85	-3,242.51	14,454,947.50	1,703,750.44	39.80263935	-80.77449708
20,987.00	90.15	330.38	11,234.55	8,897.51	-3,289.34	14,455,030.15	1,703,703.61	39.80286667	-80.77466308
21,081.00	91.38	330.47	11,233.30	8,979.25	-3,335.73	14,455,111.90	1,703,657.22	39.80309148	-80.77482752
21,176.00	91.56	330.82	11,230.86	9,062.03	-3,382.28	14,455,194.67	1,703,610.66	39.80331912	-80.77499255
21,270.00	91.74	330.82	11,228.15	9,144.06	-3,428.10	14,455,276.71	1,703,564.85	39.80354473	-80.77515492
21,363.00	91.65	330.47	11,225.40	9,225.09	-3,473.67	14,455,357.73	1,703,519.28	39.80376756	-80.77531646
21,457.00	91.96	330.82	11,222.44	9,306.97	-3,519.72	14,455,439.62	1,703,473.22	39.80399276	-80.77547972
21,551.00	92.00	330.91	11,219.19	9,389.03	-3,565.46	14,455,521.68	1,703,427.48	39.80421843	-80.77564184



Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-18 HU (slot P)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B-28)
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+26 @ 1291.00usft (Nabors B-28)
<b>Well:</b>	Old Crow N-18 HU (slot P)	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Aug1919_v14

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WV Department of Environmental Protection

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
21,646.00	92.13	330.47	11,215.77	9,471.82	-3,611.94	14,455,604.46	1,703,381.01	39.80444610	-80.77580658
21,745.00	91.21	330.11	11,212.88	9,557.77	-3,660.98	14,455,690.41	1,703,331.96	39.80468247	-80.77598044
21,839.00	92.04	330.47	11,210.22	9,639.37	-3,707.55	14,455,772.02	1,703,285.40	39.80490691	-80.77614553
21,932.00	91.78	330.82	11,207.12	9,720.39	-3,753.11	14,455,853.04	1,703,239.83	39.80512971	-80.77630705
22,026.00	90.59	330.20	11,205.18	9,802.19	-3,799.38	14,455,934.84	1,703,193.57	39.80535468	-80.77647105
22,120.00	91.34	330.64	11,203.59	9,883.93	-3,845.77	14,456,016.57	1,703,147.17	39.80557947	-80.77663552
22,215.00	90.59	330.73	11,201.99	9,966.75	-3,892.28	14,456,099.40	1,703,100.67	39.80580724	-80.77680037
22,310.00	91.12	330.38	11,200.57	10,049.47	-3,938.97	14,456,182.12	1,703,053.97	39.80603472	-80.77696591
22,404.00	91.78	330.99	11,198.20	10,131.40	-3,984.98	14,456,264.05	1,703,007.96	39.80626006	-80.77712900
22,499.00	92.09	329.85	11,194.99	10,213.97	-4,031.85	14,456,346.62	1,702,961.10	39.80648713	-80.77729515
22,593.00	92.84	331.34	11,190.94	10,295.78	-4,077.96	14,456,428.43	1,702,914.99	39.80671212	-80.77745861
22,687.00	92.04	330.64	11,186.94	10,377.91	-4,123.50	14,456,510.56	1,702,869.44	39.80693799	-80.77762005
22,782.00	91.16	329.59	11,184.29	10,460.25	-4,170.82	14,456,592.90	1,702,822.13	39.80716442	-80.77778780
22,877.00	88.48	329.50	11,184.59	10,542.13	-4,218.97	14,456,674.78	1,702,773.98	39.80738962	-80.77795852
22,970.00	89.27	329.50	11,186.41	10,622.25	-4,266.16	14,456,754.90	1,702,726.79	39.80760996	-80.77812585
23,066.00	90.33	329.85	11,186.75	10,705.11	-4,314.63	14,456,837.76	1,702,678.32	39.80783786	-80.77829771
23,160.00	91.30	329.50	11,185.41	10,786.24	-4,362.08	14,456,918.89	1,702,630.86	39.80806098	-80.77846597
23,253.00	91.47	329.32	11,183.17	10,866.27	-4,409.39	14,456,998.92	1,702,583.55	39.80828110	-80.77863374
23,348.00	90.86	328.27	11,181.23	10,947.51	-4,458.60	14,457,080.16	1,702,534.34	39.80850453	-80.77880825
23,443.00	89.41	328.18	11,181.01	11,028.27	-4,508.63	14,457,160.92	1,702,484.32	39.80872666	-80.77898567
23,538.00	90.33	328.97	11,181.23	11,109.33	-4,558.16	14,457,241.98	1,702,434.79	39.80894962	-80.77916132
23,632.00	91.30	329.15	11,179.89	11,189.95	-4,606.48	14,457,322.60	1,702,386.46	39.80917133	-80.77933269
23,727.00	90.37	330.03	11,178.50	11,271.87	-4,654.56	14,457,404.52	1,702,338.38	39.80939663	-80.77950318
23,819.00	91.25	330.11	11,177.20	11,351.59	-4,700.46	14,457,484.24	1,702,292.49	39.80961588	-80.77966592
23,914.00	92.18	329.67	11,174.36	11,433.73	-4,748.10	14,457,566.38	1,702,244.85	39.80984179	-80.77983482
24,008.00	92.09	330.20	11,170.86	11,515.03	-4,795.16	14,457,647.68	1,702,197.79	39.81006537	-80.78000169
24,102.00	91.16	328.97	11,168.19	11,596.06	-4,842.72	14,457,728.71	1,702,150.22	39.81028821	-80.78017036
24,197.00	91.47	327.74	11,166.01	11,676.91	-4,892.55	14,457,809.56	1,702,100.39	39.81051059	-80.78034709
24,291.00	91.08	328.44	11,163.92	11,756.69	-4,942.23	14,457,889.33	1,702,050.72	39.81073001	-80.78052328
24,384.00	90.24	328.62	11,162.85	11,836.00	-4,990.77	14,457,968.65	1,702,002.17	39.81094815	-80.78069546
24,479.00	90.77	328.27	11,162.01	11,916.95	-5,040.49	14,458,049.60	1,701,952.46	39.81117080	-80.78087178
24,574.00	90.90	330.29	11,160.63	11,998.61	-5,089.01	14,458,131.25	1,701,903.94	39.81139537	-80.78104386
24,667.00	92.18	330.11	11,158.13	12,079.28	-5,135.21	14,458,211.93	1,701,857.74	39.81161723	-80.78120767
24,762.00	92.88	330.29	11,153.93	12,161.63	-5,182.38	14,458,294.28	1,701,810.57	39.81184372	-80.78137491
24,857.00	93.54	330.20	11,148.61	12,243.98	-5,229.45	14,458,376.63	1,701,763.50	39.81207017	-80.78154183
24,915.00	94.11	330.11	11,144.75	12,294.18	-5,258.25	14,458,426.82	1,701,734.70	39.81220822	-80.78164395
<b>Survey @ 24915.00 MD 11144.75 TVD</b>									
24,961.00	94.11	330.11	11,141.45	12,333.95	-5,281.11	14,458,466.60	1,701,711.83	39.81231761	-80.78172502
<b>Survey projected to 24961.00 MD 11141.45 TVD</b>									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
189.00	189.00	-0.11	0.10	MWD surveys
24,915.00	11,144.75	12,294.18	-5,258.25	Survey @ 24915.00 MD 11144.75 TVD
24,961.00	11,141.45	12,333.95	-5,281.11	Survey projected to 24961.00 MD 11141.45 TVD