

PETROLEUM DEVELOPMENT CORP Weld County CO

Well Name: Thornton 21K-443

Surface Location: Thornton 21K-HZ Pad Sec.21-T7N-R66W
 North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone
 Ground Elevation: 4963.0

+N/-S

+E/-W

Northing

Easting

Latitude

Longitude

Slot

0.0

0.0

1447514.79

3197716.34

40.559650

-104.788410

RKB -15' WELL @ 4978.0ft (RKB -15')

WELLBORE TARGET DETAILS				
Name	TVD	+N/-S	+E/-W	Shape
LOT-A	1.0	273.3	-1180.9	Polygon
BHL 2140'FNL, 1080'FWL	7458.0	-4550.4	-172.3	Point

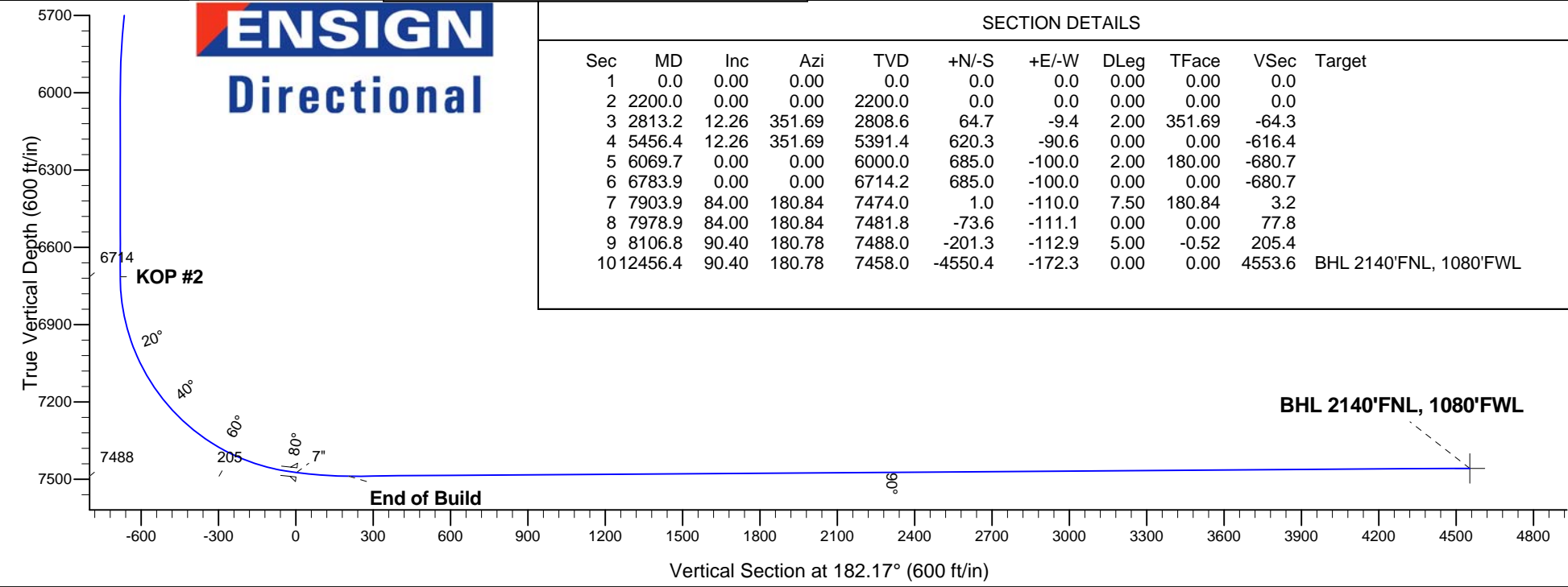
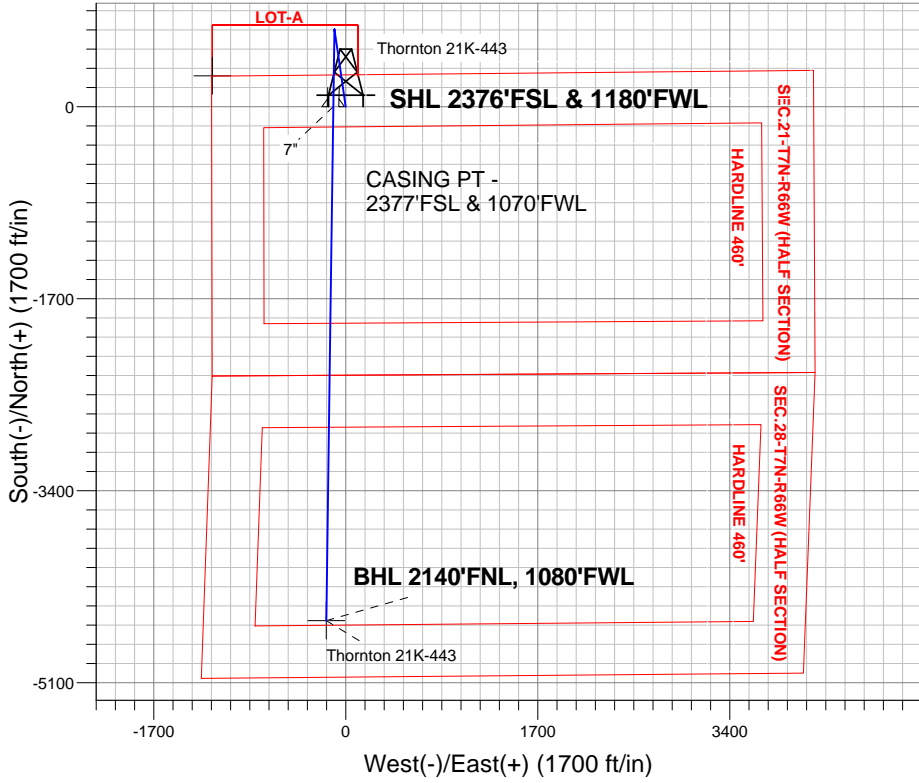
Azimuths to True North
 Magnetic North: 8.69°

 Magnetic Field
 Strength: 53056.1srT
 Dip Angle: 67.12°
 Date: 12/4/2012
 Model: IGRF2010

Thornton 21K-HZ Pad Sec.21-T7N-R66W
 Thornton 21K-443
 Plan #1 (12-04-12)
 14:14, December 05 2012

ANNOTATIONS

TVD	MD	Annotation
2200.0	2200.0	KOP #1
6714.2	6783.9	KOP #2
7488.0	8106.8	End of Build





PETROLEUM DEVELOPMENT CORP Weld County CO

SEC.21-T7N-R66W

Thornton 21K-HZ Pad Sec.21-T7N-R66W

Thornton 21K-443

Wellbore #1

Plan: Plan #1 (12-04-12)

Standard Planning Report

05 December, 2012

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 21K-443
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Project:	SEC.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-04-12)		

Project	SEC.21-T7N-R66W, Weld County, Colorado		
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 21K-HZ Pad Sec.21-T7N-R66W		
Site Position:		Northing:	1,447,573.71 ft
From:	Lat/Long	Easting:	3,197,793.67 ft
Position Uncertainty:	0.0 ft	Slot Radius:	"
		Latitude:	40.559810
		Longitude:	-104.788130
		Grid Convergence:	0.46 °

Well	Thornton 21K-443		
Well Position	+N/-S	-58.3 ft	Northing:
	+E/-W	-77.8 ft	Easting:
Position Uncertainty		0.0 ft	Wellhead Elevation:
			Latitude:
			Longitude:
			Ground Level:

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	12/4/2012	8.69	67.13	53,056

Design	Plan #1 (12-04-12)			
Audit Notes:				
Version:	Phase:	PROTOTYPE	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.0	0.0	0.0	182.17

Plan Sections										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
2,200.0	0.00	0.00	2,200.0	0.0	0.0	0.00	0.00	0.00	0.00	
2,813.2	12.26	351.69	2,808.6	64.7	-9.4	2.00	2.00	0.00	351.69	
5,456.4	12.26	351.69	5,391.4	620.3	-90.6	0.00	0.00	0.00	0.00	
6,069.7	0.00	0.00	6,000.0	685.0	-100.0	2.00	-2.00	0.00	180.00	
6,783.9	0.00	0.00	6,714.2	685.0	-100.0	0.00	0.00	0.00	0.00	
7,903.9	84.00	180.84	7,474.0	1.0	-110.0	7.50	7.50	0.00	180.84	
7,978.9	84.00	180.84	7,481.8	-73.6	-111.1	0.00	0.00	0.00	0.00	
8,106.8	90.40	180.78	7,488.0	-201.3	-112.9	5.00	5.00	-0.05	-0.52	
12,456.4	90.40	180.78	7,458.0	-4,550.4	-172.3	0.00	0.00	0.00	0.00	BHL 2140'FNL, 108

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Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-04-12)		

Planned 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	0.00	0.00	1.0	0.0	0.0	0.0	0.00	0.00	0.00
LOT-A									
40.0	0.00	0.00	40.0	0.0	0.0	0.0	0.00	0.00	0.00
80.0	0.00	0.00	80.0	0.0	0.0	0.0	0.00	0.00	0.00
120.0	0.00	0.00	120.0	0.0	0.0	0.0	0.00	0.00	0.00
160.0	0.00	0.00	160.0	0.0	0.0	0.0	0.00	0.00	0.00
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00
240.0	0.00	0.00	240.0	0.0	0.0	0.0	0.00	0.00	0.00
280.0	0.00	0.00	280.0	0.0	0.0	0.0	0.00	0.00	0.00
320.0	0.00	0.00	320.0	0.0	0.0	0.0	0.00	0.00	0.00
360.0	0.00	0.00	360.0	0.0	0.0	0.0	0.00	0.00	0.00
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	0.00
440.0	0.00	0.00	440.0	0.0	0.0	0.0	0.00	0.00	0.00
480.0	0.00	0.00	480.0	0.0	0.0	0.0	0.00	0.00	0.00
520.0	0.00	0.00	520.0	0.0	0.0	0.0	0.00	0.00	0.00
560.0	0.00	0.00	560.0	0.0	0.0	0.0	0.00	0.00	0.00
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	0.00
640.0	0.00	0.00	640.0	0.0	0.0	0.0	0.00	0.00	0.00
680.0	0.00	0.00	680.0	0.0	0.0	0.0	0.00	0.00	0.00
720.0	0.00	0.00	720.0	0.0	0.0	0.0	0.00	0.00	0.00
760.0	0.00	0.00	760.0	0.0	0.0	0.0	0.00	0.00	0.00
800.0	0.00	0.00	800.0	0.0	0.0	0.0	0.00	0.00	0.00
840.0	0.00	0.00	840.0	0.0	0.0	0.0	0.00	0.00	0.00
880.0	0.00	0.00	880.0	0.0	0.0	0.0	0.00	0.00	0.00
920.0	0.00	0.00	920.0	0.0	0.0	0.0	0.00	0.00	0.00
960.0	0.00	0.00	960.0	0.0	0.0	0.0	0.00	0.00	0.00
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.0	0.00	0.00	0.00
1,040.0	0.00	0.00	1,040.0	0.0	0.0	0.0	0.00	0.00	0.00
1,080.0	0.00	0.00	1,080.0	0.0	0.0	0.0	0.00	0.00	0.00
1,120.0	0.00	0.00	1,120.0	0.0	0.0	0.0	0.00	0.00	0.00
1,160.0	0.00	0.00	1,160.0	0.0	0.0	0.0	0.00	0.00	0.00
1,200.0	0.00	0.00	1,200.0	0.0	0.0	0.0	0.00	0.00	0.00
1,240.0	0.00	0.00	1,240.0	0.0	0.0	0.0	0.00	0.00	0.00
1,280.0	0.00	0.00	1,280.0	0.0	0.0	0.0	0.00	0.00	0.00
1,320.0	0.00	0.00	1,320.0	0.0	0.0	0.0	0.00	0.00	0.00
1,360.0	0.00	0.00	1,360.0	0.0	0.0	0.0	0.00	0.00	0.00
1,400.0	0.00	0.00	1,400.0	0.0	0.0	0.0	0.00	0.00	0.00
1,440.0	0.00	0.00	1,440.0	0.0	0.0	0.0	0.00	0.00	0.00
1,480.0	0.00	0.00	1,480.0	0.0	0.0	0.0	0.00	0.00	0.00
1,520.0	0.00	0.00	1,520.0	0.0	0.0	0.0	0.00	0.00	0.00
1,560.0	0.00	0.00	1,560.0	0.0	0.0	0.0	0.00	0.00	0.00
1,600.0	0.00	0.00	1,600.0	0.0	0.0	0.0	0.00	0.00	0.00
1,640.0	0.00	0.00	1,640.0	0.0	0.0	0.0	0.00	0.00	0.00
1,680.0	0.00	0.00	1,680.0	0.0	0.0	0.0	0.00	0.00	0.00
1,720.0	0.00	0.00	1,720.0	0.0	0.0	0.0	0.00	0.00	0.00
1,760.0	0.00	0.00	1,760.0	0.0	0.0	0.0	0.00	0.00	0.00
1,800.0	0.00	0.00	1,800.0	0.0	0.0	0.0	0.00	0.00	0.00
1,840.0	0.00	0.00	1,840.0	0.0	0.0	0.0	0.00	0.00	0.00
1,880.0	0.00	0.00	1,880.0	0.0	0.0	0.0	0.00	0.00	0.00
1,920.0	0.00	0.00	1,920.0	0.0	0.0	0.0	0.00	0.00	0.00
1,960.0	0.00	0.00	1,960.0	0.0	0.0	0.0	0.00	0.00	0.00
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.0	0.00	0.00	0.00

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Wellbore:	Wellbore #1		
Design:	Plan #1 (12-04-12)		

Planned 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)
2,040.0	0.00	0.00	2,040.0	0.0	0.0	0.0	0.00	0.00	0.00
2,080.0	0.00	0.00	2,080.0	0.0	0.0	0.0	0.00	0.00	0.00
2,120.0	0.00	0.00	2,120.0	0.0	0.0	0.0	0.00	0.00	0.00
2,160.0	0.00	0.00	2,160.0	0.0	0.0	0.0	0.00	0.00	0.00
2,200.0	0.00	0.00	2,200.0	0.0	0.0	0.0	0.00	0.00	0.00
KOP #1									
2,240.0	0.80	351.69	2,240.0	0.3	0.0	-0.3	2.00	2.00	0.00
2,280.0	1.60	351.69	2,280.0	1.1	-0.2	-1.1	2.00	2.00	0.00
2,320.0	2.40	351.69	2,320.0	2.5	-0.4	-2.5	2.00	2.00	0.00
2,360.0	3.20	351.69	2,359.9	4.4	-0.6	-4.4	2.00	2.00	0.00
2,400.0	4.00	351.69	2,399.8	6.9	-1.0	-6.9	2.00	2.00	0.00
2,440.0	4.80	351.69	2,439.7	9.9	-1.5	-9.9	2.00	2.00	0.00
2,480.0	5.60	351.69	2,479.6	13.5	-2.0	-13.4	2.00	2.00	0.00
2,520.0	6.40	351.69	2,519.3	17.7	-2.6	-17.6	2.00	2.00	0.00
2,560.0	7.20	351.69	2,559.1	22.4	-3.3	-22.2	2.00	2.00	0.00
2,600.0	8.00	351.69	2,598.7	27.6	-4.0	-27.4	2.00	2.00	0.00
2,640.0	8.80	351.69	2,638.3	33.4	-4.9	-33.2	2.00	2.00	0.00
2,680.0	9.60	351.69	2,677.8	39.7	-5.8	-39.4	2.00	2.00	0.00
2,720.0	10.40	351.69	2,717.1	46.6	-6.8	-46.3	2.00	2.00	0.00
2,760.0	11.20	351.69	2,756.4	54.0	-7.9	-53.7	2.00	2.00	0.00
2,800.0	12.00	351.69	2,795.6	61.9	-9.0	-61.6	2.00	2.00	0.00
2,813.2	12.26	351.69	2,808.6	64.7	-9.4	-64.3	2.00	2.00	0.00
2,840.0	12.26	351.69	2,834.7	70.3	-10.3	-69.9	0.00	0.00	0.00
2,880.0	12.26	351.69	2,873.8	78.7	-11.5	-78.2	0.00	0.00	0.00
2,920.0	12.26	351.69	2,912.9	87.1	-12.7	-86.6	0.00	0.00	0.00
2,960.0	12.26	351.69	2,952.0	95.5	-13.9	-95.0	0.00	0.00	0.00
3,000.0	12.26	351.69	2,991.1	104.0	-15.2	-103.3	0.00	0.00	0.00
3,040.0	12.26	351.69	3,030.2	112.4	-16.4	-111.7	0.00	0.00	0.00
3,080.0	12.26	351.69	3,069.2	120.8	-17.6	-120.0	0.00	0.00	0.00
3,120.0	12.26	351.69	3,108.3	129.2	-18.9	-128.4	0.00	0.00	0.00
3,160.0	12.26	351.69	3,147.4	137.6	-20.1	-136.7	0.00	0.00	0.00
3,200.0	12.26	351.69	3,186.5	146.0	-21.3	-145.1	0.00	0.00	0.00
3,240.0	12.26	351.69	3,225.6	154.4	-22.5	-153.4	0.00	0.00	0.00
3,280.0	12.26	351.69	3,264.7	162.8	-23.8	-161.8	0.00	0.00	0.00
3,320.0	12.26	351.69	3,303.8	171.2	-25.0	-170.2	0.00	0.00	0.00
3,360.0	12.26	351.69	3,342.8	179.6	-26.2	-178.5	0.00	0.00	0.00
3,400.0	12.26	351.69	3,381.9	188.0	-27.5	-186.9	0.00	0.00	0.00
3,440.0	12.26	351.69	3,421.0	196.4	-28.7	-195.2	0.00	0.00	0.00
3,480.0	12.26	351.69	3,460.1	204.9	-29.9	-203.6	0.00	0.00	0.00
3,520.0	12.26	351.69	3,499.2	213.3	-31.1	-211.9	0.00	0.00	0.00
3,560.0	12.26	351.69	3,538.3	221.7	-32.4	-220.3	0.00	0.00	0.00
3,600.0	12.26	351.69	3,577.4	230.1	-33.6	-228.6	0.00	0.00	0.00
3,640.0	12.26	351.69	3,616.5	238.5	-34.8	-237.0	0.00	0.00	0.00
3,680.0	12.26	351.69	3,655.5	246.9	-36.0	-245.4	0.00	0.00	0.00
3,720.0	12.26	351.69	3,694.6	255.3	-37.3	-253.7	0.00	0.00	0.00
3,760.0	12.26	351.69	3,733.7	263.7	-38.5	-262.1	0.00	0.00	0.00
3,800.0	12.26	351.69	3,772.8	272.1	-39.7	-270.4	0.00	0.00	0.00
3,840.0	12.26	351.69	3,811.9	280.5	-41.0	-278.8	0.00	0.00	0.00
3,880.0	12.26	351.69	3,851.0	288.9	-42.2	-287.1	0.00	0.00	0.00
3,920.0	12.26	351.69	3,890.1	297.3	-43.4	-295.5	0.00	0.00	0.00
3,960.0	12.26	351.69	3,929.2	305.7	-44.6	-303.8	0.00	0.00	0.00
4,000.0	12.26	351.69	3,968.2	314.2	-45.9	-312.2	0.00	0.00	0.00
4,040.0	12.26	351.69	4,007.3	322.6	-47.1	-320.6	0.00	0.00	0.00

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Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-04-12)		

Planned 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)
4,080.0	12.26	351.69	4,046.4	331.0	-48.3	-328.9	0.00	0.00	0.00
4,120.0	12.26	351.69	4,085.5	339.4	-49.5	-337.3	0.00	0.00	0.00
4,160.0	12.26	351.69	4,124.6	347.8	-50.8	-345.6	0.00	0.00	0.00
4,200.0	12.26	351.69	4,163.7	356.2	-52.0	-354.0	0.00	0.00	0.00
4,240.0	12.26	351.69	4,202.8	364.6	-53.2	-362.3	0.00	0.00	0.00
4,280.0	12.26	351.69	4,241.9	373.0	-54.5	-370.7	0.00	0.00	0.00
4,320.0	12.26	351.69	4,280.9	381.4	-55.7	-379.0	0.00	0.00	0.00
4,360.0	12.26	351.69	4,320.0	389.8	-56.9	-387.4	0.00	0.00	0.00
4,400.0	12.26	351.69	4,359.1	398.2	-58.1	-395.8	0.00	0.00	0.00
4,440.0	12.26	351.69	4,398.2	406.6	-59.4	-404.1	0.00	0.00	0.00
4,480.0	12.26	351.69	4,437.3	415.1	-60.6	-412.5	0.00	0.00	0.00
4,520.0	12.26	351.69	4,476.4	423.5	-61.8	-420.8	0.00	0.00	0.00
4,560.0	12.26	351.69	4,515.5	431.9	-63.0	-429.2	0.00	0.00	0.00
4,600.0	12.26	351.69	4,554.5	440.3	-64.3	-437.5	0.00	0.00	0.00
4,640.0	12.26	351.69	4,593.6	448.7	-65.5	-445.9	0.00	0.00	0.00
4,680.0	12.26	351.69	4,632.7	457.1	-66.7	-454.2	0.00	0.00	0.00
4,720.0	12.26	351.69	4,671.8	465.5	-68.0	-462.6	0.00	0.00	0.00
4,760.0	12.26	351.69	4,710.9	473.9	-69.2	-471.0	0.00	0.00	0.00
4,800.0	12.26	351.69	4,750.0	482.3	-70.4	-479.3	0.00	0.00	0.00
4,840.0	12.26	351.69	4,789.1	490.7	-71.6	-487.7	0.00	0.00	0.00
4,880.0	12.26	351.69	4,828.2	499.1	-72.9	-496.0	0.00	0.00	0.00
4,920.0	12.26	351.69	4,867.2	507.5	-74.1	-504.4	0.00	0.00	0.00
4,960.0	12.26	351.69	4,906.3	516.0	-75.3	-512.7	0.00	0.00	0.00
5,000.0	12.26	351.69	4,945.4	524.4	-76.5	-521.1	0.00	0.00	0.00
5,040.0	12.26	351.69	4,984.5	532.8	-77.8	-529.4	0.00	0.00	0.00
5,080.0	12.26	351.69	5,023.6	541.2	-79.0	-537.8	0.00	0.00	0.00
5,120.0	12.26	351.69	5,062.7	549.6	-80.2	-546.2	0.00	0.00	0.00
5,160.0	12.26	351.69	5,101.8	558.0	-81.5	-554.5	0.00	0.00	0.00
5,200.0	12.26	351.69	5,140.9	566.4	-82.7	-562.9	0.00	0.00	0.00
5,240.0	12.26	351.69	5,179.9	574.8	-83.9	-571.2	0.00	0.00	0.00
5,280.0	12.26	351.69	5,219.0	583.2	-85.1	-579.6	0.00	0.00	0.00
5,320.0	12.26	351.69	5,258.1	591.6	-86.4	-587.9	0.00	0.00	0.00
5,360.0	12.26	351.69	5,297.2	600.0	-87.6	-596.3	0.00	0.00	0.00
5,400.0	12.26	351.69	5,336.3	608.4	-88.8	-604.6	0.00	0.00	0.00
5,440.0	12.26	351.69	5,375.4	616.8	-90.1	-613.0	0.00	0.00	0.00
5,456.4	12.26	351.69	5,391.4	620.3	-90.6	-616.4	0.00	0.00	0.00
5,480.0	11.79	351.69	5,414.5	625.2	-91.3	-621.3	2.00	-2.00	0.00
5,520.0	10.99	351.69	5,453.7	633.0	-92.4	-629.0	2.00	-2.00	0.00
5,560.0	10.19	351.69	5,493.0	640.3	-93.5	-636.3	2.00	-2.00	0.00
5,600.0	9.39	351.69	5,532.4	647.0	-94.5	-643.0	2.00	-2.00	0.00
5,640.0	8.59	351.69	5,571.9	653.2	-95.4	-649.1	2.00	-2.00	0.00
5,680.0	7.79	351.69	5,611.5	658.8	-96.2	-654.7	2.00	-2.00	0.00
5,720.0	6.99	351.69	5,651.2	663.9	-96.9	-659.8	2.00	-2.00	0.00
5,760.0	6.19	351.69	5,690.9	668.5	-97.6	-664.3	2.00	-2.00	0.00
5,800.0	5.39	351.69	5,730.7	672.4	-98.2	-668.3	2.00	-2.00	0.00
5,840.0	4.59	351.69	5,770.6	675.9	-98.7	-671.7	2.00	-2.00	0.00
5,880.0	3.79	351.69	5,810.5	678.8	-99.1	-674.6	2.00	-2.00	0.00
5,920.0	2.99	351.69	5,850.4	681.1	-99.4	-676.9	2.00	-2.00	0.00
5,960.0	2.19	351.69	5,890.4	682.9	-99.7	-678.7	2.00	-2.00	0.00
6,000.0	1.39	351.69	5,930.3	684.2	-99.9	-679.9	2.00	-2.00	0.00
6,040.0	0.59	351.69	5,970.3	684.8	-100.0	-680.6	2.00	-2.00	0.00
6,069.7	0.00	0.00	6,000.0	685.0	-100.0	-680.7	2.00	-2.00	0.00
6,080.0	0.00	0.00	6,010.3	685.0	-100.0	-680.7	0.00	0.00	0.00

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 21K-443
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Project:	SEC.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-04-12)		

Planned 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)
6,120.0	0.00	0.00	6,050.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,160.0	0.00	0.00	6,090.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,200.0	0.00	0.00	6,130.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,240.0	0.00	0.00	6,170.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,280.0	0.00	0.00	6,210.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,320.0	0.00	0.00	6,250.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,360.0	0.00	0.00	6,290.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,400.0	0.00	0.00	6,330.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,440.0	0.00	0.00	6,370.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,480.0	0.00	0.00	6,410.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,520.0	0.00	0.00	6,450.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,560.0	0.00	0.00	6,490.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,600.0	0.00	0.00	6,530.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,640.0	0.00	0.00	6,570.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,680.0	0.00	0.00	6,610.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,720.0	0.00	0.00	6,650.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,760.0	0.00	0.00	6,690.3	685.0	-100.0	-680.7	0.00	0.00	0.00
6,783.9	0.00	0.00	6,714.2	685.0	-100.0	-680.7	0.00	0.00	0.00
KOP #2									
6,800.0	1.21	180.84	6,730.3	684.8	-100.0	-680.6	7.51	7.51	0.00
6,840.0	4.21	180.84	6,770.3	682.9	-100.0	-678.7	7.50	7.50	0.00
6,880.0	7.21	180.84	6,810.1	679.0	-100.1	-674.7	7.50	7.50	0.00
6,920.0	10.21	180.84	6,849.6	672.9	-100.2	-668.6	7.50	7.50	0.00
6,960.0	13.21	180.84	6,888.8	664.8	-100.3	-660.5	7.50	7.50	0.00
7,000.0	16.21	180.84	6,927.5	654.6	-100.4	-650.4	7.50	7.50	0.00
7,040.0	19.21	180.84	6,965.6	642.5	-100.6	-638.2	7.50	7.50	0.00
7,080.0	22.21	180.84	7,003.0	628.3	-100.8	-624.1	7.50	7.50	0.00
7,120.0	25.21	180.84	7,039.6	612.2	-101.1	-608.0	7.50	7.50	0.00
7,160.0	28.21	180.84	7,075.3	594.3	-101.3	-590.0	7.50	7.50	0.00
7,200.0	31.21	180.84	7,110.1	574.5	-101.6	-570.2	7.50	7.50	0.00
7,240.0	34.21	180.84	7,143.7	552.8	-101.9	-548.6	7.50	7.50	0.00
7,280.0	37.21	180.84	7,176.2	529.5	-102.3	-525.2	7.50	7.50	0.00
7,320.0	40.21	180.84	7,207.4	504.5	-102.6	-500.2	7.50	7.50	0.00
7,360.0	43.21	180.84	7,237.2	477.9	-103.0	-473.6	7.50	7.50	0.00
7,400.0	46.21	180.84	7,265.7	449.7	-103.4	-445.5	7.50	7.50	0.00
7,440.0	49.21	180.84	7,292.6	420.2	-103.9	-415.9	7.50	7.50	0.00
7,480.0	52.21	180.84	7,317.9	389.2	-104.3	-385.0	7.50	7.50	0.00
7,520.0	55.21	180.84	7,341.6	357.0	-104.8	-352.8	7.50	7.50	0.00
7,560.0	58.21	180.84	7,363.5	323.5	-105.3	-319.3	7.50	7.50	0.00
7,600.0	61.21	180.84	7,383.7	289.0	-105.8	-284.8	7.50	7.50	0.00
7,640.0	64.21	180.84	7,402.0	253.5	-106.3	-249.3	7.50	7.50	0.00
7,680.0	67.21	180.84	7,418.5	217.0	-106.9	-212.8	7.50	7.50	0.00
7,720.0	70.21	180.84	7,433.0	179.8	-107.4	-175.6	7.50	7.50	0.00
7,760.0	73.21	180.84	7,445.6	141.8	-108.0	-137.6	7.50	7.50	0.00
7,800.0	76.21	180.84	7,456.1	103.2	-108.5	-99.0	7.50	7.50	0.00
7,840.0	79.21	180.84	7,464.6	64.1	-109.1	-60.0	7.50	7.50	0.00
7,880.0	82.21	180.84	7,471.1	24.7	-109.7	-20.5	7.50	7.50	0.00
7,903.9	84.00	180.84	7,474.0	1.0	-110.0	3.2	7.49	7.49	0.00
7"									
7,920.0	84.00	180.84	7,475.6	-15.1	-110.3	19.2	0.00	0.00	0.00
7,960.0	84.00	180.84	7,479.8	-54.8	-110.8	59.0	0.00	0.00	0.00
7,978.9	84.00	180.84	7,481.8	-73.6	-111.1	77.8	0.00	0.00	0.00
8,000.0	85.06	180.83	7,483.8	-94.6	-111.4	98.8	5.00	5.00	-0.05

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 21K-443
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Project:	SEC.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-04-12)		

Planned 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)
8,040.0	87.06	180.81	7,486.6	-134.5	-112.0	138.7	5.00	5.00	-0.05
8,080.0	89.06	180.79	7,487.9	-174.5	-112.6	178.6	5.00	5.00	-0.05
8,106.8	90.40	180.78	7,488.0	-201.3	-112.9	205.4	5.00	5.00	-0.05
End of Build									
8,120.0	90.40	180.78	7,488.0	-214.5	-113.1	218.6	0.00	0.00	0.00
8,160.0	90.40	180.78	7,487.7	-254.5	-113.7	258.6	0.00	0.00	0.00
8,200.0	90.40	180.78	7,487.4	-294.5	-114.2	298.6	0.00	0.00	0.00
8,240.0	90.40	180.78	7,487.1	-334.5	-114.7	338.6	0.00	0.00	0.00
8,280.0	90.40	180.78	7,486.9	-374.5	-115.3	378.6	0.00	0.00	0.00
8,320.0	90.40	180.78	7,486.6	-414.5	-115.8	418.6	0.00	0.00	0.00
8,360.0	90.40	180.78	7,486.3	-454.5	-116.4	458.5	0.00	0.00	0.00
8,400.0	90.40	180.78	7,486.0	-494.5	-116.9	498.5	0.00	0.00	0.00
8,440.0	90.40	180.78	7,485.7	-534.5	-117.5	538.5	0.00	0.00	0.00
8,480.0	90.40	180.78	7,485.5	-574.5	-118.0	578.5	0.00	0.00	0.00
8,520.0	90.40	180.78	7,485.2	-614.4	-118.6	618.5	0.00	0.00	0.00
8,560.0	90.40	180.78	7,484.9	-654.4	-119.1	658.5	0.00	0.00	0.00
8,600.0	90.40	180.78	7,484.6	-694.4	-119.7	698.5	0.00	0.00	0.00
8,640.0	90.40	180.78	7,484.4	-734.4	-120.2	738.5	0.00	0.00	0.00
8,680.0	90.40	180.78	7,484.1	-774.4	-120.8	778.4	0.00	0.00	0.00
8,720.0	90.40	180.78	7,483.8	-814.4	-121.3	818.4	0.00	0.00	0.00
8,760.0	90.40	180.78	7,483.5	-854.4	-121.8	858.4	0.00	0.00	0.00
8,800.0	90.40	180.78	7,483.3	-894.4	-122.4	898.4	0.00	0.00	0.00
8,840.0	90.40	180.78	7,483.0	-934.4	-122.9	938.4	0.00	0.00	0.00
8,880.0	90.40	180.78	7,482.7	-974.4	-123.5	978.4	0.00	0.00	0.00
8,920.0	90.40	180.78	7,482.4	-1,014.4	-124.0	1,018.4	0.00	0.00	0.00
8,960.0	90.40	180.78	7,482.2	-1,054.4	-124.6	1,058.4	0.00	0.00	0.00
9,000.0	90.40	180.78	7,481.9	-1,094.4	-125.1	1,098.3	0.00	0.00	0.00
9,040.0	90.40	180.78	7,481.6	-1,134.4	-125.7	1,138.3	0.00	0.00	0.00
9,080.0	90.40	180.78	7,481.3	-1,174.4	-126.2	1,178.3	0.00	0.00	0.00
9,120.0	90.40	180.78	7,481.0	-1,214.4	-126.8	1,218.3	0.00	0.00	0.00
9,160.0	90.40	180.78	7,480.8	-1,254.4	-127.3	1,258.3	0.00	0.00	0.00
9,200.0	90.40	180.78	7,480.5	-1,294.4	-127.9	1,298.3	0.00	0.00	0.00
9,240.0	90.40	180.78	7,480.2	-1,334.4	-128.4	1,338.3	0.00	0.00	0.00
9,280.0	90.40	180.78	7,479.9	-1,374.4	-128.9	1,378.3	0.00	0.00	0.00
9,320.0	90.40	180.78	7,479.7	-1,414.4	-129.5	1,418.2	0.00	0.00	0.00
9,360.0	90.40	180.78	7,479.4	-1,454.3	-130.0	1,458.2	0.00	0.00	0.00
9,400.0	90.40	180.78	7,479.1	-1,494.3	-130.6	1,498.2	0.00	0.00	0.00
9,440.0	90.40	180.78	7,478.8	-1,534.3	-131.1	1,538.2	0.00	0.00	0.00
9,480.0	90.40	180.78	7,478.6	-1,574.3	-131.7	1,578.2	0.00	0.00	0.00
9,520.0	90.40	180.78	7,478.3	-1,614.3	-132.2	1,618.2	0.00	0.00	0.00
9,560.0	90.40	180.78	7,478.0	-1,654.3	-132.8	1,658.2	0.00	0.00	0.00
9,600.0	90.40	180.78	7,477.7	-1,694.3	-133.3	1,698.2	0.00	0.00	0.00
9,640.0	90.40	180.78	7,477.5	-1,734.3	-133.9	1,738.1	0.00	0.00	0.00
9,680.0	90.40	180.78	7,477.2	-1,774.3	-134.4	1,778.1	0.00	0.00	0.00
9,720.0	90.40	180.78	7,476.9	-1,814.3	-135.0	1,818.1	0.00	0.00	0.00
9,760.0	90.40	180.78	7,476.6	-1,854.3	-135.5	1,858.1	0.00	0.00	0.00
9,800.0	90.40	180.78	7,476.4	-1,894.3	-136.0	1,898.1	0.00	0.00	0.00
9,840.0	90.40	180.78	7,476.1	-1,934.3	-136.6	1,938.1	0.00	0.00	0.00
9,880.0	90.40	180.78	7,475.8	-1,974.3	-137.1	1,978.1	0.00	0.00	0.00
9,920.0	90.40	180.78	7,475.5	-2,014.3	-137.7	2,018.1	0.00	0.00	0.00
9,960.0	90.40	180.78	7,475.2	-2,054.3	-138.2	2,058.0	0.00	0.00	0.00
10,000.0	90.40	180.78	7,475.0	-2,094.3	-138.8	2,098.0	0.00	0.00	0.00
10,040.0	90.40	180.78	7,474.7	-2,134.3	-139.3	2,138.0	0.00	0.00	0.00

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 21K-443
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Project:	SEC.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-04-12)		

Planned 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)
10,080.0	90.40	180.78	7,474.4	-2,174.3	-139.9	2,178.0	0.00	0.00	0.00
10,120.0	90.40	180.78	7,474.1	-2,214.3	-140.4	2,218.0	0.00	0.00	0.00
10,160.0	90.40	180.78	7,473.9	-2,254.3	-141.0	2,258.0	0.00	0.00	0.00
10,200.0	90.40	180.78	7,473.6	-2,294.3	-141.5	2,298.0	0.00	0.00	0.00
10,240.0	90.40	180.78	7,473.3	-2,334.2	-142.1	2,337.9	0.00	0.00	0.00
10,280.0	90.40	180.78	7,473.0	-2,374.2	-142.6	2,377.9	0.00	0.00	0.00
10,320.0	90.40	180.78	7,472.8	-2,414.2	-143.1	2,417.9	0.00	0.00	0.00
10,360.0	90.40	180.78	7,472.5	-2,454.2	-143.7	2,457.9	0.00	0.00	0.00
10,400.0	90.40	180.78	7,472.2	-2,494.2	-144.2	2,497.9	0.00	0.00	0.00
10,440.0	90.40	180.78	7,471.9	-2,534.2	-144.8	2,537.9	0.00	0.00	0.00
10,480.0	90.40	180.78	7,471.7	-2,574.2	-145.3	2,577.9	0.00	0.00	0.00
10,520.0	90.40	180.78	7,471.4	-2,614.2	-145.9	2,617.9	0.00	0.00	0.00
10,560.0	90.40	180.78	7,471.1	-2,654.2	-146.4	2,657.8	0.00	0.00	0.00
10,600.0	90.40	180.78	7,470.8	-2,694.2	-147.0	2,697.8	0.00	0.00	0.00
10,640.0	90.40	180.78	7,470.5	-2,734.2	-147.5	2,737.8	0.00	0.00	0.00
10,680.0	90.40	180.78	7,470.3	-2,774.2	-148.1	2,777.8	0.00	0.00	0.00
10,720.0	90.40	180.78	7,470.0	-2,814.2	-148.6	2,817.8	0.00	0.00	0.00
10,760.0	90.40	180.78	7,469.7	-2,854.2	-149.1	2,857.8	0.00	0.00	0.00
10,800.0	90.40	180.78	7,469.4	-2,894.2	-149.7	2,897.8	0.00	0.00	0.00
10,840.0	90.40	180.78	7,469.2	-2,934.2	-150.2	2,937.8	0.00	0.00	0.00
10,880.0	90.40	180.78	7,468.9	-2,974.2	-150.8	2,977.7	0.00	0.00	0.00
10,920.0	90.40	180.78	7,468.6	-3,014.2	-151.3	3,017.7	0.00	0.00	0.00
10,960.0	90.40	180.78	7,468.3	-3,054.2	-151.9	3,057.7	0.00	0.00	0.00
11,000.0	90.40	180.78	7,468.1	-3,094.2	-152.4	3,097.7	0.00	0.00	0.00
11,040.0	90.40	180.78	7,467.8	-3,134.2	-153.0	3,137.7	0.00	0.00	0.00
11,080.0	90.40	180.78	7,467.5	-3,174.1	-153.5	3,177.7	0.00	0.00	0.00
11,120.0	90.40	180.78	7,467.2	-3,214.1	-154.1	3,217.7	0.00	0.00	0.00
11,160.0	90.40	180.78	7,467.0	-3,254.1	-154.6	3,257.7	0.00	0.00	0.00
11,200.0	90.40	180.78	7,466.7	-3,294.1	-155.2	3,297.6	0.00	0.00	0.00
11,240.0	90.40	180.78	7,466.4	-3,334.1	-155.7	3,337.6	0.00	0.00	0.00
11,280.0	90.40	180.78	7,466.1	-3,374.1	-156.2	3,377.6	0.00	0.00	0.00
11,320.0	90.40	180.78	7,465.9	-3,414.1	-156.8	3,417.6	0.00	0.00	0.00
11,360.0	90.40	180.78	7,465.6	-3,454.1	-157.3	3,457.6	0.00	0.00	0.00
11,400.0	90.40	180.78	7,465.3	-3,494.1	-157.9	3,497.6	0.00	0.00	0.00
11,440.0	90.40	180.78	7,465.0	-3,534.1	-158.4	3,537.6	0.00	0.00	0.00
11,480.0	90.40	180.78	7,464.7	-3,574.1	-159.0	3,577.6	0.00	0.00	0.00
11,520.0	90.40	180.78	7,464.5	-3,614.1	-159.5	3,617.5	0.00	0.00	0.00
11,560.0	90.40	180.78	7,464.2	-3,654.1	-160.1	3,657.5	0.00	0.00	0.00
11,600.0	90.40	180.78	7,463.9	-3,694.1	-160.6	3,697.5	0.00	0.00	0.00
11,640.0	90.40	180.78	7,463.6	-3,734.1	-161.2	3,737.5	0.00	0.00	0.00
11,680.0	90.40	180.78	7,463.4	-3,774.1	-161.7	3,777.5	0.00	0.00	0.00
11,720.0	90.40	180.78	7,463.1	-3,814.1	-162.3	3,817.5	0.00	0.00	0.00
11,760.0	90.40	180.78	7,462.8	-3,854.1	-162.8	3,857.5	0.00	0.00	0.00
11,800.0	90.40	180.78	7,462.5	-3,894.1	-163.3	3,897.5	0.00	0.00	0.00
11,840.0	90.40	180.78	7,462.3	-3,934.1	-163.9	3,937.4	0.00	0.00	0.00
11,880.0	90.40	180.78	7,462.0	-3,974.1	-164.4	3,977.4	0.00	0.00	0.00
11,920.0	90.40	180.78	7,461.7	-4,014.0	-165.0	4,017.4	0.00	0.00	0.00
11,960.0	90.40	180.78	7,461.4	-4,054.0	-165.5	4,057.4	0.00	0.00	0.00
12,000.0	90.40	180.78	7,461.2	-4,094.0	-166.1	4,097.4	0.00	0.00	0.00
12,040.0	90.40	180.78	7,460.9	-4,134.0	-166.6	4,137.4	0.00	0.00	0.00
12,080.0	90.40	180.78	7,460.6	-4,174.0	-167.2	4,177.4	0.00	0.00	0.00
12,120.0	90.40	180.78	7,460.3	-4,214.0	-167.7	4,217.4	0.00	0.00	0.00
12,160.0	90.40	180.78	7,460.0	-4,254.0	-168.3	4,257.3	0.00	0.00	0.00

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 21K-443
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Project:	SEC.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (12-04-12)		

Planned 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)
12,200.0	90.40	180.78	7,459.8	-4,294.0	-168.8	4,297.3	0.00	0.00	0.00
12,240.0	90.40	180.78	7,459.5	-4,334.0	-169.4	4,337.3	0.00	0.00	0.00
12,280.0	90.40	180.78	7,459.2	-4,374.0	-169.9	4,377.3	0.00	0.00	0.00
12,320.0	90.40	180.78	7,458.9	-4,414.0	-170.4	4,417.3	0.00	0.00	0.00
12,360.0	90.40	180.78	7,458.7	-4,454.0	-171.0	4,457.3	0.00	0.00	0.00
12,400.0	90.40	180.78	7,458.4	-4,494.0	-171.5	4,497.3	0.00	0.00	0.00
12,440.0	90.40	180.78	7,458.1	-4,534.0	-172.1	4,537.3	0.00	0.00	0.00
12,456.4	90.40	180.78	7,458.0	-4,550.4	-172.3	4,553.6	0.00	0.00	0.00
BHL 2140'FNL, 1080'FWL									

Targets

Target Name	- hit/miss target	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
LOT-A		0.00	0.00	1.0	273.3	-1,180.9	1,447,778.57	3,196,533.31	40.560400	-104.792660
- plan misses target center by 1212.1ft at 1.0ft MD (1.0 TVD, 0.0 N, 0.0 E)										
- Polygon										
Point 1				1.0	0.0	0.0	1,447,778.57	3,196,533.31		
Point 2				1.0	449.0	0.0	1,448,227.54	3,196,529.71		
Point 3				1.0	449.0	1,289.0	1,448,237.89	3,197,818.63		
Point 4				1.0	0.0	1,289.0	1,447,788.91	3,197,822.23		
Point 5				1.0	449.0	1,289.0	1,448,237.89	3,197,818.63		
Point 6				1.0	449.0	0.0	1,448,227.54	3,196,529.71		
BHL 2140'FNL, 1080'I		0.00	0.00	7,458.0	-4,550.4	-172.3	1,442,963.32	3,197,580.55	40.547160	-104.789030
- plan hits target center										
- Point										

Casing Points

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,903.9	7,474.0	7"	7	8-3/4

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
2,200.0	2,200.0	0.0	0.0	KOP #1
6,783.9	6,714.2	685.0	-100.0	KOP #2
8,106.8	7,488.0	-201.3	-112.9	End of Build



PETROLEUM DEVELOPMENT CORP Weld County CO

SEC.21-T7N-R66W

Thornton 21K-HZ Pad Sec.21-T7N-R66W

Thornton 21K-443

Wellbore #1

Plan #1 (12-04-12)

Anticollision Report

05 December, 2012



Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21K-443
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Reference Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	Landmark
Reference Design:	Plan #1 (12-04-12)	Offset TVD Reference:	Offset Datum

Reference	Plan #1 (12-04-12)		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 1,000.0ft	Error Surface:	Elliptical Conic
Warning Levels Evaluated at:	2.00 Sigma		

Survey Tool Program	Date	12/4/2012		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
0.0	12,456.4	Plan #1 (12-04-12) (Wellbore #1)	MWD	MWD - Standard

Summary						
Site Name	Reference Measured Depth (ft)	Offset Measured Depth (ft)	Distance Between Centres (ft)	Between Ellipses (ft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
Thornton 21K-HZ Pad Sec.21-T7N-R66W						
Thornton 21G-223 - Wellbore #1 - Plan #1 (12-04-12)	1,000.0	1,000.0	76.8	72.5	17.985	CC, ES
Thornton 21G-223 - Wellbore #1 - Plan #1 (12-04-12)	12,456.4	12,318.5	463.4	284.9	2.596	SF
Thornton 21G-403 - Wellbore #1 - Plan #1 (12-04-12)	400.0	400.0	99.5	97.9	63.210	CC, ES
Thornton 21G-403 - Wellbore #1 - Plan #1 (12-04-12)	12,456.4	12,487.3	880.8	696.0	4.767	SF
Thornton 21K-203 - Wellbore #1 - Plan #1 (12-03-12)	2,000.0	2,000.0	75.0	66.3	8.559	CC, ES
Thornton 21K-203 - Wellbore #1 - Plan #1 (12-03-12)	12,456.4	11,821.6	460.9	285.6	2.630	SF

Offset Design												
Thornton 21K-HZ Pad Sec.21-T7N-R66W - Thornton 21G-223 - Wellbore #1 - Plan #1 (12-04-12)												
Survey Program: 0-MWD												
Reference												
Measured Depth (ft)	Vertical Depth (ft)	Offset Measured Depth (ft)	Vertical Depth (ft)	Semi Major Axis Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Distance Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor
0.0	0.0	0.0	0.0	0.0	0.0	-40.63	58.3	-50.0	76.8			
100.0	100.0	100.0	100.0	0.1	0.1	-40.63	58.3	-50.0	76.8	76.6	0.22	341.723
200.0	200.0	200.0	200.0	0.3	0.3	-40.63	58.3	-50.0	76.8	76.1	0.67	113.908
300.0	300.0	300.0	300.0	0.6	0.6	-40.63	58.3	-50.0	76.8	75.7	1.12	68.345
400.0	400.0	400.0	400.0	0.8	0.8	-40.63	58.3	-50.0	76.8	75.2	1.57	48.818
500.0	500.0	500.0	500.0	1.0	1.0	-40.63	58.3	-50.0	76.8	74.8	2.02	37.969
600.0	600.0	600.0	600.0	1.2	1.2	-40.63	58.3	-50.0	76.8	74.3	2.47	31.066
700.0	700.0	700.0	700.0	1.5	1.5	-40.63	58.3	-50.0	76.8	73.9	2.92	26.286
800.0	800.0	800.0	800.0	1.7	1.7	-40.63	58.3	-50.0	76.8	73.4	3.37	22.782
900.0	900.0	900.0	900.0	1.9	1.9	-40.63	58.3	-50.0	76.8	73.0	3.82	20.101
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	-40.63	58.3	-50.0	76.8	72.5	4.27	17.985 CC, ES
1,100.0	1,100.0	1,097.4	1,097.3	2.4	2.4	-40.58	59.6	-51.0	78.5	73.8	4.71	16.661
1,200.0	1,200.0	1,194.5	1,194.3	2.6	2.6	-40.43	63.5	-54.1	83.6	78.4	5.15	16.220
1,300.0	1,300.0	1,291.2	1,290.7	2.8	2.8	-40.22	69.9	-59.1	92.1	86.5	5.60	16.445
1,400.0	1,400.0	1,387.2	1,386.0	3.0	3.0	-39.99	78.9	-66.1	103.9	97.8	6.04	17.187
1,500.0	1,500.0	1,482.3	1,480.1	3.3	3.3	-39.76	90.2	-75.0	119.0	112.5	6.49	18.330
1,600.0	1,600.0	1,580.1	1,576.3	3.5	3.6	-39.55	103.5	-85.5	136.3	129.3	6.94	19.627
1,700.0	1,700.0	1,678.5	1,673.3	3.7	3.9	-39.38	117.0	-96.0	153.7	146.3	7.40	20.772
1,800.0	1,800.0	1,777.0	1,770.3	3.9	4.2	-39.25	130.4	-106.6	171.1	163.2	7.85	21.778
1,900.0	1,900.0	1,875.5	1,867.2	4.2	4.5	-39.14	143.9	-117.1	188.4	180.1	8.31	22.667
2,000.0	2,000.0	1,974.0	1,964.2	4.4	4.9	-39.06	157.4	-127.7	205.8	197.1	8.77	23.456

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21K-443
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Reference Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	Landmark
Reference Design:	Plan #1 (12-04-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21K-HZ Pad Sec.21-T7N-R66W - Thornton 21G-223 - Wellbore #1 - Plan #1 (12-04-12)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference	Offset	Semi Major Axis	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	Offset Wellbore Centre +E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
2,100.0	2,100.0	2,072.4	2,061.2	4.6	5.2	-38.98		170.9	-138.3	223.2	214.0	9.24	24.162	
2,200.0	2,200.0	2,170.9	2,158.2	4.8	5.6	-38.92		184.3	-148.8	240.6	230.9	9.70	24.797	
2,300.0	2,300.0	2,269.6	2,255.4	5.1	5.9	-30.59		197.9	-159.4	256.5	246.4	10.14	25.294	
2,400.0	2,399.8	2,368.8	2,353.0	5.3	6.3	-30.97		211.4	-170.1	269.4	258.8	10.60	25.415	
2,500.0	2,499.5	2,468.2	2,450.9	5.5	6.7	-31.71		225.0	-180.7	279.5	268.4	11.06	25.271	
2,600.0	2,598.7	2,567.8	2,549.0	5.7	7.1	-32.79		238.6	-191.4	286.6	275.1	11.51	24.893	
2,700.0	2,697.5	2,667.4	2,647.1	6.0	7.4	-34.22		252.3	-202.1	291.0	279.0	11.97	24.307	
2,800.0	2,795.6	2,766.9	2,745.1	6.2	7.8	-36.03		265.9	-212.8	292.7	280.2	12.44	23.533	
2,813.2	2,808.6	2,780.1	2,758.1	6.3	7.9	-36.30		267.7	-214.2	292.7	280.2	12.50	23.418	
2,900.0	2,893.3	2,866.4	2,843.0	6.5	8.2	-38.09		279.5	-223.4	293.0	280.0	12.95	22.620	
3,000.0	2,991.1	2,965.8	2,940.9	6.8	8.6	-40.15		293.1	-234.1	293.6	280.1	13.49	21.762	
3,100.0	3,088.8	3,065.2	3,038.9	7.2	8.9	-42.19		306.7	-244.8	294.7	280.6	14.06	20.963	
3,200.0	3,186.5	3,164.7	3,136.8	7.5	9.3	-44.22		320.3	-255.4	296.1	281.5	14.65	20.219	
3,300.0	3,284.2	3,264.1	3,234.7	7.8	9.7	-46.23		333.9	-266.1	297.9	282.6	15.26	19.526	
3,400.0	3,381.9	3,363.5	3,332.6	8.2	10.1	-48.21		347.5	-276.8	300.1	284.2	15.89	18.881	
3,500.0	3,479.7	3,463.0	3,430.5	8.6	10.5	-50.17		361.1	-287.4	302.6	286.0	16.55	18.280	
3,600.0	3,577.4	3,562.4	3,528.5	8.9	10.9	-52.08		374.7	-298.1	305.4	288.2	17.24	17.722	
3,700.0	3,675.1	3,661.8	3,626.4	9.3	11.3	-53.96		388.4	-308.8	308.6	290.7	17.94	17.204	
3,800.0	3,772.8	3,761.3	3,724.3	9.7	11.6	-55.80		402.0	-319.4	312.2	293.5	18.67	16.723	
3,900.0	3,870.5	3,860.7	3,822.2	10.1	12.0	-57.60		415.6	-330.1	316.0	296.6	19.41	16.278	
4,000.0	3,968.2	3,960.1	3,920.1	10.5	12.4	-59.35		429.2	-340.8	320.2	300.0	20.18	15.866	
4,100.0	4,066.0	4,059.6	4,018.1	10.9	12.8	-61.06		442.8	-351.4	324.6	303.7	20.96	15.487	
4,200.0	4,163.7	4,159.0	4,116.0	11.3	13.2	-62.72		456.4	-362.1	329.4	307.6	21.76	15.136	
4,300.0	4,261.4	4,258.4	4,213.9	11.7	13.6	-64.33		470.0	-372.8	334.4	311.8	22.57	14.814	
4,400.0	4,359.1	4,357.9	4,311.8	12.1	14.0	-65.90		483.6	-383.5	339.6	316.2	23.40	14.517	
4,500.0	4,456.8	4,457.3	4,409.7	12.6	14.4	-67.41		497.2	-394.1	345.1	320.9	24.23	14.244	
4,600.0	4,554.5	4,556.7	4,507.7	13.0	14.8	-68.88		510.8	-404.8	350.9	325.8	25.07	13.994	
4,700.0	4,652.3	4,656.2	4,605.6	13.4	15.1	-70.30		524.4	-415.5	356.9	330.9	25.93	13.764	
4,800.0	4,750.0	4,755.6	4,703.5	13.8	15.5	-71.67		538.0	-426.1	363.0	336.2	26.78	13.554	
4,900.0	4,847.7	4,855.1	4,801.4	14.2	15.9	-73.00		551.6	-436.8	369.4	341.8	27.65	13.361	
5,000.0	4,945.4	4,954.5	4,899.3	14.7	16.3	-74.28		565.2	-447.5	376.0	347.5	28.52	13.184	
5,100.0	5,043.1	5,053.9	4,997.3	15.1	16.7	-75.51		578.8	-458.1	382.7	353.3	29.39	13.023	
5,200.0	5,140.9	5,153.4	5,095.2	15.5	17.1	-76.71		592.4	-468.8	389.7	359.4	30.26	12.875	
5,300.0	5,238.6	5,252.8	5,193.1	16.0	17.5	-77.86		606.0	-479.5	396.8	365.6	31.14	12.740	
5,400.0	5,336.3	5,352.2	5,291.0	16.4	17.9	-78.97		619.7	-490.1	404.0	372.0	32.02	12.617	
5,456.4	5,391.4	5,408.3	5,346.3	16.6	18.1	-79.58		627.3	-496.1	408.2	375.6	32.52	12.552	
5,500.0	5,434.1	5,451.7	5,389.0	16.8	18.3	-80.06		633.3	-500.8	411.4	378.6	32.88	12.514	
5,600.0	5,532.4	5,551.3	5,487.0	17.1	18.7	-80.81		646.9	-511.5	419.5	385.9	33.60	12.483	
5,700.0	5,631.4	5,659.5	5,593.8	17.4	19.0	-81.24		660.5	-522.2	427.3	393.0	34.23	12.481	
5,800.0	5,730.7	5,769.5	5,703.0	17.6	19.3	-81.56		671.1	-530.5	433.2	398.4	34.77	12.461	
5,900.0	5,830.4	5,879.7	5,812.9	17.9	19.5	-81.78		678.5	-536.2	437.3	402.1	35.22	12.417	
6,000.0	5,930.3	5,990.1	5,923.1	18.0	19.7	-81.89		682.5	-539.4	439.6	404.0	35.59	12.349	
6,069.7	6,000.0	6,067.0	6,000.0	18.1	19.8	-90.22		683.3	-540.0	440.0	404.1	35.90	12.257	
6,100.0	6,030.3	6,097.3	6,030.3	18.2	19.8	-90.22		683.3	-540.0	440.0	404.0	35.99	12.227	
6,200.0	6,130.3	6,197.3	6,130.3	18.3	20.0	-90.22		683.3	-540.0	440.0	403.7	36.30	12.120	
6,300.0	6,230.3	6,297.3	6,230.3	18.5	20.1	-90.22		683.3	-540.0	440.0	403.4	36.62	12.015	
6,400.0	6,330.3	6,397.3	6,330.3	18.6	20.3	-90.22		683.3	-540.0	440.0	403.1	36.95	11.910	
6,500.0	6,430.3	6,497.3	6,430.3	18.8	20.4	-90.22		683.3	-540.0	440.0	402.7	37.27	11.806	
6,600.0	6,530.3	6,597.3	6,530.3	19.0	20.6	-90.22		683.3	-540.0	440.0	402.4	37.60	11.703	
6,644.8	6,575.2	6,642.2	6,575.2	19.0	20.7	-90.22		683.3	-540.0	440.0	402.3	37.75	11.657	
6,700.0	6,630.3	6,696.9	6,629.8	19.1	20.7	-90.37		682.2	-540.0	440.0	402.1	37.93	11.602	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21K-443
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Reference Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	Landmark
Reference Design:	Plan #1 (12-04-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21K-HZ Pad Sec.21-T7N-R66W - Thornton 21G-223 - Wellbore #1 - Plan #1 (12-04-12)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference	Offset	Semi Major Axis	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	Offset Wellbore Centre +E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
6,783.9	6,714.2	6,778.8	6,711.2	19.3	20.8	-91.52		673.3	-540.2	440.3	402.1	38.21	11.524	
6,800.0	6,730.3	6,794.3	6,726.5	19.3	20.8	87.31		670.7	-540.2	440.4	402.3	38.18	11.536	
6,850.0	6,780.2	6,842.1	6,773.2	19.3	20.7	86.29		660.5	-540.4	440.9	402.6	38.30	11.513	
6,900.0	6,829.9	6,889.5	6,818.8	19.4	20.7	85.29		647.7	-540.5	441.5	403.1	38.35	11.513	
6,950.0	6,879.0	6,936.4	6,863.1	19.3	20.6	84.32		632.1	-540.8	442.2	403.8	38.33	11.536	
7,000.0	6,927.5	6,982.9	6,905.9	19.3	20.5	83.37		614.1	-541.0	443.0	404.7	38.26	11.579	
7,050.0	6,975.0	7,029.0	6,947.3	19.2	20.5	82.46		593.6	-541.3	443.9	405.8	38.12	11.643	
7,100.0	7,021.4	7,074.8	6,987.0	19.1	20.4	81.58		570.9	-541.7	444.8	406.9	37.94	11.726	
7,150.0	7,066.5	7,120.3	7,025.1	19.0	20.2	80.74		546.1	-542.1	445.9	408.2	37.70	11.826	
7,200.0	7,110.1	7,165.4	7,061.3	18.9	20.1	79.94		519.2	-542.5	446.9	409.5	37.43	11.941	
7,250.0	7,151.9	7,210.3	7,095.7	18.7	20.0	79.18		490.4	-542.9	448.0	410.9	37.12	12.069	
7,300.0	7,191.9	7,254.8	7,128.1	18.5	19.9	78.47		459.8	-543.3	449.1	412.4	36.80	12.207	
7,350.0	7,229.9	7,300.0	7,159.1	18.4	19.7	77.80		427.0	-543.8	450.2	413.8	36.45	12.352	
7,400.0	7,265.7	7,343.3	7,186.9	18.2	19.6	77.20		393.9	-544.3	451.3	415.2	36.11	12.497	
7,450.0	7,299.1	7,387.1	7,213.2	18.1	19.5	76.63		358.7	-544.8	452.3	416.6	35.79	12.640	
7,500.0	7,330.0	7,430.9	7,237.3	17.9	19.3	76.12		322.3	-545.4	453.3	417.8	35.49	12.775	
7,550.0	7,358.2	7,474.4	7,259.2	17.8	19.2	75.66		284.6	-545.9	454.2	419.0	35.22	12.896	
7,600.0	7,383.7	7,517.8	7,278.8	17.7	19.1	75.26		246.0	-546.5	455.0	420.0	35.01	12.998	
7,650.0	7,406.3	7,561.1	7,296.2	17.7	19.0	74.91		206.3	-547.1	455.8	420.9	34.86	13.075	
7,700.0	7,426.0	7,604.2	7,311.3	17.6	18.9	74.62		165.9	-547.7	456.4	421.6	34.78	13.122	
7,750.0	7,442.6	7,650.0	7,324.7	17.6	18.8	74.37		122.2	-548.3	456.9	422.2	34.80	13.133	
7,800.0	7,456.1	7,690.3	7,334.4	17.7	18.7	74.20		83.1	-548.9	457.3	422.4	34.90	13.106	
7,850.0	7,466.4	7,733.2	7,342.4	17.8	18.6	74.07		40.9	-549.5	457.6	422.5	35.10	13.039	
7,903.9	7,474.0	7,780.2	7,348.5	17.9	18.5	74.00		-5.7	-550.2	457.8	422.4	35.42	12.925	
7,938.7	7,477.6	7,815.0	7,352.1	18.1	18.4	74.00		-40.3	-550.8	457.8	422.1	35.73	12.811	
7,978.9	7,481.8	7,854.7	7,356.3	18.2	18.4	74.00		-79.8	-551.3	457.8	421.7	36.12	12.675	
8,000.0	7,483.8	7,873.8	7,358.0	18.3	18.5	74.00		-98.8	-551.6	457.8	421.5	36.34	12.598	
8,106.8	7,488.0	7,970.2	7,362.1	19.0	19.3	74.03		-195.1	-553.0	457.8	420.1	37.69	12.145	
8,119.1	7,488.0	7,981.8	7,362.0	19.1	19.4	74.03		-206.7	-553.2	457.8	419.9	37.87	12.087	
8,200.0	7,487.4	8,062.2	7,361.2	19.7	20.2	74.00		-287.0	-554.3	457.9	418.7	39.19	11.685	
8,300.0	7,486.7	8,162.2	7,360.2	20.7	21.3	73.96		-387.0	-555.7	458.0	417.0	41.05	11.159	
8,400.0	7,486.0	8,262.2	7,359.2	21.7	22.4	73.93		-487.0	-557.1	458.1	415.0	43.15	10.618	
8,500.0	7,485.3	8,362.2	7,358.2	22.9	23.7	73.89		-587.0	-558.5	458.3	412.8	45.45	10.083	
8,600.0	7,484.6	8,462.2	7,357.2	24.2	25.0	73.85		-687.0	-559.9	458.4	410.5	47.93	9.563	
8,700.0	7,483.9	8,562.2	7,356.1	25.5	26.4	73.81		-787.0	-561.3	458.5	408.0	50.56	9.068	
8,800.0	7,483.3	8,662.2	7,355.1	26.9	27.9	73.78		-886.9	-562.7	458.6	405.3	53.32	8.602	
8,900.0	7,482.6	8,762.2	7,354.1	28.4	29.4	73.74		-986.9	-564.1	458.8	402.6	56.19	8.165	
9,000.0	7,481.9	8,862.2	7,353.1	30.0	30.9	73.70		-1,086.9	-565.5	458.9	399.8	59.15	7.759	
9,100.0	7,481.2	8,962.2	7,352.1	31.5	32.5	73.67		-1,186.9	-566.9	459.0	396.8	62.18	7.382	
9,200.0	7,480.5	9,062.2	7,351.1	33.1	34.1	73.63		-1,286.9	-568.3	459.2	393.9	65.29	7.033	
9,300.0	7,479.8	9,162.2	7,350.1	34.8	35.7	73.59		-1,386.9	-569.7	459.3	390.8	68.45	6.710	
9,400.0	7,479.1	9,262.2	7,349.1	36.4	37.4	73.55		-1,486.8	-571.1	459.4	387.7	71.66	6.411	
9,500.0	7,478.4	9,362.2	7,348.0	38.1	39.1	73.52		-1,586.8	-572.5	459.5	384.6	74.92	6.134	
9,600.0	7,477.7	9,462.2	7,347.0	39.8	40.8	73.48		-1,686.8	-573.9	459.7	381.5	78.22	5.877	
9,700.0	7,477.0	9,562.2	7,346.0	41.6	42.5	73.44		-1,786.8	-575.4	459.8	378.3	81.54	5.639	
9,800.0	7,476.4	9,662.2	7,345.0	43.3	44.3	73.41		-1,886.8	-576.8	459.9	375.0	84.90	5.417	
9,900.0	7,475.7	9,762.2	7,344.0	45.1	46.0	73.37		-1,986.8	-578.2	460.1	371.8	88.28	5.211	
10,000.0	7,475.0	9,862.2	7,343.0	46.8	47.8	73.33		-2,086.7	-579.6	460.2	368.5	91.69	5.019	
10,100.0	7,474.3	9,962.2	7,342.0	48.6	49.6	73.29		-2,186.7	-581.0	460.3	365.2	95.11	4.840	
10,200.0	7,473.6	10,062.2	7,341.0	50.4	51.4	73.26		-2,286.7	-582.4	460.4	361.9	98.56	4.672	
10,300.0	7,472.9	10,162.2	7,339.9	52.2	53.2	73.22		-2,386.7	-583.8	460.6	358.6	102.02	4.515	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21K-443
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Reference Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	Landmark
Reference Design:	Plan #1 (12-04-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21K-HZ Pad Sec.21-T7N-R66W - Thornton 21G-223 - Wellbore #1 - Plan #1 (12-04-12)												Offset Site Error: 0.0 ft	
Survey Program: 0-MWD												Offset Well Error: 0.0 ft	
Reference		Offset		Semi Major Axis			Distance				Warning		
Measured Depth	Vertical Depth	Measured Depth	Vertical Depth	Reference	Offset	Highside Toolface	Offset Wellbore Centre		Between Centres	Between Ellipses		Minimum Separation	Separation Factor
(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	+N/-S (ft)	+E/-W (ft)	(ft)	(ft)		(ft)	
10,400.0	7,472.2	10,262.2	7,338.9	54.0	55.0	73.18	-2,486.7	-585.2	460.7	355.2	105.49	4.367	
10,500.0	7,471.5	10,362.2	7,337.9	55.8	56.8	73.15	-2,586.7	-586.6	460.8	351.9	108.98	4.229	
10,600.0	7,470.8	10,462.2	7,336.9	57.7	58.6	73.11	-2,686.7	-588.0	461.0	348.5	112.48	4.098	
10,700.0	7,470.1	10,562.2	7,335.9	59.5	60.4	73.07	-2,786.6	-589.4	461.1	345.1	115.98	3.975	
10,800.0	7,469.4	10,662.2	7,334.9	61.3	62.2	73.04	-2,886.6	-590.8	461.2	341.7	119.50	3.860	
10,900.0	7,468.8	10,762.2	7,333.9	63.2	64.1	73.00	-2,986.6	-592.2	461.4	338.3	123.03	3.750	
11,000.0	7,468.1	10,862.2	7,332.9	65.0	65.9	72.96	-3,086.6	-593.6	461.5	334.9	126.56	3.646	
11,100.0	7,467.4	10,962.2	7,331.8	66.9	67.8	72.93	-3,186.6	-595.0	461.6	331.5	130.10	3.548	
11,200.0	7,466.7	11,062.2	7,330.8	68.7	69.6	72.89	-3,286.6	-596.4	461.7	328.1	133.65	3.455	
11,300.0	7,466.0	11,162.2	7,329.8	70.6	71.5	72.85	-3,386.5	-597.8	461.9	324.7	137.20	3.366	
11,400.0	7,465.3	11,262.2	7,328.8	72.4	73.3	72.82	-3,486.5	-599.2	462.0	321.3	140.76	3.282	
11,500.0	7,464.6	11,362.2	7,327.8	74.3	75.2	72.78	-3,586.5	-600.6	462.1	317.8	144.32	3.202	
11,600.0	7,463.9	11,462.2	7,326.8	76.2	77.0	72.74	-3,686.5	-602.0	462.3	314.4	147.88	3.126	
11,700.0	7,463.2	11,562.2	7,325.8	78.0	78.9	72.71	-3,786.5	-603.4	462.4	311.0	151.45	3.053	
11,800.0	7,462.5	11,662.2	7,324.8	79.9	80.8	72.67	-3,886.5	-604.8	462.5	307.5	155.02	2.984	
11,900.0	7,461.8	11,762.2	7,323.7	81.8	82.6	72.63	-3,986.5	-606.2	462.7	304.1	158.60	2.917	
12,000.0	7,461.2	11,862.2	7,322.7	83.7	84.5	72.60	-4,086.4	-607.6	462.8	300.6	162.18	2.854	
12,100.0	7,460.5	11,962.2	7,321.7	85.5	86.4	72.56	-4,186.4	-609.0	462.9	297.2	165.76	2.793	
12,200.0	7,459.8	12,062.2	7,320.7	87.4	88.3	72.52	-4,286.4	-610.4	463.1	293.7	169.34	2.734	
12,300.0	7,459.1	12,162.2	7,319.7	89.3	90.1	72.49	-4,386.4	-611.9	463.2	290.3	172.93	2.679	
12,400.0	7,458.4	12,262.2	7,318.7	91.2	92.0	72.45	-4,486.4	-613.3	463.3	286.8	176.52	2.625	
12,456.4	7,458.0	12,318.5	7,318.1	92.2	93.1	72.43	-4,542.7	-614.0	463.4	284.9	178.54	2.596 SF	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21K-443
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Reference Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	Landmark
Reference Design:	Plan #1 (12-04-12)	Offset TVD Reference:	Offset Datum

Offset Design		Thornton 21K-HZ Pad Sec.21-T7N-R66W - Thornton 21G-403 - Wellbore #1 - Plan #1 (12-04-12)											Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Minimum Separation (ft)	Separation Factor	Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference	Offset (ft)		+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)				
0.0	0.0	0.0	0.0	0.0	0.0	-54.12	58.3	-80.6	99.5					
100.0	100.0	100.0	100.0	0.1	0.1	-54.12	58.3	-80.6	99.5	99.2	0.22	442.467		
200.0	200.0	200.0	200.0	0.3	0.3	-54.12	58.3	-80.6	99.5	98.8	0.67	147.489		
300.0	300.0	300.0	300.0	0.6	0.6	-54.12	58.3	-80.6	99.5	98.3	1.12	88.493		
400.0	400.0	400.0	400.0	0.8	0.8	-54.12	58.3	-80.6	99.5	97.9	1.57	63.210 CC, ES		
500.0	500.0	496.6	496.6	1.0	1.0	-54.14	59.2	-81.9	101.1	99.1	2.01	50.281		
600.0	600.0	593.0	592.9	1.2	1.2	-54.19	62.0	-85.9	106.2	103.7	2.45	43.293		
700.0	700.0	689.0	688.5	1.5	1.4	-54.26	66.6	-92.5	114.6	111.7	2.90	39.516		
800.0	800.0	784.3	783.1	1.7	1.7	-54.35	73.0	-101.7	126.3	123.0	3.35	37.693		
900.0	900.0	878.7	876.5	1.9	2.0	-54.44	81.0	-113.4	141.3	137.5	3.81	37.125		
1,000.0	1,000.0	972.1	968.3	2.1	2.3	-54.52	90.8	-127.4	159.6	155.3	4.27	37.398		
1,100.0	1,100.0	1,067.1	1,061.2	2.4	2.7	-54.60	102.2	-143.8	180.6	175.9	4.74	38.137		
1,200.0	1,200.0	1,164.8	1,156.5	2.6	3.1	-54.67	114.2	-161.0	202.1	196.9	5.20	38.843		
1,300.0	1,300.0	1,262.4	1,251.9	2.8	3.5	-54.72	126.1	-178.3	223.6	218.0	5.67	39.410		
1,400.0	1,400.0	1,360.1	1,347.3	3.0	3.9	-54.76	138.1	-195.5	245.1	239.0	6.15	39.866		
1,500.0	1,500.0	1,457.7	1,442.7	3.3	4.4	-54.80	150.1	-212.8	266.6	260.0	6.63	40.241		
1,600.0	1,600.0	1,555.4	1,538.0	3.5	4.8	-54.83	162.1	-230.0	288.1	281.0	7.11	40.553		
1,700.0	1,700.0	1,653.1	1,633.4	3.7	5.3	-54.86	174.0	-247.3	309.6	302.0	7.59	40.816		
1,800.0	1,800.0	1,750.7	1,728.8	3.9	5.7	-54.88	186.0	-264.5	331.1	323.1	8.07	41.041		
1,900.0	1,900.0	1,848.4	1,824.2	4.2	6.2	-54.90	198.0	-281.8	352.6	344.1	8.55	41.235		
2,000.0	2,000.0	1,946.0	1,919.6	4.4	6.6	-54.92	210.0	-299.0	374.1	365.1	9.04	41.403		
2,100.0	2,100.0	2,043.7	2,014.9	4.6	7.1	-54.94	222.0	-316.3	395.6	386.1	9.52	41.551		
2,200.0	2,200.0	2,141.4	2,110.3	4.8	7.5	-54.95	233.9	-333.5	417.1	407.1	10.01	41.682		
2,300.0	2,300.0	2,239.3	2,205.9	5.1	8.0	-46.53	245.9	-350.8	437.5	427.1	10.41	42.038		
2,400.0	2,399.8	2,337.6	2,301.9	5.3	8.4	-46.75	258.0	-368.2	455.5	444.6	10.89	41.806		
2,500.0	2,499.5	2,436.1	2,398.2	5.5	8.9	-47.29	270.1	-385.6	471.2	459.8	11.38	41.400		
2,600.0	2,598.7	2,534.8	2,494.6	5.7	9.3	-48.12	282.2	-403.0	484.6	472.8	11.87	40.834		
2,700.0	2,697.5	2,633.6	2,591.0	6.0	9.8	-49.22	294.3	-420.4	496.0	483.6	12.36	40.115		
2,800.0	2,795.6	2,732.3	2,687.4	6.2	10.3	-50.59	306.4	-437.9	505.3	492.5	12.88	39.244		
2,813.2	2,808.6	2,745.3	2,700.1	6.3	10.3	-50.79	308.0	-440.2	506.5	493.5	12.95	39.117		
2,900.0	2,893.3	2,830.8	2,783.6	6.5	10.7	-52.21	318.5	-455.3	513.7	500.3	13.43	38.266		
3,000.0	2,991.1	2,929.4	2,879.9	6.8	11.2	-53.80	330.6	-472.7	522.5	508.5	14.00	37.322		
3,100.0	3,088.8	3,027.9	2,976.1	7.2	11.6	-55.34	342.7	-490.1	531.7	517.1	14.60	36.420		
3,200.0	3,186.5	3,126.5	3,072.4	7.5	12.1	-56.83	354.8	-507.5	541.3	526.1	15.22	35.559		
3,300.0	3,284.2	3,225.0	3,168.6	7.8	12.6	-58.27	366.8	-524.9	551.2	535.3	15.87	34.739		
3,400.0	3,381.9	3,323.6	3,264.9	8.2	13.0	-59.65	378.9	-542.3	561.5	544.9	16.53	33.961		
3,500.0	3,479.7	3,422.1	3,361.1	8.6	13.5	-60.99	391.0	-559.7	572.0	554.8	17.22	33.222		
3,600.0	3,577.4	3,520.7	3,457.3	8.9	13.9	-62.28	403.1	-577.1	582.9	565.0	17.92	32.524		
3,700.0	3,675.1	3,619.2	3,553.6	9.3	14.4	-63.52	415.2	-594.5	594.1	575.4	18.64	31.864		
3,800.0	3,772.8	3,717.8	3,649.8	9.7	14.9	-64.71	427.3	-611.9	605.5	586.1	19.38	31.241		
3,900.0	3,870.5	3,816.3	3,746.1	10.1	15.3	-65.86	439.4	-629.3	617.2	597.0	20.13	30.655		
4,000.0	3,968.2	3,914.9	3,842.3	10.5	15.8	-66.97	451.5	-646.7	629.1	608.2	20.90	30.103		
4,100.0	4,066.0	4,013.4	3,938.6	10.9	16.3	-68.04	463.5	-664.1	641.2	619.6	21.68	29.584		
4,200.0	4,163.7	4,112.0	4,034.8	11.3	16.7	-69.06	475.6	-681.6	653.6	631.1	22.46	29.096		
4,300.0	4,261.4	4,210.5	4,131.1	11.7	17.2	-70.05	487.7	-699.0	666.2	642.9	23.26	28.637		
4,400.0	4,359.1	4,309.1	4,227.3	12.1	17.6	-71.01	499.8	-716.4	678.9	654.9	24.07	28.206		
4,500.0	4,456.8	4,407.6	4,323.6	12.6	18.1	-71.93	511.9	-733.8	691.9	667.0	24.89	27.801		
4,600.0	4,554.5	4,506.2	4,419.8	13.0	18.6	-72.81	524.0	-751.2	705.0	679.3	25.71	27.421		
4,700.0	4,652.3	4,604.7	4,516.1	13.4	19.0	-73.66	536.1	-768.6	718.2	691.7	26.54	27.063		
4,800.0	4,750.0	4,703.3	4,612.3	13.8	19.5	-74.49	548.2	-786.0	731.7	704.3	27.38	26.727		
4,900.0	4,847.7	4,801.8	4,708.6	14.2	20.0	-75.28	560.2	-803.4	745.2	717.0	28.22	26.410		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21K-443
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Reference Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	Landmark
Reference Design:	Plan #1 (12-04-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21K-HZ Pad Sec.21-T7N-R66W - Thornton 21G-403 - Wellbore #1 - Plan #1 (12-04-12)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference	Offset	Semi Major Axis	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	Offset Wellbore Centre +E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
5,000.0	4,945.4	4,900.4	4,804.8	14.7	20.4	-76.04		572.3	-820.8	758.9	729.9	29.06	26.113	
5,100.0	5,043.1	4,998.9	4,901.0	15.1	20.9	-76.78		584.4	-838.2	772.8	742.8	29.91	25.832	
5,200.0	5,140.9	5,097.5	4,997.3	15.5	21.3	-77.49		596.5	-855.6	786.7	755.9	30.77	25.568	
5,300.0	5,238.6	5,196.1	5,093.5	16.0	21.8	-78.18		608.6	-873.0	800.8	769.2	31.63	25.319	
5,400.0	5,336.3	5,294.6	5,189.8	16.4	22.3	-78.84		620.7	-890.4	815.0	782.5	32.49	25.085	
5,456.4	5,391.4	5,350.2	5,244.1	16.6	22.5	-79.21		627.5	-900.2	823.0	790.0	32.98	24.958	
5,500.0	5,434.1	5,393.2	5,286.1	16.8	22.7	-79.59		632.8	-907.8	829.3	796.0	33.34	24.874	
5,600.0	5,532.4	5,491.9	5,382.5	17.1	23.2	-80.28		644.9	-925.3	844.2	810.2	34.09	24.766	
5,700.0	5,631.4	5,622.5	5,510.6	17.4	23.6	-80.87		659.3	-946.0	858.0	823.2	34.81	24.650	
5,800.0	5,730.7	5,754.7	5,641.3	17.6	24.0	-81.31		670.4	-962.1	868.5	833.1	35.43	24.515	
5,900.0	5,830.4	5,887.7	5,773.6	17.9	24.3	-81.61		678.2	-973.2	875.8	839.8	35.95	24.362	
6,000.0	5,930.3	6,021.2	5,906.9	18.0	24.5	-81.77		682.4	-979.3	879.8	843.4	36.37	24.192	
6,069.7	6,000.0	6,114.3	6,000.0	18.1	24.6	-90.11		683.3	-980.6	880.6	843.8	36.75	23.960	
6,100.0	6,030.3	6,144.6	6,030.3	18.2	24.6	-90.11		683.3	-980.6	880.6	843.7	36.84	23.904	
6,200.0	6,130.3	6,244.6	6,130.3	18.3	24.8	-90.11		683.3	-980.6	880.6	843.4	37.14	23.710	
6,300.0	6,230.3	6,344.6	6,230.3	18.5	24.9	-90.11		683.3	-980.6	880.6	843.1	37.45	23.515	
6,400.0	6,330.3	6,444.6	6,330.3	18.6	25.0	-90.11		683.3	-980.6	880.6	842.8	37.76	23.321	
6,500.0	6,430.3	6,544.6	6,430.3	18.8	25.1	-90.11		683.3	-980.6	880.6	842.5	38.07	23.129	
6,600.0	6,530.3	6,644.6	6,530.3	19.0	25.2	-90.11		683.3	-980.6	880.6	842.2	38.39	22.938	
6,700.0	6,630.3	6,744.6	6,630.3	19.1	25.4	-90.11		683.3	-980.6	880.6	841.9	38.71	22.749	
6,783.9	6,714.2	6,828.5	6,714.2	19.3	25.5	-90.11		683.3	-980.6	880.6	841.6	38.98	22.592	
6,800.0	6,730.3	6,844.3	6,730.0	19.3	25.5	89.05		683.1	-980.6	880.6	841.7	38.88	22.651	
6,850.0	6,780.2	6,893.4	6,779.0	19.3	25.5	89.05		680.5	-980.6	880.6	841.6	38.96	22.601	
6,900.0	6,829.9	6,942.5	6,827.8	19.4	25.5	89.06		674.8	-980.7	880.6	841.6	38.99	22.587	
6,950.0	6,879.0	6,991.6	6,876.0	19.3	25.5	89.07		666.0	-980.8	880.6	841.6	38.95	22.607	
7,000.0	6,927.5	7,040.7	6,923.7	19.3	25.5	89.09		654.0	-981.0	880.6	841.7	38.86	22.659	
7,050.0	6,975.0	7,089.8	6,970.4	19.2	25.5	89.11		639.1	-981.2	880.6	841.8	38.72	22.742	
7,100.0	7,021.4	7,138.9	7,016.2	19.1	25.4	89.13		621.1	-981.5	880.6	842.0	38.53	22.852	
7,150.0	7,066.5	7,188.1	7,060.7	19.0	25.3	89.16		600.3	-981.8	880.5	842.2	38.31	22.987	
7,200.0	7,110.1	7,237.3	7,103.7	18.9	25.2	89.19		576.6	-982.1	880.5	842.5	38.05	23.142	
7,250.0	7,151.9	7,286.5	7,145.3	18.7	25.1	89.22		550.1	-982.5	880.5	842.8	37.77	23.314	
7,300.0	7,191.9	7,335.7	7,185.0	18.5	25.0	89.26		521.1	-982.9	880.5	843.0	37.47	23.496	
7,350.0	7,229.9	7,385.0	7,222.8	18.4	24.9	89.30		489.5	-983.4	880.5	843.3	37.18	23.684	
7,400.0	7,265.7	7,434.4	7,258.5	18.2	24.8	89.34		455.5	-983.9	880.5	843.6	36.89	23.869	
7,450.0	7,299.1	7,483.7	7,292.0	18.1	24.6	89.39		419.2	-984.4	880.5	843.8	36.62	24.046	
7,500.0	7,330.0	7,533.1	7,323.1	17.9	24.5	89.44		380.8	-985.0	880.5	844.1	36.37	24.205	
7,550.0	7,358.2	7,582.6	7,351.7	17.8	24.4	89.49		340.5	-985.5	880.4	844.3	36.17	24.339	
7,600.0	7,383.7	7,632.1	7,377.6	17.7	24.3	89.54		298.3	-986.2	880.4	844.4	36.03	24.439	
7,650.0	7,406.3	7,681.7	7,400.8	17.7	24.1	89.60		254.5	-986.8	880.4	844.5	35.94	24.498	
7,700.0	7,426.0	7,731.3	7,421.1	17.6	24.0	89.65		209.2	-987.4	880.4	844.5	35.92	24.510	
7,750.0	7,442.6	7,781.0	7,438.5	17.6	23.9	89.71		162.7	-988.1	880.4	844.4	35.98	24.468	
7,800.0	7,456.1	7,830.7	7,452.7	17.7	23.8	89.77		115.1	-988.8	880.4	844.2	36.12	24.371	
7,850.0	7,466.4	7,880.5	7,463.9	17.8	23.7	89.83		66.6	-989.5	880.4	844.0	36.35	24.217	
7,903.9	7,474.0	7,934.2	7,472.4	17.9	23.7	89.90		13.5	-990.3	880.3	843.6	36.70	23.990	
7,978.9	7,481.8	8,009.2	7,480.4	18.2	23.6	89.91		-61.0	-991.4	880.3	843.0	37.35	23.567	
8,000.0	7,483.8	8,030.4	7,482.6	18.3	23.6	89.92		-82.0	-991.7	880.3	842.8	37.58	23.427	
8,030.0	7,486.0	8,060.5	7,485.1	18.5	23.6	89.94		-112.1	-992.1	880.3	842.4	37.95	23.200	
8,106.8	7,488.0	8,137.6	7,488.0	19.0	23.8	90.00		-189.1	-993.2	880.3	841.4	38.93	22.615	
8,200.0	7,487.4	8,230.9	7,487.5	19.7	24.1	90.00		-282.4	-994.5	880.3	839.9	40.41	21.785	
8,300.0	7,486.7	8,330.9	7,486.8	20.7	24.7	90.00		-382.4	-995.8	880.4	838.1	42.27	20.827	
8,400.0	7,486.0	8,430.9	7,486.1	21.7	25.4	90.00		-482.4	-997.2	880.4	836.0	44.38	19.835	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21K-443
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Reference Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	Landmark
Reference Design:	Plan #1 (12-04-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21K-HZ Pad Sec.21-T7N-R66W - Thornton 21G-403 - Wellbore #1 - Plan #1 (12-04-12)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference	Offset	Semi Major Axis	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Distance Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
8,500.0	7,485.3	8,530.9	7,485.4	22.9	26.4	90.01	90.01	-582.3	-998.6	880.4	833.7	46.72	18.844	
8,600.0	7,484.6	8,630.9	7,484.7	24.2	27.5	90.01	90.01	-682.3	-1,000.0	880.4	831.1	49.24	17.879	
8,700.0	7,483.9	8,730.9	7,484.0	25.5	28.8	90.01	90.01	-782.3	-1,001.3	880.4	828.5	51.93	16.955	
8,800.0	7,483.3	8,830.9	7,483.3	26.9	30.1	90.01	90.01	-882.3	-1,002.7	880.4	825.7	54.75	16.081	
8,900.0	7,482.6	8,930.9	7,482.7	28.4	31.5	90.01	90.01	-982.3	-1,004.1	880.4	822.7	57.69	15.261	
9,000.0	7,481.9	9,030.9	7,482.0	30.0	32.9	90.01	90.01	-1,082.3	-1,005.5	880.4	819.7	60.73	14.497	
9,100.0	7,481.2	9,130.9	7,481.3	31.5	34.4	90.01	90.01	-1,182.3	-1,006.8	880.4	816.6	63.86	13.787	
9,200.0	7,480.5	9,230.9	7,480.6	33.1	35.9	90.01	90.01	-1,282.3	-1,008.2	880.4	813.4	67.06	13.129	
9,300.0	7,479.8	9,330.9	7,479.9	34.8	37.5	90.01	90.01	-1,382.2	-1,009.6	880.5	810.1	70.32	12.520	
9,400.0	7,479.1	9,430.9	7,479.2	36.4	39.1	90.01	90.01	-1,482.2	-1,011.0	880.5	806.8	73.65	11.956	
9,500.0	7,478.4	9,530.9	7,478.5	38.1	40.7	90.01	90.01	-1,582.2	-1,012.3	880.5	803.5	77.01	11.433	
9,600.0	7,477.7	9,630.9	7,477.8	39.8	42.3	90.01	90.01	-1,682.2	-1,013.7	880.5	800.1	80.43	10.948	
9,700.0	7,477.0	9,730.9	7,477.1	41.6	44.0	90.01	90.01	-1,782.2	-1,015.1	880.5	796.6	83.87	10.498	
9,800.0	7,476.4	9,830.9	7,476.4	43.3	45.7	90.01	90.01	-1,882.2	-1,016.5	880.5	793.2	87.35	10.080	
9,900.0	7,475.7	9,930.9	7,475.8	45.1	47.4	90.01	90.01	-1,982.2	-1,017.8	880.5	789.7	90.86	9.691	
10,000.0	7,475.0	10,030.9	7,475.1	46.8	49.1	90.01	90.01	-2,082.2	-1,019.2	880.5	786.1	94.40	9.328	
10,100.0	7,474.3	10,130.9	7,474.4	48.6	50.9	90.01	90.01	-2,182.2	-1,020.6	880.5	782.6	97.96	8.989	
10,200.0	7,473.6	10,230.9	7,473.7	50.4	52.6	90.01	90.01	-2,282.1	-1,022.0	880.5	779.0	101.54	8.672	
10,300.0	7,472.9	10,330.9	7,473.0	52.2	54.4	90.01	90.01	-2,382.1	-1,023.4	880.6	775.4	105.13	8.376	
10,400.0	7,472.2	10,430.9	7,472.3	54.0	56.1	90.01	90.01	-2,482.1	-1,024.7	880.6	771.8	108.75	8.097	
10,500.0	7,471.5	10,530.9	7,471.6	55.8	57.9	90.01	90.01	-2,582.1	-1,026.1	880.6	768.2	112.38	7.836	
10,600.0	7,470.8	10,630.9	7,470.9	57.7	59.7	90.01	90.01	-2,682.1	-1,027.5	880.6	764.6	116.02	7.590	
10,700.0	7,470.1	10,730.9	7,470.2	59.5	61.5	90.01	90.01	-2,782.1	-1,028.9	880.6	760.9	119.67	7.358	
10,800.0	7,469.4	10,830.9	7,469.6	61.3	63.3	90.01	90.01	-2,882.1	-1,030.2	880.6	757.3	123.34	7.140	
10,900.0	7,468.8	10,930.9	7,468.9	63.2	65.1	90.01	90.01	-2,982.1	-1,031.6	880.6	753.6	127.01	6.933	
11,000.0	7,468.1	11,030.9	7,468.2	65.0	66.9	90.01	90.01	-3,082.0	-1,033.0	880.6	749.9	130.70	6.738	
11,100.0	7,467.4	11,130.9	7,467.5	66.9	68.7	90.01	90.01	-3,182.0	-1,034.4	880.6	746.2	134.39	6.553	
11,200.0	7,466.7	11,230.9	7,466.8	68.7	70.5	90.01	90.01	-3,282.0	-1,035.7	880.6	742.6	138.10	6.377	
11,300.0	7,466.0	11,330.9	7,466.1	70.6	72.4	90.01	90.01	-3,382.0	-1,037.1	880.7	738.9	141.81	6.210	
11,400.0	7,465.3	11,430.9	7,465.4	72.4	74.2	90.01	90.01	-3,482.0	-1,038.5	880.7	735.1	145.52	6.052	
11,500.0	7,464.6	11,530.9	7,464.7	74.3	76.0	90.01	90.01	-3,582.0	-1,039.9	880.7	731.4	149.24	5.901	
11,600.0	7,463.9	11,630.9	7,464.0	76.2	77.9	90.01	90.01	-3,682.0	-1,041.2	880.7	727.7	152.97	5.757	
11,700.0	7,463.2	11,730.9	7,463.3	78.0	79.7	90.01	90.01	-3,782.0	-1,042.6	880.7	724.0	156.71	5.620	
11,800.0	7,462.5	11,830.9	7,462.7	79.9	81.6	90.01	90.01	-3,881.9	-1,044.0	880.7	720.3	160.44	5.489	
11,900.0	7,461.8	11,930.9	7,462.0	81.8	83.4	90.01	90.01	-3,981.9	-1,045.4	880.7	716.5	164.19	5.364	
12,000.0	7,461.2	12,030.9	7,461.3	83.7	85.3	90.01	90.01	-4,081.9	-1,046.7	880.7	712.8	167.94	5.244	
12,100.0	7,460.5	12,130.9	7,460.6	85.5	87.1	90.01	90.01	-4,181.9	-1,048.1	880.7	709.1	171.69	5.130	
12,200.0	7,459.8	12,230.9	7,459.9	87.4	89.0	90.01	90.01	-4,281.9	-1,049.5	880.7	705.3	175.44	5.020	
12,300.0	7,459.1	12,330.9	7,459.2	89.3	90.8	90.01	90.01	-4,381.9	-1,050.9	880.8	701.6	179.20	4.915	
12,400.0	7,458.4	12,430.9	7,458.5	91.2	92.6	90.01	90.01	-4,481.9	-1,052.2	880.8	697.9	182.85	4.817	
12,456.4	7,458.0	12,487.3	7,458.1	92.2	93.5	90.01	90.01	-4,538.3	-1,053.0	880.8	696.0	184.77	4.767 SF	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21K-443
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Reference Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	Landmark
Reference Design:	Plan #1 (12-04-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21K-HZ Pad Sec.21-T7N-R66W - Thornton 21K-203 - Wellbore #1 - Plan #1 (12-03-12)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference	Offset	Semi Major Axis	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	Offset Wellbore Centre +E/-W (ft)	Distance Between Centres (ft)	Distance Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
0.0	0.0	0.0	0.0	0.0	0.0	39.02	39.02	58.3	47.2	75.0				
100.0	100.0	100.0	100.0	0.1	0.1	39.02	39.02	58.3	47.2	75.0	74.8	0.22	333.791	
200.0	200.0	200.0	200.0	0.3	0.3	39.02	39.02	58.3	47.2	75.0	74.4	0.67	111.264	
300.0	300.0	300.0	300.0	0.6	0.6	39.02	39.02	58.3	47.2	75.0	73.9	1.12	66.758	
400.0	400.0	400.0	400.0	0.8	0.8	39.02	39.02	58.3	47.2	75.0	73.5	1.57	47.684	
500.0	500.0	500.0	500.0	1.0	1.0	39.02	39.02	58.3	47.2	75.0	73.0	2.02	37.088	
600.0	600.0	600.0	600.0	1.2	1.2	39.02	39.02	58.3	47.2	75.0	72.6	2.47	30.345	
700.0	700.0	700.0	700.0	1.5	1.5	39.02	39.02	58.3	47.2	75.0	72.1	2.92	25.676	
800.0	800.0	800.0	800.0	1.7	1.7	39.02	39.02	58.3	47.2	75.0	71.7	3.37	22.253	
900.0	900.0	900.0	900.0	1.9	1.9	39.02	39.02	58.3	47.2	75.0	71.2	3.82	19.635	
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	39.02	39.02	58.3	47.2	75.0	70.8	4.27	17.568	
1,100.0	1,100.0	1,100.0	1,100.0	2.4	2.4	39.02	39.02	58.3	47.2	75.0	70.3	4.72	15.895	
1,200.0	1,200.0	1,200.0	1,200.0	2.6	2.6	39.02	39.02	58.3	47.2	75.0	69.9	5.17	14.513	
1,300.0	1,300.0	1,300.0	1,300.0	2.8	2.8	39.02	39.02	58.3	47.2	75.0	69.4	5.62	13.352	
1,400.0	1,400.0	1,400.0	1,400.0	3.0	3.0	39.02	39.02	58.3	47.2	75.0	69.0	6.07	12.363	
1,500.0	1,500.0	1,500.0	1,500.0	3.3	3.3	39.02	39.02	58.3	47.2	75.0	68.5	6.52	11.510	
1,600.0	1,600.0	1,600.0	1,600.0	3.5	3.5	39.02	39.02	58.3	47.2	75.0	68.1	6.97	10.767	
1,700.0	1,700.0	1,700.0	1,700.0	3.7	3.7	39.02	39.02	58.3	47.2	75.0	67.6	7.42	10.115	
1,800.0	1,800.0	1,800.0	1,800.0	3.9	3.9	39.02	39.02	58.3	47.2	75.0	67.2	7.87	9.537	
1,900.0	1,900.0	1,900.0	1,900.0	4.2	4.2	39.02	39.02	58.3	47.2	75.0	66.7	8.32	9.021	
2,000.0	2,000.0	2,000.0	2,000.0	4.4	4.4	39.02	39.02	58.3	47.2	75.0	66.3	8.77	8.559 CC, ES	
2,100.0	2,100.0	2,097.6	2,097.5	4.6	4.6	39.44	39.44	59.1	48.7	76.6	67.4	9.20	8.326	
2,200.0	2,200.0	2,194.9	2,194.7	4.8	4.8	40.61	40.61	61.7	52.9	81.5	71.8	9.64	8.453	
2,300.0	2,300.0	2,291.8	2,291.3	5.1	5.0	51.31	51.31	66.0	60.0	88.5	78.4	10.07	8.786	
2,400.0	2,399.8	2,388.9	2,387.7	5.3	5.2	55.40	55.40	71.9	69.7	96.8	86.3	10.50	9.220	
2,500.0	2,499.5	2,488.1	2,486.1	5.5	5.5	60.57	60.57	78.4	80.6	104.8	93.9	10.93	9.590	
2,600.0	2,598.7	2,587.2	2,584.4	5.7	5.7	66.56	66.56	84.9	91.4	112.2	100.9	11.37	9.867	
2,700.0	2,697.5	2,685.9	2,682.3	6.0	6.0	73.28	73.28	91.4	102.2	119.7	107.9	11.83	10.116	
2,800.0	2,795.6	2,784.2	2,779.8	6.2	6.2	80.58	80.58	97.9	112.9	128.1	115.8	12.32	10.397	
2,813.2	2,808.6	2,797.2	2,792.7	6.3	6.3	81.58	81.58	98.8	114.3	129.4	117.0	12.39	10.440	
2,900.0	2,893.3	2,882.2	2,877.0	6.5	6.5	87.89	87.89	104.4	123.6	138.4	125.5	12.84	10.775	
3,000.0	2,991.1	2,980.2	2,974.1	6.8	6.8	94.17	94.17	110.8	134.3	150.6	137.2	13.38	11.255	
3,100.0	3,088.8	3,078.1	3,071.3	7.2	7.0	99.47	99.47	117.3	145.0	164.4	150.4	13.93	11.796	
3,200.0	3,186.5	3,176.1	3,168.5	7.5	7.3	103.94	103.94	123.8	155.7	179.3	164.8	14.50	12.367	
3,300.0	3,284.2	3,274.1	3,265.6	7.8	7.6	107.71	107.71	130.2	166.4	195.2	180.1	15.08	12.947	
3,400.0	3,381.9	3,372.0	3,362.8	8.2	7.9	110.90	110.90	136.7	177.1	211.8	196.1	15.66	13.523	
3,500.0	3,479.7	3,470.0	3,460.0	8.6	8.2	113.64	113.64	143.1	187.8	228.9	212.7	16.25	14.086	
3,600.0	3,577.4	3,568.0	3,557.2	8.9	8.5	115.99	115.99	149.6	198.5	246.5	229.7	16.85	14.630	
3,700.0	3,675.1	3,665.9	3,654.3	9.3	8.8	118.03	118.03	156.0	209.2	264.4	247.0	17.45	15.154	
3,800.0	3,772.8	3,763.9	3,751.5	9.7	9.0	119.81	119.81	162.5	219.9	282.7	264.6	18.06	15.655	
3,900.0	3,870.5	3,861.9	3,848.7	10.1	9.3	121.37	121.37	169.0	230.6	301.1	282.4	18.66	16.133	
4,000.0	3,968.2	3,959.9	3,945.8	10.5	9.6	122.75	122.75	175.4	241.3	319.7	300.5	19.28	16.588	
4,100.0	4,066.0	4,057.8	4,043.0	10.9	9.9	123.98	123.98	181.9	252.0	338.5	318.7	19.89	17.021	
4,200.0	4,163.7	4,155.8	4,140.2	11.3	10.2	125.09	125.09	188.3	262.7	357.5	337.0	20.51	17.432	
4,300.0	4,261.4	4,253.8	4,237.3	11.7	10.5	126.08	126.08	194.8	273.4	376.5	355.4	21.13	17.823	
4,400.0	4,359.1	4,351.7	4,334.5	12.1	10.8	126.97	126.97	201.3	284.2	395.7	373.9	21.75	18.194	
4,500.0	4,456.8	4,449.7	4,431.7	12.6	11.1	127.79	127.79	207.7	294.9	414.9	392.6	22.37	18.548	
4,600.0	4,554.5	4,547.7	4,528.8	13.0	11.4	128.53	128.53	214.2	305.6	434.2	411.2	23.00	18.883	
4,700.0	4,652.3	4,645.6	4,626.0	13.4	11.7	129.21	129.21	220.6	316.3	453.6	430.0	23.62	19.203	
4,800.0	4,750.0	4,750.6	4,730.4	13.8	12.0	130.05	130.05	226.7	326.3	472.4	448.2	24.21	19.509	
4,900.0	4,847.7	4,856.4	4,835.8	14.2	12.2	131.25	131.25	230.9	333.2	489.7	464.9	24.75	19.782	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21K-443
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Reference Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	Landmark
Reference Design:	Plan #1 (12-04-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21K-HZ Pad Sec.21-T7N-R66W - Thornton 21K-203 - Wellbore #1 - Plan #1 (12-03-12)													Offset Site Error:	0.0 ft
Survey Program: 0-MWD													Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference	Offset	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	Offset Wellbore Centre +E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
5,000.0	4,945.4	4,961.9	4,941.2	14.7	12.4	132.76	233.0	336.7	505.7	480.4	25.25	20.024		
5,100.0	5,043.1	5,063.8	5,043.1	15.1	12.6	134.47	233.3	337.2	520.7	495.0	25.72	20.247		
5,200.0	5,140.9	5,161.5	5,140.9	15.5	12.8	136.07	233.3	337.2	536.0	509.8	26.18	20.471		
5,300.0	5,238.6	5,259.3	5,238.6	16.0	13.0	137.58	233.3	337.2	551.7	525.0	26.65	20.701		
5,400.0	5,336.3	5,357.0	5,336.3	16.4	13.2	139.02	233.3	337.2	567.7	540.6	27.11	20.940		
5,456.4	5,391.4	5,412.1	5,391.4	16.6	13.3	139.79	233.3	337.2	576.9	549.5	27.37	21.078		
5,500.0	5,434.1	5,454.8	5,434.1	16.8	13.4	140.44	233.3	337.2	583.8	556.2	27.58	21.169		
5,600.0	5,532.4	5,553.1	5,532.4	17.1	13.5	141.71	233.3	337.2	597.9	569.9	28.01	21.343		
5,700.0	5,631.4	5,652.0	5,631.4	17.4	13.7	142.70	233.3	337.2	609.5	581.1	28.43	21.437		
5,800.0	5,730.7	5,751.4	5,730.7	17.6	13.9	143.43	233.3	337.2	618.4	589.6	28.83	21.451		
5,900.0	5,830.4	5,851.1	5,830.4	17.9	14.1	143.92	233.3	337.2	624.6	595.4	29.20	21.387		
6,000.0	5,930.3	5,951.0	5,930.3	18.0	14.3	144.19	233.3	337.2	628.0	598.4	29.56	21.246		
6,069.7	6,000.0	6,020.7	6,000.0	18.1	14.5	135.93	233.3	337.2	628.7	598.8	29.84	21.068		
6,100.0	6,030.3	6,051.0	6,030.3	18.2	14.5	135.93	233.3	337.2	628.7	598.7	29.95	20.989		
6,200.0	6,130.3	6,151.0	6,130.3	18.3	14.7	135.93	233.3	337.2	628.7	598.3	30.34	20.722		
6,300.0	6,230.3	6,251.0	6,230.3	18.5	14.9	135.93	233.3	337.2	628.7	597.9	30.73	20.460		
6,400.0	6,330.3	6,351.0	6,330.3	18.6	15.1	135.93	233.3	337.2	628.7	597.5	31.12	20.203		
6,500.0	6,430.3	6,451.0	6,430.3	18.8	15.3	135.93	233.3	337.2	628.7	597.2	31.51	19.952		
6,600.0	6,530.3	6,551.0	6,530.3	19.0	15.5	135.93	233.3	337.2	628.7	596.8	31.90	19.706		
6,638.1	6,568.4	6,589.1	6,568.4	19.0	15.6	135.93	233.3	337.2	628.7	596.6	32.05	19.614		
6,700.0	6,630.3	6,634.0	6,613.3	19.1	15.7	135.97	232.7	337.2	629.3	597.0	32.25	19.513		
6,783.9	6,714.2	6,686.7	6,665.9	19.3	15.8	136.21	228.9	337.2	633.6	601.2	32.47	19.514		
6,800.0	6,730.3	6,700.0	6,679.1	19.3	15.8	-44.48	227.4	337.1	634.8	602.4	32.44	19.568		
6,850.0	6,780.2	6,728.0	6,706.7	19.3	15.8	-44.16	223.4	337.1	637.9	605.5	32.43	19.672		
6,900.0	6,829.9	6,750.0	6,728.4	19.4	15.9	-43.95	219.5	337.0	640.3	607.9	32.34	19.797		
6,950.0	6,879.0	6,790.2	6,767.7	19.3	15.9	-43.78	210.9	336.9	641.5	609.3	32.20	19.924		
7,000.0	6,927.5	6,821.4	6,797.8	19.3	15.9	-43.74	202.8	336.8	642.0	610.0	31.98	20.071		
7,050.0	6,975.0	6,850.0	6,825.1	19.2	16.0	-43.78	194.3	336.7	641.5	609.8	31.72	20.227		
7,100.0	7,021.4	6,883.6	6,856.8	19.1	16.0	-43.92	183.0	336.5	640.2	608.8	31.40	20.389		
7,150.0	7,066.5	6,914.7	6,885.6	19.0	16.0	-44.15	171.3	336.3	638.0	607.0	31.05	20.551		
7,200.0	7,110.1	6,950.0	6,917.7	18.9	16.0	-44.51	156.7	336.1	635.0	604.3	30.67	20.703		
7,250.0	7,151.9	6,977.2	6,941.9	18.7	16.1	-44.91	144.4	335.9	631.0	600.7	30.27	20.844		
7,300.0	7,191.9	7,000.0	6,961.9	18.5	16.1	-45.36	133.4	335.8	626.3	596.4	29.87	20.967		
7,350.0	7,229.9	7,039.8	6,996.0	18.4	16.1	-46.07	112.8	335.5	620.6	591.1	29.51	21.029		
7,400.0	7,265.7	7,071.3	7,022.2	18.2	16.1	-46.81	95.3	335.2	614.3	585.1	29.18	21.050		
7,450.0	7,299.1	7,100.0	7,045.4	18.1	16.1	-47.61	78.4	335.0	607.2	578.3	28.90	21.012		
7,500.0	7,330.0	7,134.6	7,072.5	17.9	16.2	-48.62	56.9	334.6	599.4	570.7	28.70	20.883		
7,550.0	7,358.2	7,166.4	7,096.5	17.8	16.2	-49.70	36.0	334.3	591.0	562.4	28.59	20.669		
7,600.0	7,383.7	7,200.0	7,120.9	17.7	16.3	-50.94	13.0	334.0	582.0	553.4	28.59	20.352		
7,650.0	7,406.3	7,230.6	7,142.3	17.7	16.3	-52.24	-8.9	333.7	572.4	543.7	28.70	19.945		
7,700.0	7,426.0	7,263.0	7,163.9	17.6	16.3	-53.70	-33.0	333.3	562.4	533.5	28.93	19.440		
7,750.0	7,442.6	7,300.0	7,187.3	17.6	16.4	-55.44	-61.7	332.9	552.1	522.8	29.33	18.823		
7,800.0	7,456.1	7,328.4	7,204.3	17.7	16.5	-57.04	-84.5	332.6	541.5	511.7	29.78	18.183		
7,850.0	7,466.4	7,361.6	7,223.1	17.8	16.6	-58.92	-111.8	332.2	530.7	500.3	30.38	17.467		
7,903.9	7,474.0	7,400.0	7,243.3	17.9	16.7	-61.21	-144.4	331.7	519.1	487.9	31.18	16.646		
7,978.9	7,481.8	7,450.0	7,267.2	18.2	17.0	-63.14	-188.4	331.0	504.7	472.6	32.12	15.715		
8,000.0	7,483.8	7,464.6	7,273.6	18.3	17.1	-63.83	-201.5	330.8	501.2	468.8	32.44	15.448		
8,106.8	7,488.0	7,542.8	7,303.6	19.0	17.6	-67.48	-273.7	329.8	485.0	450.7	34.28	14.147		
8,200.0	7,487.4	7,614.7	7,324.6	19.7	18.1	-69.88	-342.4	328.8	474.4	438.4	35.93	13.203		
8,300.0	7,486.7	7,695.9	7,340.4	20.7	18.9	-71.76	-422.0	327.6	467.5	429.7	37.83	12.357		
8,400.0	7,486.0	7,779.8	7,347.7	21.7	19.7	-72.68	-505.5	326.3	464.5	424.6	39.84	11.658		

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21K-443
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Reference Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	Landmark
Reference Design:	Plan #1 (12-04-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21K-HZ Pad Sec.21-T7N-R66W - Thornton 21K-203 - Wellbore #1 - Plan #1 (12-03-12)												Offset Site Error: 0.0 ft	
Survey Program: 0-MWD												Offset Well Error: 0.0 ft	
Reference		Offset		Semi Major Axis		Distance							Warning
Measured Depth	Vertical Depth	Measured Depth	Vertical Depth	Reference	Offset	Highside Toolface	Offset Wellbore Centre	Between Centres	Between Ellipses	Minimum Separation	Separation Factor		
(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	+N/-S (ft)	+E/-W (ft)	(ft)	(ft)	(ft)		
8,462.2	7,485.6	7,836.4	7,347.9	22.5	20.4	-72.75	-562.1	325.5	464.2	423.0	41.18	11.272	
8,500.0	7,485.3	7,874.3	7,347.6	22.9	20.8	-72.74	-599.9	325.0	464.2	422.1	42.04	11.041	
8,600.0	7,484.6	7,974.3	7,346.9	24.2	22.1	-72.73	-699.9	323.5	464.1	419.6	44.48	10.434	
8,700.0	7,483.9	8,074.3	7,346.1	25.5	23.4	-72.72	-799.9	322.0	464.0	416.9	47.08	9.856	
8,800.0	7,483.3	8,174.3	7,345.4	26.9	24.8	-72.71	-899.9	320.5	463.9	414.1	49.82	9.313	
8,900.0	7,482.6	8,274.3	7,344.6	28.4	26.3	-72.70	-999.9	319.1	463.8	411.2	52.67	8.806	
9,000.0	7,481.9	8,374.3	7,343.9	30.0	27.8	-72.69	-1,099.9	317.6	463.8	408.1	55.62	8.337	
9,100.0	7,481.2	8,474.3	7,343.1	31.5	29.4	-72.68	-1,199.9	316.1	463.7	405.0	58.66	7.904	
9,200.0	7,480.5	8,574.3	7,342.4	33.1	31.0	-72.67	-1,299.9	314.6	463.6	401.8	61.77	7.506	
9,300.0	7,479.8	8,674.3	7,341.6	34.8	32.7	-72.65	-1,399.8	313.2	463.5	398.6	64.93	7.138	
9,400.0	7,479.1	8,774.3	7,340.9	36.4	34.3	-72.64	-1,499.8	311.7	463.4	395.3	68.15	6.800	
9,500.0	7,478.4	8,874.3	7,340.1	38.1	36.0	-72.63	-1,599.8	310.2	463.3	391.9	71.42	6.488	
9,600.0	7,477.7	8,974.3	7,339.4	39.8	37.8	-72.62	-1,699.8	308.7	463.2	388.5	74.72	6.200	
9,700.0	7,477.0	9,074.3	7,338.6	41.6	39.5	-72.61	-1,799.8	307.3	463.2	385.1	78.06	5.933	
9,800.0	7,476.4	9,174.3	7,337.9	43.3	41.3	-72.60	-1,899.8	305.8	463.1	381.6	81.43	5.687	
9,900.0	7,475.7	9,274.3	7,337.1	45.1	43.0	-72.59	-1,999.8	304.3	463.0	378.2	84.82	5.458	
10,000.0	7,475.0	9,374.3	7,336.4	46.8	44.8	-72.58	-2,099.7	302.9	462.9	374.7	88.24	5.246	
10,100.0	7,474.3	9,474.3	7,335.6	48.6	46.6	-72.57	-2,199.7	301.4	462.8	371.1	91.67	5.049	
10,200.0	7,473.6	9,574.3	7,334.9	50.4	48.4	-72.56	-2,299.7	299.9	462.7	367.6	95.13	4.864	
10,300.0	7,472.9	9,674.3	7,334.1	52.2	50.2	-72.54	-2,399.7	298.4	462.6	364.0	98.60	4.692	
10,400.0	7,472.2	9,774.3	7,333.4	54.0	52.0	-72.53	-2,499.7	297.0	462.6	360.5	102.09	4.531	
10,500.0	7,471.5	9,874.3	7,332.6	55.8	53.9	-72.52	-2,599.7	295.5	462.5	356.9	105.59	4.380	
10,600.0	7,470.8	9,974.3	7,331.9	57.7	55.7	-72.51	-2,699.7	294.0	462.4	353.3	109.10	4.238	
10,700.0	7,470.1	10,074.3	7,331.1	59.5	57.5	-72.50	-2,799.6	292.5	462.3	349.7	112.62	4.105	
10,800.0	7,469.4	10,174.3	7,330.4	61.3	59.4	-72.49	-2,899.6	291.1	462.2	346.1	116.15	3.979	
10,900.0	7,468.8	10,274.3	7,329.6	63.2	61.2	-72.48	-2,999.6	289.6	462.1	342.4	119.69	3.861	
11,000.0	7,468.1	10,374.3	7,328.9	65.0	63.1	-72.47	-3,099.6	288.1	462.1	338.8	123.24	3.749	
11,100.0	7,467.4	10,474.3	7,328.1	66.9	64.9	-72.46	-3,199.6	286.6	462.0	335.2	126.80	3.643	
11,200.0	7,466.7	10,574.3	7,327.4	68.7	66.8	-72.44	-3,299.6	285.2	461.9	331.5	130.36	3.543	
11,300.0	7,466.0	10,674.3	7,326.6	70.6	68.6	-72.43	-3,399.6	283.7	461.8	327.9	133.93	3.448	
11,400.0	7,465.3	10,774.3	7,325.9	72.4	70.5	-72.42	-3,499.5	282.2	461.7	324.2	137.50	3.358	
11,500.0	7,464.6	10,874.3	7,325.1	74.3	72.4	-72.41	-3,599.5	280.7	461.6	320.5	141.08	3.272	
11,600.0	7,463.9	10,974.3	7,324.4	76.2	74.3	-72.40	-3,699.5	279.3	461.5	316.9	144.67	3.190	
11,700.0	7,463.2	11,074.3	7,323.6	78.0	76.1	-72.39	-3,799.5	277.8	461.5	313.2	148.25	3.113	
11,800.0	7,462.5	11,174.3	7,322.9	79.9	78.0	-72.38	-3,899.5	276.3	461.4	309.5	151.85	3.038	
11,900.0	7,461.8	11,274.3	7,322.1	81.8	79.9	-72.37	-3,999.5	274.9	461.3	305.8	155.44	2.968	
12,000.0	7,461.2	11,374.3	7,321.4	83.7	81.8	-72.36	-4,099.5	273.4	461.2	302.2	159.04	2.900	
12,100.0	7,460.5	11,474.3	7,320.6	85.5	83.6	-72.34	-4,199.5	271.9	461.1	298.5	162.64	2.835	
12,200.0	7,459.8	11,574.3	7,319.9	87.4	85.5	-72.33	-4,299.4	270.4	461.0	294.8	166.25	2.773	
12,300.0	7,459.1	11,674.3	7,319.1	89.3	87.4	-72.32	-4,399.4	269.0	460.9	291.1	169.86	2.714	
12,400.0	7,458.4	11,774.3	7,318.4	91.2	89.3	-72.31	-4,499.4	267.5	460.9	287.4	173.47	2.657	
12,440.5	7,458.1	11,814.8	7,318.1	91.9	90.0	-72.31	-4,539.9	266.9	460.8	285.9	174.88	2.635	
12,456.4	7,458.0	11,821.6	7,318.0	92.2	90.1	-72.31	-4,546.7	266.8	460.9	285.6	175.26	2.630 SF	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21K-443
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4978.0ft (RKB -15')
Reference Site:	Thornton 21K-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4978.0ft (RKB -15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21K-443	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0ft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	Landmark
Reference Design:	Plan #1 (12-04-12)	Offset TVD Reference:	Offset Datum

Reference Depths are relative to WELL @ 4978.0ft (RKB -15')

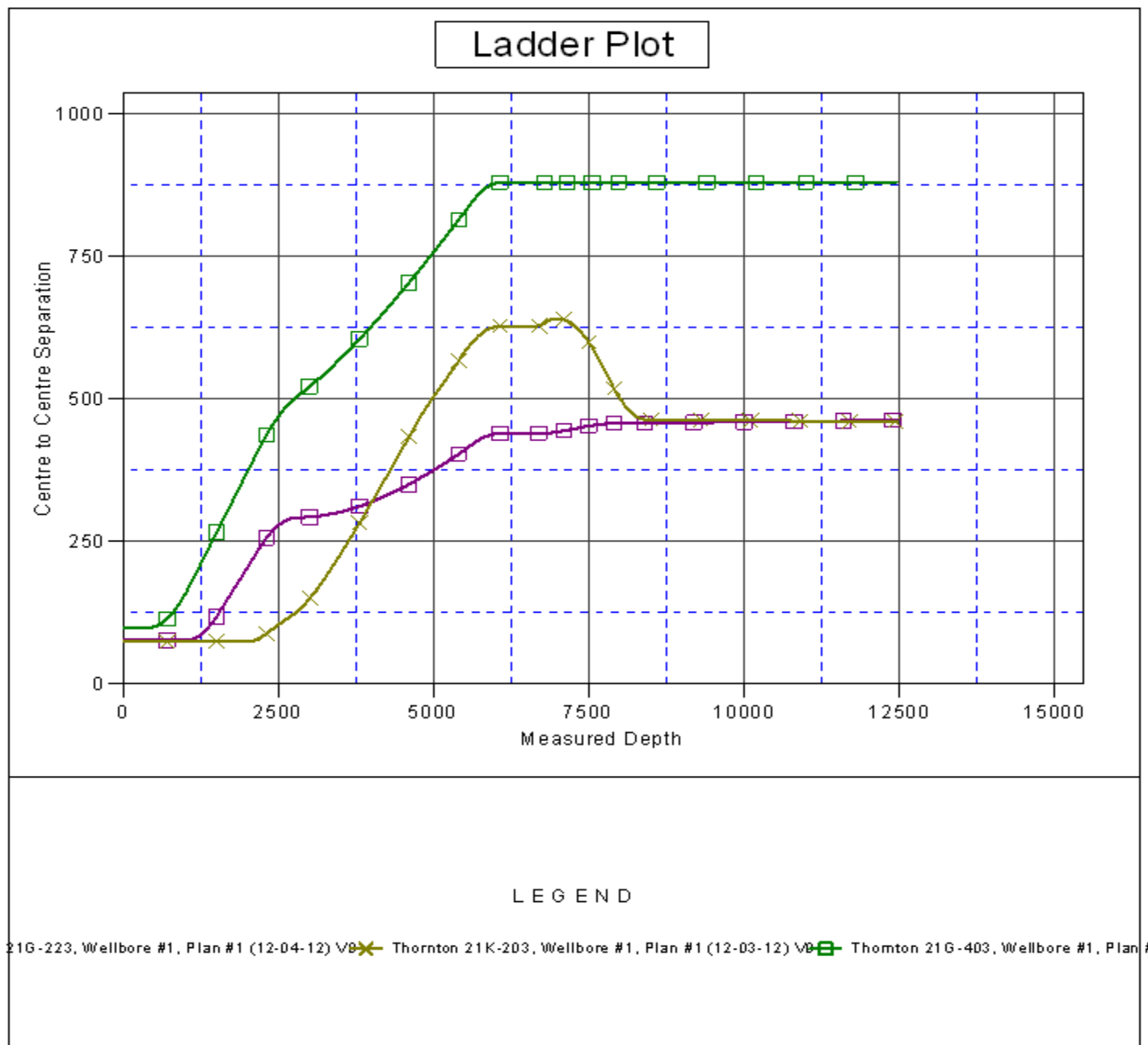
Offset Depths are relative to Offset Datum

Central Meridian is -105.500000 °

Coordinates are relative to: Thornton 21K-443

Coordinate System is US State Plane 1983, Colorado Northern Zone

Grid Convergence at Surface is: 0.46°



Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21K-443
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4978.0ft (RKB -15')
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