



Well: Old Crow N-17 HU (slot O)
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	10206.00	7.95	120.34	10154.36	-392.69	519.09	0.00	0.000	-593.83	Survey @ 10206.00 MD 10154.36 TVD
2	10330.00	7.95	120.34	10277.17	-401.36	533.89	0.00	0.000	-608.54	Proj. Begin 6°/100' build/turn
3	10367.69	9.74	129.38	10314.41	-404.70	536.60	6.00	42.333	-613.73	Begin 6°/100' build/turn
4	11348.09	50.00	335.65	11191.10	-86.75	436.97	6.00	-156.659	-287.03	Begin 8°/100' build/turn
5	11864.60	91.00	330.00	11360.00	335.57	218.65	8.00	-8.577	189.21	Begin 91.00° lateral
6	27673.19	91.00	330.00	11085.00	14023.90	-7684.86	0.00	0.000	15991.46	PBHLTD 27673.19 MD/11085.00 TVD

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Annotation
179.00	0.53	355.18	179.00	0.82	-0.07	0.76	MWD surveys
27699.00	91.87	330.99	11053.39	13956.52	-7649.62	15917.28	Survey @ 27699.00 MD 11053.39 TVD
27771.00	91.87	330.99	11051.04	14021.45	-7684.72	15989.25	Survey projected to 27771.00 MD 11051.04 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)

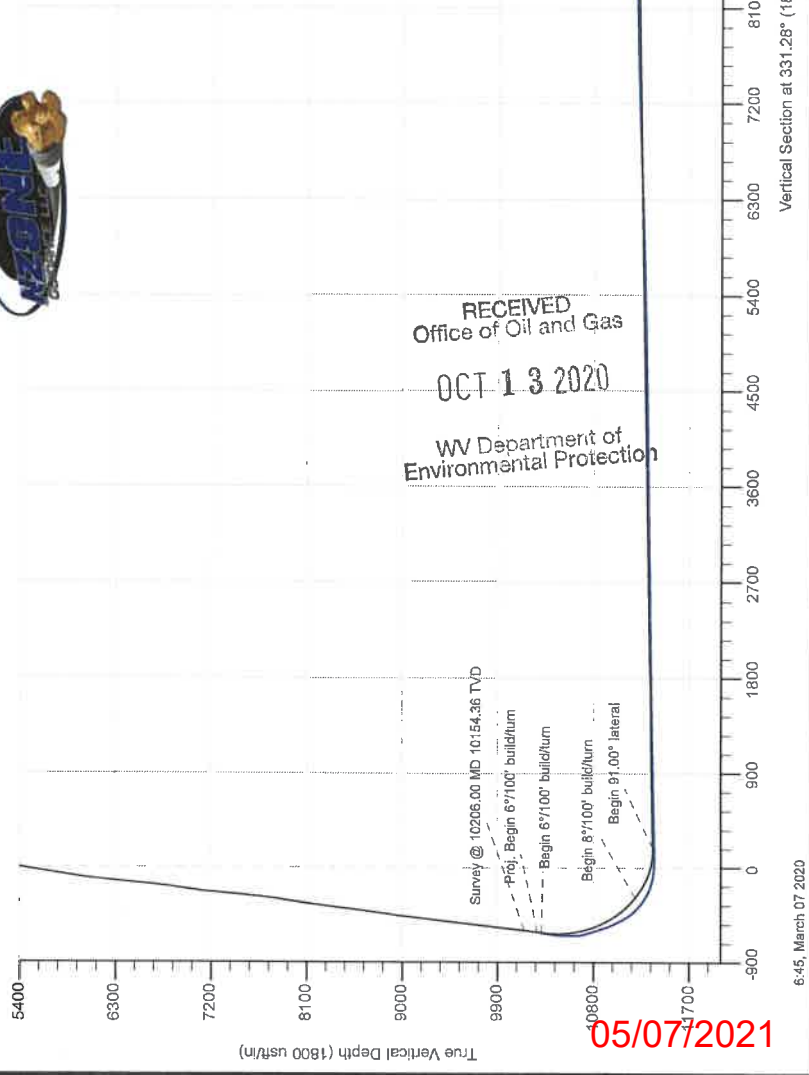
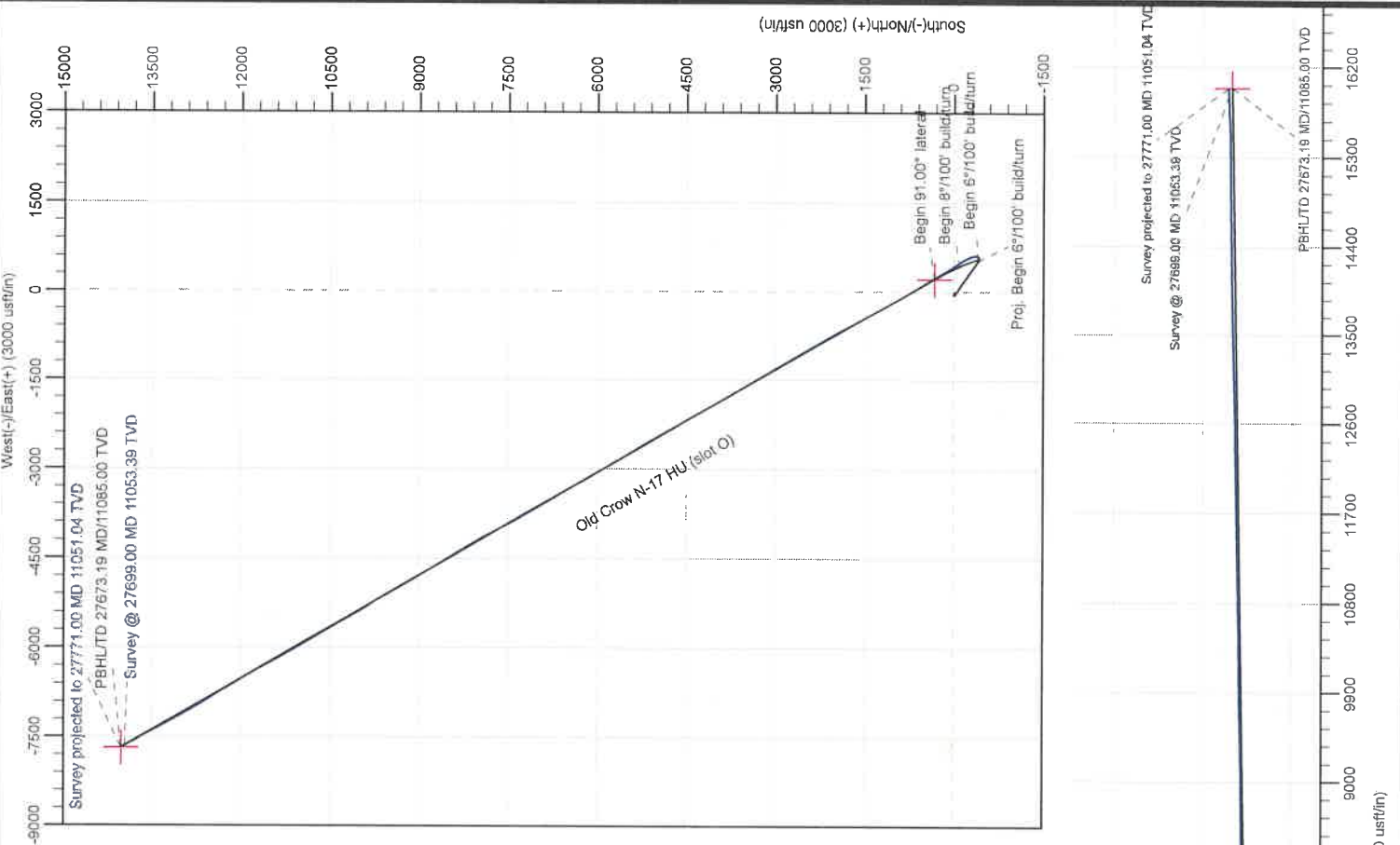
System Datum: Mean Sea Level
 Depth Reference: RKB=1265+26 @ 1291.00usft. (Nabors B.28)

Northing 14446140.48 Easting 1706983.87
 Latitude 39.77842996 Longitude -80.76305739

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.880°



Azimuths to Grid North
 True North: -0.15°
 Magnetic North: -8.88°
 Magnetic Field
 Strength: 51879.9nT
 Dip Angle: 66.74°
 Date: 1/8/2020
 Model: IGRF2015



05/07/2021



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Old Crow N-17 HU (slot O)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1265+26 @ 1291.00usft (Nabors B 28)
Site:	Old Crow Pad	MD Reference:	RKB=1265+26 @ 1291.00usft (Nabors B 28)
Well:	Old Crow N-17 HU (slot O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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

Well	Old Crow N-17 HU (slot O)					
Well Position	+N/-S	0.00 usft	Northing:	14,446,140.48 usft	Latitude:	39.77842996
	+E/-W	0.00 usft	Easting:	1,706,983.86 usft	Longitude:	-80.76306739
Position Uncertainty		0.00 usft	Wellhead Elevation:	usft	Ground Level:	1,265.00 usft

Wellbore	Original Hole				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	1/8/2020	-8.729	66.743	51,879.92476463

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	331.28	

Survey Program	Date 3/7/2020				
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
179.00	923.00	MWD surf (Original Hole)	MWD	MWD - Standard	RECEIVED Office of Oil and Gas OCT 13 2020 WV Department of Environmental Protection
1,004.00	2,762.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,857.00	10,206.00	MWD (Original Hole)	MWD	MWD - Standard	
10,275.00	19,123.00	MWD Halliburton (Original Hole)	MWD	MWD - Standard	
19,187.00	27,699.00	MWD Nzone (Original Hole)	MWD	MWD - Standard	
27,771.00	27,771.00	Projection (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	14,446,140.48	1,706,983.86	39.77842996	-80.76306739	
179.00	0.53	355.18	179.00	0.82	-0.07	14,446,141.31	1,706,983.79	39.77843223	-80.76306763	
MWD surveys										
240.00	0.57	358.18	239.99	1.41	-0.10	14,446,141.89	1,706,983.76	39.77843383	-80.76306774	
287.00	0.22	12.06	286.99	1.73	-0.09	14,446,142.21	1,706,983.77	39.77843472	-80.76306770	
330.00	0.48	337.52	329.99	1.98	-0.14	14,446,142.46	1,706,983.72	39.77843540	-80.76306788	
377.00	0.26	308.43	376.99	2.23	-0.30	14,446,142.71	1,706,983.56	39.77843608	-80.76306844	

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Site:	Old Crow Pad	MD Reference:	RKB=1265+26 @ 1291.00usft (Nabors B 28)
Well:	Old Crow N-17 HU (slot O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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Survey										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	
420.00	0.40	331.10	419.99	2.42	-0.45	14,446,142.90	1,706,983.41	39.77843661	-80.76306897	
467.00	0.18	315.46	466.99	2.61	-0.58	14,446,143.10	1,706,983.28	39.77843715	-80.76306944	
510.00	0.04	261.14	509.99	2.66	-0.64	14,446,143.14	1,706,983.22	39.77843727	-80.76306966	
557.00	0.13	34.38	556.99	2.70	-0.63	14,446,143.18	1,706,983.23	39.77843739	-80.76306961	
600.00	0.09	229.32	599.99	2.72	-0.63	14,446,143.20	1,706,983.24	39.77843744	-80.76306960	
647.00	0.09	282.59	646.99	2.70	-0.69	14,446,143.19	1,706,983.17	39.77843739	-80.76306983	
691.00	0.13	277.14	690.99	2.72	-0.78	14,446,143.20	1,706,983.09	39.77843743	-80.76307013	
738.00	0.22	317.92	737.99	2.79	-0.89	14,446,143.27	1,706,982.98	39.77843764	-80.76307053	
781.00	0.18	291.81	780.99	2.88	-1.01	14,446,143.36	1,706,982.86	39.77843787	-80.76307095	
828.00	0.13	261.14	827.99	2.90	-1.13	14,446,143.38	1,706,982.74	39.77843793	-80.76307138	
876.00	0.05	261.14	875.99	2.89	-1.20	14,446,143.37	1,706,982.66	39.77843790	-80.76307164	
923.00	0.22	347.71	922.99	2.97	-1.24	14,446,143.45	1,706,982.62	39.77843813	-80.76307178	
1,004.00	0.22	206.11	1,003.99	2.98	-1.34	14,446,143.46	1,706,982.52	39.77843816	-80.76307215	
1,063.00	0.66	197.17	1,062.99	2.56	-1.49	14,446,143.04	1,706,982.37	39.77843699	-80.76307268	
1,157.00	1.05	205.94	1,156.98	1.26	-2.03	14,446,141.75	1,706,981.83	39.77843345	-80.76307461	
1,251.00	1.45	230.47	1,250.95	-0.27	-3.32	14,446,140.22	1,706,980.54	39.77842925	-80.76307923	
1,346.00	1.45	247.17	1,345.92	-1.50	-5.36	14,446,138.98	1,706,978.50	39.77842589	-80.76308648	
1,440.00	0.79	252.87	1,439.91	-2.15	-7.07	14,446,138.33	1,706,976.79	39.77842411	-80.76309259	
1,535.00	1.01	270.54	1,534.89	-2.34	-8.54	14,446,138.15	1,706,975.33	39.77842361	-80.76309780	
1,630.00	0.79	254.46	1,629.88	-2.50	-10.01	14,446,137.98	1,706,973.86	39.77842316	-80.76310303	
1,723.00	0.40	184.85	1,722.88	-3.00	-10.65	14,446,137.48	1,706,973.21	39.77842181	-80.76310533	
1,818.00	0.75	148.02	1,817.87	-3.86	-10.35	14,446,136.63	1,706,973.51	39.77841945	-80.76310427	
1,913.00	0.57	168.68	1,912.87	-4.85	-9.93	14,446,135.63	1,706,973.94	39.77841672	-80.76310277	
2,007.00	1.85	265.01	2,006.85	-5.44	-11.35	14,446,135.04	1,706,972.52	39.77841511	-80.76310783	
2,102.00	3.82	269.49	2,101.73	-5.60	-16.04	14,446,134.88	1,706,967.82	39.77841470	-80.76312454	
2,197.00	4.09	269.05	2,196.50	-5.68	-22.59	14,446,134.80	1,706,961.27	39.77841452	-80.76314786	
2,291.00	2.86	259.40	2,290.33	-6.17	-28.25	14,446,134.31	1,706,955.61	39.77841322	-80.76316800	
2,385.00	2.55	238.55	2,384.23	-7.69	-32.34	14,446,132.79	1,706,951.53	39.77840907	-80.76318256	
2,478.00	2.37	204.54	2,477.15	-10.52	-34.90	14,446,129.96	1,706,948.96	39.77840132	-80.76319172	
2,573.00	2.37	212.36	2,572.07	-13.97	-36.77	14,446,126.51	1,706,947.09	39.77839187	-80.76319839	
2,668.00	1.14	231.26	2,667.02	-16.22	-38.56	14,446,124.26	1,706,945.31	39.77838570	-80.76320478	
2,762.00	0.92	249.27	2,761.00	-17.07	-39.99	14,446,123.41	1,706,943.87	39.77838337	-80.76320990	
2,857.00	1.14	291.29	2,855.99	-17.00	-41.59	14,446,123.48	1,706,942.28	39.77838359	-80.76321557	
2,952.00	1.32	348.15	2,950.97	-15.58	-42.69	14,446,124.90	1,706,941.17	39.77838748	-80.76321949	
3,046.00	1.45	23.57	3,044.95	-13.43	-42.44	14,446,127.05	1,706,941.43	39.77839338	-80.76321857	
3,139.00	1.27	56.62	3,137.92	-11.79	-41.11	14,446,128.69	1,706,942.76	39.77839789	-80.76321382	
3,233.00	1.32	36.67	3,231.90	-10.35	-39.59	14,446,130.14	1,706,944.27	39.77840184	-80.76320840	
3,327.00	1.19	18.39	3,325.88	-8.55	-38.64	14,446,131.93	1,706,945.23	39.77840676	-80.76320499	
3,422.00	0.97	336.99	3,420.86	-6.88	-38.64	14,446,133.61	1,706,945.22	39.77841136	-80.76320499	
3,515.00	0.57	331.72	3,513.85	-5.74	-39.17	14,446,134.74	1,706,944.70	39.77841447	-80.76320685	
3,610.00	1.05	297.53	3,608.84	-4.92	-40.16	14,446,135.56	1,706,943.70	39.77841673	-80.76321039	
3,705.00	0.62	275.99	3,703.83	-4.47	-41.45	14,446,136.01	1,706,942.42	39.77841799	-80.76321495	
3,799.00	0.22	154.53	3,797.83	-4.58	-41.87	14,446,135.90	1,706,941.99	39.77841769	-80.76321647	
3,894.00	0.97	244.79	3,892.83	-5.09	-42.52	14,446,135.40	1,706,941.34	39.77841630	-80.76321879	
3,989.00	0.48	199.35	3,987.82	-5.80	-43.38	14,446,134.68	1,706,940.48	39.77841434	-80.76322185	
4,084.00	0.62	155.14	4,082.81	-6.65	-43.30	14,446,133.84	1,706,940.57	39.77841203	-80.76322156	
4,179.00	1.10	175.89	4,177.80	-8.02	-43.02	14,446,132.46	1,706,940.85	39.77840824	-80.76322057	
4,272.00	0.57	198.56	4,270.79	-9.35	-43.10	14,446,131.13	1,706,940.76	39.77840460	-80.76322088	
4,367.00	0.97	54.77	4,365.79	-9.33	-42.59	14,446,131.15	1,706,941.27	39.77840464	-80.76321908	
4,462.00	0.70	32.36	4,460.78	-8.38	-41.63	14,446,132.10	1,706,942.24	39.77840725	-80.76321563	
4,558.00	1.41	34.91	4,556.76	-6.92	-40.64	14,446,133.57	1,706,943.23	39.77841126	-80.76321209	
4,653.00	1.98	3.36	4,651.72	-4.32	-39.87	14,446,136.16	1,706,943.99	39.77841839	-80.76320934	
4,749.00	2.94	348.50	4,747.63	-0.25	-40.26	14,446,140.23	1,706,943.60	39.77842956	-80.76321071	
4,843.00	3.60	351.67	4,841.48	5.03	-41.17	14,446,145.51	1,706,942.69	39.77844408	-80.76321389	
4,938.00	3.47	5.91	4,936.30	10.84	-41.31	14,446,151.32	1,706,942.56	39.77846004	-80.76321432	

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Survey										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	
5,033.00	2.15	31.31	5,031.19	15.22	-40.09	14,446,155.71	1,706,943.78	39.77847206	-80.76320993	
5,128.00	1.80	100.83	5,126.14	16.47	-37.69	14,446,156.95	1,706,946.17	39.77847546	-80.76320140	
5,223.00	3.69	143.63	5,221.04	13.72	-34.42	14,446,154.21	1,706,949.45	39.77846790	-80.76318976	
5,318.00	7.29	154.30	5,315.59	5.83	-29.99	14,446,146.31	1,706,953.88	39.77844619	-80.76317407	
5,413.00	10.24	149.60	5,409.47	-6.89	-23.10	14,446,133.59	1,706,960.76	39.77841121	-80.76314967	
5,507.00	9.98	146.09	5,502.01	-20.86	-14.33	14,446,119.63	1,706,969.54	39.77837279	-80.76311858	
5,602.00	9.58	137.30	5,595.64	-33.50	-4.37	14,446,106.98	1,706,979.49	39.77833800	-80.76308327	
5,697.00	10.24	126.23	5,689.23	-44.30	7.80	14,446,096.18	1,706,991.66	39.77830825	-80.76304004	
5,791.00	11.21	124.65	5,781.59	-54.43	22.06	14,446,086.05	1,707,005.92	39.77828032	-80.76298940	
5,886.00	10.72	121.92	5,874.85	-64.35	37.15	14,446,076.13	1,707,021.02	39.77825296	-80.76293576	
5,981.00	9.45	123.50	5,968.38	-73.33	51.16	14,446,067.15	1,707,035.02	39.77822820	-80.76288600	
6,076.00	7.87	117.00	6,062.30	-80.59	63.46	14,446,059.89	1,707,047.32	39.77820818	-80.76284229	
6,171.00	7.60	117.97	6,156.43	-86.49	74.80	14,446,053.99	1,707,058.66	39.77819190	-80.76280197	
6,265.00	6.37	120.95	6,249.73	-92.09	84.76	14,446,048.40	1,707,068.63	39.77817645	-80.76276657	
6,359.00	6.59	129.57	6,343.14	-98.20	93.39	14,446,042.28	1,707,077.26	39.77815959	-80.76273591	
6,454.00	5.63	125.52	6,437.60	-104.38	101.39	14,446,036.10	1,707,085.25	39.77814256	-80.76270751	
6,549.00	7.16	122.45	6,532.00	-110.27	110.18	14,446,030.21	1,707,094.04	39.77812634	-80.76267628	
6,643.00	6.59	121.66	6,625.33	-116.24	119.71	14,446,024.24	1,707,103.58	39.77810986	-80.76264240	
6,737.00	7.51	121.48	6,718.61	-122.28	129.54	14,446,018.20	1,707,113.41	39.77809320	-80.76260747	
6,832.00	9.10	125.79	6,812.62	-129.92	140.93	14,446,010.56	1,707,124.80	39.77807215	-80.76256700	
6,926.00	9.49	127.83	6,905.38	-139.02	153.08	14,446,001.46	1,707,136.95	39.77804707	-80.76252384	
7,021.00	8.96	126.49	6,999.15	-148.22	165.21	14,445,992.26	1,707,149.08	39.77802171	-80.76248075	
7,115.00	7.65	128.16	7,092.16	-156.44	176.02	14,445,984.04	1,707,159.88	39.77799906	-80.76244237	
7,209.00	5.89	125.88	7,185.51	-163.13	184.85	14,445,977.35	1,707,168.71	39.77798061	-80.76241101	
7,303.00	5.45	120.69	7,279.05	-168.24	192.59	14,445,972.24	1,707,176.46	39.77796653	-80.76238348	
7,398.00	5.98	118.76	7,373.57	-172.92	200.81	14,445,967.56	1,707,184.68	39.77795361	-80.76235428	
7,493.00	6.06	126.58	7,468.05	-178.29	209.18	14,445,962.19	1,707,193.04	39.77793881	-80.76232456	
7,635.00	7.25	128.51	7,609.09	-188.34	222.21	14,445,952.14	1,707,206.07	39.77791112	-80.76227827	
7,682.00	7.34	131.33	7,655.71	-192.17	226.78	14,445,948.32	1,707,210.65	39.77790057	-80.76226202	
7,777.00	8.13	129.39	7,749.85	-200.44	236.53	14,445,940.05	1,707,220.40	39.77787779	-80.76222740	
7,871.00	9.27	123.94	7,842.77	-208.88	247.95	14,445,931.60	1,707,231.82	39.77785451	-80.76218684	
7,965.00	10.33	120.60	7,935.39	-217.40	261.49	14,445,923.08	1,707,245.35	39.77783102	-80.76213874	
8,060.00	9.84	123.59	8,028.93	-226.23	275.58	14,445,914.26	1,707,259.44	39.77780667	-80.76208866	
8,154.00	8.75	125.61	8,121.69	-234.83	288.08	14,445,905.65	1,707,271.95	39.77778295	-80.76204424	
8,249.00	7.38	124.73	8,215.75	-242.52	298.97	14,445,897.96	1,707,282.84	39.77776176	-80.76200556	
8,344.00	7.29	122.10	8,309.97	-249.20	309.09	14,445,891.29	1,707,292.96	39.77774335	-80.76196960	
8,438.00	7.82	122.62	8,403.16	-255.81	319.53	14,445,884.67	1,707,303.40	39.77772510	-80.76193251	
8,533.00	7.25	124.91	8,497.34	-262.73	329.89	14,445,877.75	1,707,313.76	39.77770604	-80.76189570	
8,626.00	8.35	127.90	8,589.47	-270.23	340.03	14,445,870.25	1,707,323.90	39.77768535	-80.76185968	
8,720.00	8.79	129.22	8,682.42	-278.97	350.98	14,445,861.51	1,707,334.85	39.77766128	-80.76182079	
8,815.00	9.32	126.93	8,776.24	-288.18	362.76	14,445,852.30	1,707,346.62	39.77763590	-80.76177897	
8,910.00	8.79	124.56	8,870.06	-296.92	374.88	14,445,843.56	1,707,358.75	39.77761181	-80.76173589	
9,004.00	8.22	121.57	8,963.02	-304.51	386.52	14,445,835.97	1,707,370.39	39.77759087	-80.76169453	
9,099.00	7.56	122.01	9,057.12	-311.38	397.61	14,445,829.10	1,707,381.47	39.77757193	-80.76165514	
9,194.00	7.38	120.52	9,151.32	-317.79	408.16	14,445,822.69	1,707,392.03	39.77755424	-80.76161764	
9,289.00	7.69	121.31	9,245.50	-324.19	418.85	14,445,816.29	1,707,402.71	39.77753659	-80.76157966	
9,383.00	8.57	127.28	9,338.55	-331.70	429.80	14,445,808.78	1,707,413.66	39.77751588	-80.76154077	
9,478.00	8.57	123.59	9,432.49	-339.91	441.33	14,445,800.57	1,707,425.19	39.77749327	-80.76149982	
9,574.00	7.42	126.76	9,527.56	-347.57	452.25	14,445,792.91	1,707,436.11	39.77747213	-80.76146100	
9,668.00	6.90	125.88	9,620.82	-354.52	461.69	14,445,785.97	1,707,445.55	39.77745300	-80.76142748	
9,764.00	6.55	124.29	9,716.16	-360.98	470.88	14,445,779.50	1,707,454.75	39.77743518	-80.76139481	
9,859.00	6.86	123.59	9,810.51	-367.17	480.09	14,445,773.31	1,707,463.95	39.77741810	-80.76136211	
9,954.00	7.78	125.00	9,904.74	-374.00	490.08	14,445,766.48	1,707,473.95	39.77739928	-80.76132661	
10,047.00	8.09	124.47	9,996.85	-381.31	500.63	14,445,759.17	1,707,484.50	39.77737912	-80.76128912	
10,142.00	7.65	120.43	10,090.95	-388.30	511.60	14,445,752.18	1,707,495.46	39.77735985	-80.76125017	

Company: Tug Hill Operating LLC
Project: Marshall County, West Virginia.
Site: Old Crow Pad
Well: Old Crow N-17 HU (slot O)
Wellbore: Original Hole
Design: Surveys Original Hole

Local Co-ordinate Reference: Well Old Crow N-17 HU (slot O)
TVD Reference: RKB=1265+26 @ 1291.00usft (Nabors B 28)
MD Reference: RKB=1265+26 @ 1291.00usft (Nabors B 28)
North Reference: Grid
Survey Calculation Method: Minimum Curvature
Database: DB_Aug1919_v14

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Survey

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
10,206.00	7.95	120.34	10,154.36	-392.69	519.09	14,445,747.79	1,707,502.95	39.77734773	-80.76122354
10,315.00	9.00	129.62	10,262.18	-401.94	532.16	14,445,738.54	1,707,516.03	39.77732225	-80.76117710
10,335.00	8.83	132.99	10,281.93	-403.98	534.49	14,445,736.50	1,707,518.35	39.77731682	-80.76116883
10,382.00	10.02	123.00	10,328.30	-408.67	540.56	14,445,731.81	1,707,524.42	39.77730370	-80.76114728
10,429.00	12.47	108.98	10,374.40	-412.55	548.79	14,445,727.93	1,707,532.65	39.77729299	-80.76111802
10,476.00	12.79	97.66	10,420.27	-414.89	558.74	14,445,725.59	1,707,542.61	39.77728648	-80.76108261
10,523.00	10.67	89.87	10,466.29	-415.58	568.25	14,445,724.91	1,707,552.12	39.77728453	-80.76104877
10,554.00	11.54	82.49	10,496.71	-415.16	574.20	14,445,725.32	1,707,558.06	39.77728562	-80.76102761
10,586.00	13.42	75.92	10,527.96	-413.84	580.97	14,445,726.64	1,707,564.84	39.77728920	-80.76100348
10,617.00	15.35	69.93	10,557.99	-411.56	588.32	14,445,728.92	1,707,572.18	39.77729541	-80.76097732
10,664.00	16.37	56.74	10,603.21	-405.79	599.70	14,445,734.69	1,707,583.57	39.77731118	-80.76093674
10,712.00	17.10	39.38	10,649.21	-396.62	609.84	14,445,743.86	1,707,593.71	39.77733629	-80.76090056
10,759.00	18.34	22.17	10,694.01	-384.42	617.02	14,445,756.06	1,707,600.89	39.77736973	-80.76087489
10,807.00	20.01	8.91	10,739.36	-389.31	621.15	14,445,771.18	1,707,605.01	39.77741121	-80.76086007
10,855.00	20.48	357.28	10,784.42	-352.80	622.02	14,445,787.68	1,707,605.89	39.77745654	-80.76085680
10,902.00	18.42	346.68	10,828.75	-337.35	619.92	14,445,803.13	1,707,603.78	39.77749897	-80.76086414
10,949.00	17.53	342.44	10,873.45	-323.38	616.07	14,445,817.10	1,707,599.94	39.77753738	-80.76087769
10,997.00	19.87	342.48	10,918.92	-308.71	611.44	14,445,831.78	1,707,595.30	39.77757771	-80.76089406
11,044.00	23.15	342.13	10,962.64	-292.29	606.19	14,445,848.19	1,707,590.06	39.77762283	-80.76091256
11,090.00	26.04	347.34	11,004.46	-273.83	601.21	14,445,866.65	1,707,585.07	39.77767357	-80.76093014
11,140.00	26.57	340.86	11,049.30	-252.55	595.13	14,445,887.93	1,707,579.00	39.77773205	-80.76095155
11,187.00	31.45	331.18	11,090.41	-231.85	585.76	14,445,908.63	1,707,569.63	39.77778895	-80.76098470
11,234.00	36.08	326.80	11,129.48	-209.52	572.27	14,445,930.97	1,707,556.13	39.77785040	-80.76103253
11,281.00	41.08	326.59	11,166.21	-185.03	556.18	14,445,955.45	1,707,540.04	39.77791776	-80.76108957
11,329.00	45.80	328.77	11,201.05	-157.13	538.56	14,445,983.35	1,707,522.42	39.77799450	-80.76115200
11,376.00	50.39	328.16	11,232.43	-127.33	520.26	14,446,013.15	1,707,504.13	39.77807648	-80.76121684
11,423.00	54.18	328.36	11,261.18	-95.72	500.71	14,446,044.76	1,707,484.57	39.77816344	-80.76128614
11,468.00	58.47	327.97	11,286.13	-63.91	480.96	14,446,076.57	1,707,464.82	39.77825094	-80.76135614
11,518.00	63.07	326.53	11,310.54	-27.23	457.35	14,446,113.25	1,707,441.22	39.77835184	-80.76143981
11,572.00	68.33	324.72	11,332.75	13.36	429.56	14,446,153.84	1,707,413.43	39.77846353	-80.76153834
11,613.00	73.50	325.68	11,346.15	45.17	407.46	14,446,185.65	1,707,391.32	39.77855105	-80.76161670
11,660.00	77.98	327.64	11,357.73	83.22	382.44	14,446,223.70	1,707,366.30	39.77865572	-80.76170540
11,708.00	82.05	327.89	11,366.05	123.20	357.23	14,446,263.68	1,707,341.09	39.77876569	-80.76179475
11,803.00	90.81	329.37	11,371.96	204.08	307.93	14,446,344.56	1,707,291.79	39.77898817	-80.76196947
11,897.00	89.87	328.73	11,371.40	284.69	259.58	14,446,425.17	1,707,243.45	39.77920991	-80.76214077
11,955.00	90.94	328.65	11,370.99	334.24	229.45	14,446,474.72	1,707,213.31	39.77934621	-80.76224757
11,985.00	91.48	328.62	11,370.36	359.85	213.83	14,446,500.33	1,707,197.70	39.77941665	-80.76230290
12,040.00	91.48	327.04	11,368.94	406.39	184.56	14,446,546.87	1,707,168.43	39.77954468	-80.76240665
12,134.00	90.99	328.69	11,366.91	485.97	134.57	14,446,626.45	1,707,118.44	39.77976358	-80.76258382
12,229.00	91.23	329.58	11,365.07	567.50	85.85	14,446,707.98	1,707,069.71	39.77998784	-80.76275648
12,323.00	91.30	328.96	11,363.00	648.28	37.83	14,446,788.76	1,707,021.69	39.78021003	-80.76292665
12,418.00	91.11	329.70	11,361.00	729.97	-10.62	14,446,870.45	1,706,973.24	39.78043474	-80.76309832
12,513.00	91.11	330.12	11,359.16	812.15	-58.24	14,446,952.63	1,706,925.62	39.78066078	-80.76326705
12,608.00	91.11	330.26	11,357.32	894.57	-105.46	14,447,035.05	1,706,878.40	39.78088745	-80.76343434
12,702.00	90.99	329.87	11,355.60	976.01	-152.36	14,447,116.49	1,706,831.50	39.78111146	-80.76360051
12,797.00	91.23	330.13	11,353.76	1,058.27	-199.85	14,447,198.75	1,706,784.01	39.78133771	-80.76376878
12,891.00	91.30	329.71	11,351.68	1,139.59	-246.95	14,447,280.07	1,706,736.91	39.78156138	-80.76393567
12,985.00	91.30	330.09	11,349.55	1,220.89	-294.08	14,447,361.37	1,706,689.78	39.78178500	-80.76410266
13,079.00	91.24	330.17	11,347.46	1,302.39	-340.89	14,447,442.87	1,706,642.98	39.78200914	-80.76426849
13,173.00	91.23	328.46	11,345.44	1,383.20	-388.84	14,447,523.68	1,706,595.02	39.78223143	-80.76443844
13,267.00	91.48	330.55	11,343.22	1,464.17	-436.53	14,447,604.65	1,706,547.34	39.78245414	-80.76460741
13,361.00	91.05	330.30	11,341.14	1,545.91	-482.91	14,447,686.39	1,706,500.95	39.78267894	-80.76477175
13,456.00	90.80	330.99	11,339.61	1,628.70	-529.48	14,447,769.18	1,706,454.39	39.78290664	-80.76493672
13,550.00	90.86	331.12	11,338.24	1,710.94	-574.96	14,447,851.43	1,706,408.90	39.78313285	-80.76509787
13,643.00	90.80	331.83	11,336.90	1,792.65	-619.37	14,447,933.13	1,706,364.49	39.78335754	-80.76525517

Company: Tug Hill Operating LLC	Local Co-ordinate Reference: Well Old Crow N-17 HU (slot O)
Project: Marshall County, West Virginia.	TVD Reference: RKB=1265+26 @ 1291.00usft (Nabors B 28)
Site: Old Crow Pad	MD Reference: RKB=1265+26 @ 1291.00usft (Nabors B 28)
Well: Old Crow N-17 HU (slot O)	North Reference: Grid
Wellbore: Original Hole	Survey Calculation Method: Minimum Curvature
Design: Surveys Original Hole	Database: DB_Aug1919_v14

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Survey									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	
13,737.00	90.74	332.15	11,335.63	1,875.63	-663.51	14,448,016.11	1,706,320.35	39.78358575	-80.76541152	
13,831.00	90.86	331.03	11,334.32	1,958.30	-708.23	14,448,098.78	1,706,275.63	39.78381310	-80.76556993	
13,925.00	90.87	330.44	11,332.90	2,040.29	-754.18	14,448,180.77	1,706,229.69	39.78403861	-80.76573271	
14,019.00	90.87	329.47	11,331.48	2,121.65	-801.23	14,448,262.13	1,706,182.63	39.78426238	-80.76589946	
14,113.00	90.87	328.58	11,330.05	2,202.23	-849.61	14,448,342.72	1,706,134.26	39.78448404	-80.76607089	
14,208.00	90.80	329.86	11,328.66	2,283.84	-898.22	14,448,424.32	1,706,085.65	39.78470850	-80.76624316	
14,302.00	90.99	329.39	11,327.20	2,364.93	-945.74	14,448,505.51	1,706,038.12	39.78493153	-80.76641158	
14,395.00	90.86	329.34	11,325.69	2,444.94	-993.13	14,448,585.42	1,705,990.74	39.78515160	-80.76657951	
14,490.00	90.86	329.60	11,324.27	2,526.76	-1,041.38	14,448,667.24	1,705,942.49	39.78537664	-80.76675051	
14,584.00	90.80	330.06	11,322.91	2,608.02	-1,088.62	14,448,748.50	1,705,895.25	39.78560014	-80.76691790	
14,679.00	90.93	330.22	11,321.47	2,690.40	-1,135.91	14,448,830.88	1,705,847.96	39.78582671	-80.76708549	
14,774.00	91.11	329.73	11,319.78	2,772.63	-1,183.44	14,448,913.12	1,705,800.43	39.78605290	-80.76725391	
14,869.00	90.99	329.90	11,318.04	2,854.74	-1,231.19	14,448,995.22	1,705,752.67	39.78627872	-80.76742315	
14,963.00	90.99	330.24	11,316.42	2,936.19	-1,278.09	14,449,076.67	1,705,705.78	39.78650274	-80.76758933	
15,058.00	90.86	329.41	11,314.88	3,018.31	-1,325.83	14,449,158.79	1,705,658.03	39.78672860	-80.76775852	
15,153.00	90.99	330.19	11,313.35	3,100.40	-1,373.61	14,449,240.88	1,705,610.25	39.78695439	-80.76792785	
15,248.00	90.62	329.96	11,312.01	3,182.73	-1,421.00	14,449,323.21	1,705,562.86	39.78718082	-80.76809578	
15,342.00	90.93	329.67	11,310.74	3,263.97	-1,468.26	14,449,404.46	1,705,515.61	39.78740428	-80.76826325	
15,437.00	90.80	329.99	11,309.31	3,346.10	-1,516.00	14,449,486.58	1,705,467.87	39.78763015	-80.76843243	
15,532.00	90.86	329.81	11,307.93	3,428.28	-1,563.63	14,449,568.76	1,705,420.23	39.78785617	-80.76860126	
15,627.00	90.86	329.55	11,306.51	3,510.27	-1,611.59	14,449,650.75	1,705,372.28	39.78808170	-80.76877121	
15,722.00	90.86	329.66	11,305.08	3,592.21	-1,659.65	14,449,732.69	1,705,324.22	39.78830705	-80.76894154	
15,816.00	90.80	329.83	11,303.72	3,673.39	-1,707.01	14,449,813.88	1,705,276.86	39.78853035	-80.76910937	
15,911.00	90.80	329.60	11,302.39	3,755.42	-1,754.91	14,449,895.90	1,705,228.95	39.78875596	-80.76927915	
16,006.00	90.74	329.92	11,301.12	3,837.49	-1,802.75	14,449,977.97	1,705,181.11	39.78898167	-80.76944870	
16,101.00	90.80	329.83	11,299.84	3,919.65	-1,850.42	14,450,060.13	1,705,133.44	39.78920765	-80.76961766	
16,196.00	90.92	329.66	11,298.41	4,001.70	-1,898.28	14,450,142.18	1,705,085.58	39.78943332	-80.76978728	
16,290.00	91.05	329.64	11,296.80	4,082.80	-1,945.77	14,450,223.29	1,705,038.09	39.78965639	-80.76995559	
16,385.00	90.86	329.52	11,295.21	4,164.71	-1,993.87	14,450,305.20	1,704,990.00	39.78988168	-80.77012606	
16,480.00	90.74	330.81	11,293.89	4,247.11	-2,041.13	14,450,387.60	1,704,942.74	39.79010830	-80.77029353	
16,575.00	90.80	330.71	11,292.61	4,330.00	-2,087.53	14,450,470.48	1,704,896.34	39.79033626	-80.77045796	
16,669.00	90.93	329.94	11,291.19	4,411.66	-2,134.06	14,450,552.14	1,704,849.81	39.79056085	-80.77062286	
16,765.00	91.05	330.39	11,289.53	4,494.93	-2,181.81	14,450,635.41	1,704,802.05	39.79078986	-80.77079210	
16,860.00	90.93	329.85	11,287.89	4,577.29	-2,229.13	14,450,717.77	1,704,754.73	39.79101637	-80.77095980	
16,954.00	90.86	329.65	11,286.42	4,658.48	-2,276.48	14,450,798.96	1,704,707.38	39.79123967	-80.77112762	
17,049.00	91.42	330.73	11,284.53	4,740.89	-2,323.70	14,450,881.37	1,704,660.17	39.79146633	-80.77129496	
17,144.00	91.55	331.00	11,282.07	4,823.84	-2,369.93	14,450,964.32	1,704,613.93	39.79169446	-80.77145881	
17,239.00	91.54	330.81	11,279.51	4,906.82	-2,416.11	14,451,047.30	1,704,567.75	39.79192268	-80.77162245	
17,333.00	91.48	331.81	11,277.03	4,989.25	-2,461.22	14,451,129.73	1,704,522.64	39.79214937	-80.77178229	
17,427.00	91.67	329.90	11,274.45	5,071.32	-2,506.98	14,451,211.80	1,704,476.88	39.79237506	-80.77194445	
17,522.00	91.85	329.19	11,271.53	5,153.17	-2,555.11	14,451,293.65	1,704,428.75	39.79260019	-80.77211505	
17,616.00	91.79	329.16	11,268.55	5,233.85	-2,603.26	14,451,374.33	1,704,380.61	39.79282209	-80.77228571	
17,711.00	91.73	329.30	11,265.63	5,315.44	-2,651.83	14,451,455.92	1,704,332.03	39.79304649	-80.77245791	
17,806.00	91.85	329.50	11,262.66	5,397.17	-2,700.17	14,451,537.65	1,704,283.70	39.79327129	-80.77262925	
17,900.00	91.79	329.70	11,259.68	5,478.20	-2,747.71	14,451,618.69	1,704,236.15	39.79349416	-80.77279777	
17,994.00	91.79	329.84	11,256.74	5,559.38	-2,795.02	14,451,699.86	1,704,188.85	39.79371743	-80.77296544	
18,088.00	91.61	329.75	11,253.95	5,640.58	-2,842.29	14,451,781.07	1,704,141.58	39.79394076	-80.77313299	
18,182.00	91.85	329.97	11,251.11	5,721.84	-2,889.46	14,451,862.32	1,704,094.40	39.79416423	-80.77330021	
18,277.00	92.04	329.74	11,247.89	5,803.94	-2,937.14	14,451,944.42	1,704,046.72	39.79439004	-80.77346922	
18,371.00	91.85	329.74	11,244.70	5,885.09	-2,984.48	14,452,025.57	1,703,999.38	39.79461322	-80.77363703	
18,465.00	91.54	329.31	11,241.92	5,966.07	-3,032.14	14,452,106.55	1,703,951.73	39.79483594	-80.77380595	
18,560.00	91.54	329.42	11,239.36	6,047.78	-3,080.53	14,452,188.26	1,703,903.34	39.79506068	-80.77397749	
18,654.00	91.60	330.08	11,236.79	6,128.95	-3,127.87	14,452,269.43	1,703,856.00	39.79528392	-80.77414529	
18,747.00	91.72	330.15	11,234.09	6,209.55	-3,174.18	14,452,350.03	1,703,809.68	39.79550559	-80.77430947	
18,841.00	91.61	330.55	11,231.36	6,291.20	-3,220.67	14,452,431.69	1,703,763.20	39.79573016	-80.77447422	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Old Crow N-17 HU (slot O)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1265+26 @ 1291.00usft (Nabors B 28)
Site:	Old Crow Pad	MD Reference:	RKB=1265+26 @ 1291.00usft (Nabors B 28)
Well:	Old Crow N-17 HU (slot O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	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
18,935.00	91.61	330.49	11,228.72	6,373.00	-3,266.91	14,452,513.48	1,703,716.96	39.79595512	-80.77463811
19,030.00	91.66	330.40	11,226.01	6,455.61	-3,313.75	14,452,596.09	1,703,670.12	39.79618230	-80.77480413
19,123.00	91.60	329.83	11,223.37	6,536.21	-3,360.07	14,452,676.69	1,703,623.80	39.79640397	-80.77496831
19,187.00	91.65	329.32	11,221.55	6,591.37	-3,392.46	14,452,731.85	1,703,591.40	39.79655569	-80.77508316
19,282.00	92.00	329.32	11,218.53	6,673.03	-3,440.91	14,452,813.51	1,703,542.95	39.79678029	-80.77525492
19,376.00	91.03	328.80	11,216.04	6,753.63	-3,489.22	14,452,894.11	1,703,494.64	39.79700196	-80.77542620
19,471.00	91.30	327.74	11,214.11	6,834.41	-3,539.17	14,452,974.89	1,703,444.69	39.79722415	-80.77560331
19,566.00	91.25	329.15	11,212.00	6,915.34	-3,588.88	14,453,055.82	1,703,394.99	39.79744675	-80.77577954
19,661.00	91.56	329.32	11,209.67	6,996.95	-3,637.46	14,453,137.43	1,703,346.41	39.79767120	-80.77595177
19,756.00	91.12	329.76	11,207.44	7,078.81	-3,685.60	14,453,219.30	1,703,298.26	39.79789635	-80.77612245
19,850.00	91.34	330.03	11,205.43	7,160.11	-3,732.74	14,453,300.60	1,703,251.12	39.79811995	-80.77628955
19,945.00	91.96	330.73	11,202.69	7,242.67	-3,779.67	14,453,383.15	1,703,204.19	39.79834698	-80.77645592
20,040.00	90.77	330.20	11,200.43	7,325.30	-3,826.49	14,453,465.78	1,703,157.37	39.79857423	-80.77662186
20,135.00	90.81	330.82	11,199.12	7,407.98	-3,873.25	14,453,548.46	1,703,110.61	39.79880162	-80.77678761
20,229.00	90.68	332.31	11,197.90	7,490.63	-3,918.00	14,453,631.11	1,703,065.86	39.79902890	-80.77694622
20,324.00	90.15	331.52	11,197.21	7,574.44	-3,962.73	14,453,714.92	1,703,021.14	39.79925938	-80.77710470
20,419.00	90.37	331.78	11,196.78	7,658.04	-4,007.84	14,453,798.53	1,702,976.03	39.79948929	-80.77726457
20,514.00	90.64	331.96	11,195.94	7,741.82	-4,052.63	14,453,882.30	1,702,931.24	39.79971966	-80.77742329
20,609.00	90.95	332.49	11,194.62	7,825.87	-4,096.89	14,453,966.35	1,702,886.97	39.79995078	-80.77758015
20,704.00	90.59	330.82	11,193.34	7,909.47	-4,141.99	14,454,049.95	1,702,841.87	39.80018067	-80.77773998
20,798.00	90.95	330.99	11,192.08	7,991.60	-4,187.69	14,454,132.08	1,702,796.17	39.80040654	-80.77790198
20,893.00	90.99	329.85	11,190.47	8,074.20	-4,234.58	14,454,214.68	1,702,749.28	39.80063371	-80.77806819
20,988.00	91.21	329.76	11,188.65	8,156.30	-4,282.35	14,454,296.78	1,702,701.51	39.80085949	-80.77823755
21,083.00	91.30	329.67	11,186.57	8,238.31	-4,330.25	14,454,378.79	1,702,653.61	39.80108505	-80.77840736
21,178.00	91.30	329.50	11,184.41	8,320.22	-4,378.33	14,454,460.70	1,702,605.53	39.80131031	-80.77857783
21,272.00	91.47	329.59	11,182.14	8,401.22	-4,425.96	14,454,541.71	1,702,557.90	39.80153310	-80.77874671
21,366.00	91.52	329.67	11,179.69	8,482.30	-4,473.47	14,454,622.78	1,702,510.39	39.80175608	-80.77891515
21,461.00	90.59	327.65	11,177.94	8,563.42	-4,522.87	14,454,703.90	1,702,460.99	39.80197919	-80.77909032
21,556.00	91.03	327.74	11,176.60	8,643.70	-4,573.64	14,454,784.19	1,702,410.23	39.80220002	-80.77927037
21,650.00	90.59	328.53	11,175.27	8,723.53	-4,623.26	14,454,864.01	1,702,360.61	39.80241958	-80.77944634
21,744.00	90.64	328.44	11,174.26	8,803.66	-4,672.39	14,454,944.14	1,702,311.47	39.80263997	-80.77962057
21,838.00	90.15	329.50	11,173.61	8,884.21	-4,720.84	14,455,024.69	1,702,263.02	39.80286150	-80.77979239
21,932.00	90.81	329.85	11,172.82	8,965.34	-4,768.30	14,455,105.82	1,702,215.56	39.80308464	-80.77996066
22,026.00	91.03	329.85	11,171.31	9,046.61	-4,815.51	14,455,187.09	1,702,168.36	39.80330815	-80.78012803
22,121.00	90.99	329.76	11,169.64	9,128.71	-4,863.28	14,455,269.19	1,702,120.58	39.80353393	-80.78029741
22,215.00	91.08	330.20	11,167.94	9,210.09	-4,910.30	14,455,350.57	1,702,073.56	39.80375773	-80.78046411
22,310.00	91.16	330.11	11,166.08	9,292.47	-4,957.57	14,455,432.95	1,702,026.29	39.80398430	-80.78063170
22,404.00	91.16	329.94	11,164.18	9,373.88	-5,004.53	14,455,514.36	1,701,979.34	39.80420819	-80.78079818
22,499.00	91.47	330.11	11,162.00	9,456.15	-5,051.98	14,455,596.63	1,701,931.89	39.80443445	-80.78096641
22,591.00	91.52	330.03	11,159.60	9,535.86	-5,097.86	14,455,676.34	1,701,886.00	39.80465364	-80.78112911
22,685.00	91.65	329.85	11,157.00	9,617.18	-5,144.93	14,455,757.66	1,701,838.93	39.80487730	-80.78129599
22,780.00	91.12	329.59	11,154.70	9,699.20	-5,192.82	14,455,839.68	1,701,791.05	39.80510286	-80.78146578
22,874.00	91.12	329.59	11,152.87	9,780.25	-5,240.39	14,455,920.73	1,701,743.47	39.80532577	-80.78163447
22,968.00	91.34	329.85	11,150.85	9,861.41	-5,287.78	14,456,001.89	1,701,696.09	39.80554897	-80.78180249
23,061.00	91.43	329.94	11,148.60	9,941.84	-5,334.41	14,456,082.32	1,701,649.45	39.80577016	-80.78196784
23,155.00	91.21	330.11	11,146.44	10,023.24	-5,381.36	14,456,163.73	1,701,602.50	39.80599404	-80.78213432
23,250.00	91.25	330.11	11,144.40	10,105.59	-5,428.69	14,456,246.07	1,701,555.17	39.80622049	-80.78230213
23,344.00	91.34	330.29	11,142.27	10,187.14	-5,475.40	14,456,327.62	1,701,508.47	39.80644476	-80.78246773
23,439.00	91.16	329.59	11,140.20	10,269.34	-5,522.97	14,456,409.82	1,701,460.89	39.80667083	-80.78263641
23,534.00	90.55	329.06	11,138.78	10,351.04	-5,571.43	14,456,491.52	1,701,412.43	39.80689552	-80.78280826
23,629.00	91.25	329.67	11,137.29	10,432.77	-5,619.83	14,456,573.25	1,701,364.03	39.80712029	-80.78297991
23,723.00	91.43	329.67	11,135.09	10,513.88	-5,667.29	14,456,654.36	1,701,316.57	39.80734336	-80.78314818
23,818.00	91.60	329.15	11,132.58	10,595.63	-5,715.62	14,456,736.11	1,701,268.25	39.80756819	-80.78331956
23,912.00	91.38	328.18	11,130.14	10,675.89	-5,764.48	14,456,816.37	1,701,219.38	39.80778893	-80.78349287
24,008.00	90.90	328.80	11,128.23	10,757.72	-5,814.65	14,456,898.20	1,701,169.22	39.80801399	-80.78367079

WV Department of
Environmental Protection



Survey Report - Geographic



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Old Crow N-17 HU (slot O)
Project:	Marshall County, West Virginia.	TVD Reference:	RKB=1265+26 @ 1291.00usft (Nabors B 28)
Site:	Old Crow Pad	MD Reference:	RKB=1265+26 @ 1291.00usft (Nabors B 28)
Well:	Old Crow N-17 HU (slot O)	North Reference:	Grid
Wellbore:	Original Hole	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Original Hole	Database:	DB_Aug1919_v14

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Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
24,103.00	91.03	328.97	11,126.63	10,839.04	-5,863.73	14,456,979.52	1,701,120.13	39.80823764	-80.78384487
24,199.00	90.64	329.50	11,125.23	10,921.52	-5,912.83	14,457,062.00	1,701,071.03	39.80846448	-80.78401900
24,294.00	90.07	330.20	11,124.64	11,003.67	-5,960.55	14,457,144.15	1,701,023.32	39.80869039	-80.78418820
24,389.00	90.64	330.99	11,124.05	11,086.42	-6,007.19	14,457,226.91	1,700,976.68	39.80891798	-80.78435357
24,483.00	90.99	331.08	11,122.71	11,168.66	-6,052.71	14,457,309.14	1,700,931.16	39.80914411	-80.78451494
24,579.00	91.25	330.47	11,120.84	11,252.42	-6,099.57	14,457,392.90	1,700,884.30	39.80937446	-80.78468109
24,673.00	91.52	330.73	11,118.56	11,334.29	-6,145.70	14,457,474.77	1,700,838.17	39.80959960	-80.78484466
24,768.00	91.82	331.08	11,115.80	11,417.27	-6,191.87	14,457,557.75	1,700,791.99	39.80982778	-80.78500838
24,863.00	92.13	330.91	11,112.52	11,500.30	-6,237.91	14,457,640.79	1,700,745.95	39.81005612	-80.78517160
24,957.00	91.52	330.38	11,109.53	11,582.19	-6,283.97	14,457,722.67	1,700,699.90	39.81028131	-80.78533490
25,052.00	91.78	330.55	11,106.79	11,664.81	-6,330.78	14,457,805.29	1,700,653.09	39.81050852	-80.78550089
25,147.00	91.74	330.64	11,103.88	11,747.53	-6,377.40	14,457,888.02	1,700,606.46	39.81073600	-80.78566620
25,242.00	90.95	330.47	11,101.65	11,830.24	-6,424.09	14,457,970.72	1,700,559.78	39.81096344	-80.78583174
25,337.00	91.38	330.47	11,099.71	11,912.88	-6,470.90	14,458,053.36	1,700,512.96	39.81119071	-80.78599774
25,432.00	91.30	330.11	11,097.49	11,995.37	-6,517.97	14,458,135.85	1,700,465.89	39.81141755	-80.78616465
25,526.00	91.52	330.03	11,095.18	12,076.81	-6,564.86	14,458,217.29	1,700,419.01	39.81164151	-80.78633092
25,621.00	91.16	329.59	11,092.96	12,158.90	-6,612.62	14,458,299.38	1,700,371.25	39.81186727	-80.78650030
25,715.00	91.03	329.41	11,091.16	12,239.88	-6,660.32	14,458,380.36	1,700,323.55	39.81208997	-80.78666947
25,810.00	91.08	329.50	11,089.41	12,321.68	-6,708.59	14,458,462.16	1,700,275.28	39.81231494	-80.78684067
25,904.00	91.47	328.97	11,087.32	12,402.43	-6,756.66	14,458,542.92	1,700,227.21	39.81253702	-80.78701117
25,999.00	91.16	327.74	11,085.14	12,483.29	-6,806.49	14,458,623.77	1,700,177.38	39.81275938	-80.78718792
26,093.00	90.99	327.21	11,083.38	12,562.53	-6,857.02	14,458,703.01	1,700,126.85	39.81297733	-80.78736720
26,187.00	90.59	328.00	11,082.08	12,641.89	-6,907.37	14,458,782.37	1,700,076.49	39.81319561	-80.78754585
26,281.00	89.41	329.67	11,082.08	12,722.32	-6,956.02	14,458,862.80	1,700,027.85	39.81341681	-80.78771839
26,375.00	90.51	330.20	11,082.15	12,803.67	-7,003.11	14,458,944.15	1,699,980.76	39.81364053	-80.78788540
26,470.00	90.42	329.94	11,081.38	12,886.00	-7,050.51	14,459,026.48	1,699,933.36	39.81386693	-80.78805349
26,564.00	90.64	330.91	11,080.51	12,967.75	-7,096.90	14,459,108.23	1,699,886.97	39.81409174	-80.78822180
26,659.00	90.77	330.64	11,079.34	13,050.65	-7,143.28	14,459,191.13	1,699,840.59	39.81431971	-80.78838247
26,753.00	90.86	330.99	11,078.00	13,132.71	-7,189.11	14,459,273.19	1,699,794.75	39.81454536	-80.78854500
26,847.00	91.12	330.91	11,076.38	13,214.87	-7,234.75	14,459,355.35	1,699,749.12	39.81477129	-80.78870683
26,942.00	91.43	330.99	11,074.26	13,297.90	-7,280.87	14,459,438.38	1,699,703.00	39.81499961	-80.78887036
27,037.00	90.81	331.17	11,072.40	13,381.03	-7,326.80	14,459,521.52	1,699,657.07	39.81522822	-80.78903323
27,132.00	90.90	331.08	11,070.99	13,464.21	-7,372.67	14,459,604.70	1,699,611.20	39.81545695	-80.78919589
27,226.00	91.03	330.73	11,069.40	13,546.34	-7,418.37	14,459,686.82	1,699,565.49	39.81568279	-80.78935795
27,321.00	91.60	330.55	11,067.22	13,629.12	-7,464.94	14,459,769.60	1,699,518.93	39.81591041	-80.78952309
27,415.00	92.66	330.55	11,063.73	13,710.91	-7,511.12	14,459,851.39	1,699,472.75	39.81613534	-80.78968687
27,509.00	92.35	330.82	11,059.62	13,792.80	-7,557.10	14,459,933.28	1,699,426.77	39.81636052	-80.78984993
27,604.00	91.65	330.64	11,056.31	13,875.62	-7,603.52	14,460,016.10	1,699,380.35	39.81658826	-80.79001455
27,699.00	91.87	330.99	11,053.39	13,958.52	-7,649.82	14,460,099.00	1,699,334.04	39.81681622	-80.79017875
Survey @ 27699.00 MD 11053.39 TVD									
27,771.00	91.87	330.99	11,051.04	14,021.45	-7,684.72	14,460,161.93	1,699,299.15	39.81698928	-80.79030251
Survey projected to 27771.00 MD 11051.04 TVD									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
179.00	179.00	0.82	-0.07	MWD surveys
27,699.00	11,053.39	13,958.52	-7,649.82	Survey @ 27699.00 MD 11053.39 TVD
27,771.00	11,051.04	14,021.45	-7,684.72	Survey projected to 27771.00 MD 11051.04 TVD

05/07/2021



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