



Ryan Energy Technologies Survey Report



097-3718
097-03718

Company: Chesapeake Operating, Inc.	Date: 8/12/2010	Time: 16:46:08	Page: 1
Field: Upshur Co, WV	Co-ordinate(NE) Reference: Site: Lynette Howes 5H, Grid North		
Site: Lynette Howes 5H	Vertical (TVD) Reference: Est RKB 1857.0		
Well: Well # L Howes 5H	Section (VS) Reference: Well (0.00N,0.00E,357.96Azi)		
Wellpath: L Howes 5H	Survey Calculation Method: Minimum Curvature	Db: Sybase	

Field: Upshur Co, WV

Map System: US State Plane Coordinate System 1927	Map Zone: West Virginia, Southern Zone
Geo Datum: NAD27 (Clarke 1866)	Coordinate System: Site Centre
Sys Datum: Mean Sea Level	Geomagnetic Model: IGRF2010

Site: Lynette Howes 5H
Upshur Co, WV

Site Position:	Northing: 697923.00 ft	Latitude: 38 54 50.254 N
From: Map	Easting: 2225947.00 ft	Longitude: 80 12 21.483 W
Position Uncertainty: 0.00 ft		North Reference: Grid
Ground Level: 1842.00 ft		Grid Convergence: 0.49 deg

Well: Well # L Howes 5H **Slot Name:**

Well Position:	+N-S 0.00 ft	Northing: 697923.00 ft	Latitude: 38 54 50.254 N
	+E-W 0.00 ft	Easting: 2225947.00 ft	Longitude: 80 12 21.483 W
Position Uncertainty:	0.00 ft		

Wellpath: L Howes 5H

Current Datum: Est RKB	Height 1857.00 ft	Drilled From: Surface	
Magnetic Data: 6/30/2010		Tie-on Depth: 0.00 ft	
Field Strength: 52528 nT		Above System Datum: Mean Sea Level	
Vertical Section: Depth From (TVD)	+N-S	Declination: -8.63 deg	
ft	ft	Mag Dip Angle: 66.82 deg	
		+E-W	
		ft	
		Direction	
		deg	
0.00	0.00	0.00	357.96

Survey Program for Definitive Wellpath

Date: 8/12/2010	Validated: No	Version: 2
Actual From	To	Survey
ft	ft	
100.00	2415.00	Survey #1 (100.00-2415.00)
2873.00	5432.00	Survey #2 (2873.00-5432.00)
5514.00	13205.00	Survey #3 (5514.00-13205.00)
13259.00	13259.00	Survey #4 (13259.00-13259.00)

	Toolcode	Tool Name
	Gyro	Gyro MS
	SS	Singleshot
	MWD	MWD - Standard
	Projection	Projection

Survey

MD ft	Incl deg	Azim deg	TVD ft	+N/-S ft	+E/-W ft	VS ft	DLS deg/100ft	Build deg/100ft	Turn deg/100ft	Tool/Comment
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	TIE LINE
100.00	0.44	129.76	100.00	-0.25	0.30	-0.26	0.44	0.44	0.00	Gyro
200.00	0.49	127.89	200.00	-0.75	0.93	-0.79	0.05	0.05	-1.87	Gyro
300.00	0.27	121.60	299.99	-1.14	1.47	-1.19	0.22	-0.22	-6.29	Gyro
400.00	0.33	129.44	399.99	-1.45	1.89	-1.51	0.07	0.06	7.84	Gyro
500.00	0.37	133.84	499.99	-1.85	2.34	-1.94	0.05	0.04	4.40	Gyro
600.00	0.29	107.42	599.99	-2.15	2.82	-2.25	0.17	-0.08	-26.42	Gyro
700.00	0.21	126.49	699.99	-2.34	3.21	-2.45	0.11	-0.08	19.07	Gyro
800.00	0.40	124.45	799.99	-2.64	3.64	-2.77	0.19	0.19	-2.04	Gyro
900.00	0.30	105.42	899.98	-2.91	4.18	-3.06	0.15	-0.10	-19.03	Gyro
1000.00	0.44	120.03	999.98	-3.17	4.77	-3.34	0.17	0.14	14.61	Gyro
1100.00	0.49	126.47	1099.98	-3.62	5.44	-3.81	0.07	0.05	6.44	Gyro
1200.00	0.95	116.07	1199.97	-4.24	6.53	-4.47	0.48	0.46	-10.40	Gyro
1300.00	0.09	224.05	1299.97	-4.66	7.22	-4.91	0.98	-0.86	107.98	Gyro
1400.00	0.30	163.26	1399.97	-4.97	7.24	-5.22	0.27	0.21	-60.79	Gyro
1500.00	0.44	121.18	1499.96	-5.41	7.65	-5.68	0.30	0.14	-42.08	Gyro
1600.00	0.40	111.10	1599.96	-5.74	8.30	-6.03	0.08	-0.04	-10.08	Gyro
1700.00	0.56	116.85	1699.96	-6.09	9.06	-6.40	0.17	0.16	5.75	Gyro
1800.00	0.56	121.30	1799.95	-6.56	9.92	-6.91	0.04	0.00	4.45	Gyro
1900.00	0.36	119.31	1899.95	-6.97	10.61	-7.34	0.20	-0.20	-1.99	Gyro

WV GEOLOGICAL SURVEY
MORGANTOWN, WV

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Field: Upshur Co, WV	Co-ordinate(NE) Reference:	Site: Lynette Howes 5H, Grid North	
Site: Lynette Howes 5H	Vertical (TVD) Reference:	Est RKB 1857.0	
Well: Well # L Howes 5H	Section (VS) Reference:	Well (0.00N,0.00E,357.96Azi)	
Wellpath: L Howes 5H	Survey Calculation Method:	Minimum Curvature	Db: Sybase

Survey

MD ft	Incl deg	Azim deg	TVD ft	+N/-S ft	+E/-W ft	VS ft	DLS deg/100ft	Build deg/100ft	Turn deg/100ft	Tool/Comment
2000.00	0.52	109.30	1999.95	-7.27	11.31	-7.67	0.18	0.16	-10.01	Gyro
2100.00	0.60	111.41	2099.94	-7.61	12.23	-8.04	0.08	0.08	2.11	Gyro
2200.00	0.61	118.06	2199.94	-8.05	13.18	-8.52	0.07	0.01	6.65	Gyro
2300.00	0.46	111.01	2299.93	-8.45	14.03	-8.94	0.16	-0.15	-7.05	Gyro
2400.00	0.65	119.12	2399.93	-8.87	14.90	-9.39	0.21	0.19	8.11	Gyro
2415.00	0.51	116.90	2414.93	-8.94	15.03	-9.47	0.95	-0.93	-14.80	Gyro
2873.00	0.40	55.60	2872.91	-8.96	18.17	-9.60	0.10	-0.02	-13.38	SS
3233.00	0.30	40.60	3232.91	-7.53	19.82	-8.23	0.04	-0.03	-4.17	SS
3607.00	0.60	202.00	3606.90	-8.61	19.72	-9.30	0.24	0.08	43.16	SS
3924.00	0.20	202.20	3923.89	-10.66	18.89	-11.32	0.13	-0.13	0.06	SS
4428.00	1.00	156.80	4427.86	-15.51	20.29	-16.23	0.17	0.16	-9.01	SS
4803.00	1.25	128.80	4802.79	-21.08	24.77	-21.95	0.16	0.07	-7.47	SS
5114.00	2.40	119.00	5113.63	-26.37	33.11	-27.53	0.38	0.37	-3.15	SS
5432.00	2.10	135.40	5431.39	-33.74	43.02	-35.25	0.22	-0.09	5.16	SS
5514.00	2.20	106.30	5513.33	-35.26	45.59	-36.86	1.32	0.12	-35.49	MWD
5578.00	7.30	91.70	5577.10	-35.72	50.84	-37.51	8.13	7.97	-22.81	MWD
5641.00	10.40	87.10	5639.34	-35.55	60.52	-37.68	5.04	4.92	-7.30	MWD
5705.00	11.30	86.50	5702.19	-34.88	72.55	-37.44	1.42	1.41	-0.94	MWD
5768.00	12.90	89.30	5763.79	-34.41	85.74	-37.44	2.70	2.54	4.44	MWD
5831.00	14.90	92.60	5824.95	-34.70	100.86	-38.26	3.41	3.17	5.24	MWD
5893.00	16.90	95.30	5884.57	-35.89	117.80	-40.06	3.44	3.23	4.35	MWD
5955.00	18.30	97.40	5943.67	-37.98	136.43	-42.81	2.48	2.26	3.39	MWD
6017.00	20.50	95.40	6002.14	-40.25	156.89	-45.81	3.71	3.55	-3.23	MWD
6080.00	22.50	94.20	6060.76	-42.17	179.90	-48.55	3.25	3.17	-1.90	MWD
6144.00	22.50	92.90	6119.89	-43.69	204.34	-50.94	0.78	0.00	-2.03	MWD
6207.00	22.20	94.80	6178.16	-45.30	228.24	-53.39	1.24	-0.48	3.02	MWD
6268.00	21.70	98.20	6234.74	-47.87	250.89	-56.77	2.24	-0.82	5.57	MWD
6331.00	21.00	99.40	6293.41	-51.37	273.56	-61.08	1.31	-1.11	1.90	MWD
6395.00	20.50	94.60	6353.26	-54.14	296.04	-64.65	2.77	-0.78	-7.50	MWD
6458.00	19.90	90.70	6412.39	-55.16	317.76	-66.44	2.34	-0.95	-6.19	MWD
6520.00	19.50	90.70	6470.76	-55.42	338.66	-67.44	0.65	-0.65	0.00	MWD
6584.00	21.10	91.50	6530.79	-55.85	360.86	-68.66	2.54	2.50	1.25	MWD
6646.00	22.60	92.60	6588.33	-56.68	383.91	-70.31	2.51	2.42	1.77	MWD
6710.00	24.00	94.70	6647.11	-58.31	409.17	-72.83	2.54	2.19	3.28	MWD
6773.00	23.00	95.30	6704.89	-60.49	434.20	-75.91	1.63	-1.59	0.95	MWD
6805.00	20.80	88.30	6734.58	-60.90	446.11	-76.74	10.66	-6.87	-21.87	MWD
6837.00	18.90	77.90	6764.69	-59.65	456.86	-75.87	12.51	-5.94	-32.50	MWD
6869.00	17.40	67.10	6795.10	-56.70	466.34	-73.26	11.49	-4.69	-33.75	MWD
6901.00	17.10	59.60	6825.67	-52.45	474.80	-69.32	7.01	-0.94	-23.44	MWD
6933.00	16.50	47.90	6856.31	-47.02	482.23	-64.16	10.71	-1.87	-36.56	MWD
6965.00	17.00	38.10	6886.96	-40.30	488.49	-57.66	8.95	1.56	-30.62	MWD
6997.00	18.50	32.40	6917.44	-32.33	494.10	-49.89	7.17	4.69	-17.81	MWD
7029.00	20.50	30.20	6947.60	-23.20	499.64	-40.97	6.66	6.25	-6.87	MWD
7061.00	23.40	27.20	6977.28	-12.70	505.36	-30.68	9.71	9.06	-9.37	MWD
7093.00	26.40	26.20	7006.30	-0.66	511.41	-18.87	9.47	9.37	-3.12	MWD
7125.00	28.20	26.30	7034.73	12.50	517.90	-5.94	5.63	5.62	0.31	MWD
7156.00	31.00	25.90	7061.69	26.25	524.64	7.56	9.05	9.03	-1.29	MWD
7187.00	33.30	28.50	7087.93	40.91	532.19	21.94	8.66	7.42	8.39	MWD
7218.00	36.00	27.90	7113.43	56.45	540.51	37.17	8.78	8.71	-1.94	MWD
7249.00	39.50	25.30	7137.94	73.42	548.99	53.83	12.40	11.29	-8.39	MWD
7281.00	43.30	23.80	7161.94	92.67	557.77	72.75	12.27	11.87	-4.69	MWD
7312.00	47.80	24.70	7183.64	112.84	566.86	92.59	14.66	14.52	2.90	MWD
7343.00	52.00	23.40	7203.61	134.49	576.52	113.88	13.92	13.55	-4.19	MWD
7375.00	57.80	19.80	7222.00	158.82	586.12	137.86	20.32	18.12	-11.25	MWD

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Wellpath: L Howes 5H	Survey Calculation Method:	Minimum Curvature	Db: Sybase

Survey

MD ft	Incl deg	Azim deg	TVD ft	+N/-S ft	+E/-W ft	VS ft	DLS deg/100ft	Build deg/100ft	Turn deg/100ft	Tool/Comment
7407.00	61.40	16.30	7238.20	185.06	594.66	163.78	14.68	11.25	-10.94	MWD
7439.00	66.30	11.80	7252.30	212.91	601.60	191.36	19.84	15.31	-14.06	MWD
7470.00	69.90	7.10	7263.87	241.27	606.31	219.54	18.24	11.61	-15.16	MWD
7502.00	73.90	5.20	7273.81	271.51	609.56	249.64	13.71	12.50	-5.94	MWD
7534.00	76.60	4.60	7281.96	302.34	612.20	280.35	8.63	8.44	-1.87	MWD
7565.00	78.50	4.30	7288.64	332.52	614.55	310.43	6.20	6.13	-0.97	MWD
7597.00	79.70	3.70	7294.69	363.86	616.74	341.68	4.18	3.75	-1.87	MWD
7629.00	80.60	2.80	7300.16	395.34	618.53	373.07	3.95	2.81	-2.81	MWD
7661.00	81.80	1.90	7305.06	426.93	619.82	404.60	4.67	3.75	-2.81	MWD
7692.00	83.70	1.30	7308.97	457.67	620.68	435.29	6.42	6.13	-1.94	MWD
7722.00	84.20	1.10	7312.13	487.50	621.31	465.07	1.79	1.67	-0.67	MWD
7753.00	84.80	0.70	7315.10	518.35	621.79	495.89	2.32	1.94	-1.29	MWD
7785.00	86.80	359.90	7317.45	550.26	621.96	527.77	6.73	6.25	-2.50	MWD
7816.00	88.90	359.60	7318.61	581.24	621.82	558.74	6.84	6.77	-0.97	MWD
7848.00	89.30	359.70	7319.11	613.24	621.63	590.72	1.29	1.25	0.31	MWD
7912.00	89.40	359.80	7319.84	677.23	621.35	654.68	0.22	0.16	0.16	MWD
7974.00	88.40	357.70	7321.03	739.20	620.00	716.66	3.75	-1.61	-3.39	MWD
8038.00	88.40	357.50	7322.82	803.12	617.32	780.63	0.31	0.00	-0.31	MWD
8101.00	87.90	357.10	7324.85	866.02	614.35	843.60	1.02	-0.79	-0.63	MWD
8164.00	87.80	356.70	7327.21	928.88	610.95	906.54	0.65	-0.16	-0.63	MWD
8227.00	88.60	356.90	7329.19	991.75	607.43	969.50	1.31	1.27	0.32	MWD
8290.00	88.30	356.30	7330.90	1054.61	603.70	1032.46	1.06	-0.48	-0.95	MWD
8353.00	89.50	356.40	7332.11	1117.47	599.69	1095.42	1.91	1.90	0.16	MWD
8417.00	89.10	355.80	7332.89	1181.32	595.33	1159.38	1.13	-0.62	-0.94	MWD
8481.00	89.80	354.80	7333.50	1245.10	590.09	1223.31	1.91	1.09	-1.56	MWD
8544.00	89.90	354.60	7333.67	1307.83	584.27	1286.20	0.35	0.16	-0.32	MWD
8608.00	89.60	354.20	7333.95	1371.53	578.03	1350.08	0.78	-0.47	-0.62	MWD
8672.00	91.00	354.80	7333.61	1435.23	571.89	1413.96	2.38	2.19	0.94	MWD
8736.00	91.50	354.80	7332.22	1498.95	566.09	1477.85	0.78	0.78	0.00	MWD
8798.00	91.60	357.10	7330.54	1560.77	561.72	1539.78	3.71	0.16	3.71	MWD
8861.00	91.30	357.10	7328.94	1623.67	558.53	1602.76	0.48	-0.48	0.00	MWD
8924.00	91.10	356.90	7327.63	1686.57	555.23	1665.73	0.45	-0.32	-0.32	MWD
8987.00	91.00	357.00	7326.47	1749.47	551.88	1728.71	0.22	-0.16	0.16	MWD
9050.00	90.70	356.70	7325.54	1812.36	548.42	1791.69	0.67	-0.48	-0.48	MWD
9112.00	89.90	358.10	7325.21	1874.30	545.61	1853.69	2.60	-1.29	2.26	MWD
9174.00	89.50	357.80	7325.54	1936.26	543.39	1915.69	0.81	-0.65	-0.48	MWD
9237.00	89.30	359.30	7326.20	1999.23	541.80	1978.68	2.40	-0.32	2.38	MWD
9301.00	89.20	359.80	7327.03	2063.22	541.29	2042.65	0.80	-0.16	0.78	MWD
9363.00	89.10	359.40	7327.95	2125.22	540.86	2104.62	0.66	-0.16	-0.65	MWD
9426.00	90.20	359.00	7328.34	2188.21	539.98	2167.60	1.86	1.75	-0.63	MWD
9489.00	90.40	358.60	7328.01	2251.19	538.66	2230.59	0.71	0.32	-0.63	MWD
9552.00	90.60	359.50	7327.46	2314.18	537.62	2293.58	1.46	0.32	1.43	MWD
9615.00	90.70	357.90	7326.74	2377.16	536.19	2356.57	2.54	0.16	-2.54	MWD
9676.00	90.60	357.60	7326.05	2438.11	533.79	2417.56	0.52	-0.16	-0.49	MWD
9738.00	90.80	357.30	7325.29	2500.04	531.04	2479.55	0.58	0.32	-0.48	MWD
9800.00	89.40	358.10	7325.19	2561.99	528.55	2541.55	2.60	-2.26	1.29	MWD
9862.00	89.40	358.10	7325.84	2623.95	526.49	2603.55	0.00	0.00	0.00	MWD
9925.00	89.70	357.80	7326.33	2686.91	524.24	2666.55	0.67	0.48	-0.48	MWD
9989.00	89.40	359.30	7326.83	2750.89	522.62	2730.54	2.39	-0.47	2.34	MWD
10052.00	89.30	359.30	7327.55	2813.88	521.85	2793.52	0.16	-0.16	0.00	MWD
10116.00	89.50	359.50	7328.22	2877.87	521.18	2857.49	0.44	0.31	0.31	MWD
10179.00	89.60	359.60	7328.71	2940.87	520.68	2920.47	0.22	0.16	0.16	MWD
10242.00	89.80	359.40	7329.04	3003.86	520.13	2983.44	0.45	0.32	-0.32	MWD

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Survey Report



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Survey

MD ft	Incl deg	Azim deg	TVD ft	+N/-S ft	+E/-W ft	VS ft	DLS deg/100ft	Build deg/100ft	Turn deg/100ft	Tool/Comment
10306.00	89.70	0.10	7329.32	3067.86	519.86	3047.41	1.10	-0.16	1.09	MWD
10370.00	89.70	359.00	7329.66	3131.86	519.35	3111.38	1.72	0.00	-1.72	MWD
10433.00	89.40	358.00	7330.15	3194.83	517.70	3174.38	1.66	-0.48	-1.59	MWD
10496.00	89.20	357.40	7330.92	3257.78	515.18	3237.37	1.00	-0.32	-0.95	MWD
10560.00	90.10	357.10	7331.31	3321.70	512.10	3301.37	1.48	1.41	-0.47	MWD
10623.00	89.60	356.50	7331.48	3384.60	508.59	3364.35	1.24	-0.79	-0.95	MWD
10688.00	90.90	356.80	7331.19	3449.49	504.79	3429.33	2.05	2.00	0.46	MWD
10751.00	90.60	356.70	7330.37	3512.38	501.22	3492.31	0.50	-0.48	-0.16	MWD
10813.00	90.50	358.00	7329.77	3574.31	498.35	3554.31	2.10	-0.16	2.10	MWD
10877.00	90.20	357.70	7329.38	3638.26	495.95	3618.30	0.66	-0.47	-0.47	MWD
10941.00	91.20	358.00	7328.60	3702.21	493.55	3682.30	1.63	1.56	0.47	MWD
11005.00	90.90	357.80	7327.43	3766.16	491.21	3746.29	0.56	-0.47	-0.31	MWD
11069.00	91.60	359.10	7326.03	3830.12	489.47	3810.27	2.31	1.09	2.03	MWD
11132.00	90.90	359.00	7324.66	3893.10	488.43	3873.24	1.12	-1.11	-0.16	MWD
11197.00	91.30	359.10	7323.41	3958.07	487.35	3938.22	0.63	0.62	0.15	MWD
11260.00	90.90	358.80	7322.20	4021.05	486.20	4001.20	0.79	-0.63	-0.48	MWD
11323.00	91.20	359.80	7321.05	4084.04	485.43	4064.17	1.66	0.48	1.59	MWD
11387.00	89.40	358.80	7320.71	4148.03	484.65	4128.15	3.22	-2.81	-1.56	MWD
11450.00	89.10	358.30	7321.54	4211.00	483.05	4191.14	0.93	-0.48	-0.79	MWD
11513.00	89.10	358.00	7322.53	4273.96	481.02	4254.13	0.48	0.00	-0.48	MWD
11576.00	89.10	358.10	7323.51	4336.92	478.88	4317.12	0.16	0.00	0.16	MWD
11638.00	89.40	358.40	7324.33	4398.88	476.98	4379.11	0.68	0.48	0.48	MWD
11701.00	89.90	358.70	7324.71	4461.86	475.39	4442.11	0.93	0.79	0.48	MWD
11765.00	90.20	358.50	7324.66	4525.84	473.83	4506.11	0.56	0.47	-0.31	MWD
11829.00	90.20	357.60	7324.43	4589.80	471.65	4570.10	1.41	0.00	-1.41	MWD
11893.00	89.60	357.60	7324.54	4653.75	468.97	4634.10	0.94	-0.94	0.00	MWD
11954.00	89.50	359.00	7325.02	4714.72	467.16	4695.10	2.30	-0.16	2.30	MWD
12016.00	89.10	359.00	7325.78	4776.70	466.08	4757.08	0.65	-0.65	0.00	MWD
12078.00	89.10	358.10	7326.75	4838.67	464.51	4819.07	1.45	0.00	-1.45	MWD
12139.00	89.20	358.60	7327.66	4899.64	462.75	4880.06	0.84	0.16	0.82	MWD
12201.00	89.40	358.50	7328.42	4961.62	461.18	4942.06	0.36	0.32	-0.16	MWD
12263.00	89.50	358.10	7329.01	5023.59	459.34	5004.05	0.66	0.16	-0.65	MWD
12325.00	89.60	358.70	7329.50	5085.56	457.61	5066.05	0.98	0.16	0.97	MWD
12388.00	89.40	359.30	7330.05	5148.55	456.51	5129.03	1.00	-0.32	0.95	MWD
12451.00	89.10	358.60	7330.87	5211.53	455.36	5192.02	1.21	-0.48	-1.11	MWD
12515.00	90.50	359.70	7331.10	5275.52	454.41	5256.00	2.78	2.19	1.72	MWD
12579.00	90.30	0.10	7330.65	5339.52	454.30	5319.96	0.70	-0.31	0.63	MWD
12642.00	89.80	359.90	7330.59	5402.52	454.30	5382.92	0.85	-0.79	-0.32	MWD
12705.00	90.00	359.60	7330.70	5465.52	454.02	5445.89	0.57	0.32	-0.48	MWD
12767.00	89.70	359.80	7330.87	5527.52	453.70	5507.86	0.58	-0.48	0.32	MWD
12829.00	90.00	359.70	7331.03	5589.52	453.43	5569.83	0.51	0.48	-0.16	MWD
12893.00	89.40	359.30	7331.36	5653.51	452.87	5633.81	1.13	-0.94	-0.62	MWD
12955.00	88.90	359.00	7332.28	5715.50	451.95	5695.79	0.94	-0.81	-0.48	MWD
13016.00	89.40	359.60	7333.19	5776.49	451.20	5756.76	1.28	0.82	0.98	MWD
13079.00	89.50	359.00	7333.79	5839.48	450.43	5819.74	0.97	0.16	-0.95	MWD
13142.00	89.10	358.20	7334.56	5902.46	448.90	5882.74	1.42	-0.63	-1.27	MWD
13205.00	89.20	358.50	7335.50	5965.42	447.08	5945.73	0.50	0.16	0.48	MWD
13259.00	89.20	358.50	7336.25	6019.40	445.67	5999.72	0.00	0.00	0.00	PROJECTED to TD

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