



Well: Old Crow N-01 HM (slot K)  
 Site: Old Crow Pad  
 Project: Marshall County, West Virginia.  
 Design: rev4

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Annotation
1	5698.00	32.60	329.28	5419.24	1086.35	-637.87	0.00	0.00	1259.78	Survey @ 5698.00 MD 5419.24 TVD
2	5898.00	32.60	329.28	5587.73	1178.99	-692.92	0.00	0.00	1367.53	KOP Begin 2"/100' build/turn
3	5952.64	33.48	328.09	5633.53	1204.43	-708.40	2.00	-37.00	1397.31	Begin 33.48° tangent
4	6766.51	33.48	328.09	6312.38	1585.53	-945.73	0.00	0.00	1846.10	Begin 8"/100' build/turn
5	6973.11	50.00	328.80	6466.01	1702.40	-1017.34	8.00	1.92	1983.14	Begin 10"/100' build/turn
6	7383.22	91.00	329.74	6600.00	2027.86	-1210.34	10.00	1.43	2361.51	Begin 91.00° lateral
7	20826.51	91.00	329.74	6365.00	13637.46	-7984.10	0.00	0.00	15802.73	PBHL/TD 20826.51 MD 6365.00 TVD

DESIGN TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
BHL Old Crow N-01 HM r4 - plan hits target center	6365.00	13637.46	-7984.10	14459809.29	1698963.43	39.81602300	-80.79150100	Point
LP Old Crow N-01 HM 50 E r4 - plan misses target center by 0.02usft at 7383.22usft MD (6600.00 TVD, 2027.86 N, -1210.34 E)	6600.00	2027.87	-1210.33	14448199.70	1705737.21	39.78409411	-80.76748556	Point

ANNOTATIONS SURVEYS

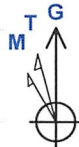
MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Annotation
188.00	0.09	235.90	188.00	-0.08	-0.12	-0.01	MWD surveys
20738.00	89.41	328.98	6455.78	13582.70	-7932.16	15729.22	Survey @ 20738.00 MD 6455.78 TVD
20797.00	89.41	328.98	6456.39	13633.26	-7962.56	15788.22	Survey Proj. to 20797.00 MD 6456.39 TVD

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+32.5 @ 1297.50usft

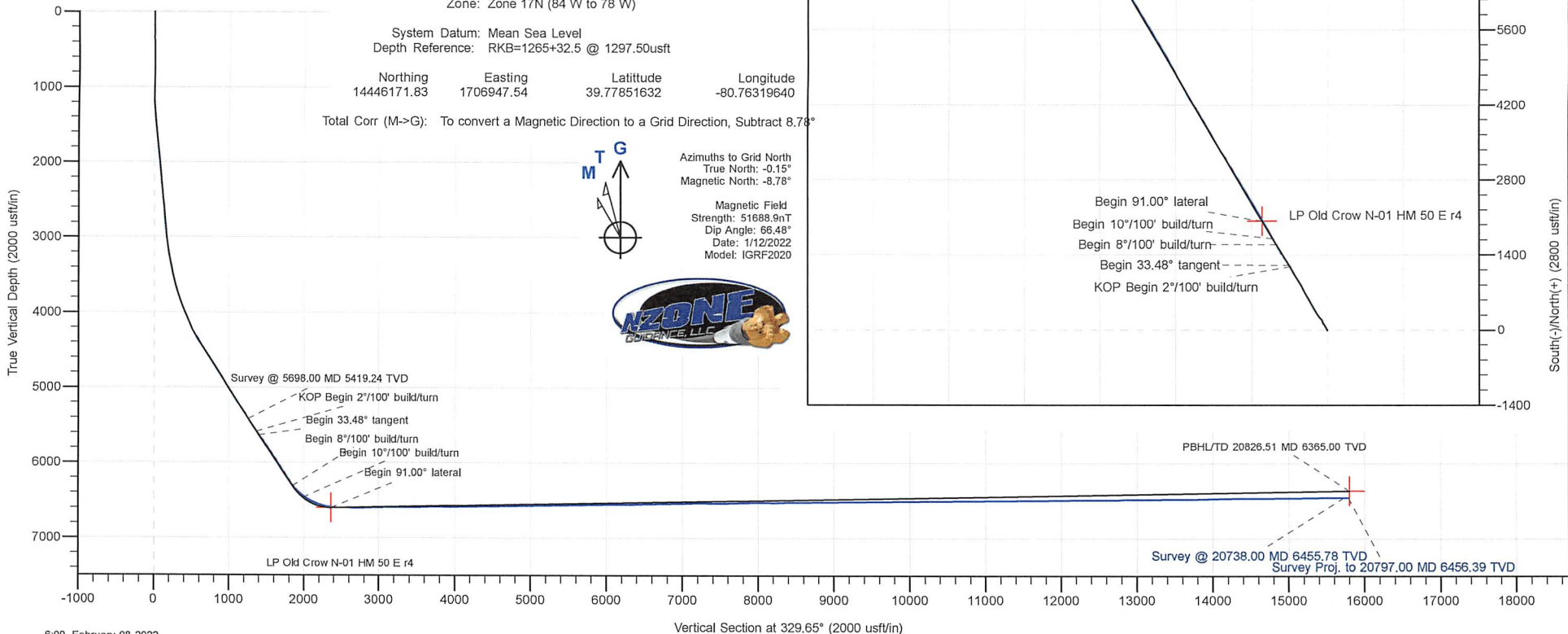
Northing	Easting	Latitude	Longitude
14446171.83	1706947.54	39.77651632	-80.76319640

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.78°



Azimuths to Grid North  
 True North: -0.15°  
 Magnetic North: -8.78°

Magnetic Field  
 Strength: 51688.9nT  
 Dip Angle: 66.48°  
 Date: 1/12/2022  
 Model: IGRF2020





Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-01 HM (slot K)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+32.5 @ 1297.50usft
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+32.5 @ 1297.50usft
<b>Well:</b>	Old Crow N-01 HM (slot K)	<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_Dec2220_v16

<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>	0.15 °

<b>Well</b>	Old Crow N-01 HM (slot K)					
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b>	14,446,171.83 usft	<b>Latitude:</b>	39.77851632
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b>	1,706,947.54 usft	<b>Longitude:</b>	-80.76319640
<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>
	IGRF2020	1/12/2022	-8.62	66.48	51,688.92890230

<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	329.65

<b>Survey Program</b>	<b>Date</b>	2/8/2022			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
188.00	1,011.00	MWD surf (Original Hole)	MWD	MWD - Standard	
1,072.00	2,810.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,875.00	20,738.00	MWD (Original Hole)	MWD	MWD - Standard	
20,797.00	20,797.00	Projection (Original Hole)	MWD	MWD - Standard	

<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Map Northing (usft)</b>	<b>Map Easting (usft)</b>	<b>Latitude</b>	<b>Longitude</b>	
0.00	0.00	0.00	0.00	0.00	0.00	14,446,171.83	1,706,947.54	39.77851632	-80.76319640	
188.00	0.09	235.90	188.00	-0.08	-0.12	14,446,171.75	1,706,947.41	39.77851610	-80.76319684	
<b>MWD surveys</b>										
235.00	0.18	353.15	235.00	-0.03	-0.16	14,446,171.80	1,706,947.37	39.77851624	-80.76319698	
278.00	0.13	150.29	278.00	-0.01	-0.15	14,446,171.83	1,706,947.39	39.77851631	-80.76319692	
325.00	0.13	93.08	325.00	-0.05	-0.07	14,446,171.78	1,706,947.47	39.77851617	-80.76319664	
368.00	0.18	93.34	368.00	-0.06	0.05	14,446,171.77	1,706,947.59	39.77851615	-80.76319622	
415.00	0.22	172.99	415.00	-0.16	0.14	14,446,171.68	1,706,947.67	39.77851589	-80.76319592	
458.00	0.24	249.49	458.00	-0.27	0.06	14,446,171.56	1,706,947.60	39.77851558	-80.76319619	



Survey Report - Geographic



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<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+32.5 @ 1297.50usft
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+32.5 @ 1297.50usft
<b>Well:</b>	Old Crow N-01 HM (slot K)	<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_Dec2220_v16

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
505.00	0.18	229.58	505.00	-0.35	-0.09	14,446,171.48	1,706,947.45	39.77851536	-80.76319672	
548.00	0.27	242.16	548.00	-0.44	-0.23	14,446,171.39	1,706,947.31	39.77851511	-80.76319722	
595.00	0.27	282.05	595.00	-0.47	-0.43	14,446,171.36	1,706,947.10	39.77851503	-80.76319795	
638.00	0.17	184.08	638.00	-0.51	-0.54	14,446,171.32	1,706,947.00	39.77851492	-80.76319832	
685.00	0.20	286.42	685.00	-0.56	-0.62	14,446,171.27	1,706,946.91	39.77851479	-80.76319862	
729.00	0.13	230.42	729.00	-0.57	-0.73	14,446,171.26	1,706,946.80	39.77851476	-80.76319902	
776.00	0.17	271.44	776.00	-0.60	-0.85	14,446,171.23	1,706,946.69	39.77851468	-80.76319941	
823.00	0.17	315.95	823.00	-0.55	-0.96	14,446,171.28	1,706,946.57	39.77851482	-80.76319983	
870.00	0.14	0.17	870.00	-0.44	-1.01	14,446,171.39	1,706,946.52	39.77851511	-80.76320001	
917.00	0.15	300.40	917.00	-0.35	-1.06	14,446,171.48	1,706,946.47	39.77851536	-80.76320019	
1,011.00	0.18	162.20	1,011.00	-0.43	-1.13	14,446,171.40	1,706,946.41	39.77851514	-80.76320041	
1,072.00	0.20	300.80	1,072.00	-0.47	-1.19	14,446,171.36	1,706,946.35	39.77851504	-80.76320063	
1,119.00	0.75	325.74	1,118.99	-0.17	-1.43	14,446,171.66	1,706,946.10	39.77851586	-80.76320150	
1,166.00	1.40	333.60	1,165.99	0.60	-1.86	14,446,172.43	1,706,945.68	39.77851797	-80.76320301	
1,213.00	2.50	334.89	1,212.96	2.04	-2.55	14,446,173.87	1,706,944.99	39.77852194	-80.76320546	
1,260.00	3.73	335.73	1,259.89	4.36	-3.61	14,446,176.19	1,706,943.92	39.77852832	-80.76320922	
1,307.00	4.94	336.38	1,306.75	7.61	-5.05	14,446,179.44	1,706,942.48	39.77853725	-80.76321431	
1,354.00	5.54	333.28	1,353.56	11.49	-6.88	14,446,183.32	1,706,940.65	39.77854792	-80.76322079	
1,401.00	5.66	328.67	1,400.33	15.50	-9.11	14,446,187.33	1,706,938.43	39.77855894	-80.76322868	
1,448.00	5.89	327.78	1,447.09	19.51	-11.60	14,446,191.35	1,706,935.94	39.77857000	-80.76323750	
1,542.00	5.66	327.02	1,540.62	27.48	-16.69	14,446,199.32	1,706,930.84	39.77859192	-80.76325556	
1,635.00	5.40	328.48	1,633.18	35.06	-21.48	14,446,206.89	1,706,926.06	39.77861277	-80.76327252	
1,729.00	5.35	333.40	1,726.77	42.75	-25.75	14,446,214.58	1,706,921.78	39.77863391	-80.76328766	
1,824.00	5.47	333.30	1,821.35	50.76	-29.77	14,446,222.59	1,706,917.76	39.77865593	-80.76330189	
1,918.00	5.96	328.03	1,914.88	58.90	-34.37	14,446,230.73	1,706,913.17	39.77867832	-80.76331817	
2,012.00	5.66	326.12	2,008.40	66.89	-39.54	14,446,238.72	1,706,908.00	39.77870030	-80.76333649	
2,106.00	4.90	328.51	2,102.00	74.16	-44.22	14,446,245.99	1,706,903.32	39.77872030	-80.76335308	
2,200.00	5.07	327.06	2,195.64	81.07	-48.57	14,446,252.90	1,706,898.96	39.77873931	-80.76336852	
2,295.00	6.04	324.90	2,290.20	88.68	-53.73	14,446,260.51	1,706,893.81	39.77876025	-80.76338680	
2,389.00	5.20	324.77	2,383.74	96.21	-59.03	14,446,268.04	1,706,888.50	39.77878096	-80.76340560	
2,482.00	4.38	336.14	2,476.42	102.90	-62.90	14,446,274.73	1,706,884.64	39.77879936	-80.76341930	
2,577.00	4.73	339.99	2,571.12	109.89	-65.71	14,446,281.73	1,706,881.83	39.77881860	-80.76342923	
2,670.00	5.57	327.21	2,663.75	117.29	-69.46	14,446,289.12	1,706,878.07	39.77883894	-80.76344253	
2,765.00	5.42	318.42	2,758.31	124.52	-74.94	14,446,296.36	1,706,872.60	39.77885884	-80.76346195	
2,810.00	5.63	316.83	2,803.10	127.72	-77.86	14,446,299.55	1,706,869.68	39.77886765	-80.76347232	
2,875.00	5.01	322.84	2,867.82	132.31	-81.75	14,446,304.14	1,706,865.78	39.77888028	-80.76348614	
2,969.00	5.76	343.61	2,961.42	140.11	-85.56	14,446,311.94	1,706,861.97	39.77890172	-80.76349963	
3,063.00	6.02	348.70	3,054.92	149.47	-87.86	14,446,321.30	1,706,859.67	39.77892744	-80.76350772	
3,157.00	8.88	341.70	3,148.12	161.19	-91.11	14,446,333.02	1,706,856.43	39.77895966	-80.76351916	
3,251.00	11.57	332.76	3,240.62	176.46	-97.70	14,446,348.30	1,706,849.84	39.77900165	-80.76354248	
3,345.00	11.63	324.66	3,332.71	192.58	-107.50	14,446,364.41	1,706,840.04	39.77904597	-80.76357720	
3,439.00	10.90	318.54	3,424.90	206.97	-118.86	14,446,378.80	1,706,828.67	39.77908557	-80.76361752	
3,533.00	12.14	318.28	3,517.01	221.00	-131.32	14,446,392.84	1,706,816.21	39.77912421	-80.76366174	
3,627.00	14.30	320.55	3,608.51	237.35	-145.28	14,446,409.18	1,706,802.26	39.77916920	-80.76371126	
3,721.00	16.71	322.79	3,699.08	257.08	-160.83	14,446,428.91	1,706,786.70	39.77922350	-80.76376643	
3,815.00	18.98	325.98	3,788.56	280.51	-177.56	14,446,452.35	1,706,769.98	39.77928798	-80.76382575	
3,909.00	20.30	328.88	3,877.09	307.15	-194.54	14,446,478.98	1,706,753.00	39.77936124	-80.76388594	
4,004.00	21.43	328.41	3,965.86	336.04	-212.15	14,446,507.87	1,706,735.39	39.77944071	-80.76394834	
4,098.00	22.75	326.32	4,052.96	365.79	-231.22	14,446,537.62	1,706,716.31	39.77952256	-80.76401596	
4,192.00	23.08	330.45	4,139.54	396.95	-250.39	14,446,568.78	1,706,697.14	39.77960826	-80.76408389	
4,285.00	25.65	331.56	4,224.25	430.51	-268.97	14,446,602.34	1,706,678.56	39.77970057	-80.76414970	
4,379.00	28.90	333.53	4,307.79	468.74	-288.79	14,446,640.57	1,706,658.75	39.77980571	-80.76421989	
4,473.00	32.51	333.03	4,388.60	511.60	-310.38	14,446,683.43	1,706,637.16	39.77992357	-80.76429633	
4,567.00	33.19	331.46	4,467.57	556.72	-334.13	14,446,728.55	1,706,613.41	39.78004765	-80.76438043	
4,661.00	33.20	329.05	4,546.24	601.39	-359.66	14,446,773.23	1,706,587.88	39.78017052	-80.76447088	



Survey Report - Geographic



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<b>Wellbore:</b>	Original Hole	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Dec2220_v16

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
4,755.00	33.00	326.68	4,624.98	644.86	-386.95	14,446,816.69	1,706,560.58	39.78029008	-80.76456764
4,849.00	31.19	329.56	4,704.62	687.24	-413.35	14,446,859.07	1,706,534.18	39.78040666	-80.76466120
4,944.00	32.22	333.74	4,785.45	731.17	-437.02	14,446,903.00	1,706,510.51	39.78052747	-80.76474504
5,038.00	32.94	333.89	4,864.66	776.59	-459.36	14,446,948.42	1,706,488.18	39.78065237	-80.76482412
5,132.00	32.61	331.50	4,943.70	821.80	-482.69	14,446,993.63	1,706,464.84	39.78077670	-80.76490675
5,226.00	32.24	328.92	5,023.05	865.53	-507.72	14,447,037.37	1,706,439.81	39.78089699	-80.76499544
5,320.00	31.86	326.10	5,102.72	907.60	-534.50	14,447,079.43	1,706,413.03	39.78101271	-80.76509037
5,414.00	33.04	328.15	5,182.05	949.96	-561.87	14,447,121.80	1,706,385.67	39.78112925	-80.76518737
5,509.00	33.93	333.49	5,261.30	995.70	-587.37	14,447,167.53	1,706,360.16	39.78125503	-80.76527773
5,603.00	33.37	330.35	5,339.55	1,041.65	-611.87	14,447,213.48	1,706,335.66	39.78138139	-80.76536451
5,698.00	32.60	329.28	5,419.24	1,086.35	-637.87	14,447,258.19	1,706,309.66	39.78150436	-80.76545664
5,742.00	32.22	327.67	5,456.39	1,106.46	-650.20	14,447,278.29	1,706,297.33	39.78155965	-80.76550033
5,835.00	34.37	327.75	5,534.12	1,149.61	-677.47	14,447,321.44	1,706,270.06	39.78167836	-80.76559699
5,929.00	34.29	329.25	5,611.74	1,194.81	-705.17	14,447,366.64	1,706,242.37	39.78180269	-80.76569516
6,023.00	35.03	328.90	5,689.06	1,240.66	-732.64	14,447,412.50	1,706,214.89	39.78192882	-80.76579253
6,118.00	34.15	326.87	5,767.27	1,286.34	-761.30	14,447,458.18	1,706,186.23	39.78205447	-80.76589411
6,212.00	33.19	328.81	5,845.50	1,330.45	-789.05	14,447,502.28	1,706,158.49	39.78217580	-80.76599246
6,306.00	31.91	327.23	5,924.74	1,373.35	-815.82	14,447,545.18	1,706,131.72	39.78229381	-80.76608736
6,399.00	32.22	326.96	6,003.55	1,414.80	-842.64	14,447,586.63	1,706,104.89	39.78240784	-80.76618244
6,493.00	33.05	329.16	6,082.71	1,457.82	-869.44	14,447,629.65	1,706,078.09	39.78252617	-80.76627745
6,586.00	33.71	329.95	6,160.37	1,501.93	-895.37	14,447,673.76	1,706,052.17	39.78264750	-80.76636932
6,681.00	34.11	330.92	6,239.21	1,548.03	-921.52	14,447,719.86	1,706,026.02	39.78277429	-80.76646196
6,728.00	33.71	330.30	6,278.22	1,570.88	-934.38	14,447,742.71	1,706,013.15	39.78283712	-80.76650755
6,775.00	37.49	329.25	6,316.43	1,594.51	-948.16	14,447,766.34	1,705,999.37	39.78290211	-80.76655638
6,822.00	42.15	329.51	6,352.52	1,620.40	-963.49	14,447,792.23	1,705,984.05	39.78297334	-80.76661068
6,869.00	45.58	329.25	6,386.40	1,648.43	-980.07	14,447,820.26	1,705,967.46	39.78305042	-80.76666947
6,916.00	50.33	329.25	6,417.87	1,678.41	-997.92	14,447,850.24	1,705,949.62	39.78313290	-80.76673269
6,964.00	54.81	329.51	6,447.03	1,711.21	-1,017.32	14,447,883.04	1,705,930.21	39.78322310	-80.76680147
7,011.00	58.24	329.77	6,472.95	1,745.03	-1,037.13	14,447,916.86	1,705,910.40	39.78331613	-80.76687167
7,058.00	61.05	329.25	6,496.70	1,779.97	-1,057.71	14,447,951.81	1,705,889.82	39.78341224	-80.76694460
7,105.00	64.09	328.98	6,518.35	1,815.77	-1,079.12	14,447,987.60	1,705,868.41	39.78351070	-80.76702048
7,152.00	66.86	329.07	6,537.86	1,852.43	-1,101.13	14,448,024.26	1,705,846.41	39.78361153	-80.76709847
7,199.00	70.07	330.30	6,555.11	1,890.17	-1,123.19	14,448,062.00	1,705,824.35	39.78371533	-80.76717664
7,246.00	74.02	331.01	6,569.59	1,929.13	-1,145.09	14,448,100.97	1,705,802.44	39.78382250	-80.76725425
7,293.00	77.54	331.97	6,581.14	1,969.16	-1,166.83	14,448,141.00	1,705,780.70	39.78393259	-80.76733126
7,340.00	80.84	331.80	6,589.95	2,009.88	-1,188.58	14,448,181.71	1,705,758.95	39.78404455	-80.76740832
7,387.00	84.26	331.36	6,596.05	2,050.86	-1,210.76	14,448,222.69	1,705,736.77	39.78415725	-80.76748688
7,434.00	88.13	331.36	6,599.16	2,092.01	-1,233.23	14,448,263.84	1,705,714.30	39.78427042	-80.76756650
7,481.00	88.53	331.18	6,600.53	2,133.20	-1,255.82	14,448,305.04	1,705,691.72	39.78438372	-80.76764650
7,528.00	88.70	329.07	6,601.67	2,173.94	-1,279.22	14,448,345.78	1,705,668.32	39.78449577	-80.76772943
7,575.00	90.68	329.07	6,602.18	2,254.57	-1,327.53	14,448,426.40	1,705,620.00	39.78471754	-80.76790065
7,622.00	91.08	329.16	6,600.73	2,335.23	-1,375.78	14,448,507.06	1,705,571.76	39.78493940	-80.76807165
7,669.00	91.52	329.07	6,598.58	2,416.74	-1,424.53	14,448,588.57	1,705,523.00	39.78516359	-80.76824444
7,716.00	90.55	329.34	6,596.88	2,497.47	-1,472.65	14,448,669.30	1,705,474.89	39.78538564	-80.76841497
7,763.00	91.12	329.25	6,595.51	2,578.29	-1,520.64	14,448,750.12	1,705,426.90	39.78560792	-80.76858506
7,810.00	91.43	328.54	6,593.42	2,658.75	-1,569.19	14,448,830.58	1,705,378.35	39.78582924	-80.76875714
7,857.00	90.29	329.25	6,592.04	2,737.51	-1,616.71	14,448,909.34	1,705,330.83	39.78604588	-80.76892557
7,904.00	90.42	330.13	6,591.45	2,819.52	-1,664.65	14,448,991.36	1,705,282.88	39.78627145	-80.76909548
7,951.00	90.11	329.69	6,591.02	2,899.99	-1,711.28	14,449,071.82	1,705,236.26	39.78649276	-80.76926072
7,998.00	89.80	329.69	6,591.09	2,982.00	-1,759.22	14,449,153.84	1,705,188.31	39.78671833	-80.76943063
8,045.00	91.96	328.98	6,589.65	3,062.84	-1,807.16	14,449,234.68	1,705,140.38	39.78694068	-80.76960052
8,092.00	90.73	328.10	6,587.42	3,143.86	-1,856.72	14,449,315.69	1,705,090.81	39.78716351	-80.76977622
8,139.00	90.42	327.05	6,586.48	3,223.19	-1,907.12	14,449,395.03	1,705,040.41	39.78738175	-80.76995490
8,186.00	89.01	329.34	6,586.95	3,303.07	-1,956.66	14,449,474.90	1,704,990.88	39.78760146	-80.77013050
8,233.00	88.88	330.65	6,588.68	3,384.46	-2,003.65	14,449,556.29	1,704,943.88	39.78782531	-80.77029706

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-01 HM (slot K)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+32.5 @ 1297.50usft
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+32.5 @ 1297.50usft
<b>Well:</b>	Old Crow N-01 HM (slot K)	<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_Dec2220_v16

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
9,034.00	91.38	330.83	6,588.46	3,467.33	-2,050.08	14,449,639.16	1,704,897.45	39.78805322	-80.77046158	
9,129.00	91.74	330.39	6,585.87	3,550.07	-2,096.69	14,449,721.90	1,704,850.85	39.78828078	-80.77062673	
9,223.00	90.81	330.57	6,583.78	3,631.85	-2,142.99	14,449,803.68	1,704,804.54	39.78850569	-80.77079081	
9,318.00	91.08	330.21	6,582.22	3,714.43	-2,189.92	14,449,886.26	1,704,757.61	39.78873281	-80.77095713	
9,412.00	90.68	329.86	6,580.77	3,795.86	-2,236.87	14,449,967.69	1,704,710.67	39.78895676	-80.77112350	
9,506.00	90.95	329.42	6,579.44	3,876.96	-2,284.38	14,450,048.79	1,704,663.16	39.78917982	-80.77129188	
9,601.00	90.20	329.16	6,578.48	3,958.63	-2,332.89	14,450,130.46	1,704,614.65	39.78940445	-80.77146383	
9,693.00	91.60	329.25	6,577.04	4,037.65	-2,379.98	14,450,209.48	1,704,567.55	39.78962178	-80.77163076	
9,787.00	91.43	328.19	6,574.55	4,117.95	-2,428.77	14,450,289.79	1,704,518.76	39.78984267	-80.77180372	
9,880.00	90.11	327.75	6,573.30	4,196.79	-2,478.09	14,450,368.62	1,704,469.45	39.79005951	-80.77197857	
9,974.00	90.86	328.19	6,572.51	4,276.47	-2,527.94	14,450,448.31	1,704,419.59	39.79027870	-80.77215531	
10,068.00	90.77	329.51	6,571.17	4,356.91	-2,576.56	14,450,528.74	1,704,370.98	39.79049994	-80.77232766	
10,163.00	90.37	329.51	6,570.22	4,438.77	-2,624.76	14,450,610.60	1,704,322.78	39.79072509	-80.77249850	
10,257.00	90.33	330.65	6,569.65	4,520.24	-2,671.64	14,450,692.07	1,704,275.89	39.79094915	-80.77266467	
10,351.00	91.47	331.27	6,568.17	4,602.41	-2,717.27	14,450,774.24	1,704,230.27	39.79117513	-80.77282634	
10,446.00	91.82	331.27	6,565.45	4,685.68	-2,762.91	14,450,857.51	1,704,184.62	39.79140413	-80.77298809	
10,540.00	89.63	330.83	6,564.26	4,767.92	-2,808.41	14,450,939.75	1,704,139.13	39.79163031	-80.77314930	
10,634.00	89.89	331.36	6,564.65	4,850.21	-2,853.84	14,451,022.04	1,704,093.69	39.79185661	-80.77331031	
10,727.00	90.20	331.27	6,564.58	4,931.80	-2,898.48	14,451,103.63	1,704,049.05	39.79208098	-80.77346849	
10,821.00	90.86	330.92	6,563.71	5,014.08	-2,943.91	14,451,185.91	1,704,003.62	39.79230727	-80.77362949	
10,915.00	90.37	330.13	6,562.70	5,095.91	-2,990.16	14,451,267.74	1,703,957.37	39.79253232	-80.77379340	
11,008.00	90.73	330.04	6,561.81	5,176.52	-3,036.54	14,451,348.35	1,703,910.99	39.79275400	-80.77395778	
11,102.00	92.13	329.86	6,559.46	5,257.85	-3,083.60	14,451,429.69	1,703,863.94	39.79297770	-80.77412457	
11,196.00	90.90	329.51	6,556.98	5,338.97	-3,131.03	14,451,510.80	1,703,816.51	39.79320080	-80.77429269	
11,290.00	90.55	329.77	6,555.79	5,420.07	-3,178.53	14,451,591.91	1,703,769.00	39.79342386	-80.77446109	
11,385.00	90.77	329.69	6,554.69	5,502.12	-3,226.42	14,451,673.95	1,703,721.12	39.79364950	-80.77463082	
11,478.00	90.77	329.34	6,553.44	5,582.25	-3,273.59	14,451,754.08	1,703,673.94	39.79386990	-80.77479805	
11,572.00	91.08	330.30	6,551.92	5,663.50	-3,320.84	14,451,835.33	1,703,626.69	39.79409336	-80.77496553	
11,666.00	90.81	330.13	6,550.37	5,745.07	-3,367.53	14,451,916.90	1,703,580.01	39.79431769	-80.77513101	
11,761.00	90.59	329.60	6,549.21	5,827.22	-3,415.22	14,451,999.06	1,703,532.32	39.79454364	-80.77530006	
11,855.00	92.04	329.86	6,547.06	5,908.38	-3,462.59	14,452,080.22	1,703,484.95	39.79476685	-80.77546798	
11,949.00	92.13	329.42	6,543.64	5,989.44	-3,510.07	14,452,161.27	1,703,437.47	39.79498978	-80.77563628	
12,043.00	91.25	328.90	6,540.86	6,070.11	-3,558.23	14,452,241.94	1,703,389.30	39.79521166	-80.77580704	
12,137.00	91.30	328.54	6,538.77	6,150.43	-3,607.03	14,452,322.26	1,703,340.51	39.79543257	-80.77598004	
12,231.00	89.71	329.07	6,537.94	6,230.83	-3,655.71	14,452,402.66	1,703,291.82	39.79565371	-80.77615265	
12,325.00	89.27	329.60	6,538.78	6,311.68	-3,703.65	14,452,483.51	1,703,243.88	39.79587608	-80.77632260	
12,420.00	89.01	329.25	6,540.21	6,393.46	-3,751.97	14,452,565.30	1,703,195.57	39.79610100	-80.77649390	
12,514.00	89.76	330.04	6,541.22	6,474.57	-3,799.47	14,452,646.40	1,703,148.07	39.79632407	-80.77666228	
12,608.00	91.16	330.74	6,540.46	6,556.29	-3,845.91	14,452,728.12	1,703,101.62	39.79654881	-80.77682690	
12,702.00	92.88	330.30	6,537.15	6,638.07	-3,892.14	14,452,809.90	1,703,055.40	39.79677371	-80.77699076	
12,796.00	91.69	330.30	6,533.40	6,719.65	-3,938.68	14,452,891.48	1,703,008.86	39.79699808	-80.77715571	
12,890.00	91.87	330.04	6,530.48	6,801.16	-3,985.41	14,452,972.99	1,702,962.12	39.79722224	-80.77732138	
12,984.00	90.90	329.69	6,528.21	6,882.43	-4,032.59	14,453,054.26	1,702,914.95	39.79744575	-80.77748862	
13,078.00	88.75	329.60	6,528.50	6,963.54	-4,080.09	14,453,135.37	1,702,867.45	39.79766882	-80.77765702	
13,172.00	88.79	329.16	6,530.51	7,044.41	-4,127.96	14,453,216.24	1,702,819.58	39.79789125	-80.77782672	
13,266.00	90.81	329.42	6,530.84	7,125.22	-4,175.96	14,453,297.06	1,702,771.58	39.79811351	-80.77799691	
13,361.00	90.95	329.42	6,529.38	7,207.00	-4,224.28	14,453,378.83	1,702,723.25	39.79833842	-80.77816824	
13,455.00	91.38	329.42	6,527.47	7,287.91	-4,272.09	14,453,459.74	1,702,675.44	39.79856095	-80.77833775	
13,549.00	91.69	328.81	6,524.95	7,368.55	-4,320.33	14,453,540.38	1,702,627.21	39.79878274	-80.77850877	
13,644.00	90.02	329.51	6,523.54	7,450.11	-4,369.02	14,453,621.94	1,702,578.51	39.79900704	-80.77868142	
13,738.00	89.67	329.34	6,523.79	7,531.04	-4,416.84	14,453,702.87	1,702,530.70	39.79922962	-80.77885094	
13,832.00	89.71	329.95	6,524.30	7,612.15	-4,464.34	14,453,783.98	1,702,483.20	39.79945270	-80.77901935	
13,926.00	90.81	329.95	6,523.87	7,693.51	-4,511.41	14,453,865.35	1,702,436.13	39.79967646	-80.77918622	
14,021.00	91.16	330.04	6,522.24	7,775.77	-4,558.91	14,453,947.60	1,702,388.63	39.79990268	-80.77935462	
14,115.00	91.65	329.60	6,519.93	7,857.00	-4,606.15	14,454,028.83	1,702,341.39	39.80012609	-80.77952210	



Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-01 HM (slot K)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+32.5 @ 1297.50usft
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+32.5 @ 1297.50usft
<b>Well:</b>	Old Crow N-01 HM (slot K)	<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_Dec2220_v16

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
14,209.00	90.59	329.77	6,518.10	7,938.13	-4,653.59	14,454,109.96	1,702,293.95	39.80034922	-80.77969028
14,303.00	89.89	329.07	6,517.70	8,019.06	-4,701.41	14,454,190.89	1,702,246.13	39.80057178	-80.77985984
14,396.00	91.16	328.98	6,516.85	8,098.79	-4,749.27	14,454,270.62	1,702,198.27	39.80079107	-80.78002954
14,490.00	90.99	328.98	6,515.09	8,179.33	-4,797.70	14,454,351.16	1,702,149.83	39.80101259	-80.78020128
14,585.00	91.43	329.07	6,513.08	8,260.77	-4,846.58	14,454,432.60	1,702,100.95	39.80123656	-80.78037461
14,679.00	90.15	329.69	6,511.78	8,341.65	-4,894.46	14,454,513.48	1,702,053.08	39.80145901	-80.78054435
14,774.00	89.41	330.04	6,512.15	8,423.81	-4,942.15	14,454,595.64	1,702,005.39	39.80168496	-80.78071345
14,869.00	89.49	330.39	6,513.06	8,506.26	-4,989.34	14,454,678.09	1,701,958.20	39.80191169	-80.78088074
14,963.00	89.63	330.13	6,513.78	8,587.87	-5,035.97	14,454,759.70	1,701,911.57	39.80213615	-80.78104605
15,057.00	90.77	330.39	6,513.46	8,669.49	-5,082.60	14,454,841.32	1,701,864.94	39.80236060	-80.78121136
15,151.00	90.77	330.30	6,512.19	8,751.17	-5,129.10	14,454,923.00	1,701,818.44	39.80258523	-80.78137623
15,245.00	91.25	330.30	6,510.54	8,832.81	-5,175.67	14,455,004.64	1,701,771.87	39.80280975	-80.78154132
15,339.00	89.98	329.60	6,509.53	8,914.17	-5,222.73	14,455,086.00	1,701,724.80	39.80303349	-80.78170820
15,434.00	89.76	329.42	6,509.74	8,996.03	-5,270.93	14,455,167.86	1,701,676.60	39.80325863	-80.78187911
15,528.00	91.03	329.07	6,509.09	9,076.80	-5,319.00	14,455,248.64	1,701,628.53	39.80348079	-80.78204956
15,622.00	90.68	328.63	6,507.69	9,157.24	-5,367.62	14,455,329.07	1,701,579.92	39.80370202	-80.78222197
15,717.00	90.20	329.25	6,506.96	9,238.62	-5,416.63	14,455,410.45	1,701,530.90	39.80392582	-80.78239578
15,811.00	89.49	328.81	6,507.22	9,319.22	-5,465.00	14,455,491.05	1,701,482.53	39.80414749	-80.78256731
15,905.00	89.63	329.25	6,507.94	9,399.81	-5,513.37	14,455,571.65	1,701,434.16	39.80436915	-80.78273884
16,000.00	91.34	330.39	6,507.13	9,481.93	-5,561.13	14,455,653.76	1,701,386.41	39.80459498	-80.78290816
16,092.00	91.52	330.48	6,504.84	9,561.93	-5,606.51	14,455,733.76	1,701,341.03	39.80481498	-80.78306905
16,187.00	90.99	329.77	6,502.76	9,644.28	-5,653.81	14,455,816.11	1,701,293.72	39.80504146	-80.78323679
16,281.00	90.51	329.60	6,501.53	9,725.42	-5,701.26	14,455,897.25	1,701,246.28	39.80526461	-80.78340502
16,376.00	90.81	328.19	6,500.43	9,806.75	-5,750.33	14,455,978.59	1,701,197.20	39.80548830	-80.78357905
16,470.00	90.73	328.98	6,499.17	9,886.97	-5,799.32	14,456,058.80	1,701,148.21	39.80570891	-80.78375280
16,564.00	89.36	329.60	6,499.09	9,967.78	-5,847.33	14,456,139.61	1,701,100.21	39.80593117	-80.78392303
16,658.00	89.85	330.39	6,499.74	10,049.18	-5,894.33	14,456,221.01	1,701,053.20	39.80615502	-80.78408970
16,753.00	91.03	331.01	6,499.01	10,132.02	-5,940.82	14,456,303.86	1,701,006.72	39.80638284	-80.78425453
16,847.00	91.74	331.36	6,496.74	10,214.36	-5,986.11	14,456,386.19	1,700,961.42	39.80660925	-80.78441510
16,941.00	90.64	330.57	6,494.79	10,296.53	-6,031.72	14,456,468.36	1,700,915.81	39.80683521	-80.78457680
17,034.00	90.77	329.25	6,493.64	10,376.99	-6,078.35	14,456,548.82	1,700,869.19	39.80705648	-80.78474212
17,128.00	91.12	329.51	6,492.09	10,457.87	-6,126.22	14,456,629.70	1,700,821.32	39.80727892	-80.78491189
17,223.00	90.15	330.13	6,491.04	10,539.98	-6,173.97	14,456,711.82	1,700,773.56	39.80750475	-80.78508123
17,316.00	89.63	330.13	6,491.22	10,620.63	-6,220.29	14,456,792.46	1,700,727.25	39.80772652	-80.78524546
17,409.00	89.10	329.60	6,492.25	10,701.05	-6,266.98	14,456,872.89	1,700,680.56	39.80794770	-80.78541102
17,504.00	90.20	330.65	6,492.83	10,783.43	-6,314.29	14,456,955.26	1,700,633.24	39.80817423	-80.78557880
17,598.00	90.86	329.95	6,491.96	10,865.07	-6,360.86	14,457,036.91	1,700,586.67	39.80839876	-80.78574394
17,692.00	90.99	329.69	6,490.44	10,946.32	-6,408.11	14,457,118.15	1,700,539.42	39.80862220	-80.78591149
17,786.00	91.82	329.42	6,488.14	11,027.33	-6,455.73	14,457,199.17	1,700,491.81	39.80884499	-80.78608035
17,880.00	90.95	328.63	6,485.87	11,107.90	-6,504.09	14,457,279.74	1,700,443.44	39.80906658	-80.78625188
17,974.00	89.36	327.05	6,485.61	11,187.48	-6,554.12	14,457,359.31	1,700,393.41	39.80928543	-80.78642936
18,067.00	89.01	328.54	6,486.94	11,266.16	-6,603.68	14,457,437.99	1,700,343.85	39.80950183	-80.78660516
18,160.00	89.71	329.86	6,487.97	11,346.03	-6,651.30	14,457,517.87	1,700,296.24	39.80972151	-80.78677404
18,254.00	92.44	329.42	6,486.21	11,427.12	-6,698.80	14,457,598.95	1,700,248.74	39.80994450	-80.78694248
18,348.00	91.16	330.92	6,483.26	11,508.62	-6,745.53	14,457,680.45	1,700,202.01	39.81016863	-80.78710820
18,441.00	91.08	330.21	6,481.44	11,589.60	-6,791.22	14,457,761.43	1,700,156.31	39.81039132	-80.78727023
18,536.00	90.59	330.39	6,480.06	11,672.11	-6,838.29	14,457,843.94	1,700,109.25	39.81061823	-80.78743712
18,630.00	89.89	330.21	6,479.66	11,753.76	-6,884.86	14,457,925.59	1,700,062.68	39.81084276	-80.78760228
18,723.00	90.33	330.39	6,479.48	11,834.54	-6,930.94	14,458,006.38	1,700,016.60	39.81106491	-80.78776567
18,815.00	91.16	330.57	6,478.29	11,914.59	-6,976.26	14,458,086.43	1,699,971.27	39.81128505	-80.78792640
18,909.00	91.82	330.39	6,475.84	11,996.36	-7,022.56	14,458,168.20	1,699,924.97	39.81150991	-80.78809059
19,004.00	91.65	330.04	6,472.97	12,078.78	-7,069.73	14,458,250.61	1,699,877.80	39.81173654	-80.78825786
19,097.00	90.99	330.13	6,470.83	12,159.36	-7,116.10	14,458,331.19	1,699,831.44	39.81195815	-80.78842230
19,190.00	90.42	329.95	6,469.68	12,239.93	-7,162.54	14,458,411.76	1,699,785.00	39.81217971	-80.78858700
19,284.00	90.24	328.63	6,469.14	12,320.74	-7,210.54	14,458,492.58	1,699,736.99	39.81240196	-80.78875226

<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-01 HM (slot K)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+32.5 @ 1297.50usft
<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+32.5 @ 1297.50usft
<b>Well:</b>	Old Crow N-01 HM (slot K)	<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_Dec2220_v16

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
19,378.00	90.64	329.60	6,468.42	12,401.41	-7,258.79	14,458,573.24	1,699,688.74	39.81262381	-80.78892840
19,473.00	90.37	329.34	6,467.58	12,483.24	-7,307.05	14,458,655.07	1,699,640.49	39.81284884	-80.78909956
19,567.00	89.63	329.16	6,467.58	12,564.02	-7,355.11	14,458,735.85	1,699,592.42	39.81307100	-80.78927003
19,661.00	89.14	329.86	6,468.59	12,645.02	-7,402.80	14,458,816.85	1,699,544.73	39.81329374	-80.78943918
19,755.00	90.95	330.65	6,468.52	12,726.63	-7,449.44	14,458,898.46	1,699,498.10	39.81351817	-80.78960457
19,850.00	90.68	330.21	6,467.16	12,809.25	-7,496.31	14,458,981.08	1,699,451.22	39.81374536	-80.78977081
19,943.00	90.29	329.86	6,466.38	12,889.81	-7,542.76	14,459,061.64	1,699,404.77	39.81396692	-80.78993554
20,037.00	90.64	330.83	6,465.61	12,971.50	-7,589.27	14,459,143.33	1,699,358.27	39.81419154	-80.79010048
20,131.00	90.15	331.88	6,464.97	13,053.99	-7,634.33	14,459,225.82	1,699,313.21	39.81441838	-80.79026025
20,225.00	91.65	331.27	6,463.49	13,136.64	-7,679.07	14,459,308.47	1,699,268.47	39.81464566	-80.79041888
20,319.00	91.38	331.01	6,461.00	13,218.94	-7,724.42	14,459,390.77	1,699,223.11	39.81487196	-80.79057971
20,413.00	90.86	331.44	6,459.17	13,301.31	-7,769.66	14,459,473.15	1,699,177.87	39.81509847	-80.79074013
20,507.00	91.38	330.65	6,457.33	13,383.55	-7,815.16	14,459,555.38	1,699,132.38	39.81532460	-80.79090147
20,602.00	90.55	329.51	6,455.73	13,465.87	-7,862.54	14,459,637.70	1,699,085.00	39.81555099	-80.79106951
20,696.00	89.76	329.07	6,455.48	13,546.69	-7,910.54	14,459,718.52	1,699,036.99	39.81577324	-80.79123979
20,738.00	89.41	328.98	6,455.78	13,582.70	-7,932.16	14,459,754.53	1,699,015.38	39.81587227	-80.79131647
<b>Survey @ 20738.00 MD 6455.78 TVD</b>									
20,797.00	89.41	328.98	6,456.39	13,633.26	-7,962.56	14,459,805.09	1,698,984.97	39.81601132	-80.79142432
<b>Survey Proj. to 20797.00 MD 6456.39 TVD</b>									

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
188.00	188.00	-0.08	-0.12	MWD surveys
20,738.00	6,455.78	13,582.70	-7,932.16	Survey @ 20738.00 MD 6455.78 TVD
20,797.00	6,456.39	13,633.26	-7,962.56	Survey Proj. to 20797.00 MD 6456.39 TVD