



Well: Old Crow N-05 HM (slot A)  
 Site: Old Crow Pad  
 Project: Marshall County, West Virginia.  
 Design: rev5

DESIGN TARGET DETAILS

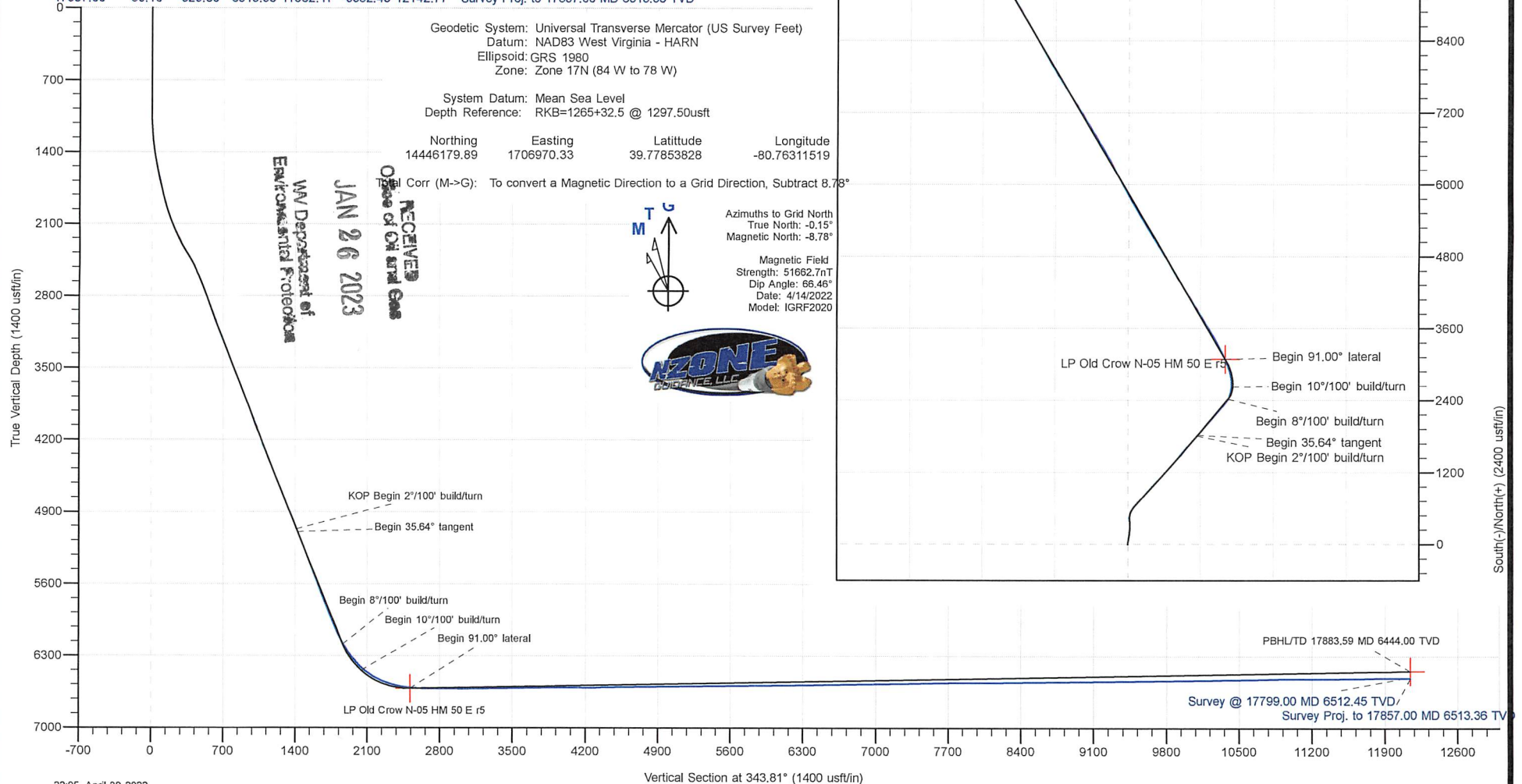
Name	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Shape
BHL Old Crow N-05 HM r5	6444.00	11661.91	-3385.83	14457841.79	1703584.50	39.81058900	-80.77506200	Point
- plan hits target center								
LP Old Crow N-05 HM 50 E r5	6617.00	3086.80	1614.95	14449266.68	1708585.28	39.78700359	-80.75733736	Point
- plan misses target center by 0.27usft at 7955.33usft MD (6616.98 TVD, 3086.93 N, 1615.18 E)								

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
1	5515.00	35.51	41.15	4905.45	1718.57	1068.79	0.00	0.00	1352.42	Survey @ 5515.00 MD 4905.45 TVD
2	5715.00	35.51	41.15	5068.25	1806.05	1145.23	0.00	0.00	1415.12	KOP Begin 2°/100' build/turn
3	5749.19	35.64	40.00	5096.06	1821.16	1158.16	2.00	-79.75	1426.02	Begin 35.64° tangent
4	7092.07	35.64	40.00	6187.45	2420.57	1661.05	0.00	0.00	1861.45	Begin 8°/100' build/turn
5	7435.39	50.00	4.83	6442.20	2632.30	1737.88	8.00	-73.05	2043.36	Begin 10°/100' build/turn
6	7955.44	91.00	329.75	6616.98	3087.02	1615.13	10.00	-46.82	2514.28	Begin 91.00° lateral
7	17883.59	91.00	329.75	6444.00	11661.91	-3385.83	0.00	0.00	12143.47	PBHL/TD 17883.59 MD 6444.00 TVD

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSect	Annotation
188.00	0.29	353.06	188.00	0.47	-0.06	0.47	MVD surveys
17799.00	89.10	329.60	6512.45	11612.15	-3353.08	12086.56	Survey @ 17799.00 MD 6512.45 TVD
17857.00	89.10	329.60	6513.36	11662.17	-3382.43	12142.77	Survey Proj. to 17857.00 MD 6513.36 TVD



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-05 HM (slot A)
<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-05 HM (slot A)	<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_Feb2822

<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-05 HM (slot A)					
<b>Well Position</b>	<b>+N/-S</b>	0.00 usft	<b>Northing:</b>	14,446,179.89 usft	<b>Latitude:</b>	39.77853828
	<b>+E/-W</b>	0.00 usft	<b>Easting:</b>	1,706,970.33 usft	<b>Longitude:</b>	-80.76311519
<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	4/14/2022	-8.62	66.46	51,662.71115108

<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	343.81	

<b>Survey Program</b>	<b>Date</b>	4/30/2022			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
188.00	1,012.00	MWD surf (Original Hole)	MWD	MWD - Standard	
1,022.00	2,927.00	MWD int (Original Hole)	MWD	MWD - Standard	
2,980.00	17,799.00	MWD (Original Hole)	MWD	MWD - Standard	
17,857.00	17,857.00	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	14,446,179.89	1,706,970.33	39.77853828	-80.76311519	
188.00	0.29	353.06	188.00	0.47	-0.06	14,446,180.36	1,706,970.27	39.77853958	-80.76311539	
<b>MWD surveys</b>										
235.00	0.20	339.78	235.00	0.67	-0.10	14,446,180.56	1,706,970.23	39.77854012	-80.76311554	
279.00	0.20	353.73	279.00	0.82	-0.14	14,446,180.70	1,706,970.20	39.77854052	-80.76311566	
326.00	0.08	338.26	326.00	0.93	-0.16	14,446,180.82	1,706,970.17	39.77854083	-80.76311574	
368.00	0.05	338.05	368.00	0.97	-0.17	14,446,180.86	1,706,970.16	39.77854095	-80.76311580	
415.00	0.03	258.17	415.00	0.99	-0.19	14,446,180.88	1,706,970.14	39.77854100	-80.76311587	
459.00	0.03	242.87	459.00	0.98	-0.22	14,446,180.87	1,706,970.12	39.77854098	-80.76311595	



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<b>Site:</b>	Old Crow Pad	<b>MD Reference:</b>	RKB=1265+32.5 @ 1297.50usft
<b>Well:</b>	Old Crow N-05 HM (slot A)	<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_Feb2822

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
506.00	0.03	149.03	506.00	0.96	-0.22	14,446,180.85	1,706,970.11	39.77854093	-80.76311596
549.00	0.03	276.65	549.00	0.96	-0.23	14,446,180.84	1,706,970.11	39.77854091	-80.76311598
596.00	0.10	318.83	596.00	0.99	-0.26	14,446,180.88	1,706,970.07	39.77854100	-80.76311612
639.00	0.00	81.23	639.00	1.02	-0.29	14,446,180.91	1,706,970.04	39.77854108	-80.76311621
686.00	0.03	221.80	686.00	1.01	-0.30	14,446,180.90	1,706,970.03	39.77854105	-80.76311624
729.00	0.03	81.23	729.00	1.00	-0.29	14,446,180.89	1,706,970.04	39.77854103	-80.76311623
774.00	0.03	271.02	774.00	1.00	-0.29	14,446,180.89	1,706,970.04	39.77854104	-80.76311623
821.00	0.03	279.28	821.00	1.01	-0.32	14,446,180.89	1,706,970.01	39.77854104	-80.76311631
868.00	0.08	275.16	868.00	1.01	-0.36	14,446,180.90	1,706,969.97	39.77854106	-80.76311647
915.00	0.07	216.87	915.00	0.99	-0.41	14,446,180.88	1,706,969.92	39.77854100	-80.76311665
962.00	0.08	264.87	962.00	0.96	-0.46	14,446,180.85	1,706,969.87	39.77854093	-80.76311683
1,012.00	0.08	189.01	1,012.00	0.93	-0.50	14,446,180.81	1,706,969.83	39.77854083	-80.76311697
1,022.00	0.09	179.93	1,022.00	0.91	-0.50	14,446,180.80	1,706,969.83	39.77854079	-80.76311698
1,070.00	0.31	334.79	1,070.00	0.99	-0.56	14,446,180.88	1,706,969.77	39.77854101	-80.76311717
1,117.00	1.32	0.02	1,116.99	1.65	-0.61	14,446,181.54	1,706,969.72	39.77854281	-80.76311736
1,164.00	2.59	4.50	1,163.96	3.25	-0.53	14,446,183.14	1,706,969.80	39.77854721	-80.76311705
1,211.00	4.09	5.73	1,210.88	5.97	-0.28	14,446,185.86	1,706,970.05	39.77855469	-80.76311613
1,258.00	6.02	7.75	1,257.70	10.08	0.22	14,446,189.97	1,706,970.55	39.77856598	-80.76311431
1,305.00	7.51	7.23	1,304.37	15.57	0.94	14,446,195.46	1,706,971.27	39.77858105	-80.76311170
1,352.00	8.79	8.81	1,350.89	22.17	1.88	14,446,202.06	1,706,972.21	39.77859915	-80.76310830
1,399.00	9.80	7.23	1,397.28	29.69	2.93	14,446,209.58	1,706,973.26	39.77861979	-80.76310448
1,446.00	10.59	7.23	1,443.53	37.94	3.98	14,446,217.83	1,706,974.31	39.77864245	-80.76310068
1,493.00	11.29	8.72	1,489.68	46.77	5.22	14,446,226.66	1,706,975.55	39.77866669	-80.76309618
1,541.00	12.22	7.31	1,536.67	56.46	6.58	14,446,236.34	1,706,976.91	39.77869328	-80.76309125
1,588.00	12.61	7.84	1,582.57	66.47	7.91	14,446,246.36	1,706,978.24	39.77872077	-80.76308641
1,635.00	13.18	6.79	1,628.39	76.87	9.24	14,446,256.76	1,706,979.57	39.77874933	-80.76308157
1,682.00	13.89	9.07	1,674.08	87.77	10.77	14,446,267.65	1,706,981.10	39.77877923	-80.76307605
1,729.00	14.02	12.24	1,719.70	98.90	12.86	14,446,278.79	1,706,983.19	39.77880980	-80.76306848
1,776.00	14.81	10.83	1,765.22	110.37	15.20	14,446,290.25	1,706,985.53	39.77884126	-80.76306006
1,823.00	15.69	11.09	1,810.56	122.50	17.55	14,446,302.39	1,706,987.88	39.77887458	-80.76305158
1,870.00	16.00	10.30	1,855.78	135.11	19.93	14,446,315.00	1,706,990.26	39.77890919	-80.76304299
1,917.00	17.18	7.84	1,900.82	148.36	22.03	14,446,328.25	1,706,992.36	39.77894556	-80.76303537
1,964.00	17.80	7.14	1,945.65	162.37	23.87	14,446,342.25	1,706,994.20	39.77898401	-80.76302869
2,011.00	18.98	7.14	1,990.24	177.08	25.72	14,446,356.97	1,706,996.05	39.77902440	-80.76302199
2,058.00	21.18	7.05	2,034.38	193.09	27.71	14,446,372.98	1,706,998.04	39.77906836	-80.76301475
2,104.00	22.02	5.56	2,077.15	209.92	29.56	14,446,389.81	1,706,999.89	39.77911457	-80.76300799
2,151.00	22.98	4.94	2,120.58	227.83	31.21	14,446,407.72	1,707,001.54	39.77916374	-80.76300197
2,198.00	24.21	3.89	2,163.65	246.59	32.65	14,446,426.48	1,707,002.98	39.77921524	-80.76299665
2,245.00	25.71	3.10	2,206.26	266.38	33.86	14,446,446.27	1,707,004.19	39.77926960	-80.76299217
2,293.00	27.20	2.39	2,249.23	287.74	34.88	14,446,467.63	1,707,005.21	39.77932825	-80.76298834
2,324.00	28.48	1.25	2,276.64	302.21	35.33	14,446,482.10	1,707,005.66	39.77936798	-80.76298658
2,356.00	29.71	359.49	2,304.60	317.77	35.43	14,446,497.66	1,707,005.76	39.77941071	-80.76298609
2,387.00	30.89	357.56	2,331.37	333.40	35.02	14,446,513.29	1,707,005.35	39.77945364	-80.76298739
2,418.00	32.08	354.92	2,357.80	349.55	33.96	14,446,529.44	1,707,004.29	39.77949800	-80.76299104
2,450.00	33.35	352.29	2,384.73	366.74	32.02	14,446,546.62	1,707,002.35	39.77954521	-80.76299776
2,482.00	32.74	353.43	2,411.55	384.05	29.85	14,446,563.94	1,707,000.18	39.77959277	-80.76300532
2,513.00	31.16	355.54	2,437.86	400.37	28.27	14,446,580.26	1,706,998.60	39.77963761	-80.76301080
2,544.00	29.44	357.65	2,464.62	415.98	27.33	14,446,595.87	1,706,997.66	39.77968049	-80.76301398
2,576.00	27.91	0.11	2,492.70	431.33	27.03	14,446,611.22	1,706,997.36	39.77972264	-80.76301494
2,607.00	26.50	3.45	2,520.27	445.49	27.46	14,446,625.38	1,706,997.79	39.77976153	-80.76301327
2,639.00	26.50	6.52	2,548.91	459.71	28.70	14,446,639.60	1,706,999.03	39.77980057	-80.76300872
2,670.00	27.47	8.81	2,576.53	473.65	30.58	14,446,653.54	1,707,000.91	39.77983883	-80.76300190
2,701.00	27.82	11.88	2,604.00	487.80	33.16	14,446,667.68	1,707,003.49	39.77987766	-80.76299257
2,733.00	27.55	15.14	2,632.33	502.25	36.63	14,446,682.14	1,707,006.96	39.77991732	-80.76298808
2,764.00	27.60	17.95	2,659.81	516.00	40.72	14,446,695.89	1,707,011.05	39.77995506	-80.76296541





Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-05 HM (slot A)
<b>Project:</b>	Marshall County, West Virginia.	<b>TVD Reference:</b>	RKB=1265+32.5 @ 1297.50usft
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<b>Design:</b>	Surveys Original Hole	<b>Database:</b>	DB_Feb2822

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
2,796.00	28.03	21.11	2,688.12	530.07	45.71	14,446,709.95	1,707,016.04	39.77999366	-80.76294750	
2,827.00	28.61	24.01	2,715.41	543.64	51.35	14,446,723.53	1,707,021.68	39.78003090	-80.76292729	
2,859.00	28.87	27.00	2,743.47	557.52	57.98	14,446,737.41	1,707,028.31	39.78006898	-80.76290358	
2,890.00	29.14	30.08	2,770.58	570.72	65.16	14,446,750.61	1,707,035.49	39.78010517	-80.76287789	
2,927.00	29.58	33.59	2,802.83	586.13	74.73	14,446,766.02	1,707,045.06	39.78014741	-80.76284369	
2,980.00	30.23	39.04	2,848.78	607.39	90.37	14,446,787.28	1,707,060.70	39.78020569	-80.76278781	
3,017.00	30.71	40.54	2,880.67	621.81	102.38	14,446,801.70	1,707,072.71	39.78024519	-80.76274493	
3,064.00	32.08	41.33	2,920.79	640.30	118.42	14,446,820.19	1,707,088.75	39.78029586	-80.76268765	
3,111.00	33.71	40.71	2,960.25	659.56	135.17	14,446,839.45	1,707,105.50	39.78034863	-80.76262785	
3,159.00	34.32	39.66	3,000.04	680.07	152.50	14,446,859.96	1,707,122.83	39.78040484	-80.76256599	
3,253.00	36.78	42.56	3,076.52	721.21	188.45	14,446,901.10	1,707,158.78	39.78051756	-80.76243763	
3,347.00	36.91	40.36	3,151.75	763.45	225.77	14,446,943.34	1,707,196.10	39.78063328	-80.76230442	
3,441.00	35.42	42.03	3,227.64	805.20	262.29	14,446,985.08	1,707,232.62	39.78074766	-80.76217403	
3,536.00	36.52	43.44	3,304.52	846.17	300.15	14,447,026.06	1,707,270.49	39.78085991	-80.76203885	
3,631.00	37.31	44.32	3,380.48	887.29	339.71	14,447,067.18	1,707,310.04	39.78097256	-80.76189768	
3,726.00	35.95	39.92	3,456.73	929.29	377.73	14,447,109.18	1,707,348.06	39.78108761	-80.76176196	
3,819.00	36.04	40.36	3,531.97	971.07	412.96	14,447,150.96	1,707,383.29	39.78120211	-80.76163615	
3,914.00	38.01	42.38	3,607.81	1,013.98	450.78	14,447,193.87	1,707,421.11	39.78131967	-80.76150112	
4,008.00	37.00	42.65	3,682.38	1,056.17	489.45	14,447,236.05	1,707,459.78	39.78143523	-80.76136307	
4,103.00	35.77	43.17	3,758.86	1,097.44	527.82	14,447,277.33	1,707,498.15	39.78154831	-80.76122612	
4,198.00	35.95	41.86	3,835.86	1,138.46	565.43	14,447,318.35	1,707,535.76	39.78166069	-80.76109188	
4,292.00	36.21	42.19	3,911.83	1,179.59	602.48	14,447,359.47	1,707,572.82	39.78177335	-80.76095957	
4,386.00	35.82	43.52	3,987.86	1,220.10	640.07	14,447,399.99	1,707,610.40	39.78188435	-80.76082539	
4,480.00	36.17	42.47	4,063.91	1,260.51	677.74	14,447,440.40	1,707,648.07	39.78199504	-80.76069092	
4,574.00	34.45	39.31	4,140.62	1,301.55	713.32	14,447,481.44	1,707,683.65	39.78210748	-80.76056389	
4,668.00	33.97	40.98	4,218.36	1,341.95	747.39	14,447,521.84	1,707,717.72	39.78221818	-80.76044225	
4,762.00	35.51	41.33	4,295.60	1,382.28	782.64	14,447,562.16	1,707,752.97	39.78232867	-80.76031638	
4,856.00	36.30	41.15	4,371.74	1,423.73	818.98	14,447,603.62	1,707,789.31	39.78244224	-80.76018664	
4,950.00	36.43	42.21	4,447.44	1,465.35	856.04	14,447,645.24	1,707,826.37	39.78255628	-80.76005432	
5,044.00	35.16	39.66	4,523.69	1,506.87	892.07	14,447,686.75	1,707,862.40	39.78267003	-80.75992568	
5,138.00	35.33	37.90	4,600.46	1,549.15	926.04	14,447,729.04	1,707,896.37	39.78278590	-80.75980436	
5,232.00	36.17	38.69	4,676.74	1,592.25	960.08	14,447,772.14	1,707,930.41	39.78290401	-80.75968280	
5,326.00	36.39	40.45	4,752.52	1,635.12	995.51	14,447,815.01	1,707,965.84	39.78302148	-80.75955627	
5,420.00	36.03	41.77	4,828.37	1,676.96	1,032.02	14,447,856.85	1,708,002.35	39.78313612	-80.75942592	
5,515.00	35.51	41.15	4,905.45	1,718.57	1,068.79	14,447,898.46	1,708,039.12	39.78325013	-80.75929465	
5,623.00	35.12	40.61	4,993.58	1,765.78	1,109.65	14,447,945.66	1,708,079.98	39.78337946	-80.75914875	
5,717.00	36.26	41.49	5,069.92	1,807.13	1,145.66	14,447,987.01	1,708,115.99	39.78349275	-80.75902015	
5,812.00	36.44	42.28	5,146.43	1,849.05	1,183.26	14,448,028.93	1,708,153.59	39.78360759	-80.75888593	
5,906.00	36.62	41.14	5,221.97	1,890.82	1,220.48	14,448,070.70	1,708,190.81	39.78372203	-80.75875302	
6,000.00	36.09	39.21	5,297.67	1,933.38	1,256.43	14,448,113.27	1,708,226.76	39.78383866	-80.75862466	
6,095.00	35.47	38.68	5,374.74	1,976.58	1,291.35	14,448,156.47	1,708,261.68	39.78395704	-80.75849996	
6,187.00	35.16	40.70	5,449.82	2,017.50	1,325.30	14,448,197.39	1,708,295.63	39.78406917	-80.75837870	
6,282.00	34.37	41.41	5,527.86	2,058.35	1,360.88	14,448,238.24	1,708,331.21	39.78418109	-80.75825167	
6,377.00	34.46	41.14	5,606.23	2,098.70	1,396.30	14,448,278.59	1,708,366.63	39.78429165	-80.75812521	
6,470.00	35.03	40.26	5,682.65	2,138.89	1,430.86	14,448,318.78	1,708,401.19	39.78440175	-80.75800180	
6,563.00	35.78	40.61	5,758.45	2,179.90	1,465.80	14,448,359.79	1,708,436.13	39.78451411	-80.75787701	
6,657.00	36.04	40.97	5,834.59	2,221.64	1,501.82	14,448,401.53	1,708,472.15	39.78462847	-80.75774840	
6,751.00	36.04	41.05	5,910.59	2,263.37	1,538.11	14,448,443.26	1,708,508.44	39.78474281	-80.75761882	
6,837.00	36.44	40.61	5,979.96	2,301.84	1,571.35	14,448,481.73	1,708,541.68	39.78484821	-80.75750013	
6,868.00	36.26	40.70	6,004.93	2,315.78	1,583.32	14,448,495.67	1,708,553.65	39.78488640	-80.75745739	
6,915.00	37.41	38.51	6,042.54	2,337.49	1,601.28	14,448,517.38	1,708,571.61	39.78494589	-80.75739327	
6,963.00	38.07	37.71	6,080.50	2,360.61	1,619.41	14,448,540.50	1,708,589.74	39.78500924	-80.75732851	
7,004.00	38.11	36.92	6,112.77	2,380.72	1,634.74	14,448,560.61	1,708,605.07	39.78506437	-80.75727374	
7,057.00	37.98	35.34	6,154.51	2,407.10	1,654.00	14,448,586.99	1,708,624.33	39.78513667	-80.75720493	
7,104.00	38.64	28.49	6,191.41	2,431.81	1,669.37	14,448,611.66	1,708,639.70	39.78520441	-80.75714997	





Survey Report - Geographic



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-05 HM (slot A)
<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-05 HM (slot A)	<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_Feb2822

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JAN 26 2023

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
7,151.00	39.30	22.33	6,227.96	2,458.48	1,682.03	14,448,638.37	1,708,652.36	39.78527757	-80.75710465
7,198.00	40.75	17.59	6,263.96	2,486.88	1,692.32	14,448,666.77	1,708,662.65	39.78535548	-80.75706774
7,244.00	41.45	15.83	6,298.63	2,515.84	1,701.01	14,448,695.73	1,708,671.34	39.78543495	-80.75703652
7,291.00	42.64	12.93	6,333.53	2,546.33	1,708.82	14,448,726.22	1,708,679.15	39.78551862	-80.75700844
7,337.00	45.27	8.71	6,366.65	2,577.68	1,714.78	14,448,757.56	1,708,685.11	39.78560466	-80.75698691
7,384.00	48.40	5.37	6,398.80	2,611.69	1,718.96	14,448,791.58	1,708,689.29	39.78569804	-80.75697172
7,431.00	50.95	2.65	6,429.22	2,647.42	1,721.45	14,448,827.31	1,708,691.78	39.78579616	-80.75696252
7,478.00	54.11	358.95	6,457.81	2,684.71	1,721.94	14,448,864.60	1,708,692.27	39.78589855	-80.75696039
7,524.00	58.24	355.09	6,483.42	2,722.85	1,719.92	14,448,902.74	1,708,690.25	39.78600331	-80.75696720
7,571.00	61.10	352.10	6,507.16	2,763.15	1,715.38	14,448,943.04	1,708,685.71	39.78611402	-80.75698297
7,618.00	64.40	349.11	6,528.68	2,804.36	1,708.55	14,448,984.25	1,708,678.88	39.78622724	-80.75700690
7,665.00	67.65	346.21	6,547.78	2,846.30	1,699.36	14,449,026.19	1,708,669.69	39.78634248	-80.75703921
7,712.00	70.20	344.19	6,564.68	2,888.69	1,688.15	14,449,068.58	1,708,658.48	39.78645899	-80.75707869
7,759.00	73.71	342.17	6,579.24	2,931.45	1,675.22	14,449,111.34	1,708,645.55	39.78657653	-80.75712433
7,806.00	76.88	340.41	6,591.17	2,974.50	1,660.63	14,449,154.39	1,708,630.96	39.78669486	-80.75717583
7,853.00	79.96	338.39	6,600.60	3,017.59	1,644.43	14,449,197.48	1,708,614.76	39.78681332	-80.75723309
7,900.00	82.81	336.37	6,607.64	3,060.48	1,626.56	14,449,240.37	1,708,596.89	39.78693123	-80.75729630
7,947.00	86.02	335.31	6,612.21	3,103.15	1,607.41	14,449,283.04	1,708,577.75	39.78704857	-80.75736403
7,992.00	88.26	332.94	6,614.46	3,143.59	1,587.80	14,449,323.47	1,708,558.13	39.78715975	-80.75743345
8,039.00	88.13	332.15	6,615.94	3,185.27	1,566.14	14,449,365.16	1,708,536.47	39.78727439	-80.75751015
8,086.00	87.69	332.15	6,617.65	3,226.80	1,544.20	14,449,406.69	1,708,514.53	39.78738860	-80.75758786
8,180.00	89.45	331.88	6,620.00	3,309.78	1,500.11	14,449,489.67	1,708,470.44	39.78761682	-80.75774402
8,273.00	89.14	329.25	6,621.14	3,390.76	1,454.41	14,449,570.65	1,708,424.74	39.78783955	-80.75790590
8,367.00	90.02	329.34	6,621.83	3,471.58	1,406.42	14,449,651.47	1,708,376.75	39.78806186	-80.75807598
8,461.00	91.52	329.60	6,620.57	3,552.54	1,358.67	14,449,732.43	1,708,329.00	39.78828455	-80.75824516
8,556.00	91.60	329.69	6,617.98	3,634.48	1,310.68	14,449,814.37	1,708,281.01	39.78850995	-80.75841521
8,650.00	91.43	329.25	6,615.50	3,715.42	1,262.95	14,449,895.31	1,708,233.28	39.78873259	-80.75858436
8,744.00	90.33	328.90	6,614.06	3,796.05	1,214.64	14,449,975.94	1,708,184.98	39.78895436	-80.75875553
8,838.00	89.63	329.34	6,614.09	3,876.72	1,166.40	14,450,056.61	1,708,136.73	39.78917627	-80.75892650
8,933.00	90.73	328.54	6,613.79	3,958.10	1,117.39	14,450,137.99	1,708,087.72	39.78940012	-80.75910020
9,027.00	90.42	327.93	6,612.85	4,038.02	1,067.91	14,450,217.91	1,708,038.24	39.78961996	-80.75927558
9,120.00	91.52	328.37	6,611.27	4,117.00	1,018.84	14,450,296.89	1,707,989.17	39.78983723	-80.75944950
9,214.00	91.21	328.90	6,609.03	4,197.24	969.93	14,450,377.13	1,707,940.26	39.79005795	-80.75962285
9,308.00	90.77	328.54	6,607.41	4,277.57	921.13	14,450,457.46	1,707,891.46	39.79027890	-80.75979580
9,402.00	89.76	328.46	6,606.97	4,357.71	872.01	14,450,537.60	1,707,842.34	39.79049937	-80.75996988
9,496.00	90.07	329.25	6,607.11	4,438.16	823.40	14,450,618.05	1,707,793.73	39.79072066	-80.76014218
9,590.00	89.14	328.98	6,607.76	4,518.83	775.15	14,450,698.72	1,707,745.48	39.79094255	-80.76031318
9,684.00	90.24	330.13	6,608.27	4,599.87	727.52	14,450,779.75	1,707,697.85	39.79116545	-80.76048196
9,779.00	91.34	329.25	6,606.96	4,681.87	679.58	14,450,861.76	1,707,649.91	39.79139101	-80.76065184
9,873.00	91.16	329.25	6,604.91	4,762.64	631.53	14,450,942.52	1,707,601.86	39.79161316	-80.76082212
9,967.00	90.95	328.98	6,603.18	4,843.29	583.29	14,451,023.18	1,707,553.62	39.79183502	-80.76099310
10,061.00	90.64	327.84	6,601.87	4,923.35	534.05	14,451,103.24	1,707,504.38	39.79205525	-80.76116762
10,156.00	90.81	328.72	6,600.67	5,004.16	484.11	14,451,184.04	1,707,454.44	39.79227752	-80.76134465
10,250.00	90.68	328.98	6,599.45	5,084.60	435.49	14,451,264.48	1,707,405.82	39.79249879	-80.76151697
10,345.00	90.81	329.16	6,598.21	5,166.08	386.66	14,451,345.97	1,707,356.99	39.79272292	-80.76169001
10,439.00	90.90	328.28	6,596.81	5,246.41	337.86	14,451,426.29	1,707,308.19	39.79294388	-80.76186299
10,533.00	90.51	329.07	6,595.66	5,326.70	289.00	14,451,506.59	1,707,259.33	39.79316473	-80.76203619
10,628.00	90.37	330.48	6,594.93	5,408.78	241.18	14,451,588.67	1,707,211.51	39.79339050	-80.76220565
10,722.00	90.15	329.69	6,594.50	5,490.25	194.30	14,451,670.14	1,707,164.63	39.79361459	-80.76237177
10,816.00	89.93	331.36	6,594.43	5,572.08	148.05	14,451,751.97	1,707,118.38	39.79383966	-80.76253565
10,910.00	90.73	331.53	6,593.89	5,654.65	103.12	14,451,834.54	1,707,073.45	39.79406673	-80.76269483
11,004.00	90.46	330.92	6,592.92	5,737.03	57.87	14,451,916.92	1,707,028.20	39.79429331	-80.76285513
11,099.00	90.02	330.65	6,592.52	5,819.95	11.50	14,451,999.84	1,706,981.83	39.79452136	-80.76301943
11,193.00	91.25	331.01	6,591.48	5,902.02	-34.31	14,452,081.91	1,706,936.02	39.79474708	-80.76318175
11,287.00	90.59	331.62	6,589.97	5,984.47	-79.42	14,452,164.36	1,706,890.91	39.79497384	-80.76334158



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-05 HM (slot A)
<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-05 HM (slot A)	<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_Feb2822

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
11,381.00	90.51	332.24	6,589.06	6,067.41	-123.65	14,452,247.30	1,706,846.68	39.79520194	-80.76349826	
11,475.00	89.98	331.97	6,588.66	6,150.49	-167.63	14,452,330.38	1,706,802.70	39.79543041	-80.76365405	
11,569.00	91.12	331.36	6,587.76	6,233.22	-212.24	14,452,413.11	1,706,758.09	39.79565794	-80.76381210	
11,663.00	91.03	331.27	6,586.00	6,315.67	-257.35	14,452,495.56	1,706,712.98	39.79588469	-80.76397193	
11,758.00	90.42	331.01	6,584.80	6,398.86	-303.20	14,452,578.75	1,706,667.13	39.79611349	-80.76413438	
11,852.00	90.73	330.30	6,583.85	6,480.80	-349.27	14,452,660.69	1,706,621.06	39.79633884	-80.76429761	
11,945.00	91.96	329.95	6,581.67	6,561.42	-395.58	14,452,741.30	1,706,574.75	39.79656057	-80.76446172	
12,040.00	91.38	329.77	6,578.90	6,643.54	-443.26	14,452,823.42	1,706,527.07	39.79678644	-80.76463071	
12,134.00	90.95	329.60	6,576.99	6,724.67	-490.70	14,452,904.55	1,706,479.63	39.79700959	-80.76479883	
12,228.00	90.46	330.04	6,575.83	6,805.92	-537.95	14,452,985.81	1,706,432.38	39.79723307	-80.76496630	
12,322.00	89.49	329.69	6,575.87	6,887.21	-585.14	14,453,067.10	1,706,385.19	39.79745666	-80.76513355	
12,416.00	91.47	329.25	6,575.09	6,968.17	-632.88	14,453,148.06	1,706,337.45	39.79767935	-80.76530279	
12,510.00	91.34	329.34	6,572.78	7,048.97	-680.87	14,453,228.86	1,706,289.46	39.79790159	-80.76547287	
12,604.00	91.21	328.46	6,570.69	7,129.44	-729.41	14,453,309.33	1,706,240.92	39.79812292	-80.76564494	
12,699.00	90.68	327.93	6,569.12	7,210.16	-779.47	14,453,390.05	1,706,190.86	39.79834497	-80.76582242	
12,793.00	90.37	327.84	6,568.26	7,289.78	-829.44	14,453,469.66	1,706,140.89	39.79856397	-80.76599959	
12,887.00	91.30	329.42	6,566.89	7,370.02	-878.37	14,453,549.91	1,706,091.96	39.79878470	-80.76617303	
12,982.00	91.38	329.07	6,564.67	7,451.64	-926.93	14,453,631.53	1,706,043.40	39.79900919	-80.76634519	
13,077.00	91.12	328.90	6,562.60	7,533.04	-975.87	14,453,712.93	1,705,994.46	39.79923308	-80.76651867	
13,171.00	90.90	328.63	6,560.94	7,613.40	-1,024.61	14,453,793.29	1,705,945.72	39.79945413	-80.76669144	
13,265.00	90.29	328.72	6,559.96	7,693.69	-1,073.47	14,453,873.58	1,705,896.86	39.79967498	-80.76686468	
13,359.00	89.93	328.63	6,559.78	7,773.99	-1,122.34	14,453,953.88	1,705,847.99	39.79989585	-80.76703793	
13,453.00	90.42	330.30	6,559.50	7,854.95	-1,170.10	14,454,034.84	1,705,800.23	39.80011853	-80.76720721	
13,547.00	90.37	330.48	6,558.85	7,936.67	-1,216.54	14,454,116.56	1,705,753.79	39.80034329	-80.76737181	
13,642.00	90.02	329.86	6,558.53	8,019.09	-1,263.80	14,454,198.97	1,705,706.53	39.80056996	-80.76753929	
13,736.00	90.24	330.65	6,558.31	8,100.70	-1,310.44	14,454,280.59	1,705,659.89	39.80079442	-80.76770458	
13,830.00	89.80	330.30	6,558.28	8,182.49	-1,356.76	14,454,362.38	1,705,613.57	39.80101938	-80.76786876	
13,923.00	91.21	330.74	6,557.46	8,263.45	-1,402.52	14,454,443.33	1,705,567.81	39.80124202	-80.76803095	
14,018.00	91.21	330.13	6,555.45	8,346.06	-1,449.39	14,454,525.95	1,705,520.94	39.80146923	-80.76819705	
14,112.00	91.47	329.60	6,553.26	8,427.33	-1,496.57	14,454,607.22	1,705,473.77	39.80169276	-80.76836427	
14,206.00	90.68	329.77	6,551.49	8,508.46	-1,544.00	14,454,688.35	1,705,426.33	39.80191591	-80.76853243	
14,300.00	90.29	329.69	6,550.70	8,589.64	-1,591.38	14,454,769.53	1,705,378.95	39.80213919	-80.76870038	
14,394.00	89.93	329.95	6,550.52	8,670.90	-1,638.64	14,454,850.79	1,705,331.69	39.80236268	-80.76886789	
14,488.00	90.90	330.57	6,549.83	8,752.52	-1,685.27	14,454,932.41	1,705,285.06	39.80258715	-80.76903316	
14,582.00	89.93	329.77	6,549.15	8,834.06	-1,732.02	14,455,013.95	1,705,238.31	39.80281142	-80.76919888	
14,676.00	90.37	329.86	6,548.91	8,915.31	-1,779.29	14,455,095.20	1,705,191.04	39.80303489	-80.76936642	
14,771.00	89.98	329.60	6,548.62	8,997.36	-1,827.17	14,455,177.25	1,705,143.16	39.80326056	-80.76953617	
14,865.00	90.46	330.30	6,548.26	9,078.72	-1,874.24	14,455,258.61	1,705,096.09	39.80348434	-80.76970302	
14,960.00	90.33	329.86	6,547.60	9,161.06	-1,921.63	14,455,340.95	1,705,048.70	39.80371079	-80.76987098	
15,054.00	91.60	329.60	6,546.02	9,242.23	-1,969.00	14,455,422.12	1,705,001.33	39.80393404	-80.77003892	
15,149.00	91.56	329.77	6,543.40	9,324.21	-2,016.94	14,455,504.10	1,704,953.39	39.80415951	-80.77020884	
15,243.00	91.34	329.25	6,541.02	9,405.18	-2,064.62	14,455,585.07	1,704,905.72	39.80438223	-80.77037787	
15,337.00	90.59	328.63	6,539.44	9,485.70	-2,113.11	14,455,665.58	1,704,857.22	39.80460367	-80.77054979	
15,431.00	90.73	329.25	6,538.35	9,566.21	-2,161.60	14,455,746.10	1,704,808.73	39.80482514	-80.77072172	
15,525.00	90.20	327.93	6,537.59	9,646.43	-2,210.59	14,455,826.32	1,704,759.74	39.80504579	-80.77089541	
15,620.00	90.59	329.51	6,536.94	9,727.62	-2,259.91	14,455,907.51	1,704,710.42	39.80526909	-80.77107030	
15,714.00	89.93	329.51	6,536.51	9,808.62	-2,307.60	14,455,988.51	1,704,662.73	39.80549187	-80.77123938	
15,809.00	91.74	330.65	6,535.13	9,890.94	-2,354.98	14,456,070.83	1,704,615.35	39.80571829	-80.77140733	
15,903.00	91.38	330.39	6,532.57	9,972.74	-2,401.22	14,456,152.63	1,704,569.11	39.80594326	-80.77157124	
15,997.00	90.90	330.21	6,530.70	10,054.38	-2,447.79	14,456,234.27	1,704,522.54	39.80616778	-80.77173630	
16,090.00	90.59	330.04	6,529.49	10,135.01	-2,494.11	14,456,314.90	1,704,476.22	39.80638955	-80.77190050	
16,184.00	90.51	328.81	6,528.59	10,215.94	-2,541.92	14,456,395.83	1,704,428.41	39.80661212	-80.77207001	
16,278.00	90.68	330.48	6,527.61	10,297.04	-2,589.42	14,456,476.93	1,704,380.91	39.80683519	-80.77223840	
16,372.00	89.98	329.77	6,527.07	10,378.55	-2,636.24	14,456,558.44	1,704,334.09	39.80705936	-80.77240438	
16,466.00	92.22	330.39	6,525.26	10,460.00	-2,683.11	14,456,639.89	1,704,287.22	39.80728337	-80.77257055	



<b>Company:</b>	Tug Hill Operating LLC	<b>Local Co-ordinate Reference:</b>	Well Old Crow N-05 HM (slot A)
<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-05 HM (slot A)	<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_Feb2822

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
16,560.00	92.26	330.04	6,521.59	10,541.52	-2,729.77	14,456,721.41	1,704,240.56	39.80750757	-80.77273596
16,655.00	90.55	330.21	6,519.26	10,623.87	-2,777.08	14,456,803.76	1,704,193.25	39.80773405	-80.77290365
16,747.00	90.07	329.95	6,518.76	10,703.61	-2,822.96	14,456,883.50	1,704,147.37	39.80795335	-80.77306633
16,841.00	89.05	329.69	6,519.48	10,784.86	-2,870.22	14,456,964.75	1,704,100.11	39.80817683	-80.77323385
16,935.00	89.10	329.77	6,521.00	10,866.04	-2,917.59	14,457,045.92	1,704,052.74	39.80840008	-80.77340182
17,030.00	90.73	330.13	6,521.14	10,948.26	-2,965.16	14,457,128.15	1,704,005.17	39.80862623	-80.77357047
17,124.00	90.68	329.51	6,519.99	11,029.52	-3,012.42	14,457,209.40	1,703,957.91	39.80884970	-80.77373799
17,218.00	90.99	329.86	6,518.62	11,110.65	-3,059.86	14,457,290.54	1,703,910.47	39.80907285	-80.77390620
17,312.00	90.37	329.51	6,517.50	11,191.79	-3,107.30	14,457,371.68	1,703,863.03	39.80929601	-80.77407441
17,407.00	91.65	329.86	6,515.83	11,273.79	-3,155.24	14,457,453.68	1,703,815.09	39.80952153	-80.77424439
17,501.00	91.16	329.77	6,513.52	11,355.02	-3,202.49	14,457,534.91	1,703,767.84	39.80974493	-80.77441190
17,595.00	90.59	329.51	6,512.09	11,436.12	-3,250.00	14,457,616.01	1,703,720.33	39.80996798	-80.77458034
17,688.00	90.02	329.69	6,511.59	11,516.33	-3,297.06	14,457,696.22	1,703,673.27	39.81018859	-80.77474719
17,783.00	89.23	329.69	6,512.21	11,598.34	-3,345.00	14,457,778.23	1,703,625.33	39.81041415	-80.77491718
17,799.00	89.10	329.60	6,512.45	11,612.15	-3,353.08	14,457,792.04	1,703,617.25	39.81045212	-80.77494585
<b>Survey @ 17799.00 MD 6512.45 TVD</b>									
17,857.00	89.10	329.60	6,513.36	11,662.17	-3,382.43	14,457,842.06	1,703,587.90	39.81058969	-80.77504990
<b>Survey Proj. to 17857.00 MD 6513.36 TVD</b>									

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
188.00	188.00	0.47	-0.06	MWD surveys
17,799.00	6,512.45	11,612.15	-3,353.08	Survey @ 17799.00 MD 6512.45 TVD
17,857.00	6,513.36	11,662.17	-3,382.43	Survey Proj. to 17857.00 MD 6513.36 TVD