



Well: Lackawanna 1H (slot X)
 Site: Lackawanna
 Project: Wetzel County, West Virginia (UTM17 NAD83)
 Design: rev4
 Rig: Precision 528

ANNOTATIONS SURVEYS

MD	Inc	Azi	TVD	+N/-S	+E/-W	VSecl	Annotation
2858.00	0.34	250.59	2857.91	-5.83	2.71	-6.42	Tie into original hole @ 2858 MD
20634.00	93.19	330.64	6544.98	10531.59	-4417.60	11420.57	Survey @ 20634.00 MD 6544.98 TVD
20684.00	93.19	330.64	6542.20	10575.10	-4442.08	11470.17	Survey projected to 20684.00 MD 6542.20 TVD

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSecl	Annotation
1	2858.00	0.34	250.59	2857.91	-5.83	2.71	0.00	0.000	-6.42	S/T Begin 6°/100' build/turn
2	3548.93	41.22	116.86	3491.09	-114.13	213.12	6.00	-134.006	-187.91	Begin 41.22° tangent
3	6489.57	41.22	116.86	5702.98	-989.65	1941.81	0.00	0.000	-1665.79	Begin 8°/100' build/turn
4	7570.99	50.00	330.00	6643.04	-743.22	2079.84	8.00	-155.193	-1492.27	Begin 10°/100' build
5	7980.99	91.00	330.00	6777.00	-415.61	1890.70	10.00	0.000	-1116.93	Begin 91.00° lateral
6	20669.17	91.00	330.00	6555.56	10571.01	-4452.43	0.00	0.000	1470.41	PBHL/TD 20669.17 MD/6555.56 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=1306+18 @ 1324.00ft (Precision 528)

Northing	Easting	Latitude	Longitude
14383374.84	1680777.71	39.60620769	-80.85669942

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.713°

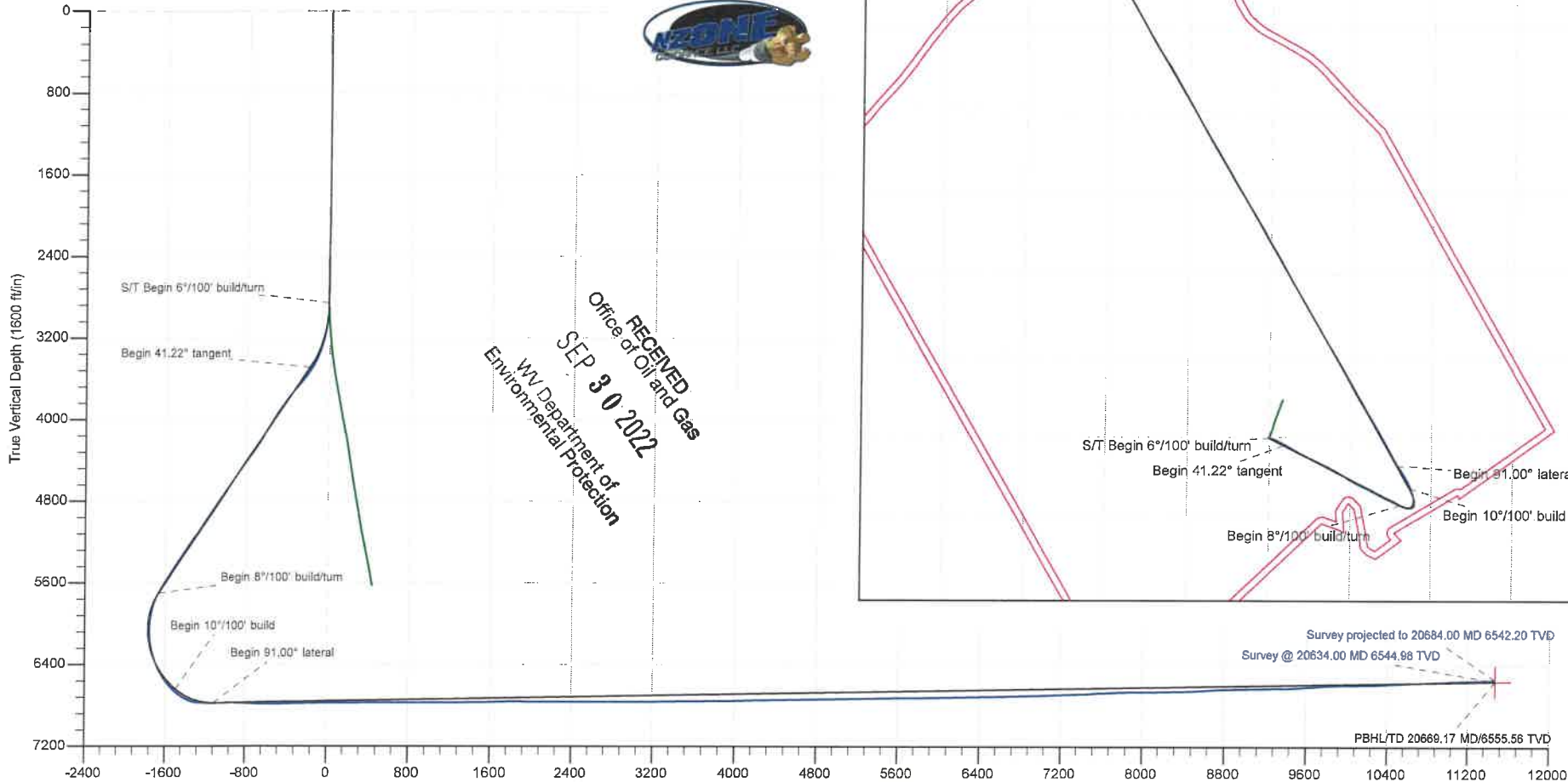


Azimuths to Grid North
 True North: -0.08°
 Magnetic North: -8.71°

Magnetic Field
 Strength: 51844.6snT
 Dip Angle: 66.65°
 Date: 8/27/2019
 Model: IGRF2015



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Vertical Section at 337.16° (1600 ft/in)

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Lackawanna 1H (slot X)
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Site:	Lackawanna	MD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Well:	Lackawanna 1H (slot X)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Project	Wetzel County, West Virginia (UTM17 NAD83)		
Map System:	Universal Transverse Mercator (US Survey Feet)	System Datum:	Mean Sea Level
Geo Datum:	NAD83 West Virginia - HARN		
Map Zone:	Zone 17N (84 W to 78 W)		

Site	Lackawanna				
Site Position:	Northing:	14,383,374.84 usft	Latitude:	39.60620769	
From:	Lat/Long	Easting:	1,680,777.71 usft	Longitude:	-80.85669942
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.091 °

Well	Lackawanna 1H (slot X)					
Well Position	+N/-S	0.00 ft	Northing:	14,383,374.84 usft	Latitude:	39.60620769
	+E/-W	0.00 ft	Easting:	1,680,777.71 usft	Longitude:	-80.85669942
Position Uncertainty	0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,306.00 ft	

Wellbore	Sidetrack 01				
Magnetics	Model Name	Sample Date	Declination	Dip Angle	Field Strength
	IGRF2015	8/27/2019	(°)	(°)	(nT)
			-8.622	66.652	51,844.62014915

Design	Surveys Sidetrack 01				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	2,858.00
Vertical Section:	Depth From (TVD)	+N/-S	+E/-W	Direction	
	(ft)	(ft)	(ft)	(°)	
	0.00	0.00	0.00	337.16	

Survey Program	Date	9/15/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
8.00	2,858.00	Gyro RKB=18 (Original Hole)	NS-GYRO-MS	North sensing gyrocompassing m/s	
2,883.00	20,634.00	MWD ST1 (Sidetrack 01)	MWD	MWD - Standard	
20,684.00	20,684.00	Projection (Sidetrack 01)	MWD	MWD - Standard	

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Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	0.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.00	0.00	231.09	18.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
108.00	0.11	231.09	108.00	-0.05	-0.07	-0.02	0.12	0.12	0.00	0.00
208.00	0.42	287.04	208.00	-0.01	-0.49	0.18	0.37	0.31	55.95	
308.00	0.36	309.38	308.00	0.30	-1.09	0.70	0.16	-0.06	22.34	
408.00	0.29	330.34	408.00	0.72	-1.45	1.23	0.14	-0.07	20.96	
508.00	0.44	284.90	507.99	1.04	-1.95	1.71	0.31	0.15	-45.44	
608.00	0.23	284.84	607.99	1.19	-2.52	2.07	0.21	-0.21	-0.06	



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Lackawanna 1H (slot X)
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	WV Department of Environmental Protection @ 1324.00ft (Precision 528)
Site:	Lackawanna	MD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Well:	Lackawanna 1H (slot X)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
708.00	0.11	308.84	707.99	1.30	-2.78	2.28	0.14	-0.12	24.00	
808.00	0.07	207.12	807.99	1.31	-2.89	2.32	0.14	-0.04	-101.72	
908.00	0.17	107.20	907.99	1.21	-2.77	2.19	0.19	0.10	-99.92	
1,008.00	0.19	121.02	1,007.99	1.08	-2.49	1.96	0.05	0.02	13.82	
1,108.00	0.22	136.23	1,107.99	0.85	-2.21	1.65	0.06	0.03	15.21	
1,208.00	0.19	211.45	1,207.99	0.57	-2.17	1.37	0.25	-0.03	75.22	
1,308.00	0.44	198.33	1,307.99	0.07	-2.37	0.98	0.26	0.25	-13.12	
1,408.00	0.36	189.48	1,407.99	-0.61	-2.55	0.43	0.10	-0.08	-8.85	
1,508.00	0.18	220.25	1,507.98	-1.04	-2.70	0.09	0.23	-0.18	30.77	
1,608.00	0.05	202.88	1,607.98	-1.20	-2.82	-0.01	0.13	-0.13	-17.37	
1,708.00	0.23	308.93	1,707.98	-1.11	-2.99	0.14	0.25	0.18	106.05	
1,808.00	0.37	334.34	1,807.98	-0.69	-3.29	0.64	0.19	0.14	25.41	
1,908.00	0.35	317.74	1,907.98	-0.18	-3.63	1.25	0.11	-0.02	-16.60	
2,008.00	0.11	215.70	2,007.98	-0.03	-3.89	1.49	0.39	-0.24	-102.04	
2,108.00	0.78	131.41	2,107.98	-0.56	-3.44	0.82	0.78	0.67	-84.29	
2,208.00	0.77	125.25	2,207.97	-1.39	-2.38	-0.36	0.08	-0.01	-6.16	
2,308.00	1.03	124.37	2,307.95	-2.29	-1.09	-1.69	0.26	0.26	-0.88	
2,408.00	1.02	123.23	2,407.94	-3.29	0.40	-3.18	0.02	-0.01	-1.14	
2,508.00	0.94	121.23	2,507.92	-4.20	1.84	-4.58	0.09	-0.08	-2.00	
2,608.00	0.45	143.60	2,607.92	-4.94	2.78	-5.63	0.55	-0.49	22.37	
2,708.00	0.11	132.72	2,707.92	-5.32	3.08	-6.10	0.34	-0.34	-10.88	
2,808.00	0.38	217.52	2,807.91	-5.65	2.95	-6.35	0.39	0.27	84.80	
2,858.00	0.34	250.59	2,857.91	-5.83	2.71	-6.42	0.42	-0.08	66.14	
Tie into original hole @ 2858 MD										
2,883.00	2.31	104.06	2,882.91	-5.98	3.13	-6.72	10.40	7.88	-586.12	
2,978.00	8.50	100.81	2,977.44	-7.76	11.89	-11.77	6.52	6.52	-3.42	
3,073.00	13.77	99.66	3,070.62	-10.98	29.94	-21.74	5.55	5.55	-1.21	
3,167.00	19.17	105.47	3,160.73	-16.98	55.87	-37.33	6.00	5.74	6.18	
3,261.00	22.79	112.67	3,248.50	-28.11	87.56	-59.90	4.72	3.85	7.66	
3,355.00	25.96	116.74	3,334.12	-44.39	122.74	-88.56	3.81	3.37	4.33	
3,451.00	32.02	118.53	3,418.05	-66.02	163.90	-124.47	6.38	6.31	1.86	
3,546.00	38.32	117.63	3,495.67	-91.74	212.17	-166.90	6.65	6.63	-0.95	
3,637.00	44.25	119.71	3,564.03	-120.58	264.79	-213.91	6.69	6.52	2.29	
3,731.00	44.56	121.67	3,631.18	-154.15	321.35	-266.80	1.50	0.33	2.09	
3,825.00	44.79	120.38	3,698.03	-188.21	377.98	-320.17	1.00	0.24	-1.37	
3,919.00	43.79	118.73	3,765.32	-220.60	435.07	-372.18	1.62	-1.06	-1.76	
4,014.00	43.18	117.38	3,834.25	-251.35	492.76	-422.91	1.17	-0.64	-1.42	
4,109.00	42.08	115.11	3,904.14	-279.81	550.45	-471.53	1.99	-1.16	-2.39	
4,204.00	40.38	117.01	3,975.59	-307.29	606.70	-518.70	2.22	-1.79	2.00	
4,299.00	38.48	115.16	4,048.97	-333.84	660.88	-564.19	2.35	-2.00	-1.95	
4,391.00	38.57	113.73	4,120.94	-357.55	713.04	-606.29	0.97	0.10	-1.55	
4,487.00	39.89	115.11	4,195.31	-382.66	768.31	-650.88	1.65	1.38	1.44	
4,581.00	41.65	117.87	4,266.50	-410.05	823.23	-697.45	2.68	1.87	2.94	



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Site:	Lackawanna	MD Reference:		North Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Well:	Lackawanna 1H (slot X)	Survey Calculation Method:		Database:	Grid
Wellbore:	Sidetrack 01				Minimum Curvature
Design:	Surveys Sidetrack 01				DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
4,675.00	42.18	118.65	4,336.45	-439.79	878.54	-746.32	0.79	0.56	0.83
4,771.00	41.68	117.47	4,407.87	-469.96	935.14	-796.10	0.97	-0.52	-1.23
4,865.00	41.35	120.16	4,478.26	-499.98	989.72	-844.95	1.93	-0.35	2.86
4,961.00	41.37	121.25	4,550.32	-532.37	1,044.26	-895.97	0.75	0.02	1.14
5,055.00	39.71	119.96	4,621.75	-563.49	1,096.84	-945.05	1.98	-1.77	-1.37
5,150.00	40.50	119.65	4,694.41	-593.90	1,149.94	-993.70	0.86	0.83	-0.33
5,245.00	43.12	119.50	4,765.22	-625.16	1,205.02	-1,043.88	2.76	2.76	-0.16
5,338.00	41.09	118.53	4,834.21	-655.41	1,259.54	-1,092.92	2.29	-2.18	-1.04
5,433.00	40.07	117.35	4,906.36	-684.37	1,314.13	-1,140.80	1.34	-1.07	-1.24
5,528.00	41.85	114.90	4,978.11	-711.76	1,370.04	-1,187.75	2.52	1.87	-2.58
5,622.00	42.46	115.22	5,047.79	-738.49	1,427.19	-1,234.56	0.69	0.65	0.34
5,718.00	42.72	115.54	5,118.47	-766.33	1,485.89	-1,283.01	0.35	0.27	0.33
5,812.00	42.45	118.28	5,187.68	-795.11	1,542.60	-1,331.54	1.99	-0.29	2.91
5,907.00	40.01	118.81	5,259.13	-825.02	1,597.60	-1,380.46	2.59	-2.57	0.56
6,002.00	40.70	118.48	5,331.52	-854.51	1,651.58	-1,428.59	0.76	0.73	-0.35
6,097.00	41.65	115.34	5,403.03	-882.80	1,707.35	-1,476.30	2.39	1.00	-3.31
6,192.00	41.93	113.23	5,473.87	-908.83	1,765.05	-1,522.69	1.51	0.29	-2.22
6,287.00	41.12	116.03	5,545.00	-935.06	1,822.29	-1,569.08	2.13	-0.85	2.95
6,316.00	40.75	116.09	5,566.91	-943.40	1,839.36	-1,583.40	1.28	-1.28	0.21
6,414.00	40.22	117.33	5,641.44	-972.00	1,896.20	-1,631.81	0.98	-0.54	1.27
6,510.00	36.22	111.26	5,716.88	-996.53	1,950.21	-1,675.39	5.71	-4.17	-6.32
6,604.00	29.67	106.25	5,795.73	-1,013.13	1,998.48	-1,709.43	7.54	-6.97	-5.33
6,699.00	23.74	99.92	5,880.58	-1,023.02	2,039.94	-1,734.63	6.92	-6.24	-6.66
6,794.00	18.90	87.88	5,969.09	-1,025.75	2,074.19	-1,750.44	6.85	-5.09	-12.67
6,889.00	15.30	68.02	6,059.96	-1,020.48	2,101.22	-1,756.07	7.17	-3.79	-20.91
6,984.00	14.64	42.35	6,151.83	-1,006.90	2,120.95	-1,751.22	6.96	-0.69	-27.02
7,079.00	16.09	23.11	6,243.49	-985.91	2,134.22	-1,737.02	5.55	1.53	-20.25
7,175.00	22.29	11.33	6,334.15	-955.78	2,143.03	-1,712.67	7.58	6.46	-12.27
7,270.00	27.34	357.71	6,420.42	-916.26	2,145.70	-1,677.29	8.00	5.32	-14.34
7,365.00	32.44	347.95	6,502.80	-869.48	2,139.50	-1,631.77	7.40	5.37	-10.27
7,412.00	34.95	342.85	6,541.91	-844.28	2,132.90	-1,605.99	8.04	5.34	-10.85
7,458.00	38.51	341.36	6,578.78	-818.11	2,124.43	-1,578.58	7.98	7.74	-3.24
7,511.00	43.08	340.66	6,618.89	-785.38	2,113.16	-1,544.04	8.67	8.62	-1.32
7,553.00	47.21	339.25	6,648.51	-757.42	2,102.94	-1,514.31	10.12	9.83	-3.36
7,576.00	49.54	339.07	6,663.78	-741.36	2,096.82	-1,497.13	10.15	10.13	-0.78
7,617.00	52.70	337.05	6,689.52	-711.76	2,084.89	-1,465.22	8.61	7.71	-4.93
7,649.00	55.12	335.21	6,708.37	-688.12	2,074.42	-1,439.37	8.88	7.56	-5.75
7,698.00	61.49	333.10	6,734.10	-650.63	2,056.23	-1,397.76	13.51	13.00	-4.31
7,744.00	69.36	329.76	6,753.22	-613.95	2,036.21	-1,356.19	18.34	17.11	-7.26
7,778.00	74.77	327.21	6,763.69	-586.39	2,019.30	-1,324.22	17.44	15.91	-7.50
7,839.00	85.23	324.57	6,774.27	-536.74	1,985.65	-1,265.40	17.67	17.15	-4.33
7,934.00	89.01	323.96	6,779.04	-459.74	1,930.24	-1,172.93	4.03	3.98	-0.64
8,029.00	92.35	327.56	6,777.91	-381.23	1,876.81	-1,079.84	5.17	3.52	3.79
8,124.00	90.46	331.95	6,775.58	-299.21	1,828.99	-985.69	5.03	-1.99	4.62

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Site:	Lackawanna	MD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
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Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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Measured Depth (ft)	Inclination (°)	Vertical Depth (ft)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
8,219.00	89.23	332.92	6,775.84	-215.00	1,785.03	-891.01	1.65	-1.29	1.02
8,314.00	86.73	330.55	6,779.19	-131.39	1,740.08	-796.51	3.62	-2.63	-2.49
8,407.00	87.38	330.81	6,783.97	-50.41	1,694.80	-704.23	0.75	0.70	0.28
8,502.00	89.27	330.90	6,786.74	32.52	1,648.35	-609.85	1.99	1.99	0.09
8,597.00	91.25	328.88	6,786.31	114.70	1,600.70	-515.62	2.98	2.08	-2.13
8,691.00	91.78	329.14	6,783.83	195.25	1,552.32	-422.61	0.63	0.56	0.28
8,786.00	91.30	328.61	6,781.27	276.54	1,503.23	-328.63	0.75	-0.51	-0.56
8,881.00	91.74	329.32	6,778.75	357.91	1,454.27	-234.64	0.88	0.46	0.75
8,974.00	90.68	329.67	6,776.79	438.02	1,407.07	-142.49	1.20	-1.14	0.38
9,070.00	91.74	330.02	6,774.76	521.01	1,358.86	-47.29	1.16	1.10	0.36
9,165.00	89.85	330.37	6,773.44	603.43	1,311.64	46.99	2.02	-1.99	0.37
9,260.00	90.68	330.81	6,773.00	686.19	1,264.99	141.37	0.99	0.87	0.46
9,355.00	90.11	330.20	6,772.35	768.87	1,218.22	235.72	0.88	-0.60	-0.64
9,450.00	90.95	330.72	6,771.47	851.52	1,171.39	330.07	1.04	0.88	0.55
9,545.00	89.76	329.67	6,770.88	933.95	1,124.17	424.36	1.67	-1.25	-1.11
9,640.00	90.55	329.58	6,770.62	1,015.91	1,076.13	518.54	0.84	0.83	-0.09
9,735.00	89.32	329.14	6,770.73	1,097.64	1,027.72	612.66	1.38	-1.29	-0.46
9,829.00	89.93	329.58	6,771.35	1,178.52	979.81	705.79	0.80	0.65	0.47
9,923.00	91.16	329.58	6,770.45	1,259.57	932.22	798.96	1.31	1.31	0.00
10,018.00	90.46	328.53	6,769.11	1,341.04	883.38	893.00	1.33	-0.74	-1.11
10,113.00	89.23	328.70	6,769.37	1,422.14	833.90	986.94	1.31	-1.29	0.18
10,208.00	90.37	329.32	6,769.70	1,503.58	784.99	1,080.98	1.37	1.20	0.65
10,303.00	89.36	329.23	6,769.92	1,585.24	736.45	1,175.08	1.07	-1.06	-0.09
10,396.00	90.20	329.32	6,770.28	1,665.18	688.94	1,267.20	0.91	0.90	0.10
10,491.00	89.49	330.02	6,770.54	1,747.18	640.97	1,361.39	1.05	-0.75	0.74
10,586.00	90.42	330.11	6,770.61	1,829.50	593.56	1,455.66	0.98	0.98	0.09
10,681.00	91.43	330.02	6,769.08	1,911.82	546.16	1,549.92	1.07	1.06	-0.09
10,776.00	92.70	330.37	6,765.66	1,994.20	498.97	1,644.16	1.39	1.34	0.37
10,872.00	90.99	330.72	6,762.56	2,077.74	451.79	1,739.46	1.82	-1.78	0.36
10,966.00	91.82	330.64	6,760.26	2,159.68	405.78	1,832.83	0.89	0.88	-0.09
11,061.00	88.26	330.81	6,760.19	2,242.53	359.33	1,927.22	3.75	-3.75	0.18
11,156.00	89.05	330.72	6,762.42	2,325.40	312.94	2,021.60	0.84	0.83	-0.09
11,250.00	90.07	331.34	6,763.15	2,407.64	267.42	2,115.06	1.27	1.09	0.66
11,345.00	89.19	330.81	6,763.76	2,490.79	221.47	2,209.52	1.08	-0.93	-0.56
11,440.00	90.29	330.55	6,764.19	2,573.61	174.95	2,303.91	1.19	1.16	-0.27
11,535.00	89.54	329.67	6,764.33	2,655.98	127.61	2,398.19	1.22	-0.79	-0.93
11,630.00	90.64	330.28	6,764.18	2,738.23	80.08	2,492.45	1.32	1.16	0.64
11,724.00	89.49	329.67	6,764.07	2,819.61	33.04	2,585.71	1.38	-1.22	-0.65
11,819.00	90.86	330.28	6,763.78	2,901.86	-14.49	2,679.96	1.58	1.44	0.64
11,914.00	89.63	329.49	6,763.38	2,984.03	-62.16	2,774.19	1.54	-1.29	-0.83
12,009.00	90.29	329.76	6,763.44	3,065.99	-110.19	2,868.37	0.75	0.69	0.28
12,103.00	89.14	328.79	6,763.91	3,146.79	-158.22	2,961.47	1.60	-1.22	-1.03
12,198.00	90.07	329.14	6,764.57	3,228.19	-207.19	3,055.50	1.05	0.98	0.37

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Lackawanna 1H (slot X)
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Site:	Lackawanna	MD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Well:	Lackawanna 1H (slot X)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
12,293.00	91.25	329.58	6,763.47	3,309.92	-255.61	3,149.61	1.33	1.24	0.46
12,387.00	92.26	330.02	6,760.59	3,391.12	-302.87	3,242.79	1.17	1.07	0.47
12,482.00	89.67	329.14	6,758.99	3,473.03	-350.96	3,336.94	2.88	-2.73	-0.93
12,575.00	90.42	329.58	6,758.92	3,553.04	-398.35	3,429.08	0.93	0.81	0.47
12,670.00	91.25	329.58	6,757.54	3,634.95	-446.45	3,523.24	0.87	0.87	0.00
12,765.00	89.85	329.14	6,756.62	3,716.68	-494.86	3,617.35	1.54	-1.47	-0.46
12,858.00	90.81	329.23	6,756.09	3,796.55	-542.50	3,709.45	1.04	1.03	0.10
12,953.00	91.87	329.14	6,753.87	3,878.12	-591.15	3,803.51	1.12	1.12	-0.09
13,048.00	89.71	329.67	6,752.56	3,959.88	-639.50	3,897.62	2.34	-2.27	0.56
13,143.00	90.42	329.93	6,752.45	4,041.98	-687.28	3,991.84	0.80	0.75	0.27
13,239.00	91.43	330.02	6,750.90	4,125.09	-735.31	4,087.07	1.06	1.05	0.09
13,333.00	89.76	330.11	6,749.92	4,206.54	-782.22	4,180.34	1.78	-1.78	0.10
13,427.00	90.68	330.37	6,749.56	4,288.14	-828.88	4,273.66	1.02	0.98	0.28
13,522.00	91.47	329.76	6,747.78	4,370.45	-876.27	4,367.91	1.05	0.83	-0.64
13,617.00	92.62	330.20	6,744.39	4,452.66	-923.77	4,462.10	1.30	1.21	0.46
13,712.00	90.99	330.28	6,741.40	4,535.08	-970.90	4,556.36	1.72	-1.72	0.08
13,806.00	90.02	330.99	6,740.57	4,617.00	-1,016.99	4,649.75	1.28	-1.03	0.76
13,900.00	90.73	331.69	6,739.96	4,699.48	-1,062.07	4,743.26	1.06	0.76	0.74
13,996.00	91.91	332.22	6,737.74	4,784.18	-1,107.20	4,838.84	1.35	1.23	0.55
14,090.00	90.99	330.28	6,735.36	4,866.57	-1,152.39	4,932.30	2.28	-0.98	-2.06
14,185.00	89.54	329.84	6,734.93	4,948.88	-1,199.81	5,026.57	1.60	-1.53	-0.46
14,280.00	90.33	329.76	6,735.03	5,030.99	-1,247.59	5,120.79	0.84	0.83	-0.08
14,374.00	91.47	331.51	6,733.56	5,112.90	-1,293.68	5,214.16	2.22	1.21	1.86
14,469.00	91.56	331.60	6,731.04	5,196.40	-1,338.91	5,308.67	0.13	0.09	0.09
14,564.00	90.64	329.93	6,729.22	5,279.28	-1,385.30	5,403.06	2.01	-0.97	-1.76
14,659.00	91.56	330.28	6,727.40	5,361.62	-1,432.64	5,497.32	1.04	0.97	0.37
14,754.00	90.95	329.23	6,725.32	5,443.67	-1,480.48	5,591.51	1.28	-0.64	-1.11
14,849.00	90.33	328.00	6,724.26	5,524.76	-1,529.95	5,685.44	1.45	-0.65	-1.29
14,944.00	91.12	328.09	6,723.05	5,605.36	-1,580.22	5,779.24	0.84	0.83	0.09
15,039.00	91.96	328.97	6,720.50	5,686.36	-1,629.80	5,873.12	1.28	0.88	0.93
15,134.00	90.20	328.97	6,718.71	5,767.74	-1,678.76	5,967.13	1.85	-1.85	0.00
15,229.00	91.43	329.67	6,717.36	5,849.44	-1,727.23	6,061.23	1.49	1.29	0.74
15,322.00	90.37	330.28	6,715.90	5,929.94	-1,773.76	6,153.49	1.31	-1.14	0.66
15,416.00	90.55	330.20	6,715.14	6,011.54	-1,820.41	6,246.80	0.21	0.19	-0.09
15,511.00	91.60	331.51	6,713.36	6,094.50	-1,866.67	6,341.21	1.77	1.11	1.38
15,605.00	90.77	330.55	6,711.42	6,176.72	-1,912.19	6,434.65	1.35	-0.88	-1.02
15,700.00	91.78	330.64	6,709.30	6,259.46	-1,958.82	6,529.00	1.07	1.06	0.09
15,795.00	90.29	329.14	6,707.59	6,341.62	-2,006.47	6,623.22	2.23	-1.57	-1.58
15,889.00	90.59	328.97	6,706.86	6,422.24	-2,054.80	6,716.28	0.37	0.32	-0.18
15,984.00	92.00	328.35	6,704.72	6,503.35	-2,104.20	6,810.21	1.62	1.48	-0.65
16,078.00	92.75	328.17	6,700.82	6,583.23	-2,153.61	6,902.99	0.82	0.80	-0.19
16,173.00	91.12	328.53	6,697.61	6,664.05	-2,203.43	6,996.82	1.76	-1.72	0.38
16,268.00	91.87	329.05	6,695.14	6,745.27	-2,252.63	7,090.77	0.96	0.79	0.55



Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Lackawanna 1H (slot X)
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Site:	Lackawanna	MD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Well:	Lackawanna 1H (slot X)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
16,363.00	92.53	329.41	6,691.49	6,826.84	-2,301.20	7,184.79	0.79	0.69	0.38
16,458.00	91.30	329.05	6,688.31	6,908.42	-2,349.77	7,278.83	1.35	-1.29	-0.38
16,553.00	92.26	328.70	6,685.36	6,989.70	-2,398.86	7,372.79	1.08	1.01	-0.37
16,649.00	93.32	329.05	6,680.69	7,071.78	-2,448.42	7,467.68	1.16	1.10	0.36
16,744.00	92.18	330.28	6,676.13	7,153.68	-2,496.34	7,561.75	1.76	-1.20	1.29
16,839.00	92.84	329.49	6,671.97	7,235.77	-2,543.96	7,655.90	1.08	0.69	-0.83
16,934.00	92.57	329.84	6,667.49	7,317.68	-2,591.89	7,749.98	0.46	-0.28	0.37
17,029.00	90.95	330.55	6,664.57	7,400.07	-2,639.08	7,844.23	1.86	-1.71	0.75
17,124.00	90.07	330.55	6,663.73	7,482.79	-2,685.79	7,938.59	0.93	-0.93	0.00
17,217.00	90.51	330.64	6,663.26	7,563.81	-2,731.45	8,030.98	0.48	0.47	0.10
17,312.00	91.38	331.16	6,661.69	7,646.80	-2,777.64	8,125.40	1.07	0.92	0.55
17,407.00	92.35	331.34	6,658.60	7,730.05	-2,823.31	8,219.85	1.04	1.02	0.19
17,502.00	90.51	331.43	6,656.23	7,813.41	-2,868.79	8,314.33	1.94	-1.94	0.09
17,598.00	91.52	331.25	6,654.53	7,897.64	-2,914.83	8,409.82	1.07	1.05	-0.19
17,693.00	92.18	332.04	6,651.46	7,981.19	-2,959.92	8,504.33	1.08	0.69	0.83
17,789.00	93.54	332.39	6,646.67	8,066.02	-3,004.62	8,599.85	1.46	1.42	0.36
17,883.00	92.88	331.69	6,641.41	8,148.91	-3,048.62	8,693.33	1.02	-0.70	-0.74
17,979.00	93.14	331.43	6,636.36	8,233.21	-3,094.28	8,788.74	0.38	0.27	-0.27
18,074.00	90.99	331.08	6,632.94	8,316.44	-3,139.93	8,883.16	2.29	-2.26	-0.37
18,170.00	90.24	331.34	6,631.91	8,400.57	-3,186.16	8,978.64	0.83	-0.78	0.27
18,265.00	90.95	330.81	6,630.92	8,483.72	-3,232.11	9,073.10	0.93	0.75	-0.56
18,359.00	91.96	331.87	6,628.54	8,566.17	-3,277.17	9,166.58	1.56	1.07	1.13
18,454.00	90.51	331.34	6,626.49	8,649.72	-3,322.34	9,261.11	1.63	-1.53	-0.56
18,549.00	91.12	331.78	6,625.14	8,733.25	-3,367.58	9,355.65	0.79	0.64	0.46
18,643.00	91.60	328.53	6,622.91	8,814.74	-3,414.34	9,448.91	3.49	0.51	-3.46
18,738.00	93.45	329.49	6,618.72	8,896.10	-3,463.20	9,542.85	2.19	1.95	1.01
18,833.00	93.80	329.58	6,612.72	8,977.82	-3,511.27	9,636.82	0.38	0.37	0.09
18,928.00	95.12	329.58	6,605.33	9,059.49	-3,559.23	9,730.71	1.39	1.39	0.00
19,023.00	93.54	328.61	6,598.16	9,140.77	-3,607.88	9,824.49	1.95	-1.66	-1.02
19,117.00	91.21	327.82	6,594.26	9,220.60	-3,657.35	9,917.26	2.62	-2.48	-0.84
19,213.00	91.87	327.74	6,591.68	9,301.78	-3,708.51	10,011.94	0.69	0.69	-0.08
19,308.00	89.54	327.82	6,590.51	9,382.14	-3,759.16	10,105.66	2.45	-2.45	0.08
19,403.00	90.77	328.26	6,590.25	9,462.74	-3,809.44	10,199.46	1.38	1.29	0.46
19,498.00	91.52	328.17	6,588.36	9,543.48	-3,859.47	10,293.28	0.80	0.79	-0.09
19,594.00	92.26	329.05	6,585.19	9,625.38	-3,909.44	10,388.16	1.20	0.77	0.92
19,688.00	93.41	328.88	6,580.54	9,705.82	-3,957.85	10,481.09	1.24	1.22	-0.18
19,783.00	92.22	330.02	6,575.88	9,787.53	-4,006.07	10,575.11	1.73	-1.25	1.20
19,877.00	93.45	329.41	6,571.23	9,868.61	-4,053.42	10,668.20	1.46	1.31	-0.65
19,972.00	91.16	330.28	6,567.41	9,950.68	-4,101.10	10,762.35	2.58	-2.41	0.92
20,067.00	91.82	330.72	6,564.94	10,033.33	-4,147.86	10,856.67	0.83	0.69	0.46
20,161.00	92.66	331.08	6,561.26	10,115.40	-4,193.54	10,950.04	0.97	0.89	0.38
20,256.00	91.34	331.69	6,557.95	10,198.75	-4,239.01	11,044.50	1.53	-1.39	0.64
20,351.00	92.62	332.57	6,554.66	10,282.67	-4,283.39	11,139.07	1.63	1.35	0.93
20,446.00	90.99	332.39	6,551.67	10,366.88	-4,327.27	11,233.71	1.73	-1.72	-0.19

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Lackawanna 1H (slot X)
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Site:	Lackawanna	MD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Well:	Lackawanna 1H (slot X)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
20,541.00	92.00	330.99	6,549.19	10,450.49	-4,372.30	11,328.24	1.82	1.06	-1.47
20,634.00	93.19	330.64	6,544.98	10,531.59	-4,417.60	11,420.57	1.33	1.28	-0.38
Survey @ 20634.00 MD 6544.98 TVD									
20,684.00	93.19	330.64	6,542.20	10,575.11	-4,442.08	11,470.17	0.00	0.00	0.00
Survey projected to 20684.00 MD 6542.20 TVD									

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
2,858.00	2,857.91	-5.83	2.71	Tie into original hole @ 2858 MD
20,634.00	6,544.98	10,531.59	-4,417.60	Survey @ 20634.00 MD 6544.98 TVD

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Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Lackawanna 1H (slot X)
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Site:	Lackawanna	MD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Well:	Lackawanna 1H (slot X)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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Project	Wetzel County, West Virginia (UTM17 NAD83)		
Map System:	Universal Transverse Mercator (US Survey Feet)	System Datum:	Mean Sea Level
Geo Datum:	NAD83 West Virginia - HARN		
Map Zone:	Zone 17N (84 W to 78 W)		

Site	Lackawanna				
Site Position:		Northing:	14,383,374.84 usft	Latitude:	39.60620769
From:	Lat/Long	Easting:	1,680,777.71 usft	Longitude:	-80.85669942
Position Uncertainty:	0.00 ft	Slot Radius:	13-3/16 "	Grid Convergence:	0.091 °

Well	Lackawanna 1H (slot X)					
Well Position	+N/-S	0.00 ft	Northing:	14,383,374.84 usft	Latitude:	39.60620769
	+E/-W	0.00 ft	Easting:	1,680,777.71 usft	Longitude:	-80.85669942
Position Uncertainty		0.00 ft	Wellhead Elevation:	ft	Ground Level:	1,306.00 ft

Wellbore	Sidetrack 01				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	8/27/2019	-8.622	66.652	51,844.62014915

Design	Surveys Sidetrack 01				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	2,858.00
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.00	0.00	0.00	337.16	

Survey Program	Date	9/15/2019			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
8.00	2,858.00	Gyro RKB=18 (Original Hole)	NS-GYRO-MS	North sensing gyrocompassing m/s	
2,883.00	20,634.00	MWD ST1 (Sidetrack 01)	MWD	MWD - Standard	
20,684.00	20,684.00	Projection (Sidetrack 01)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude	
0.00	0.00	0.00	0.00	0.00	0.00	14,383,374.84	1,680,777.71	39.60620769	-80.85669942	
8.00	0.00	0.00	8.00	0.00	0.00	14,383,374.84	1,680,777.71	39.60620769	-80.85669942	
18.00	0.00	231.09	18.00	0.00	0.00	14,383,374.84	1,680,777.71	39.60620769	-80.85669942	
108.00	0.11	231.09	108.00	-0.05	-0.07	14,383,374.79	1,680,777.65	39.60620754	-80.85669966	
208.00	0.42	287.04	208.00	-0.01	-0.49	14,383,374.84	1,680,777.22	39.60620767	-80.85670117	
308.00	0.36	309.38	308.00	0.30	-1.09	14,383,375.14	1,680,776.63	39.60620852	-80.85670327	
408.00	0.29	330.34	408.00	0.72	-1.45	14,383,375.56	1,680,776.26	39.60620967	-80.85670458	
508.00	0.44	284.90	507.99	1.04	-1.95	14,383,375.88	1,680,775.76	39.60621055	-80.85670634	
608.00	0.23	284.84	607.99	1.19	-2.52	14,383,376.03	1,680,775.20	39.60621096	-80.85670834	
708.00	0.11	308.84	707.99	1.30	-2.78	14,383,376.14	1,680,774.93	39.60621127	-80.85670930	

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Lackawanna 1H (slot X)
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Site:	Lackawanna	MD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Well:	Lackawanna 1H (slot X)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
808.00	0.07	207.12	807.99	1.31	-2.89	14,383,376.15	1,680,774.83	39.60621129	-80.85670966
908.00	0.17	107.20	907.99	1.21	-2.77	14,383,376.05	1,680,774.94	39.60621102	-80.85670926
1,008.00	0.19	121.02	1,007.99	1.08	-2.49	14,383,375.92	1,680,775.22	39.60621066	-80.85670825
1,108.00	0.22	136.23	1,107.99	0.85	-2.21	14,383,375.70	1,680,775.50	39.60621004	-80.85670728
1,208.00	0.19	211.45	1,207.99	0.57	-2.17	14,383,375.42	1,680,775.54	39.60620927	-80.85670711
1,308.00	0.44	198.33	1,307.99	0.07	-2.37	14,383,374.91	1,680,775.34	39.60620789	-80.85670785
1,408.00	0.36	189.48	1,407.99	-0.61	-2.55	14,383,374.24	1,680,775.17	39.60620603	-80.85670847
1,508.00	0.18	220.25	1,507.98	-1.04	-2.70	14,383,373.81	1,680,775.01	39.60620486	-80.85670902
1,608.00	0.05	202.88	1,607.98	-1.20	-2.82	14,383,373.65	1,680,774.89	39.60620442	-80.85670944
1,708.00	0.23	308.93	1,707.98	-1.11	-2.99	14,383,373.73	1,680,774.72	39.60620465	-80.85671005
1,808.00	0.37	334.34	1,807.98	-0.69	-3.29	14,383,374.15	1,680,774.42	39.60620580	-80.85671110
1,908.00	0.35	317.74	1,907.98	-0.18	-3.63	14,383,374.67	1,680,774.08	39.60620722	-80.85671232
2,008.00	0.11	215.70	2,007.98	-0.03	-3.89	14,383,374.81	1,680,773.82	39.60620763	-80.85671325
2,108.00	0.78	131.41	2,107.98	-0.56	-3.44	14,383,374.29	1,680,774.27	39.60620618	-80.85671164
2,208.00	0.77	125.25	2,207.97	-1.39	-2.38	14,383,373.45	1,680,775.33	39.60620387	-80.85670788
2,308.00	1.03	124.37	2,307.95	-2.29	-1.09	14,383,372.55	1,680,776.62	39.60620141	-80.85670331
2,408.00	1.02	123.23	2,407.94	-3.29	0.40	14,383,371.56	1,680,778.11	39.60619867	-80.85669803
2,508.00	0.94	121.23	2,507.92	-4.20	1.84	14,383,370.64	1,680,779.55	39.60619615	-80.85669291
2,608.00	0.45	143.60	2,607.92	-4.94	2.78	14,383,369.90	1,680,780.49	39.60619411	-80.85668959
2,708.00	0.11	132.72	2,707.92	-5.32	3.08	14,383,369.52	1,680,780.79	39.60619306	-80.85668852
2,808.00	0.38	217.52	2,807.91	-5.65	2.95	14,383,369.19	1,680,780.66	39.60619216	-80.85668898
2,858.00	0.34	250.59	2,857.91	-5.83	2.71	14,383,369.01	1,680,780.42	39.60619167	-80.85668984
Tie into original hole @ 2858 MD									
2,883.00	2.31	104.06	2,882.91	-5.98	3.13	14,383,368.87	1,680,780.84	39.60619126	-80.85668835
2,978.00	8.50	100.81	2,977.44	-7.76	11.89	14,383,367.08	1,680,789.60	39.60618633	-80.85665726
3,073.00	13.77	99.66	3,070.62	-10.98	29.94	14,383,363.87	1,680,807.66	39.60617741	-80.85659317
3,167.00	19.17	105.47	3,160.73	-16.98	55.87	14,383,357.87	1,680,833.58	39.60616083	-80.85650116
3,261.00	22.79	112.67	3,248.50	-28.11	87.56	14,383,346.73	1,680,865.27	39.60613009	-80.85638872
3,355.00	25.96	116.74	3,334.12	-44.39	122.74	14,383,330.45	1,680,900.45	39.60608523	-80.85626389
3,451.00	32.02	118.53	3,418.05	-66.02	163.90	14,383,308.82	1,680,941.62	39.60602565	-80.85611786
3,546.00	38.32	117.63	3,495.67	-91.74	212.17	14,383,283.10	1,680,989.89	39.60595481	-80.85594663
3,637.00	44.25	119.71	3,564.03	-120.58	264.79	14,383,254.26	1,681,042.51	39.60587536	-80.85575997
3,731.00	44.56	121.67	3,631.18	-154.15	321.35	14,383,220.69	1,681,099.06	39.60578291	-80.85555937
3,825.00	44.79	120.38	3,698.03	-188.21	377.98	14,383,186.63	1,681,155.69	39.60568912	-80.85535849
3,919.00	43.79	118.73	3,765.32	-220.60	435.07	14,383,154.25	1,681,212.78	39.60559994	-80.85515598
4,014.00	43.18	117.38	3,834.25	-251.35	492.76	14,383,123.50	1,681,270.47	39.60551523	-80.85495134
4,109.00	42.08	115.11	3,904.14	-279.81	550.45	14,383,095.04	1,681,328.17	39.60543681	-80.85474667
4,204.00	40.38	117.01	3,975.59	-307.29	606.70	14,383,067.55	1,681,384.41	39.60536108	-80.85454712
4,299.00	38.48	115.16	4,048.97	-333.84	660.88	14,383,041.01	1,681,438.59	39.60528793	-80.85435493
4,391.00	38.57	113.73	4,120.94	-357.55	713.04	14,383,017.29	1,681,490.75	39.60522258	-80.85416987
4,487.00	39.89	115.11	4,195.31	-382.66	768.31	14,382,992.19	1,681,546.02	39.60515338	-80.85397377
4,581.00	41.65	117.87	4,266.50	-410.05	823.23	14,382,964.79	1,681,600.94	39.60507789	-80.85377896
4,675.00	42.18	118.65	4,336.45	-439.79	878.54	14,382,935.06	1,681,656.25	39.60499599	-80.85358277
4,771.00	41.68	117.47	4,407.87	-469.96	935.14	14,382,904.88	1,681,712.85	39.60491286	-80.85338197
4,865.00	41.35	120.16	4,478.26	-499.98	989.72	14,382,874.86	1,681,767.43	39.60483017	-80.85318836
4,961.00	41.37	121.25	4,550.32	-532.37	1,044.26	14,382,842.47	1,681,821.97	39.60474097	-80.85299491
5,055.00	39.71	119.96	4,621.75	-563.49	1,096.84	14,382,811.36	1,681,874.55	39.60465528	-80.85280842
5,150.00	40.50	119.65	4,694.41	-593.90	1,149.94	14,382,780.94	1,681,927.65	39.60457151	-80.85262006
5,245.00	43.12	119.50	4,765.22	-625.16	1,205.02	14,382,749.69	1,681,982.73	39.60448542	-80.85242470
5,338.00	41.09	118.53	4,834.21	-655.41	1,259.54	14,382,719.43	1,682,037.25	39.60440209	-80.85223131
5,433.00	40.07	117.35	4,906.36	-684.37	1,314.13	14,382,690.47	1,682,091.84	39.60432231	-80.85203767
5,528.00	41.85	114.90	4,978.11	-711.76	1,370.04	14,382,663.08	1,682,147.75	39.60424682	-80.85183932
5,622.00	42.46	115.22	5,047.79	-738.49	1,427.19	14,382,636.36	1,682,204.90	39.60417318	-80.85163658
5,718.00	42.72	115.54	5,118.47	-766.33	1,485.89	14,382,608.51	1,682,263.60	39.60409643	-80.85142835
5,812.00	42.45	118.28	5,187.68	-795.11	1,542.60	14,382,579.73	1,682,320.31	39.60401714	-80.85122718

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Site:	Lackawanna	MD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Well:	Lackawanna 1H (slot X)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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Latitude
Longitude

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,907.00	40.01	118.81	5,259.13	-825.02	1,597.60	14,382,549.82	1,682,375.31	39.60393474	-80.85103208
6,002.00	40.70	118.48	5,331.52	-854.51	1,651.58	14,382,520.33	1,682,429.29	39.60385351	-80.85084059
6,097.00	41.65	115.34	5,403.03	-882.80	1,707.35	14,382,492.05	1,682,485.06	39.60377558	-80.85064278
6,192.00	41.93	113.23	5,473.87	-908.83	1,765.05	14,382,466.02	1,682,542.76	39.60370382	-80.85043807
6,287.00	41.12	116.03	5,545.00	-935.06	1,822.29	14,382,439.79	1,682,600.00	39.60363152	-80.85023500
6,316.00	40.75	116.09	5,566.91	-943.40	1,839.36	14,382,431.44	1,682,617.07	39.60360852	-80.85017445
6,414.00	40.22	117.33	5,641.44	-972.00	1,896.20	14,382,402.85	1,682,673.91	39.60352973	-80.84997283
6,510.00	36.22	111.26	5,716.88	-996.53	1,950.21	14,382,378.31	1,682,727.91	39.60346210	-80.84978123
6,604.00	29.67	106.25	5,795.73	-1,013.13	1,998.48	14,382,361.71	1,682,776.19	39.60341629	-80.84960992
6,699.00	23.74	99.92	5,880.58	-1,023.02	2,039.94	14,382,351.83	1,682,817.65	39.60338895	-80.84946280
6,794.00	18.90	87.88	5,969.09	-1,025.75	2,074.19	14,382,349.10	1,682,851.90	39.60339564	-80.84934122
6,889.00	15.30	68.02	6,059.96	-1,020.48	2,101.22	14,382,354.37	1,682,878.93	39.60338130	-80.84924522
6,984.00	14.64	42.35	6,151.83	-1,006.90	2,120.95	14,382,367.94	1,682,898.66	39.60343284	-80.84917509
7,079.00	16.09	23.11	6,243.49	-985.91	2,134.22	14,382,388.94	1,682,911.92	39.60349044	-80.84912787
7,175.00	22.29	11.33	6,334.15	-955.78	2,143.03	14,382,419.07	1,682,920.73	39.60357314	-80.84909641
7,270.00	27.34	357.71	6,420.42	-916.26	2,145.70	14,382,458.59	1,682,923.41	39.60368167	-80.84908669
7,365.00	32.44	347.95	6,502.80	-869.48	2,139.50	14,382,505.36	1,682,917.21	39.60381016	-80.84910842
7,412.00	34.95	342.85	6,541.91	-844.28	2,132.90	14,382,530.56	1,682,910.60	39.60387940	-80.84913172
7,458.00	38.51	341.36	6,578.78	-818.11	2,124.43	14,382,556.73	1,682,902.14	39.60395131	-80.84916162
7,511.00	43.08	340.66	6,618.89	-785.38	2,113.16	14,382,589.46	1,682,890.86	39.60404125	-80.84920145
7,553.00	47.21	339.25	6,648.51	-757.42	2,102.94	14,382,617.42	1,682,880.65	39.60411808	-80.84923755
7,576.00	49.54	339.07	6,663.78	-741.36	2,096.82	14,382,633.49	1,682,874.53	39.60416223	-80.84925917
7,617.00	52.70	337.05	6,689.52	-711.76	2,084.89	14,382,663.08	1,682,862.60	39.60424357	-80.84930136
7,649.00	55.12	335.21	6,708.37	-688.12	2,074.42	14,382,686.72	1,682,852.13	39.60430854	-80.84933839
7,698.00	61.49	333.10	6,734.10	-650.63	2,056.23	14,382,724.21	1,682,833.94	39.60441158	-80.84940274
7,744.00	69.36	329.76	6,753.22	-613.95	2,036.21	14,382,760.90	1,682,813.92	39.60451242	-80.84947360
7,778.00	74.77	327.21	6,763.69	-586.39	2,019.30	14,382,788.45	1,682,797.01	39.60458818	-80.84953347
7,839.00	85.23	324.57	6,774.27	-536.74	1,985.65	14,382,838.11	1,682,763.36	39.60472470	-80.84965267
7,934.00	89.01	323.96	6,779.04	-459.74	1,930.24	14,382,915.11	1,682,707.95	39.60493643	-80.84984892
8,029.00	92.35	327.56	6,777.91	-381.23	1,876.81	14,382,993.61	1,682,654.52	39.60515228	-80.85003816
8,124.00	90.46	331.95	6,775.58	-299.21	1,828.99	14,383,075.63	1,682,606.70	39.60537776	-80.85020746
8,219.00	89.23	332.92	6,775.84	-215.00	1,785.03	14,383,159.85	1,682,562.74	39.60560924	-80.85036304
8,314.00	86.73	330.55	6,779.19	-131.39	1,740.08	14,383,243.45	1,682,517.79	39.60583907	-80.85052214
8,407.00	87.38	330.81	6,783.97	-50.41	1,694.60	14,383,324.43	1,682,472.30	39.60606167	-80.85068314
8,502.00	89.27	330.90	6,786.74	32.52	1,648.35	14,383,407.37	1,682,426.06	39.60628965	-80.85084684
8,597.00	91.25	328.88	6,786.31	114.70	1,600.70	14,383,489.54	1,682,378.41	39.60651554	-80.85101555
8,691.00	91.78	329.14	6,783.83	195.25	1,552.32	14,383,570.09	1,682,330.03	39.60673699	-80.85118685
8,786.00	91.30	328.61	6,781.27	276.54	1,503.23	14,383,651.39	1,682,280.94	39.60696047	-80.85136066
8,881.00	91.74	329.32	6,778.75	357.91	1,454.27	14,383,732.76	1,682,231.98	39.60718417	-80.85153402
8,974.00	90.68	329.67	6,776.79	438.02	1,407.07	14,383,812.86	1,682,184.78	39.60740439	-80.85170112
9,070.00	91.74	330.02	6,774.76	521.01	1,358.86	14,383,895.85	1,682,136.57	39.60763253	-80.85187182
9,165.00	89.85	330.37	6,773.44	603.43	1,311.64	14,383,978.27	1,682,089.35	39.60785910	-80.85203897
9,260.00	90.68	330.81	6,773.00	686.19	1,264.99	14,384,061.03	1,682,042.70	39.60808659	-80.85220411
9,355.00	90.11	330.20	6,772.35	768.87	1,218.22	14,384,143.72	1,681,995.93	39.60831388	-80.85236970
9,450.00	90.95	330.72	6,771.47	851.52	1,171.39	14,384,226.36	1,681,949.10	39.60854107	-80.85253551
9,545.00	89.76	329.67	6,770.88	933.95	1,124.17	14,384,308.79	1,681,901.88	39.60876767	-80.85270268
9,640.00	90.55	329.58	6,770.62	1,015.91	1,076.13	14,384,390.75	1,681,853.84	39.60899297	-80.85287276
9,735.00	89.32	329.14	6,770.73	1,097.64	1,027.72	14,384,472.48	1,681,805.43	39.60921766	-80.85304419
9,829.00	89.93	329.58	6,771.35	1,178.52	979.81	14,384,553.36	1,681,757.52	39.60943999	-80.85321381
9,923.00	91.16	329.58	6,770.45	1,259.57	932.22	14,384,634.41	1,681,709.93	39.60966281	-80.85338232
10,018.00	90.46	328.53	6,769.11	1,341.04	883.38	14,384,715.88	1,681,661.09	39.60988677	-80.85355528
10,113.00	89.23	328.70	6,769.37	1,422.14	833.90	14,384,796.98	1,681,611.61	39.61010971	-80.85373047
10,208.00	90.37	329.32	6,769.70	1,503.58	784.99	14,384,878.42	1,681,562.70	39.61033359	-80.85390367
10,303.00	89.36	329.23	6,769.92	1,585.24	736.45	14,384,960.08	1,681,514.16	39.61055808	-80.85407554
10,396.00	90.20	329.32	6,770.28	1,665.18	688.94	14,385,040.02	1,681,466.65	39.61077785	-80.85424379

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Site:	Lackawanna	MD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
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Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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 Environmental Protection
 Longitude

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
10,491.00	89.49	330.02	6,770.54	1,747.18	640.97	14,385,122.02	1,681,418.68	39.61100325	-80.85441365
10,586.00	90.42	330.11	6,770.61	1,829.50	593.56	14,385,204.34	1,681,371.27	39.61122956	-80.85458150
10,681.00	91.43	330.02	6,769.08	1,911.82	546.16	14,385,286.66	1,681,323.87	39.61145584	-80.85474933
10,776.00	92.70	330.37	6,765.66	1,994.20	498.97	14,385,369.04	1,681,276.68	39.61168229	-80.85491641
10,872.00	90.99	330.72	6,762.56	2,077.74	451.79	14,385,452.58	1,681,229.50	39.61191194	-80.85508346
10,966.00	91.82	330.64	6,760.26	2,159.68	405.78	14,385,534.51	1,681,183.49	39.61213716	-80.85524638
11,061.00	88.26	330.81	6,760.19	2,242.53	359.33	14,385,617.37	1,681,137.04	39.61236491	-80.85541083
11,156.00	89.05	330.72	6,762.42	2,325.40	312.94	14,385,700.24	1,681,090.66	39.61259272	-80.85557506
11,250.00	90.07	331.34	6,763.15	2,407.64	267.42	14,385,782.48	1,681,045.13	39.61281877	-80.85573625
11,345.00	89.19	330.81	6,763.76	2,490.79	221.47	14,385,865.62	1,680,999.18	39.61304732	-80.85589892
11,440.00	90.29	330.55	6,764.19	2,573.61	174.95	14,385,948.45	1,680,952.66	39.61327500	-80.85606363
11,535.00	89.54	329.67	6,764.33	2,655.98	127.61	14,386,030.81	1,680,905.32	39.61350141	-80.85623126
11,630.00	90.64	330.28	6,764.18	2,738.23	80.08	14,386,113.06	1,680,857.79	39.61372750	-80.85639958
11,724.00	89.49	329.67	6,764.07	2,819.61	33.04	14,386,194.45	1,680,810.75	39.61395122	-80.85656613
11,819.00	90.86	330.28	6,763.78	2,901.86	-14.49	14,386,276.69	1,680,763.22	39.61417731	-80.85673445
11,914.00	89.63	329.49	6,763.38	2,984.03	-62.16	14,386,358.87	1,680,715.56	39.61440320	-80.85690323
12,009.00	90.29	329.76	6,763.44	3,065.99	-110.19	14,386,440.83	1,680,667.52	39.61462850	-80.85707335
12,103.00	89.14	328.79	6,763.91	3,146.79	-158.22	14,386,521.63	1,680,619.49	39.61485062	-80.85724342
12,198.00	90.07	329.14	6,764.57	3,228.19	-207.19	14,386,603.03	1,680,570.52	39.61507438	-80.85741687
12,293.00	91.25	329.58	6,763.47	3,309.92	-255.61	14,386,684.76	1,680,522.11	39.61529905	-80.85758832
12,387.00	92.26	330.02	6,760.59	3,391.12	-302.87	14,386,765.96	1,680,474.85	39.61552227	-80.85775568
12,482.00	89.67	329.14	6,758.99	3,473.03	-350.96	14,386,847.86	1,680,426.76	39.61574741	-80.85792599
12,575.00	90.42	329.58	6,758.92	3,553.04	-398.35	14,386,927.88	1,680,379.36	39.61596737	-80.85809384
12,670.00	91.25	329.58	6,757.54	3,634.95	-446.45	14,387,009.79	1,680,331.26	39.61619254	-80.85826417
12,765.00	89.85	329.14	6,756.62	3,716.68	-494.86	14,387,091.52	1,680,282.85	39.61641721	-80.85843562
12,858.00	90.81	329.23	6,756.09	3,796.55	-542.50	14,387,171.39	1,680,235.21	39.61663677	-80.85860434
12,953.00	91.87	329.14	6,753.87	3,878.12	-591.15	14,387,252.95	1,680,186.56	39.61686098	-80.85877665
13,048.00	89.71	329.67	6,752.56	3,959.88	-639.50	14,387,334.71	1,680,138.22	39.61708574	-80.85894786
13,143.00	90.42	329.93	6,752.45	4,041.98	-687.28	14,387,416.82	1,680,090.43	39.61731144	-80.85911709
13,239.00	91.43	330.02	6,750.90	4,125.09	-735.31	14,387,499.92	1,680,042.40	39.61753988	-80.85928718
13,333.00	89.76	330.11	6,749.92	4,206.54	-782.22	14,387,581.38	1,679,995.50	39.61776378	-80.85945329
13,427.00	90.68	330.37	6,749.56	4,288.14	-828.88	14,387,662.98	1,679,948.84	39.61798809	-80.85961852
13,522.00	91.47	329.76	6,747.78	4,370.45	-876.27	14,387,745.29	1,679,901.44	39.61821434	-80.85978637
13,617.00	92.62	330.20	6,744.39	4,452.66	-923.77	14,387,827.49	1,679,853.94	39.61844030	-80.85995458
13,712.00	90.99	330.28	6,741.40	4,535.08	-970.90	14,387,909.92	1,679,806.81	39.61866688	-80.86012149
13,806.00	90.02	330.99	6,740.57	4,617.00	-1,016.99	14,387,991.83	1,679,760.72	39.61889205	-80.86028472
13,900.00	90.73	331.69	6,739.96	4,699.48	-1,062.07	14,388,074.31	1,679,715.64	39.61911877	-80.86044435
13,996.00	91.91	332.22	6,737.74	4,784.18	-1,107.20	14,388,159.02	1,679,670.52	39.61935158	-80.86060412
14,090.00	90.99	330.28	6,735.36	4,866.57	-1,152.39	14,388,241.40	1,679,625.32	39.61957802	-80.86076417
14,185.00	89.54	329.84	6,734.93	4,948.88	-1,199.81	14,388,323.72	1,679,577.91	39.61980430	-80.86093208
14,280.00	90.33	329.76	6,735.03	5,030.99	-1,247.59	14,388,405.82	1,679,530.12	39.62003000	-80.86110132
14,374.00	91.47	331.51	6,733.56	5,112.90	-1,293.68	14,388,487.73	1,679,484.04	39.62025514	-80.86126454
14,469.00	91.56	331.60	6,731.04	5,196.40	-1,338.91	14,388,571.23	1,679,438.80	39.62048466	-80.86142471
14,564.00	90.64	329.93	6,729.22	5,279.28	-1,385.30	14,388,654.11	1,679,392.42	39.62071247	-80.86158899
14,659.00	91.56	330.28	6,727.40	5,361.62	-1,432.64	14,388,736.45	1,679,345.08	39.62093882	-80.86175665
14,754.00	90.95	329.23	6,725.32	5,443.67	-1,480.48	14,388,818.50	1,679,297.24	39.62116435	-80.86192609
14,849.00	90.33	328.00	6,724.26	5,524.76	-1,529.95	14,388,899.59	1,679,247.77	39.62138727	-80.86210133
14,944.00	91.12	328.09	6,723.05	5,605.36	-1,580.22	14,388,980.19	1,679,197.49	39.62160883	-80.86227943
15,039.00	91.96	328.97	6,720.50	5,686.36	-1,629.80	14,389,061.19	1,679,147.92	39.62183148	-80.86245504
15,134.00	90.20	328.97	6,718.71	5,767.74	-1,678.76	14,389,142.57	1,679,098.96	39.62205521	-80.86262847
15,229.00	91.43	329.67	6,717.36	5,849.44	-1,727.23	14,389,224.27	1,679,050.49	39.62227977	-80.86280015
15,322.00	90.37	330.28	6,715.90	5,929.94	-1,773.76	14,389,304.78	1,679,003.96	39.62250107	-80.86296495
15,416.00	90.55	330.20	6,715.14	6,011.54	-1,820.41	14,389,386.38	1,678,957.30	39.62272537	-80.86313020
15,511.00	91.60	331.51	6,713.36	6,094.50	-1,866.67	14,389,469.33	1,678,911.05	39.62295338	-80.86329402
15,605.00	90.77	330.55	6,711.42	6,176.72	-1,912.19	14,389,551.55	1,678,865.53	39.62317937	-80.86345523

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Lackawanna 1H (slot X)
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Site:	Lackawanna	MD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Well:	Lackawanna 1H (slot X)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude
15,700.00	91.78	330.64	6,709.30	6,259.46	-1,958.82	14,389,634.29	1,678,818.90	39.62340680
15,795.00	90.29	329.14	6,707.59	6,341.62	-2,006.47	14,389,716.45	1,678,771.25	39.62363265
15,889.00	90.59	328.97	6,706.86	6,422.24	-2,054.80	14,389,797.07	1,678,722.91	39.62385426
15,984.00	92.00	328.35	6,704.72	6,503.35	-2,104.20	14,389,878.18	1,678,673.52	39.62407723
16,078.00	92.75	328.17	6,700.82	6,583.23	-2,153.61	14,389,958.06	1,678,624.11	39.62429680
16,173.00	91.12	328.53	6,697.61	6,664.05	-2,203.43	14,390,038.88	1,678,574.29	39.62451897
16,268.00	91.87	329.05	6,695.14	6,745.27	-2,252.63	14,390,120.10	1,678,525.08	39.62474224
16,363.00	92.53	329.41	6,691.49	6,826.84	-2,301.20	14,390,201.67	1,678,476.52	39.62496645
16,458.00	91.30	329.05	6,688.31	6,908.42	-2,349.77	14,390,283.24	1,678,427.94	39.62519070
16,553.00	92.26	328.70	6,685.36	6,989.70	-2,398.86	14,390,364.53	1,678,378.86	39.62541413
16,649.00	93.32	329.05	6,680.69	7,071.78	-2,448.42	14,390,446.61	1,678,329.30	39.62563976
16,744.00	92.18	330.28	6,676.13	7,153.68	-2,496.34	14,390,528.51	1,678,281.38	39.62586487
16,839.00	92.84	329.49	6,671.97	7,235.77	-2,543.96	14,390,610.60	1,678,233.76	39.62609054
16,934.00	92.57	329.84	6,667.49	7,317.68	-2,591.89	14,390,692.50	1,678,185.83	39.62631567
17,029.00	90.95	330.55	6,664.57	7,400.07	-2,639.08	14,390,774.89	1,678,138.64	39.62654214
17,124.00	90.07	330.55	6,663.73	7,482.79	-2,685.79	14,390,857.62	1,678,091.93	39.62676951
17,217.00	90.51	330.64	6,663.26	7,563.81	-2,731.45	14,390,938.63	1,678,046.27	39.62699220
17,312.00	91.38	331.16	6,661.69	7,646.80	-2,777.64	14,391,021.63	1,678,000.07	39.62722032
17,407.00	92.35	331.34	6,658.60	7,730.05	-2,823.31	14,391,104.87	1,677,954.41	39.62744913
17,502.00	90.51	331.43	6,656.23	7,813.41	-2,868.79	14,391,188.24	1,677,908.92	39.62767827
17,598.00	91.52	331.25	6,654.53	7,897.64	-2,914.83	14,391,272.46	1,677,862.89	39.62790976
17,693.00	92.18	332.04	6,651.46	7,981.19	-2,959.92	14,391,356.02	1,677,817.80	39.62813942
17,789.00	93.54	332.39	6,646.67	8,066.02	-3,004.62	14,391,440.84	1,677,773.10	39.62837256
17,883.00	92.88	331.69	6,641.41	8,148.91	-3,048.62	14,391,523.74	1,677,729.10	39.62860040
17,979.00	93.14	331.43	6,636.36	8,233.21	-3,094.28	14,391,608.04	1,677,683.44	39.62883210
18,074.00	90.99	331.08	6,632.94	8,316.44	-3,139.93	14,391,691.27	1,677,637.79	39.62906087
18,170.00	90.24	331.34	6,631.91	8,400.57	-3,186.16	14,391,775.40	1,677,591.56	39.62929211
18,265.00	90.95	330.81	6,630.92	8,483.72	-3,232.11	14,391,858.54	1,677,545.61	39.62952063
18,359.00	91.96	331.87	6,628.54	8,566.17	-3,277.17	14,391,941.00	1,677,500.54	39.62974726
18,454.00	90.51	331.34	6,626.49	8,649.72	-3,322.34	14,392,024.54	1,677,455.38	39.62997690
18,549.00	91.12	331.78	6,625.14	8,733.25	-3,367.58	14,392,108.07	1,677,410.14	39.63020647
18,643.00	91.60	328.53	6,622.91	8,814.74	-3,414.34	14,392,189.57	1,677,363.38	39.63043049
18,738.00	93.45	329.49	6,618.72	8,896.10	-3,463.20	14,392,270.93	1,677,314.52	39.63065412
18,833.00	93.80	329.58	6,612.72	8,977.82	-3,511.27	14,392,352.65	1,677,266.45	39.63087874
18,928.00	95.12	329.58	6,605.33	9,059.49	-3,559.23	14,392,434.32	1,677,218.49	39.63110323
19,023.00	93.54	328.61	6,598.16	9,140.77	-3,607.88	14,392,515.59	1,677,169.84	39.63132664
19,117.00	91.21	327.82	6,594.26	9,220.60	-3,657.35	14,392,595.42	1,677,120.37	39.63154607
19,213.00	91.87	327.74	6,591.68	9,301.78	-3,708.51	14,392,676.61	1,677,069.21	39.63176924
19,308.00	89.54	327.82	6,590.51	9,382.14	-3,759.16	14,392,756.97	1,677,018.56	39.63199014
19,403.00	90.77	328.26	6,590.25	9,462.74	-3,809.44	14,392,837.56	1,676,968.28	39.63221169
19,498.00	91.52	328.17	6,588.36	9,543.48	-3,859.47	14,392,918.30	1,676,918.25	39.63243362
19,594.00	92.26	329.05	6,585.19	9,625.38	-3,909.44	14,393,000.20	1,676,868.28	39.63265875
19,688.00	93.41	328.88	6,580.54	9,705.82	-3,957.85	14,393,080.65	1,676,819.87	39.63287987
19,783.00	92.22	330.02	6,575.88	9,787.53	-4,006.07	14,393,162.36	1,676,771.65	39.63310447
19,877.00	93.45	329.41	6,571.23	9,868.61	-4,053.42	14,393,243.43	1,676,724.30	39.63332731
19,972.00	91.16	330.28	6,567.41	9,950.68	-4,101.10	14,393,325.50	1,676,676.62	39.63355289
20,067.00	91.82	330.72	6,564.94	10,033.33	-4,147.86	14,393,408.15	1,676,629.86	39.63378007
20,161.00	92.66	331.08	6,561.26	10,115.40	-4,193.54	14,393,490.22	1,676,584.18	39.63400565
20,256.00	91.34	331.69	6,557.95	10,198.75	-4,239.01	14,393,573.57	1,676,538.71	39.63423472
20,351.00	92.62	332.57	6,554.66	10,282.67	-4,283.39	14,393,657.50	1,676,494.33	39.63446539
20,446.00	90.99	332.39	6,551.67	10,366.88	-4,327.27	14,393,741.70	1,676,450.46	39.63469682
20,541.00	92.00	330.99	6,549.19	10,450.49	-4,372.30	14,393,825.31	1,676,405.42	39.63492661
20,634.00	93.19	330.64	6,544.98	10,531.59	-4,417.60	14,393,906.42	1,676,360.12	39.63514954

Survey @ 20634.00 MD 6544.98 TVD

Company:	Tug Hill Operating LLC	Local Co-ordinate Reference:	Well Lackawanna 1H (slot X)
Project:	Wetzel County, West Virginia (UTM17 NAD83)	TVD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Site:	Lackawanna	MD Reference:	RKB=1306+18 @ 1324.00ft (Precision 528)
Well:	Lackawanna 1H (slot X)	North Reference:	Grid
Wellbore:	Sidetrack 01	Survey Calculation Method:	Minimum Curvature
Design:	Surveys Sidetrack 01	Database:	DB_Aug1919_v14

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
20,684.00	93.19	330.64	6,542.20	10,575.11	-4,442.08	14,393,949.93	1,676,335.64	39.63526913	-80.87241750
Survey projected to 20684.00 MD 6542.20 TVD									

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
2,858.00	2,857.91	-5.83	2.71	Tie into original hole @ 2858 MD
20,634.00	6,544.98	10,531.59	-4,417.60	Survey @ 20634.00 MD 6544.98 TVD
20,684.00	6,542.20	10,575.11	-4,442.08	Survey projected to 20684.00 MD 6542.20 TVD

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