

# PETROLEUM DEVELOPMENT CORP Weld County CO

Well Name: **Waste Management 2Y-441**

Surface Location: Waste Management 2T-HZ1 Pad Sec.2-T2N-R64W  
North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone

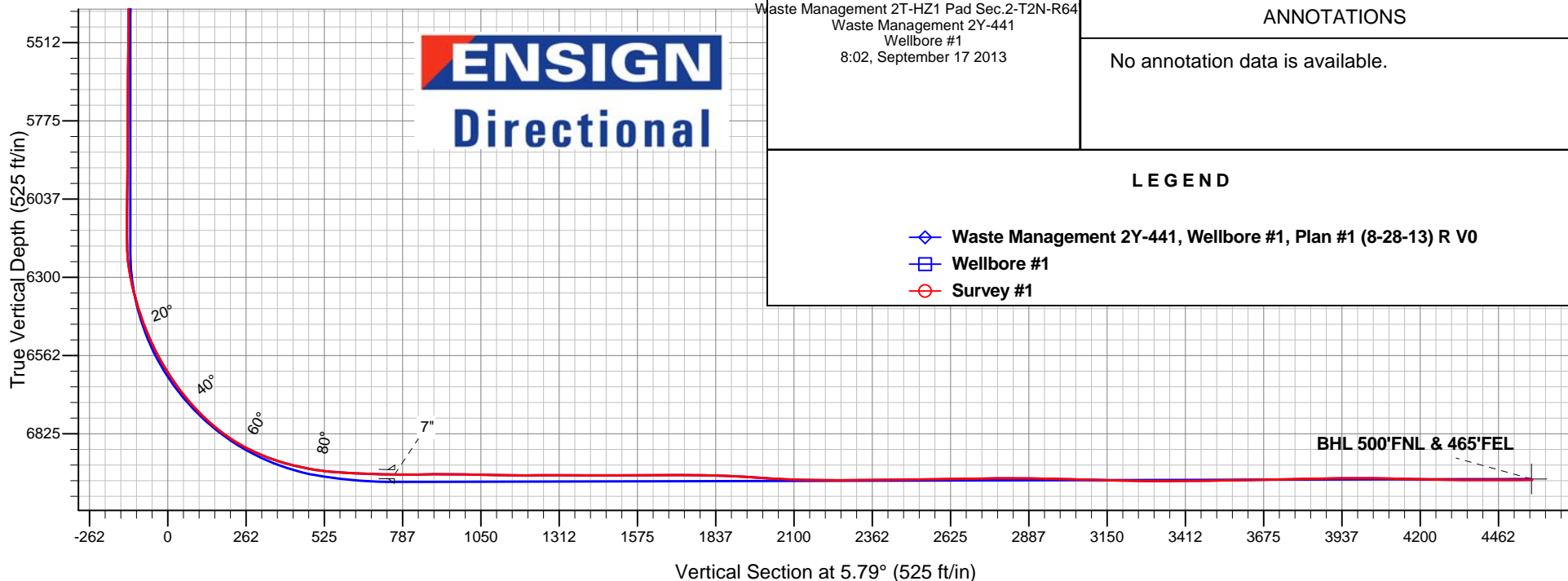
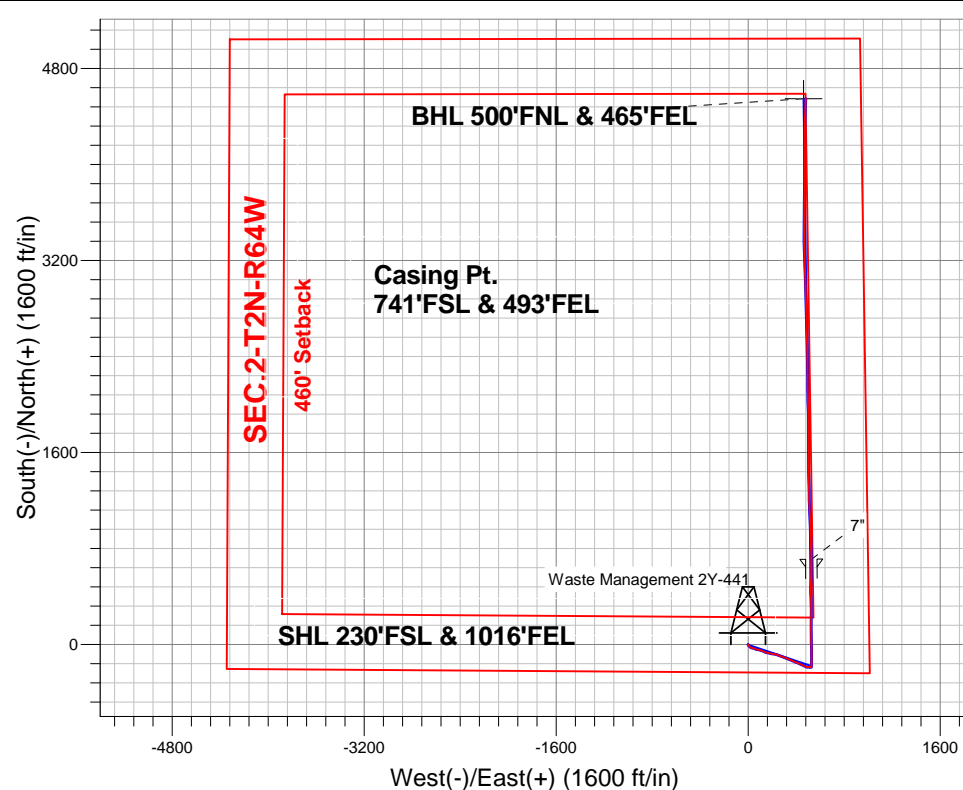
Ground Elevation: 4893.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1302951.27	3275921.07	40.160780	-104.512760	

Ensign 119 RKB - 23' WELL @ 4916.0ft (Ensign 119 RKB - 23')

## FINAL SURVEY

Projected Bottom Hole Location  
11403'MD 6979'TVD 4550'N & 481'E of SHL  
90.4 degree Incl @ 3.1 degree AZM





# **PETROLEUM DEVELOPMENT CORP Weld County CO**

**SEC.2-T2N-R64W**

**Waste Management 2T-HZ1 Pad Sec.2-T2N-R64W**

**Waste Management 2Y-441**

**Wellbore #1**

**Design: Wellbore #1**

## **Standard Survey Report**

**16 September, 2013**

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Waste Management 2Y-441
<b>Project:</b>	SEC.2-T2N-R64W	<b>TVD Reference:</b>	WELL @ 4916.0ft (Ensign 119 RKB - 23')
<b>Site:</b>	Waste Management 2T-HZ1 Pad Sec.2-T2N-R64W	<b>MD Reference:</b>	WELL @ 4916.0ft (Ensign 119 RKB - 23')
<b>Well:</b>	Waste Management 2Y-441	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	Landmark

<b>Project</b>	SEC.2-T2N-R64W, Weld County, Colorado		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		Using Well Reference Point
<b>Map Zone:</b>	Colorado Northern Zone		Using geodetic scale factor

Site	Waste Management 2T-HZ1 Pad Sec.2-T2N-R64W				
Site Position:		Northing:	1,302,951.63ft	Latitude:	40.160780
From:	Lat/Long	Easting:	3,275,951.82ft	Longitude:	-104.512650
Position Uncertainty:	0.0 ft	Slot Radius:	"	Grid Convergence:	0.64 °

Well	Waste Management 2Y-441					
Well Position	+N-S	0.0 ft	Northing:	1,302,951.27 ft	Latitude:	40.160780
	+E-W	0.0 ft	Easting:	3,275,921.07 ft	Longitude:	-104.512760
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,893.0 ft

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	8/28/2013	8.41	66.82	52,800

<b>Design</b>	Wellbore #1				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	5.79	

<b>Survey Program</b>	<b>Date</b> 9/16/2013				
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
170.0	11,403.0	Survey #1 (Wellbore #1)	MWD	MWD - Standard	

<b>Survey</b>									
<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Vertical Section (ft)</b>	<b>Dogleg Rate (°/100ft)</b>	<b>Build Rate (°/100ft)</b>	<b>Turn Rate (°/100ft)</b>
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
170.0	0.20	335.00	170.0	0.3	-0.1	0.3	0.12	0.12	0.00
261.0	0.50	187.40	261.0	0.0	-0.2	0.0	0.74	0.33	-162.20
352.0	1.20	169.70	352.0	-1.3	-0.1	-1.3	0.81	0.77	-19.45
442.0	2.40	143.00	441.9	-3.7	1.2	-3.6	1.59	1.33	-29.67
533.0	4.00	140.20	532.8	-7.7	4.4	-7.2	1.77	1.76	-3.08
624.0	5.90	141.20	623.5	-13.8	9.3	-12.8	2.09	2.09	1.10
714.0	6.90	127.80	712.9	-20.7	16.5	-18.9	1.99	1.11	-14.89
804.0	7.20	108.50	802.2	-25.8	26.1	-23.0	2.64	0.33	-21.44
897.0	6.40	103.40	894.6	-28.9	36.7	-25.0	1.08	-0.86	-5.48
986.0	6.20	109.30	983.0	-31.6	46.0	-26.8	0.76	-0.22	6.63

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Waste Management 2Y-441
<b>Project:</b>	SEC.2-T2N-R64W	<b>TVD Reference:</b>	WELL @ 4916.0ft (Ensign 119 RKB - 23')
<b>Site:</b>	Waste Management 2T-HZ1 Pad Sec.2-T2N-R64W	<b>MD Reference:</b>	WELL @ 4916.0ft (Ensign 119 RKB - 23')
<b>Well:</b>	Waste Management 2Y-441	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	Landmark

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)
1,083.0	7.80	112.50	1,079.3	-35.9	57.1	-29.9	1.70	1.65	3.30
1,179.0	8.80	103.20	1,174.3	-40.0	70.2	-32.7	1.74	1.04	-9.69
1,274.0	8.40	100.20	1,268.2	-42.9	84.1	-34.2	0.63	-0.42	-3.16
1,369.0	8.00	101.10	1,362.3	-45.4	97.5	-35.4	0.44	-0.42	0.95
1,464.0	6.80	109.00	1,456.5	-48.5	109.3	-37.3	1.65	-1.26	8.32
1,560.0	6.60	112.10	1,551.8	-52.4	119.7	-40.1	0.43	-0.21	3.23
1,655.0	6.80	117.80	1,646.2	-57.1	129.8	-43.7	0.73	0.21	6.00
1,750.0	7.00	114.40	1,740.5	-62.1	140.0	-47.7	0.48	0.21	-3.58
1,845.0	7.10	101.20	1,834.8	-65.7	151.1	-50.1	1.70	0.11	-13.89
1,940.0	7.00	101.60	1,929.1	-68.0	162.5	-51.2	0.12	-0.11	0.42
2,035.0	6.90	105.80	2,023.4	-70.7	173.7	-52.8	0.55	-0.11	4.42
2,131.0	6.60	101.10	2,118.7	-73.3	184.6	-54.3	0.65	-0.31	-4.90
2,226.0	6.20	103.70	2,213.1	-75.6	195.0	-55.5	0.52	-0.42	2.74
2,321.0	6.00	101.10	2,307.6	-77.8	204.8	-56.7	0.36	-0.21	-2.74
2,416.0	6.70	95.10	2,402.0	-79.2	215.2	-57.1	1.01	0.74	-6.32
2,511.0	6.70	101.10	2,496.3	-80.8	226.2	-57.5	0.74	0.00	6.32
2,607.0	6.20	104.60	2,591.7	-83.1	236.7	-58.9	0.66	-0.52	3.65
2,702.0	6.00	113.50	2,686.2	-86.4	246.2	-61.2	1.02	-0.21	9.37
2,797.0	6.40	108.80	2,780.6	-90.1	255.8	-63.9	0.68	0.42	-4.95
2,892.0	6.30	111.30	2,875.1	-93.7	265.6	-66.4	0.31	-0.11	2.63
2,987.0	5.90	110.20	2,969.5	-97.3	275.1	-69.1	0.44	-0.42	-1.16
3,083.0	6.20	111.60	3,065.0	-100.9	284.5	-71.7	0.35	0.31	1.46
3,178.0	6.90	110.20	3,159.4	-104.8	294.6	-74.5	0.76	0.74	-1.47
3,273.0	6.50	109.30	3,253.7	-108.5	305.1	-77.2	0.44	-0.42	-0.95
3,368.0	6.50	113.50	3,348.1	-112.4	315.1	-80.1	0.50	0.00	4.42
3,463.0	6.90	110.40	3,442.5	-116.6	325.4	-83.2	0.57	0.42	-3.26
3,559.0	6.30	117.10	3,537.8	-121.0	335.5	-86.5	1.02	-0.63	6.98
3,654.0	6.20	109.50	3,632.3	-125.1	344.9	-89.6	0.88	-0.11	-8.00
3,749.0	6.30	111.40	3,726.7	-128.7	354.6	-92.3	0.24	0.11	2.00
3,844.0	6.50	111.10	3,821.1	-132.5	364.5	-95.1	0.21	0.21	-0.32
3,940.0	6.70	116.00	3,916.5	-136.9	374.6	-98.5	0.62	0.21	5.10
4,035.0	7.30	114.40	4,010.8	-141.8	385.1	-102.3	0.66	0.63	-1.68
4,130.0	7.90	108.10	4,104.9	-146.4	396.8	-105.6	1.08	0.63	-6.63
4,225.0	7.30	110.70	4,199.1	-150.5	408.6	-108.6	0.73	-0.63	2.74
4,320.0	7.00	118.30	4,293.4	-155.4	419.4	-112.3	1.04	-0.32	8.00
4,415.0	6.90	113.90	4,387.7	-160.5	429.7	-116.3	0.57	-0.11	-4.63
4,510.0	6.10	111.60	4,482.0	-164.6	439.6	-119.5	0.89	-0.84	-2.42
4,606.0	6.30	114.80	4,577.5	-168.7	449.1	-122.6	0.42	0.21	3.33
4,701.0	6.20	120.20	4,671.9	-173.5	458.3	-126.4	0.63	-0.11	5.68
4,796.0	6.60	119.00	4,766.3	-178.7	467.5	-130.7	0.44	0.42	-1.26
4,891.0	6.90	115.50	4,860.7	-183.8	477.4	-134.7	0.54	0.32	-3.68
4,986.0	5.50	101.40	4,955.1	-187.2	487.0	-137.1	2.17	-1.47	-14.84
5,082.0	5.60	85.40	5,050.7	-187.7	496.2	-136.7	1.61	0.10	-16.67
5,177.0	4.50	72.80	5,145.3	-186.2	504.4	-134.4	1.64	-1.16	-13.26
5,272.0	2.60	71.00	5,240.1	-184.4	510.0	-132.1	2.00	-2.00	-1.89
5,367.0	0.70	84.20	5,335.1	-183.7	512.6	-131.1	2.03	-2.00	13.89
5,462.0	0.60	145.40	5,430.1	-184.0	513.5	-131.3	0.70	-0.11	64.42
5,558.0	0.90	143.90	5,526.1	-185.0	514.2	-132.3	0.31	0.31	-1.56
5,653.0	0.70	138.00	5,621.1	-186.1	515.0	-133.2	0.23	-0.21	-6.21
5,748.0	1.10	108.30	5,716.0	-186.8	516.3	-133.8	0.63	0.42	-31.26
5,843.0	0.90	116.20	5,811.0	-187.4	517.8	-134.2	0.26	-0.21	8.32
5,939.0	1.40	120.20	5,907.0	-188.3	519.5	-135.0	0.53	0.52	4.17
6,034.0	1.10	112.80	6,002.0	-189.3	521.3	-135.7	0.36	-0.32	-7.79

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Waste Management 2Y-441
<b>Project:</b>	SEC.2-T2N-R64W	<b>TVD Reference:</b>	WELL @ 4916.0ft (Ensign 119 RKB - 23')
<b>Site:</b>	Waste Management 2T-HZ1 Pad Sec.2-T2N-R64W	<b>MD Reference:</b>	WELL @ 4916.0ft (Ensign 119 RKB - 23')
<b>Well:</b>	Waste Management 2Y-441	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	Landmark

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)
6,129.0	1.10	124.40	6,097.0	-190.1	522.9	-136.4	0.23	0.00	12.21
6,224.0	1.00	68.70	6,192.0	-190.4	524.5	-136.5	1.04	-0.11	-58.63
6,271.0	5.40	9.50	6,238.9	-188.0	525.2	-134.1	10.56	9.36	-125.96
6,319.0	10.40	11.80	6,286.4	-181.5	526.5	-127.5	10.44	10.42	4.79
6,366.0	13.40	10.50	6,332.4	-172.0	528.3	-117.9	6.41	6.38	-2.77
6,414.0	14.70	359.30	6,379.0	-160.5	529.3	-106.3	6.27	2.71	-23.33
6,461.0	19.30	358.80	6,423.9	-146.7	529.0	-92.7	9.79	9.79	-1.06
6,509.0	21.70	1.80	6,468.9	-129.9	529.1	-75.9	5.46	5.00	6.25
6,556.0	24.30	359.30	6,512.1	-111.6	529.3	-57.6	5.91	5.53	-5.32
6,605.0	27.50	0.30	6,556.2	-90.2	529.2	-36.4	6.59	6.53	2.04
6,652.0	30.30	359.30	6,597.3	-67.5	529.1	-13.8	6.05	5.96	-2.13
6,700.0	34.10	358.20	6,637.9	-41.9	528.6	11.6	8.01	7.92	-2.29
6,747.0	37.70	357.00	6,676.0	-14.4	527.4	38.9	7.80	7.66	-2.55
6,795.0	40.60	358.20	6,713.2	15.9	526.1	68.9	6.24	6.04	2.50
6,842.0	43.30	358.40	6,748.2	47.3	525.2	100.0	5.75	5.74	0.43
6,890.0	47.40	359.50	6,781.9	81.4	524.6	133.9	8.70	8.54	2.29
6,937.0	52.30	1.60	6,812.2	117.3	525.0	169.7	10.97	10.43	4.47
6,985.0	56.40	0.90	6,840.2	156.3	525.8	208.5	8.62	8.54	-1.46
7,032.0	60.90	359.80	6,864.6	196.5	526.1	248.5	9.78	9.57	-2.34
7,080.0	65.60	0.50	6,886.2	239.3	526.2	291.1	9.88	9.79	1.46
7,127.0	68.90	359.80	6,904.4	282.6	526.3	334.3	7.15	7.02	-1.49
7,176.0	73.10	358.60	6,920.3	329.0	525.6	380.3	8.88	8.57	-2.45
7,223.0	77.10	358.60	6,932.4	374.4	524.5	425.3	8.51	8.51	0.00
7,271.0	79.10	357.90	6,942.3	421.3	523.1	471.9	4.40	4.17	-1.46
7,301.0	82.00	359.50	6,947.2	450.9	522.4	501.3	11.01	9.67	5.33
7,361.0	85.60	1.00	6,953.7	510.5	522.7	560.6	6.49	6.00	2.50
7,452.0	88.10	2.10	6,958.7	601.3	525.1	651.2	3.00	2.75	1.21
7,547.0	88.60	359.60	6,961.5	696.3	526.5	745.8	2.68	0.53	-2.63
7,562.2	88.97	359.55	6,961.8	711.5	526.4	760.9	2.44	2.42	-0.32
7"									
7,642.0	90.90	359.30	6,961.9	791.3	525.6	840.2	2.44	2.42	-0.32
7,737.0	90.30	357.50	6,960.9	886.2	523.0	934.4	2.00	-0.63	-1.89
7,833.0	88.50	357.30	6,961.9	982.1	518.6	1,029.4	1.89	-1.88	-0.21
7,928.0	88.80	357.20	6,964.1	1,077.0	514.1	1,123.3	0.33	0.32	-0.11
8,023.0	90.70	357.70	6,964.5	1,171.9	509.8	1,217.3	2.07	2.00	0.53
8,118.0	89.60	0.00	6,964.3	1,266.9	507.9	1,311.6	2.68	-1.16	2.42
8,213.0	89.90	357.70	6,964.7	1,361.8	506.0	1,405.9	2.44	0.32	-2.42
8,308.0	90.00	359.10	6,964.8	1,456.8	503.4	1,500.1	1.48	0.11	1.47
8,404.0	90.70	0.50	6,964.2	1,552.8	503.0	1,595.6	1.63	0.73	1.46
8,499.0	90.00	359.30	6,963.6	1,647.8	502.9	1,690.1	1.46	-0.74	-1.26
8,594.0	89.00	359.80	6,964.5	1,742.8	502.1	1,784.5	1.18	-1.05	0.53
8,689.0	87.80	0.10	6,967.1	1,837.7	502.0	1,879.0	1.30	-1.26	0.32
8,784.0	85.90	359.10	6,972.3	1,932.6	501.4	1,973.3	2.26	-2.00	-1.05
8,880.0	87.60	358.20	6,977.8	2,028.4	499.1	2,068.4	2.00	1.77	-0.94
8,975.0	88.80	359.80	6,980.7	2,123.3	497.5	2,162.7	2.10	1.26	1.68
9,070.0	90.60	359.60	6,981.2	2,218.3	497.0	2,257.1	1.91	1.89	-0.21
9,166.0	90.50	358.40	6,980.3	2,314.3	495.3	2,352.4	1.25	-0.10	-1.25
9,261.0	90.70	358.40	6,979.3	2,409.3	492.6	2,446.6	0.21	0.21	0.00
9,356.0	90.60	359.30	6,978.3	2,504.2	490.7	2,540.9	0.95	-0.11	0.95
9,451.0	90.80	358.70	6,977.1	2,599.2	489.1	2,635.3	0.67	0.21	-0.63
9,546.0	91.00	359.10	6,975.6	2,694.2	487.3	2,729.6	0.47	0.21	0.42
9,642.0	90.00	358.40	6,974.8	2,790.2	485.2	2,824.8	1.27	-1.04	-0.73

<b>Company:</b>	PETROLEUM DEVELOPMENT CORP Weld County CO	<b>Local Co-ordinate Reference:</b>	Well Waste Management 2Y-441
<b>Project:</b>	SEC.2-T2N-R64W	<b>TVD Reference:</b>	WELL @ 4916.0ft (Ensign 119 RKB - 23')
<b>Site:</b>	Waste Management 2T-HZ1 Pad Sec.2-T2N-R64W	<b>MD Reference:</b>	WELL @ 4916.0ft (Ensign 119 RKB - 23')
<b>Well:</b>	Waste Management 2Y-441	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	Landmark

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)	
9,737.0	89.30	358.20	6,975.3	2,885.1	482.3	2,919.0	0.77	-0.74	-0.21	
9,832.0	87.80	357.20	6,977.7	2,980.0	478.5	3,013.1	1.90	-1.58	-1.05	
9,927.0	88.70	358.60	6,980.6	3,074.9	475.1	3,107.1	1.75	0.95	1.47	
10,022.0	89.40	357.50	6,982.2	3,169.8	471.8	3,201.2	1.37	0.74	-1.16	
10,117.0	89.60	358.60	6,983.1	3,264.8	468.6	3,295.4	1.18	0.21	1.16	
10,213.0	90.30	358.90	6,983.1	3,360.7	466.5	3,390.6	0.79	0.73	0.31	
10,308.0	90.60	0.50	6,982.4	3,455.7	466.0	3,485.1	1.71	0.32	1.68	
10,403.0	90.90	0.90	6,981.1	3,550.7	467.2	3,579.7	0.53	0.32	0.42	
10,498.0	91.20	0.10	6,979.4	3,645.7	468.0	3,674.3	0.90	0.32	-0.84	
10,593.0	91.10	0.00	6,977.5	3,740.7	468.1	3,768.8	0.15	-0.11	-0.11	
10,689.0	91.10	1.60	6,975.7	3,836.6	469.4	3,864.4	1.67	0.00	1.67	
10,784.0	90.60	359.60	6,974.2	3,931.6	470.4	3,959.0	2.17	-0.53	-2.11	
10,879.0	88.80	0.10	6,974.7	4,026.6	470.2	4,053.5	1.97	-1.89	0.53	
10,974.0	88.60	359.60	6,976.9	4,121.6	469.9	4,148.0	0.57	-0.21	-0.53	
11,070.0	89.00	0.70	6,978.9	4,217.6	470.2	4,243.5	1.22	0.42	1.15	
11,165.0	89.70	0.70	6,980.0	4,312.5	471.3	4,338.1	0.74	0.74	0.00	
11,260.0	90.10	2.40	6,980.2	4,407.5	473.9	4,432.8	1.84	0.42	1.79	
11,347.0	90.40	3.10	6,979.8	4,494.4	478.1	4,519.7	0.88	0.34	0.80	
11,401.7	90.40	3.10	6,979.4	4,549.0	481.0	4,574.4	0.00	0.00	0.00	
BHL 500'FNL & 485'FEL										
11,403.0	90.40	3.10	6,979.4	4,550.3	481.1	4,575.6	0.00	0.00	0.00	

Casing Points					
Measured Depth (ft)	Vertical Depth (ft)	Name		Casing Diameter (")	Hole Diameter (")
7,562.2	6,961.8	7"		7	7-1/2

Checked By: _____	Approved By: _____	Date: _____
-------------------	--------------------	-------------