

PETROLEUM DEVELOPMENT CORP Weld County CO

Well Name: Thornton 14K-441

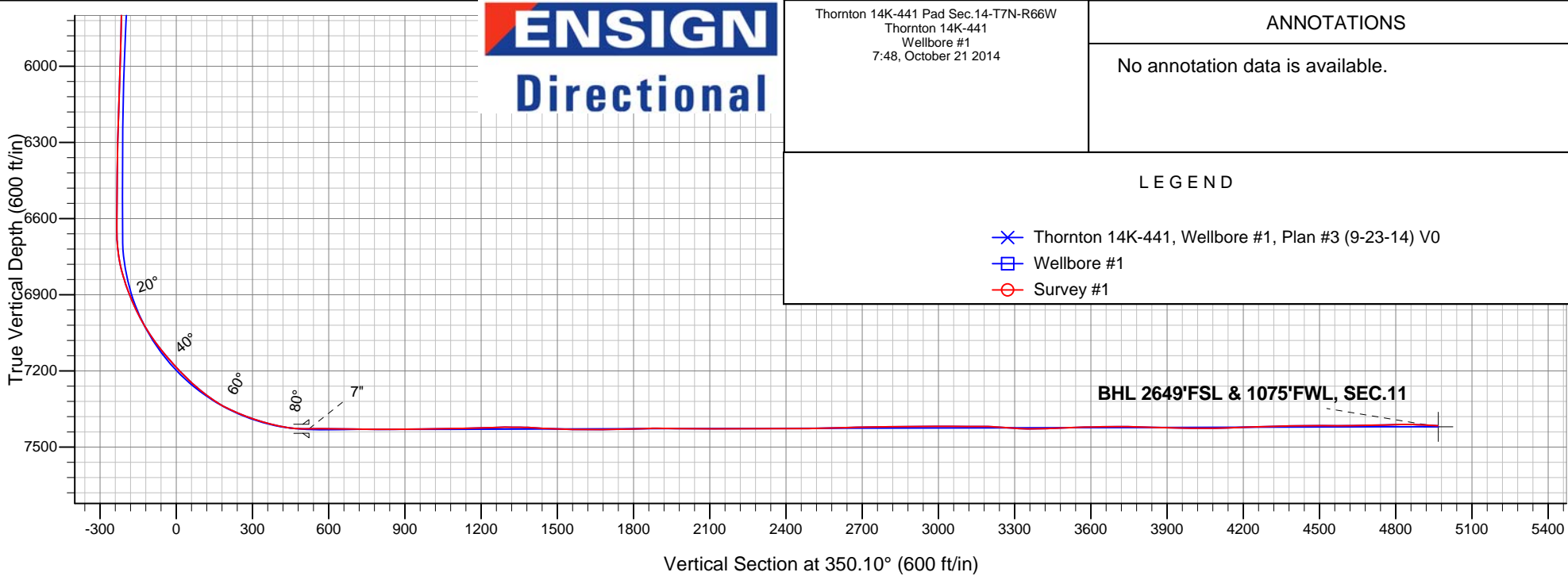
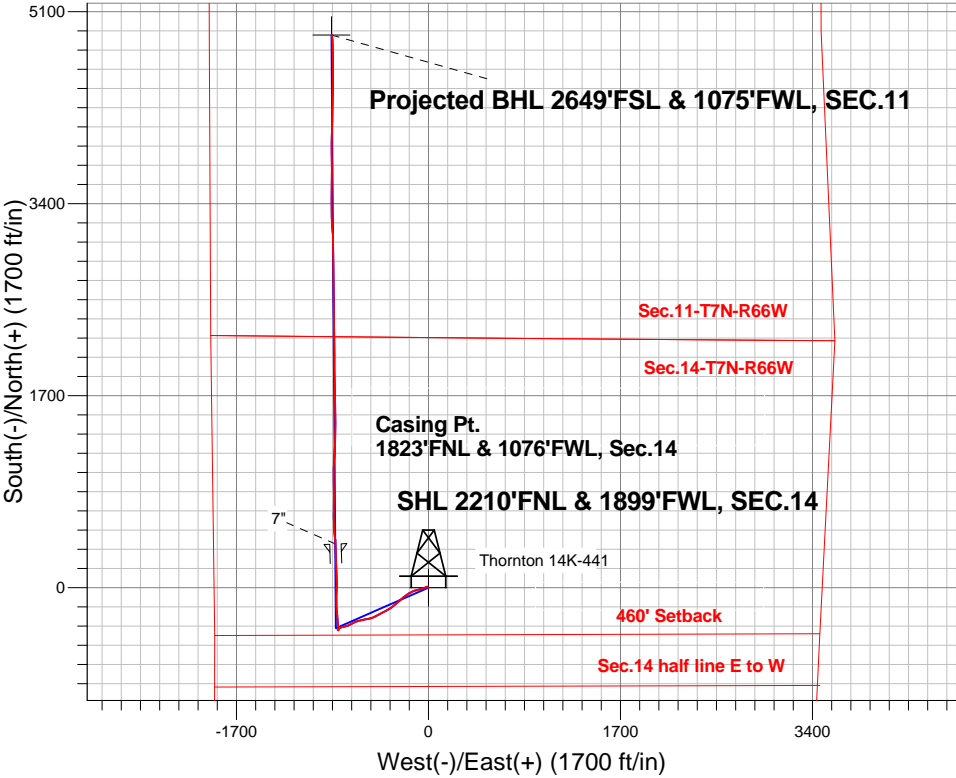
Surface Location: Thornton 14K-441 Pad Sec.14-T7N-R66W
North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone

Ground Elevation: 4925.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1453710.91	3209064.53	40.576400	-104.747380	
RKB - 15' WELL @ 4940.0ft (RKB - 15')						

FINAL SURVEY

Projected Bottom Hole Location
12441'MD 7416'TVD 4892'N & 854'W of SHL
87.0 degree Incl @ 356.1 degree AZM





PETROLEUM DEVELOPMENT CORP Weld County CO

SEC.14-T7N-R66W

Thornton 14K-441 Pad Sec.14-T7N-R66W

Thornton 14K-441

Wellbore #1

Survey: Survey #1

Standard Survey Report

21 October, 2014

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 14K-441
Project:	SEC.14-T7N-R66W	TVD Reference:	WELL @ 4940.0ft (RKB - 15')
Site:	Thornton 14K-441 Pad Sec.14-T7N-R66W	MD Reference:	WELL @ 4940.0ft (RKB - 15')
Well:	Thornton 14K-441	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Landmark

Project	SEC.14-T7N-R66W, Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		Using Well Reference Point
Map Zone:	Colorado Northern Zone		Using geodetic scale factor

Site	Thornton 14K-441 Pad Sec.14-T7N-R66W				
Site Position:		Northing:	1,453,710.92 ft	Latitude:	40.576400
From:	Lat/Long	Easting:	3,209,064.53 ft	Longitude:	-104.747380
Position Uncertainty:	0.0 ft	Slot Radius:	"	Grid Convergence:	0.49 °

Well	Thornton 14K-441					
Well Position	+N-S	0.0 ft	Northing:	1,453,710.91 ft	Latitude:	40.576400
	+E-W	0.0 ft	Easting:	3,209,064.53 ft	Longitude:	-104.747380
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,925.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	9/23/2014	8.43	67.08	52,879

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.0	0.0	0.0	350.10	

Survey Program	Date	10/21/2014			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
156.0	12,441.0	Survey #1 (Wellbore #1)	MWD	MWD - Standard	

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)	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
1.0	0.01	291.40	1.0	0.0	0.0	0.0	0.58	0.58	0.00	
SHL 2210'FNL & 1899'FWL, SEC.14										
156.0	0.90	291.40	156.0	0.4	-1.1	0.6	0.58	0.58	0.00	
283.0	1.30	295.70	283.0	1.4	-3.4	2.0	0.32	0.31	3.39	
410.0	0.40	321.00	410.0	2.4	-4.9	3.2	0.75	-0.71	19.92	
536.0	0.50	314.80	536.0	3.1	-5.6	4.1	0.09	0.08	-4.92	
662.0	0.80	308.70	661.9	4.1	-6.7	5.2	0.24	0.24	-4.84	
787.0	1.10	325.70	786.9	5.6	-8.0	6.9	0.33	0.24	13.60	
892.0	1.40	326.40	891.9	7.5	-9.3	9.0	0.29	0.29	0.67	
966.0	1.30	308.00	965.9	8.8	-10.5	10.5	0.60	-0.14	-24.86	
1,029.0	2.60	244.30	1,028.8	8.6	-12.3	10.6	3.71	2.06	-101.11	

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Site:	Thornton 14K-441 Pad Sec.14-T7N-R66W	MD Reference:	WELL @ 4940.0ft (RKB - 15')
Well:	Thornton 14K-441	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	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)
1,123.0	5.80	246.10	1,122.6	5.7	-18.6	8.9	3.41	3.40	1.91
1,248.0	7.70	245.00	1,246.7	-0.3	-32.0	5.2	1.52	1.52	-0.88
1,402.0	10.50	252.60	1,398.8	-8.9	-54.7	0.6	1.97	1.82	4.94
1,585.0	13.20	257.20	1,577.9	-18.5	-91.0	-2.6	1.56	1.48	2.51
1,767.0	14.30	250.30	1,754.6	-30.7	-132.4	-7.5	1.08	0.60	-3.79
1,949.0	14.70	236.80	1,930.9	-50.9	-172.9	-20.5	1.87	0.22	-7.42
2,131.0	13.80	231.50	2,107.3	-77.1	-209.2	-40.0	0.87	-0.49	-2.91
2,319.0	12.70	232.60	2,290.3	-103.6	-243.2	-60.3	0.60	-0.59	0.59
2,501.0	10.70	225.50	2,468.5	-127.6	-271.2	-79.1	1.35	-1.10	-3.90
2,691.0	10.30	227.60	2,655.3	-151.4	-296.3	-98.2	0.29	-0.21	1.11
2,879.0	11.00	233.80	2,840.1	-173.3	-323.2	-115.2	0.71	0.37	3.30
3,068.0	9.80	242.20	3,026.0	-191.5	-351.9	-128.2	1.02	-0.63	4.44
3,258.0	10.90	240.30	3,212.9	-207.9	-381.9	-139.2	0.61	0.58	-1.00
3,447.0	10.30	243.60	3,398.7	-224.3	-412.5	-150.1	0.45	-0.32	1.75
3,636.0	10.60	241.20	3,584.6	-240.2	-442.9	-160.5	0.28	0.16	-1.27
3,825.0	10.70	242.40	3,770.3	-256.7	-473.7	-171.5	0.13	0.05	0.63
3,983.0	10.60	252.80	3,925.6	-267.8	-500.5	-177.8	1.22	-0.06	6.58
4,141.0	12.50	257.20	4,080.4	-275.9	-531.1	-180.5	1.32	1.20	2.78
4,325.0	13.00	261.00	4,259.9	-283.5	-571.0	-181.2	0.53	0.27	2.07
4,515.0	11.40	255.90	4,445.6	-291.4	-610.3	-182.2	1.01	-0.84	-2.68
4,705.0	10.60	247.10	4,632.1	-302.8	-644.6	-187.5	0.98	-0.42	-4.63
4,894.0	9.30	242.60	4,818.2	-316.6	-674.2	-196.0	0.80	-0.69	-2.38
5,084.0	7.40	242.70	5,006.2	-329.3	-698.7	-204.3	1.00	-1.00	0.05
5,242.0	6.20	249.30	5,163.1	-337.0	-715.7	-208.9	0.91	-0.76	4.18
5,400.0	7.10	253.50	5,320.0	-342.8	-733.0	-211.7	0.65	0.57	2.66
5,548.0	7.20	263.10	5,466.9	-346.5	-751.0	-212.2	0.81	0.07	6.49
5,747.0	5.80	248.90	5,664.6	-351.6	-772.8	-213.5	1.07	-0.70	-7.14
5,937.0	4.30	242.60	5,853.9	-358.3	-788.1	-217.5	0.84	-0.79	-3.32
6,127.0	2.90	224.80	6,043.5	-365.0	-797.8	-222.5	0.93	-0.74	-9.37
6,316.0	2.20	192.30	6,232.3	-372.0	-801.9	-228.6	0.83	-0.37	-17.20
6,506.0	1.00	107.20	6,422.3	-376.0	-801.1	-232.7	1.23	-0.63	-44.79
6,696.0	1.00	102.10	6,612.2	-376.8	-797.9	-234.1	0.05	0.00	-2.68
6,727.0	1.30	84.00	6,643.2	-376.9	-797.3	-234.2	1.51	0.97	-58.39
6,759.0	2.20	17.60	6,675.2	-376.2	-796.8	-233.7	6.43	2.81	-207.50
6,791.0	5.30	2.80	6,707.1	-374.2	-796.5	-231.7	10.07	9.69	-46.25
6,822.0	8.00	358.20	6,737.9	-370.6	-796.5	-228.2	8.87	8.71	-14.84
6,854.0	10.40	353.80	6,769.5	-365.5	-796.9	-223.1	7.81	7.50	-13.75
6,885.0	14.20	352.80	6,799.8	-358.9	-797.7	-216.5	12.28	12.26	-3.23
6,917.0	16.40	352.30	6,830.7	-350.6	-798.8	-208.1	6.89	6.88	-1.56
6,949.0	18.60	353.70	6,861.2	-341.0	-799.9	-198.4	7.00	6.88	4.38
6,980.0	20.80	353.80	6,890.4	-330.6	-801.1	-188.0	7.10	7.10	0.32
7,012.0	23.40	354.00	6,920.0	-318.7	-802.3	-176.0	8.13	8.13	0.63
7,043.0	25.10	355.40	6,948.3	-306.0	-803.5	-163.3	5.79	5.48	4.52
7,075.0	26.60	356.80	6,977.1	-292.1	-804.4	-149.4	5.06	4.69	4.38
7,106.0	28.80	356.70	7,004.5	-277.7	-805.3	-135.1	7.10	7.10	-0.32
7,138.0	31.20	356.30	7,032.2	-261.7	-806.2	-119.2	7.53	7.50	-1.25
7,169.0	34.00	355.00	7,058.4	-245.1	-807.5	-102.6	9.31	9.03	-4.19
7,201.0	36.30	355.40	7,084.5	-226.7	-809.1	-84.3	7.22	7.19	1.25
7,232.0	38.30	356.10	7,109.2	-208.0	-810.4	-65.6	6.60	6.45	2.26
7,264.0	39.70	355.80	7,134.0	-187.9	-811.9	-45.5	4.41	4.38	-0.94
7,295.0	40.90	355.90	7,157.7	-167.9	-813.3	-25.6	3.88	3.87	0.32
7,327.0	42.00	357.20	7,181.7	-146.7	-814.6	-4.5	4.36	3.44	4.06
7,358.0	44.30	358.40	7,204.3	-125.6	-815.4	16.5	7.88	7.42	3.87
7,389.0	46.30	0.90	7,226.1	-103.5	-815.5	38.2	8.63	6.45	8.06

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Design:	Wellbore #1	Database:	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)
7,421.0	48.90	3.20	7,247.7	-79.9	-814.7	61.3	9.70	8.13	7.19
7,453.0	50.50	3.00	7,268.4	-55.5	-813.4	85.1	5.02	5.00	-0.63
7,484.0	52.70	2.50	7,287.6	-31.3	-812.2	108.8	7.21	7.10	-1.61
7,516.0	54.70	1.00	7,306.6	-5.5	-811.4	134.0	7.30	6.25	-4.69
7,548.0	58.30	0.30	7,324.2	21.2	-811.1	160.3	11.40	11.25	-2.19
7,579.0	62.20	0.00	7,339.6	48.1	-811.0	186.8	12.61	12.58	-0.97
7,612.0	65.10	358.90	7,354.2	77.6	-811.3	215.9	9.28	8.79	-3.33
7,643.0	67.10	357.90	7,366.8	106.0	-812.1	244.0	7.09	6.45	-3.23
7,675.0	69.60	356.80	7,378.6	135.7	-813.5	273.5	8.44	7.81	-3.44
7,707.0	71.50	357.00	7,389.3	165.8	-815.1	303.4	5.97	5.94	0.63
7,738.0	73.70	357.20	7,398.5	195.4	-816.6	332.8	7.12	7.10	0.65
7,770.0	74.70	358.40	7,407.2	226.1	-817.8	363.3	4.77	3.13	3.75
7,802.0	76.90	358.80	7,415.1	257.1	-818.6	394.0	6.98	6.88	1.25
7,833.0	80.10	358.40	7,421.3	287.5	-819.3	424.0	10.40	10.32	-1.29
7,865.0	84.40	357.90	7,425.6	319.2	-820.3	455.4	13.53	13.44	-1.56
7,892.0	87.70	358.10	7,427.5	346.1	-821.3	482.1	12.24	12.22	0.74
7,928.0	90.00	357.80	7,428.2	382.1	-822.6	517.8	6.44	6.39	-0.83
7,932.6	90.16	357.74	7,428.2	386.6	-822.7	522.3	3.78	3.55	-1.29
7"									
7,959.0	91.10	357.40	7,427.9	413.0	-823.9	548.5	3.78	3.55	-1.29
7,989.0	90.20	354.70	7,427.5	443.0	-825.9	578.3	9.49	-3.00	-9.00
8,019.0	89.30	354.00	7,427.7	472.8	-828.9	608.2	3.80	-3.00	-2.33
8,051.0	88.80	354.50	7,428.2	504.6	-832.1	640.2	2.21	-1.56	1.56
8,082.0	88.90	356.10	7,428.8	535.5	-834.6	671.0	5.17	0.32	5.16
8,114.0	89.30	357.50	7,429.3	567.5	-836.4	702.8	4.55	1.25	4.38
8,145.0	89.50	359.50	7,429.6	598.5	-837.2	733.5	6.48	0.65	6.45
8,177.0	89.30	0.70	7,430.0	630.5	-837.2	765.0	3.80	-0.63	3.75
8,208.0	90.00	0.50	7,430.2	661.5	-836.8	795.5	2.35	2.26	-0.65
8,272.0	90.50	0.50	7,429.9	725.5	-836.3	858.4	0.78	0.78	0.00
8,335.0	90.60	0.20	7,429.3	788.5	-835.9	920.4	0.50	0.16	-0.48
8,398.0	90.60	358.90	7,428.6	851.4	-836.4	982.5	2.06	0.00	-2.06
8,461.0	90.70	358.60	7,427.9	914.4	-837.8	1,044.8	0.50	0.16	-0.48
8,525.0	90.90	0.00	7,427.0	978.4	-838.5	1,108.0	2.21	0.31	2.19
8,588.0	91.30	1.00	7,425.8	1,041.4	-838.0	1,169.9	1.71	0.63	1.59
8,651.0	92.90	3.50	7,423.5	1,104.3	-835.5	1,231.5	4.71	2.54	3.97
8,714.0	90.20	2.60	7,421.8	1,167.2	-832.2	1,292.8	4.52	-4.29	-1.43
8,777.0	89.20	3.70	7,422.1	1,230.1	-828.7	1,354.2	2.36	-1.59	1.75
8,840.0	86.60	1.40	7,424.4	1,293.0	-825.9	1,415.7	5.51	-4.13	-3.65
8,903.0	87.30	0.70	7,427.8	1,355.9	-824.8	1,477.5	1.57	1.11	-1.11
8,966.0	88.40	0.30	7,430.2	1,418.8	-824.2	1,539.4	1.86	1.75	-0.63
9,030.0	89.20	0.00	7,431.5	1,482.8	-824.0	1,602.4	1.33	1.25	-0.47
9,093.0	91.00	359.50	7,431.4	1,545.8	-824.3	1,664.5	2.97	2.86	-0.79
9,157.0	92.00	359.30	7,429.7	1,609.8	-825.0	1,727.6	1.59	1.56	-0.31
9,220.0	91.20	358.90	7,427.9	1,672.7	-826.0	1,789.8	1.42	-1.27	-0.63
9,283.0	91.00	358.90	7,426.7	1,735.7	-827.2	1,852.1	0.32	-0.32	0.00
9,346.0	88.80	358.20	7,426.8	1,798.7	-828.8	1,914.4	3.66	-3.49	-1.11
9,410.0	90.00	358.20	7,427.5	1,862.7	-830.8	1,977.7	1.88	1.88	0.00
9,473.0	89.80	359.80	7,427.6	1,925.6	-831.9	2,040.0	2.56	-0.32	2.54
9,549.0	90.10	359.60	7,427.7	2,001.6	-832.3	2,114.9	0.47	0.39	-0.26
9,612.0	90.00	359.30	7,427.6	2,064.6	-832.9	2,177.1	0.50	-0.16	-0.48
9,675.0	90.00	359.60	7,427.6	2,127.6	-833.5	2,239.2	0.48	0.00	0.48
9,738.0	90.00	359.50	7,427.6	2,190.6	-834.0	2,301.4	0.16	0.00	-0.16
9,801.0	89.90	359.50	7,427.7	2,253.6	-834.5	2,363.5	0.16	-0.16	0.00

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Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Landmark

Survey									
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9,865.0	90.50	359.60	7,427.5	2,317.6	-835.0	2,426.7	0.95	0.94	0.16
9,928.0	90.60	359.10	7,426.9	2,380.6	-835.8	2,488.8	0.81	0.16	-0.79
9,991.0	91.40	358.90	7,425.8	2,443.6	-836.9	2,551.1	1.31	1.27	-0.32
10,055.0	91.50	358.90	7,424.1	2,507.6	-838.1	2,614.3	0.16	0.16	0.00
10,118.0	91.70	359.30	7,422.4	2,570.5	-839.1	2,676.5	0.71	0.32	0.63
10,181.0	90.90	359.10	7,421.0	2,633.5	-840.0	2,738.7	1.31	-1.27	-0.32
10,244.0	90.20	359.80	7,420.4	2,696.5	-840.6	2,800.9	1.57	-1.11	1.11
10,308.0	90.70	0.30	7,419.9	2,760.5	-840.5	2,863.9	1.10	0.78	0.78
10,371.0	90.50	359.60	7,419.2	2,823.5	-840.6	2,926.0	1.16	-0.32	-1.11
10,434.0	90.40	358.90	7,418.7	2,886.5	-841.4	2,988.2	1.12	-0.16	-1.11
10,496.0	89.70	359.30	7,418.6	2,948.5	-842.4	3,049.4	1.30	-1.13	0.65
10,559.0	89.60	359.50	7,419.0	3,011.5	-843.0	3,111.6	0.35	-0.16	0.32
10,622.0	90.20	359.60	7,419.1	3,074.5	-843.5	3,173.7	0.97	0.95	0.16
10,685.0	85.60	355.80	7,421.4	3,137.4	-846.0	3,236.1	9.47	-7.30	-6.03
10,748.0	86.50	355.90	7,425.8	3,200.0	-850.6	3,298.6	1.44	1.43	0.16
10,811.0	89.60	356.80	7,427.9	3,262.9	-854.6	3,361.2	5.12	4.92	1.43
10,843.0	90.70	358.10	7,427.8	3,294.8	-856.0	3,392.9	5.32	3.44	4.06
10,906.0	92.50	359.80	7,426.1	3,357.8	-857.2	3,455.2	3.93	2.86	2.70
10,970.0	92.20	0.20	7,423.5	3,421.7	-857.2	3,518.2	0.78	-0.47	0.63
11,033.0	91.60	0.90	7,421.4	3,484.7	-856.6	3,580.1	1.46	-0.95	1.11
11,096.0	90.60	0.70	7,420.2	3,547.7	-855.7	3,642.0	1.62	-1.59	-0.32
11,159.0	90.40	0.70	7,419.6	3,610.7	-854.9	3,703.9	0.32	-0.32	0.00
11,222.0	87.80	359.30	7,420.6	3,673.7	-854.9	3,765.9	4.69	-4.13	-2.22
11,285.0	89.00	0.00	7,422.4	3,736.6	-855.3	3,828.0	2.20	1.90	1.11
11,348.0	89.00	0.00	7,423.5	3,799.6	-855.3	3,890.1	0.00	0.00	0.00
11,412.0	88.40	358.90	7,424.9	3,863.6	-855.9	3,953.2	1.96	-0.94	-1.72
11,475.0	89.00	359.30	7,426.3	3,926.6	-856.9	4,015.4	1.14	0.95	0.63
11,538.0	91.30	1.40	7,426.2	3,989.6	-856.5	4,077.4	4.94	3.65	3.33
11,600.0	92.20	1.80	7,424.3	4,051.5	-854.8	4,138.1	1.59	1.45	0.65
11,664.0	92.10	1.90	7,421.9	4,115.4	-852.7	4,200.8	0.22	-0.16	0.16
11,727.0	91.20	1.90	7,420.1	4,178.4	-850.6	4,262.4	1.43	-1.43	0.00
11,789.0	91.60	2.30	7,418.6	4,240.3	-848.4	4,323.0	0.91	0.65	0.65
11,852.0	91.40	1.80	7,416.9	4,303.3	-846.1	4,384.6	0.85	-0.32	-0.79
11,915.0	90.50	0.90	7,415.9	4,366.2	-844.6	4,446.4	2.02	-1.43	-1.43
11,978.0	89.70	359.50	7,415.8	4,429.2	-844.4	4,508.5	2.56	-1.27	-2.22
12,041.0	89.90	359.10	7,416.0	4,492.2	-845.2	4,570.6	0.71	0.32	-0.63
12,104.0	90.70	359.80	7,415.6	4,555.2	-845.8	4,632.8	1.69	1.27	1.11
12,167.0	91.20	0.20	7,414.6	4,618.2	-845.8	4,694.9	1.02	0.79	0.63
12,230.0	91.70	359.60	7,413.0	4,681.2	-845.9	4,756.9	1.24	0.79	-0.95
12,293.0	91.00	359.50	7,411.5	4,744.2	-846.4	4,819.0	1.12	-1.11	-0.16
12,391.0	87.00	356.10	7,413.2	4,842.0	-850.1	4,916.1	5.36	-4.08	-3.47
12,441.0	87.00	356.10	7,415.8	4,891.9	-853.5	4,965.8	0.00	0.00	0.00
BHL 2650'FSL & 1080'FWL, SEC.11									

Casing Points					
Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")	
7,932.6	7,428.2	7"	7	7-1/2	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 14K-441
Project:	SEC.14-T7N-R66W	TVD Reference:	WELL @ 4940.0ft (RKB - 15')
Site:	Thornton 14K-441 Pad Sec.14-T7N-R66W	MD Reference:	WELL @ 4940.0ft (RKB - 15')
Well:	Thornton 14K-441	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Landmark

Checked By: _____	Approved By: _____	Date: _____
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