

PETROLEUM DEVELOPMENT CORP Weld County CO

Well Name: Thornton 21R-403

Surface Location: Thornton 21R-HZ Pad Sec.21-T7N-R66W

North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone

Ground Elevation: 4970.0

+N/-S

+E/-W

Northing

Easting

Latitude

Longitude

Slot

0.0

0.0

1450103.20

3200184.96

40.566700

-104.779450

RKB - 15' WELL @ 4985.0ft (RKB - 15')

WELLBORE TARGET DETAILS				
Name	TVD	+N/-S	+E/-W	Shape
BHL 500'FSL, 1520'FEL	7505.0	-4430.2	150.1	Point

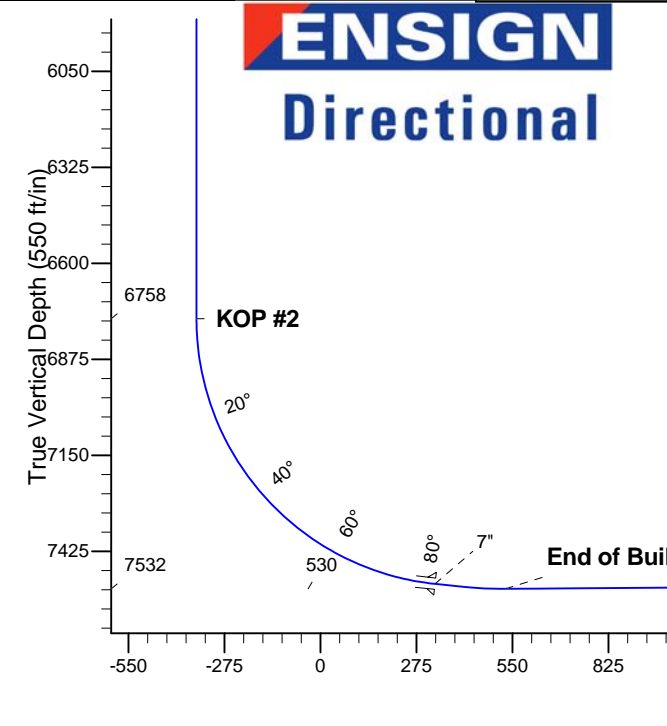
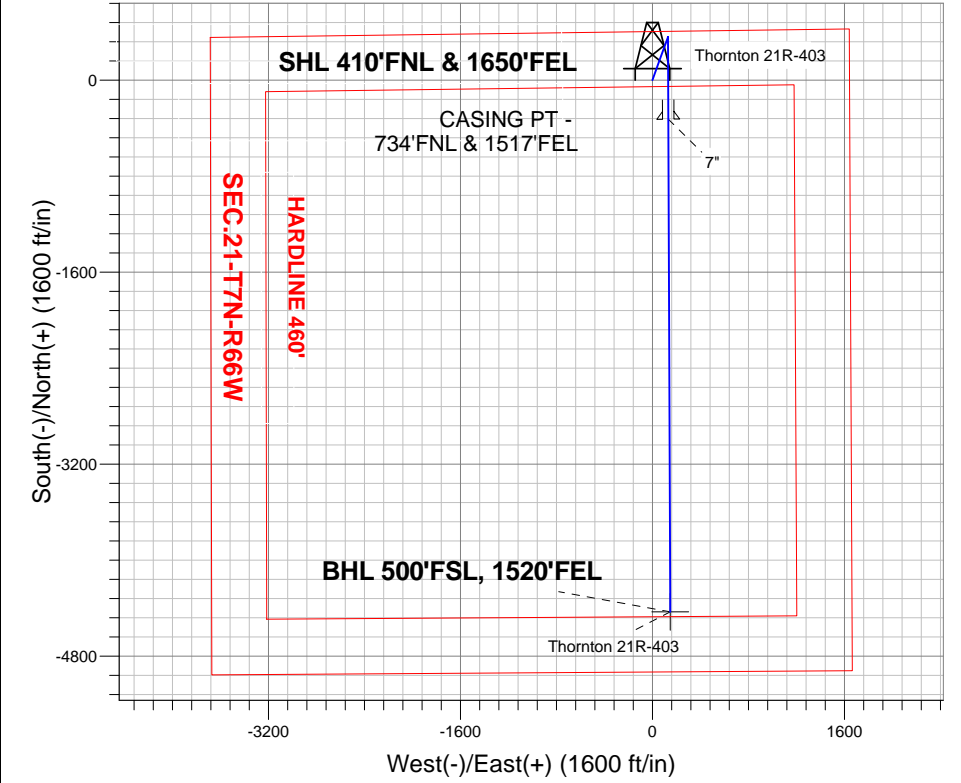
Azimuths to True North
Magnetic North: 8.69°

Magnetic Field
Strength: 53062.1nT
Dip Angle: 67.13°
Date: 11/29/2012
Model: IGRF2010

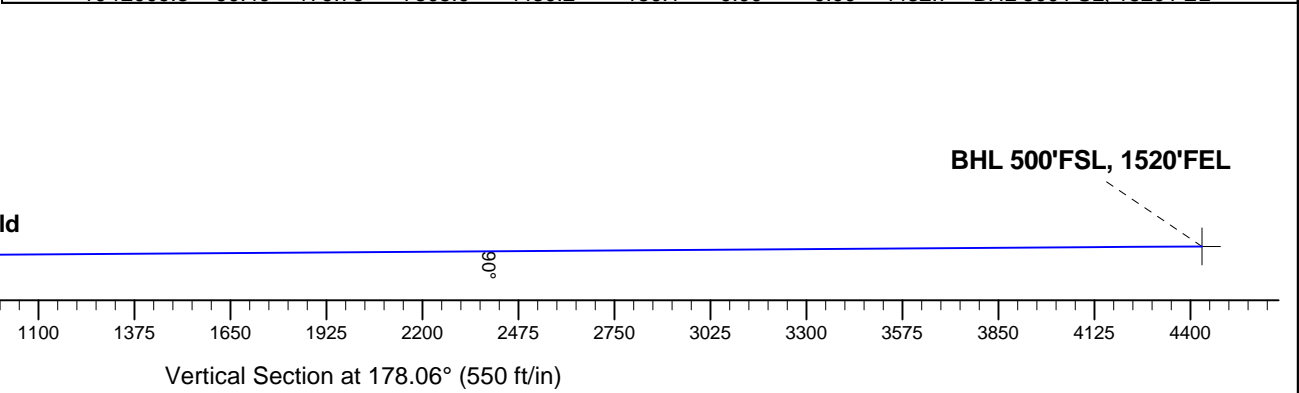
Thornton 21R-HZ Pad Sec.21-T7N-R66W
Thornton 21R-403
Plan #1 (11-29-12)
14:07, November 30 2012

ANNOTATIONS

TVD	MD	Annotation
2000.0	2000.0	KOP #1
6758.3	6783.0	KOP #2
7532.0	8104.9	End of Build



SECTION DETAILS										
Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	DLeg	TFace	VSec	Target
1	0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	
2	2000.0	0.00	0.00	2000.0	0.0	0.0	0.00	0.00	0.0	
3	2387.6	7.75	19.86	2386.4	24.6	8.9	2.00	19.86	-24.3	
4	4837.2	7.75	19.86	4813.6	335.4	121.1	0.00	0.00	-331.1	
5	5224.7	0.00	0.00	5200.0	360.0	130.0	2.00	180.00	-355.4	
6	6783.0	0.00	0.00	6758.3	360.0	130.0	0.00	0.00	-355.4	
7	7903.0	84.00	179.76	7518.0	-324.1	132.9	7.50	179.76	328.4	
8	7977.0	84.00	179.76	7525.7	-397.7	133.2	0.00	0.00	402.0	
9	8104.9	90.40	179.76	7532.0	-525.4	133.7	5.00	0.00	529.6	
10	12009.8	90.40	179.76	7505.0	-4430.2	150.1	0.00	0.00	4432.7	BHL 500'FSL, 1520'FEL





PETROLEUM DEVELOPMENT CORP Weld County CO

SEC.21-T7N-R66W

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

Thornton 21R-403

Wellbore #1

Plan: Plan #1 (11-29-12)

Standard Planning Report

30 November, 2012

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 21R-403
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Project:	SEC.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21R-403	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (11-29-12)		

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 21R-HZ Pad Sec.21-T7N-R66W			
Site Position:		Northing:	1,450,103.21 ft	Latitude:	40.566700
From:	Lat/Long	Easting:	3,200,184.96 ft	Longitude:	-104.779450
Position Uncertainty:	0.0 ft	Slot Radius:	"	Grid Convergence:	0.47 °

Well	Thornton 21R-403					
Well Position	+N/-S	0.0 ft	Northing:	1,450,103.20 ft	Latitude:	40.566700
	+E/-W	0.0 ft	Easting:	3,200,184.96 ft	Longitude:	-104.779450
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,970.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	11/29/2012	8.69	67.13	53,062

Design	Plan #1 (11-29-12)			
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	178.06

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	
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.00	0.00	0.00	0.00	
2,387.6	7.75	19.86	2,386.4	24.6	8.9	2.00	2.00	0.00	19.86	
4,837.2	7.75	19.86	4,813.6	335.4	121.1	0.00	0.00	0.00	0.00	
5,224.7	0.00	0.00	5,200.0	360.0	130.0	2.00	-2.00	0.00	180.00	
6,783.0	0.00	0.00	6,758.3	360.0	130.0	0.00	0.00	0.00	0.00	
7,903.0	84.00	179.76	7,518.0	-324.1	132.9	7.50	7.50	0.00	179.76	
7,977.0	84.00	179.76	7,525.7	-397.7	133.2	0.00	0.00	0.00	0.00	
8,104.9	90.40	179.76	7,532.0	-525.4	133.7	5.00	5.00	0.00	0.00	
12,009.8	90.40	179.76	7,505.0	-4,430.2	150.1	0.00	0.00	0.00	0.00	BHL 500'FSL, 1520

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Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21R-403	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (11-29-12)		

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
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
KOP #1									
2,040.0	0.80	19.86	2,040.0	0.3	0.1	-0.3	2.00	2.00	0.00

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Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21R-403	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (11-29-12)		

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)
2,080.0	1.60	19.86	2,080.0	1.1	0.4	-1.0	2.00	2.00	0.00
2,120.0	2.40	19.86	2,120.0	2.4	0.9	-2.3	2.00	2.00	0.00
2,160.0	3.20	19.86	2,159.9	4.2	1.5	-4.1	2.00	2.00	0.00
2,200.0	4.00	19.86	2,199.8	6.6	2.4	-6.5	2.00	2.00	0.00
2,240.0	4.80	19.86	2,239.7	9.4	3.4	-9.3	2.00	2.00	0.00
2,280.0	5.60	19.86	2,279.6	12.9	4.6	-12.7	2.00	2.00	0.00
2,320.0	6.40	19.86	2,319.3	16.8	6.1	-16.6	2.00	2.00	0.00
2,360.0	7.20	19.86	2,359.1	21.2	7.7	-21.0	2.00	2.00	0.00
2,387.6	7.75	19.86	2,386.4	24.6	8.9	-24.3	2.00	2.00	0.00
2,400.0	7.75	19.86	2,398.7	26.2	9.5	-25.9	0.00	0.00	0.00
2,440.0	7.75	19.86	2,438.3	31.3	11.3	-30.9	0.00	0.00	0.00
2,480.0	7.75	19.86	2,478.0	36.3	13.1	-35.9	0.00	0.00	0.00
2,520.0	7.75	19.86	2,517.6	41.4	15.0	-40.9	0.00	0.00	0.00
2,560.0	7.75	19.86	2,557.2	46.5	16.8	-45.9	0.00	0.00	0.00
2,600.0	7.75	19.86	2,596.9	51.6	18.6	-50.9	0.00	0.00	0.00
2,640.0	7.75	19.86	2,636.5	56.6	20.5	-55.9	0.00	0.00	0.00
2,680.0	7.75	19.86	2,676.1	61.7	22.3	-60.9	0.00	0.00	0.00
2,720.0	7.75	19.86	2,715.8	66.8	24.1	-65.9	0.00	0.00	0.00
2,760.0	7.75	19.86	2,755.4	71.9	26.0	-70.9	0.00	0.00	0.00
2,800.0	7.75	19.86	2,795.1	76.9	27.8	-76.0	0.00	0.00	0.00
2,840.0	7.75	19.86	2,834.7	82.0	29.6	-81.0	0.00	0.00	0.00
2,880.0	7.75	19.86	2,874.3	87.1	31.4	-86.0	0.00	0.00	0.00
2,920.0	7.75	19.86	2,914.0	92.2	33.3	-91.0	0.00	0.00	0.00
2,960.0	7.75	19.86	2,953.6	97.2	35.1	-96.0	0.00	0.00	0.00
3,000.0	7.75	19.86	2,993.2	102.3	36.9	-101.0	0.00	0.00	0.00
3,040.0	7.75	19.86	3,032.9	107.4	38.8	-106.0	0.00	0.00	0.00
3,080.0	7.75	19.86	3,072.5	112.5	40.6	-111.0	0.00	0.00	0.00
3,120.0	7.75	19.86	3,112.1	117.5	42.4	-116.0	0.00	0.00	0.00
3,160.0	7.75	19.86	3,151.8	122.6	44.3	-121.0	0.00	0.00	0.00
3,200.0	7.75	19.86	3,191.4	127.7	46.1	-126.1	0.00	0.00	0.00
3,240.0	7.75	19.86	3,231.0	132.8	47.9	-131.1	0.00	0.00	0.00
3,280.0	7.75	19.86	3,270.7	137.8	49.8	-136.1	0.00	0.00	0.00
3,320.0	7.75	19.86	3,310.3	142.9	51.6	-141.1	0.00	0.00	0.00
3,360.0	7.75	19.86	3,349.9	148.0	53.4	-146.1	0.00	0.00	0.00
3,400.0	7.75	19.86	3,389.6	153.1	55.3	-151.1	0.00	0.00	0.00
3,440.0	7.75	19.86	3,429.2	158.1	57.1	-156.1	0.00	0.00	0.00
3,480.0	7.75	19.86	3,468.8	163.2	58.9	-161.1	0.00	0.00	0.00
3,520.0	7.75	19.86	3,508.5	168.3	60.8	-166.1	0.00	0.00	0.00
3,560.0	7.75	19.86	3,548.1	173.4	62.6	-171.1	0.00	0.00	0.00
3,600.0	7.75	19.86	3,587.7	178.4	64.4	-176.1	0.00	0.00	0.00
3,640.0	7.75	19.86	3,627.4	183.5	66.3	-181.2	0.00	0.00	0.00
3,680.0	7.75	19.86	3,667.0	188.6	68.1	-186.2	0.00	0.00	0.00
3,720.0	7.75	19.86	3,706.6	193.7	69.9	-191.2	0.00	0.00	0.00
3,760.0	7.75	19.86	3,746.3	198.7	71.8	-196.2	0.00	0.00	0.00
3,800.0	7.75	19.86	3,785.9	203.8	73.6	-201.2	0.00	0.00	0.00
3,840.0	7.75	19.86	3,825.5	208.9	75.4	-206.2	0.00	0.00	0.00
3,880.0	7.75	19.86	3,865.2	214.0	77.3	-211.2	0.00	0.00	0.00
3,920.0	7.75	19.86	3,904.8	219.0	79.1	-216.2	0.00	0.00	0.00
3,960.0	7.75	19.86	3,944.5	224.1	80.9	-221.2	0.00	0.00	0.00
4,000.0	7.75	19.86	3,984.1	229.2	82.8	-226.2	0.00	0.00	0.00
4,040.0	7.75	19.86	4,023.7	234.2	84.6	-231.3	0.00	0.00	0.00
4,080.0	7.75	19.86	4,063.4	239.3	86.4	-236.3	0.00	0.00	0.00
4,120.0	7.75	19.86	4,103.0	244.4	88.3	-241.3	0.00	0.00	0.00

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Wellbore:	Wellbore #1		
Design:	Plan #1 (11-29-12)		

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)
4,160.0	7.75	19.86	4,142.6	249.5	90.1	-246.3	0.00	0.00	0.00
4,200.0	7.75	19.86	4,182.3	254.5	91.9	-251.3	0.00	0.00	0.00
4,240.0	7.75	19.86	4,221.9	259.6	93.8	-256.3	0.00	0.00	0.00
4,280.0	7.75	19.86	4,261.5	264.7	95.6	-261.3	0.00	0.00	0.00
4,320.0	7.75	19.86	4,301.2	269.8	97.4	-266.3	0.00	0.00	0.00
4,360.0	7.75	19.86	4,340.8	274.8	99.2	-271.3	0.00	0.00	0.00
4,400.0	7.75	19.86	4,380.4	279.9	101.1	-276.3	0.00	0.00	0.00
4,440.0	7.75	19.86	4,420.1	285.0	102.9	-281.3	0.00	0.00	0.00
4,480.0	7.75	19.86	4,459.7	290.1	104.7	-286.4	0.00	0.00	0.00
4,520.0	7.75	19.86	4,499.3	295.1	106.6	-291.4	0.00	0.00	0.00
4,560.0	7.75	19.86	4,539.0	300.2	108.4	-296.4	0.00	0.00	0.00
4,600.0	7.75	19.86	4,578.6	305.3	110.2	-301.4	0.00	0.00	0.00
4,640.0	7.75	19.86	4,618.2	310.4	112.1	-306.4	0.00	0.00	0.00
4,680.0	7.75	19.86	4,657.9	315.4	113.9	-311.4	0.00	0.00	0.00
4,720.0	7.75	19.86	4,697.5	320.5	115.7	-316.4	0.00	0.00	0.00
4,760.0	7.75	19.86	4,737.1	325.6	117.6	-321.4	0.00	0.00	0.00
4,800.0	7.75	19.86	4,776.8	330.7	119.4	-326.4	0.00	0.00	0.00
4,837.2	7.75	19.86	4,813.6	335.4	121.1	-331.1	0.00	0.00	0.00
4,840.0	7.69	19.86	4,816.4	335.7	121.2	-331.4	2.00	-2.00	0.00
4,880.0	6.89	19.86	4,856.1	340.5	123.0	-336.2	2.00	-2.00	0.00
4,920.0	6.09	19.86	4,895.8	344.8	124.5	-340.4	2.00	-2.00	0.00
4,960.0	5.29	19.86	4,935.6	348.5	125.8	-344.0	2.00	-2.00	0.00
5,000.0	4.49	19.86	4,975.5	351.7	127.0	-347.2	2.00	-2.00	0.00
5,040.0	3.69	19.86	5,015.4	354.4	128.0	-349.9	2.00	-2.00	0.00
5,080.0	2.89	19.86	5,055.3	356.6	128.8	-352.0	2.00	-2.00	0.00
5,120.0	2.09	19.86	5,095.3	358.2	129.3	-353.6	2.00	-2.00	0.00
5,160.0	1.29	19.86	5,135.3	359.3	129.8	-354.7	2.00	-2.00	0.00
5,200.0	0.49	19.86	5,175.3	359.9	130.0	-355.3	2.00	-2.00	0.00
5,224.7	0.00	0.00	5,200.0	360.0	130.0	-355.4	2.00	-2.00	0.00
5,240.0	0.00	0.00	5,215.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,280.0	0.00	0.00	5,255.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,320.0	0.00	0.00	5,295.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,360.0	0.00	0.00	5,335.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,400.0	0.00	0.00	5,375.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,440.0	0.00	0.00	5,415.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,480.0	0.00	0.00	5,455.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,520.0	0.00	0.00	5,495.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,560.0	0.00	0.00	5,535.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,600.0	0.00	0.00	5,575.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,640.0	0.00	0.00	5,615.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,680.0	0.00	0.00	5,655.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,720.0	0.00	0.00	5,695.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,760.0	0.00	0.00	5,735.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,800.0	0.00	0.00	5,775.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,840.0	0.00	0.00	5,815.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,880.0	0.00	0.00	5,855.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,920.0	0.00	0.00	5,895.3	360.0	130.0	-355.4	0.00	0.00	0.00
5,960.0	0.00	0.00	5,935.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,000.0	0.00	0.00	5,975.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,040.0	0.00	0.00	6,015.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,080.0	0.00	0.00	6,055.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,120.0	0.00	0.00	6,095.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,160.0	0.00	0.00	6,135.3	360.0	130.0	-355.4	0.00	0.00	0.00

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 21R-403
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Project:	SEC.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21R-403	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (11-29-12)		

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)
6,200.0	0.00	0.00	6,175.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,240.0	0.00	0.00	6,215.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,280.0	0.00	0.00	6,255.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,320.0	0.00	0.00	6,295.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,360.0	0.00	0.00	6,335.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,400.0	0.00	0.00	6,375.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,440.0	0.00	0.00	6,415.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,480.0	0.00	0.00	6,455.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,520.0	0.00	0.00	6,495.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,560.0	0.00	0.00	6,535.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,600.0	0.00	0.00	6,575.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,640.0	0.00	0.00	6,615.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,680.0	0.00	0.00	6,655.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,720.0	0.00	0.00	6,695.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,760.0	0.00	0.00	6,735.3	360.0	130.0	-355.4	0.00	0.00	0.00
6,783.0	0.00	0.00	6,758.3	360.0	130.0	-355.4	0.00	0.00	0.00
KOP #2									
6,800.0	1.27	179.76	6,775.3	359.8	130.0	-355.2	7.50	7.50	0.00
6,840.0	4.27	179.76	6,815.2	357.9	130.0	-353.3	7.50	7.50	0.00
6,880.0	7.27	179.76	6,855.0	353.9	130.0	-349.2	7.50	7.50	0.00
6,920.0	10.27	179.76	6,894.5	347.7	130.1	-343.1	7.50	7.50	0.00
6,960.0	13.27	179.76	6,933.7	339.6	130.1	-335.0	7.50	7.50	0.00
7,000.0	16.27	179.76	6,972.3	329.4	130.1	-324.8	7.50	7.50	0.00
7,040.0	19.27	179.76	7,010.4	317.2	130.2	-312.6	7.50	7.50	0.00
7,080.0	22.27	179.76	7,047.8	303.0	130.2	-298.4	7.50	7.50	0.00
7,120.0	25.27	179.76	7,084.4	286.9	130.3	-282.3	7.50	7.50	0.00
7,160.0	28.27	179.76	7,120.1	268.9	130.4	-264.3	7.50	7.50	0.00
7,200.0	31.27	179.76	7,154.9	249.0	130.5	-244.4	7.50	7.50	0.00
7,240.0	34.27	179.76	7,188.5	227.3	130.6	-222.8	7.50	7.50	0.00
7,280.0	37.27	179.76	7,220.9	204.0	130.7	-199.4	7.50	7.50	0.00
7,320.0	40.27	179.76	7,252.1	178.9	130.8	-174.4	7.50	7.50	0.00
7,360.0	43.27	179.76	7,281.9	152.3	130.9	-147.7	7.50	7.50	0.00
7,400.0	46.27	179.76	7,310.3	124.1	131.0	-119.6	7.50	7.50	0.00
7,440.0	49.27	179.76	7,337.2	94.5	131.1	-90.0	7.50	7.50	0.00
7,480.0	52.27	179.76	7,362.5	63.5	131.2	-59.0	7.50	7.50	0.00
7,520.0	55.27	179.76	7,386.1	31.2	131.4	-26.8	7.50	7.50	0.00
7,560.0	58.27	179.76	7,408.1	-2.2	131.5	6.7	7.50	7.50	0.00
7,600.0	61.27	179.76	7,428.2	-36.8	131.7	41.2	7.50	7.50	0.00
7,640.0	64.27	179.76	7,446.5	-72.3	131.8	76.8	7.50	7.50	0.00
7,680.0	67.27	179.76	7,462.9	-108.8	132.0	113.2	7.50	7.50	0.00
7,720.0	70.27	179.76	7,477.4	-146.1	132.1	150.5	7.50	7.50	0.00
7,760.0	73.27	179.76	7,489.9	-184.1	132.3	188.5	7.50	7.50	0.00
7,800.0	76.27	179.76	7,500.4	-222.7	132.4	227.0	7.50	7.50	0.00
7,840.0	79.27	179.76	7,508.9	-261.8	132.6	266.1	7.50	7.50	0.00
7,880.0	82.27	179.76	7,515.3	-301.2	132.8	305.6	7.50	7.50	0.00
7,903.0	84.00	179.76	7,518.0	-324.1	132.9	328.4	7.50	7.50	0.00
7"									
7,920.0	84.00	179.76	7,519.8	-341.0	132.9	345.3	0.00	0.00	0.00
7,960.0	84.00	179.76	7,524.0	-380.8	133.1	385.1	0.00	0.00	0.00
7,977.0	84.00	179.76	7,525.7	-397.7	133.2	402.0	0.00	0.00	0.00
8,000.0	85.15	179.76	7,527.9	-420.6	133.3	424.8	5.00	5.00	0.00
8,040.0	87.15	179.76	7,530.6	-460.5	133.4	464.7	5.00	5.00	0.00
8,080.0	89.15	179.76	7,531.9	-500.5	133.6	504.7	5.00	5.00	0.00

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 21R-403
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Project:	SEC.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21R-403	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (11-29-12)		

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)
8,104.9	90.39	179.76	7,532.0	-525.4	133.7	529.6	5.00	5.00	0.00
End of Build									
8,120.0	90.40	179.76	7,531.9	-540.5	133.8	544.7	0.01	0.01	0.00
8,160.0	90.40	179.76	7,531.6	-580.5	133.9	584.7	0.00	0.00	0.00
8,200.0	90.40	179.76	7,531.3	-620.5	134.1	624.6	0.00	0.00	0.00
8,240.0	90.40	179.76	7,531.1	-660.5	134.3	664.6	0.00	0.00	0.00
8,280.0	90.40	179.76	7,530.8	-700.5	134.4	704.6	0.00	0.00	0.00
8,320.0	90.40	179.76	7,530.5	-740.4	134.6	744.6	0.00	0.00	0.00
8,360.0	90.40	179.76	7,530.2	-780.4	134.8	784.6	0.00	0.00	0.00
8,400.0	90.40	179.76	7,530.0	-820.4	134.9	824.5	0.00	0.00	0.00
8,440.0	90.40	179.76	7,529.7	-860.4	135.1	864.5	0.00	0.00	0.00
8,480.0	90.40	179.76	7,529.4	-900.4	135.3	904.5	0.00	0.00	0.00
8,520.0	90.40	179.76	7,529.1	-940.4	135.4	944.5	0.00	0.00	0.00
8,560.0	90.40	179.76	7,528.9	-980.4	135.6	984.5	0.00	0.00	0.00
8,600.0	90.40	179.76	7,528.6	-1,020.4	135.8	1,024.5	0.00	0.00	0.00
8,640.0	90.40	179.76	7,528.3	-1,060.4	135.9	1,064.4	0.00	0.00	0.00
8,680.0	90.40	179.76	7,528.0	-1,100.4	136.1	1,104.4	0.00	0.00	0.00
8,720.0	90.40	179.76	7,527.7	-1,140.4	136.3	1,144.4	0.00	0.00	0.00
8,760.0	90.40	179.76	7,527.5	-1,180.4	136.5	1,184.4	0.00	0.00	0.00
8,800.0	90.40	179.76	7,527.2	-1,220.4	136.6	1,224.4	0.00	0.00	0.00
8,840.0	90.40	179.76	7,526.9	-1,260.4	136.8	1,264.3	0.00	0.00	0.00
8,880.0	90.40	179.76	7,526.6	-1,300.4	137.0	1,304.3	0.00	0.00	0.00
8,920.0	90.40	179.76	7,526.4	-1,340.4	137.1	1,344.3	0.00	0.00	0.00
8,960.0	90.40	179.76	7,526.1	-1,380.4	137.3	1,384.3	0.00	0.00	0.00
9,000.0	90.40	179.76	7,525.8	-1,420.4	137.5	1,424.3	0.00	0.00	0.00
9,040.0	90.40	179.76	7,525.5	-1,460.4	137.6	1,464.2	0.00	0.00	0.00
9,080.0	90.40	179.76	7,525.3	-1,500.4	137.8	1,504.2	0.00	0.00	0.00
9,120.0	90.40	179.76	7,525.0	-1,540.4	138.0	1,544.2	0.00	0.00	0.00
9,160.0	90.40	179.76	7,524.7	-1,580.4	138.1	1,584.2	0.00	0.00	0.00
9,200.0	90.40	179.76	7,524.4	-1,620.4	138.3	1,624.2	0.00	0.00	0.00
9,240.0	90.40	179.76	7,524.2	-1,660.4	138.5	1,664.2	0.00	0.00	0.00
9,280.0	90.40	179.76	7,523.9	-1,700.4	138.6	1,704.1	0.00	0.00	0.00
9,320.0	90.40	179.76	7,523.6	-1,740.4	138.8	1,744.1	0.00	0.00	0.00
9,360.0	90.40	179.76	7,523.3	-1,780.4	139.0	1,784.1	0.00	0.00	0.00
9,400.0	90.40	179.76	7,523.0	-1,820.4	139.1	1,824.1	0.00	0.00	0.00
9,440.0	90.40	179.76	7,522.8	-1,860.4	139.3	1,864.1	0.00	0.00	0.00
9,480.0	90.40	179.76	7,522.5	-1,900.4	139.5	1,904.0	0.00	0.00	0.00
9,520.0	90.40	179.76	7,522.2	-1,940.4	139.6	1,944.0	0.00	0.00	0.00
9,560.0	90.40	179.76	7,521.9	-1,980.4	139.8	1,984.0	0.00	0.00	0.00
9,600.0	90.40	179.76	7,521.7	-2,020.4	140.0	2,024.0	0.00	0.00	0.00
9,640.0	90.40	179.76	7,521.4	-2,060.4	140.1	2,064.0	0.00	0.00	0.00
9,680.0	90.40	179.76	7,521.1	-2,100.4	140.3	2,104.0	0.00	0.00	0.00
9,720.0	90.40	179.76	7,520.8	-2,140.4	140.5	2,143.9	0.00	0.00	0.00
9,760.0	90.40	179.76	7,520.6	-2,180.4	140.6	2,183.9	0.00	0.00	0.00
9,800.0	90.40	179.76	7,520.3	-2,220.4	140.8	2,223.9	0.00	0.00	0.00
9,840.0	90.40	179.76	7,520.0	-2,260.4	141.0	2,263.9	0.00	0.00	0.00
9,880.0	90.40	179.76	7,519.7	-2,300.4	141.1	2,303.9	0.00	0.00	0.00
9,920.0	90.40	179.76	7,519.4	-2,340.4	141.3	2,343.8	0.00	0.00	0.00
9,960.0	90.40	179.76	7,519.2	-2,380.4	141.5	2,383.8	0.00	0.00	0.00
10,000.0	90.40	179.76	7,518.9	-2,420.4	141.6	2,423.8	0.00	0.00	0.00
10,040.0	90.40	179.76	7,518.6	-2,460.4	141.8	2,463.8	0.00	0.00	0.00
10,080.0	90.40	179.76	7,518.3	-2,500.4	142.0	2,503.8	0.00	0.00	0.00

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 21R-403
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Project:	SEC.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21R-403	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (11-29-12)		

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)
10,120.0	90.40	179.76	7,518.1	-2,540.4	142.1	2,543.7	0.00	0.00	0.00
10,160.0	90.40	179.76	7,517.8	-2,580.4	142.3	2,583.7	0.00	0.00	0.00
10,200.0	90.40	179.76	7,517.5	-2,620.4	142.5	2,623.7	0.00	0.00	0.00
10,240.0	90.40	179.76	7,517.2	-2,660.4	142.6	2,663.7	0.00	0.00	0.00
10,280.0	90.40	179.76	7,517.0	-2,700.4	142.8	2,703.7	0.00	0.00	0.00
10,320.0	90.40	179.76	7,516.7	-2,740.4	143.0	2,743.7	0.00	0.00	0.00
10,360.0	90.40	179.76	7,516.4	-2,780.4	143.1	2,783.6	0.00	0.00	0.00
10,400.0	90.40	179.76	7,516.1	-2,820.4	143.3	2,823.6	0.00	0.00	0.00
10,440.0	90.40	179.76	7,515.9	-2,860.4	143.5	2,863.6	0.00	0.00	0.00
10,480.0	90.40	179.76	7,515.6	-2,900.4	143.7	2,903.6	0.00	0.00	0.00
10,520.0	90.40	179.76	7,515.3	-2,940.4	143.8	2,943.6	0.00	0.00	0.00
10,560.0	90.40	179.76	7,515.0	-2,980.4	144.0	2,983.5	0.00	0.00	0.00
10,600.0	90.40	179.76	7,514.7	-3,020.4	144.2	3,023.5	0.00	0.00	0.00
10,640.0	90.40	179.76	7,514.5	-3,060.4	144.3	3,063.5	0.00	0.00	0.00
10,680.0	90.40	179.76	7,514.2	-3,100.4	144.5	3,103.5	0.00	0.00	0.00
10,720.0	90.40	179.76	7,513.9	-3,140.4	144.7	3,143.5	0.00	0.00	0.00
10,760.0	90.40	179.76	7,513.6	-3,180.4	144.8	3,183.4	0.00	0.00	0.00
10,800.0	90.40	179.76	7,513.4	-3,220.4	145.0	3,223.4	0.00	0.00	0.00
10,840.0	90.40	179.76	7,513.1	-3,260.4	145.2	3,263.4	0.00	0.00	0.00
10,880.0	90.40	179.76	7,512.8	-3,300.4	145.3	3,303.4	0.00	0.00	0.00
10,920.0	90.40	179.76	7,512.5	-3,340.4	145.5	3,343.4	0.00	0.00	0.00
10,960.0	90.40	179.76	7,512.3	-3,380.4	145.7	3,383.4	0.00	0.00	0.00
11,000.0	90.40	179.76	7,512.0	-3,420.4	145.8	3,423.3	0.00	0.00	0.00
11,040.0	90.40	179.76	7,511.7	-3,460.4	146.0	3,463.3	0.00	0.00	0.00
11,080.0	90.40	179.76	7,511.4	-3,500.4	146.2	3,503.3	0.00	0.00	0.00
11,120.0	90.40	179.76	7,511.2	-3,540.4	146.3	3,543.3	0.00	0.00	0.00
11,160.0	90.40	179.76	7,510.9	-3,580.4	146.5	3,583.3	0.00	0.00	0.00
11,200.0	90.40	179.76	7,510.6	-3,620.4	146.7	3,623.2	0.00	0.00	0.00
11,240.0	90.40	179.76	7,510.3	-3,660.4	146.8	3,663.2	0.00	0.00	0.00
11,280.0	90.40	179.76	7,510.0	-3,700.4	147.0	3,703.2	0.00	0.00	0.00
11,320.0	90.40	179.76	7,509.8	-3,740.4	147.2	3,743.2	0.00	0.00	0.00
11,360.0	90.40	179.76	7,509.5	-3,780.4	147.3	3,783.2	0.00	0.00	0.00
11,400.0	90.40	179.76	7,509.2	-3,820.3	147.5	3,823.2	0.00	0.00	0.00
11,440.0	90.40	179.76	7,508.9	-3,860.3	147.7	3,863.1	0.00	0.00	0.00
11,480.0	90.40	179.76	7,508.7	-3,900.3	147.8	3,903.1	0.00	0.00	0.00
11,520.0	90.40	179.76	7,508.4	-3,940.3	148.0	3,943.1	0.00	0.00	0.00
11,560.0	90.40	179.76	7,508.1	-3,980.3	148.2	3,983.1	0.00	0.00	0.00
11,600.0	90.40	179.76	7,507.8	-4,020.3	148.3	4,023.1	0.00	0.00	0.00
11,640.0	90.40	179.76	7,507.6	-4,060.3	148.5	4,063.0	0.00	0.00	0.00
11,680.0	90.40	179.76	7,507.3	-4,100.3	148.7	4,103.0	0.00	0.00	0.00
11,720.0	90.40	179.76	7,507.0	-4,140.3	148.8	4,143.0	0.00	0.00	0.00
11,760.0	90.40	179.76	7,506.7	-4,180.3	149.0	4,183.0	0.00	0.00	0.00
11,800.0	90.40	179.76	7,506.5	-4,220.3	149.2	4,223.0	0.00	0.00	0.00
11,840.0	90.40	179.76	7,506.2	-4,260.3	149.3	4,262.9	0.00	0.00	0.00
11,880.0	90.40	179.76	7,505.9	-4,300.3	149.5	4,302.9	0.00	0.00	0.00
11,920.0	90.40	179.76	7,505.6	-4,340.3	149.7	4,342.9	0.00	0.00	0.00
11,960.0	90.40	179.76	7,505.3	-4,380.3	149.8	4,382.9	0.00	0.00	0.00
12,000.0	90.40	179.76	7,505.1	-4,420.3	150.0	4,422.9	0.00	0.00	0.00
12,009.8	90.40	179.76	7,505.0	-4,430.2	150.1	4,432.7	0.00	0.00	0.00

BHL 500'FSL, 1520'FEL

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 21R-403
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Project:	SEC.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	North Reference:	True
Well:	Thornton 21R-403	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (11-29-12)		

Targets

Target Name

- hit/miss target	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- Shape	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
BHL 500'FSL, 1520'FI	0.00	0.00	7,505.0	-4,430.2	150.1	1,445,674.55	3,200,371.01	40.554540	-104.778910
- plan hits target center									
- Point									

Casing Points

Measured Depth	Vertical Depth	Name	Casing Diameter	Hole Diameter
(ft)	(ft)		(")	(")
7,903.0	7,518.0	7"	7	7-1/2

Plan Annotations

Measured Depth	Vertical Depth	Local Coordinates		Comment
(ft)	(ft)	+N/-S	+E/-W	
(ft)	(ft)	(ft)	(ft)	
2,000.0	2,000.0	0.0	0.0	KOP #1
6,783.0	6,758.3	360.0	130.0	KOP #2
8,104.9	7,532.0	-525.4	133.7	End of Build



PETROLEUM DEVELOPMENT CORP Weld County CO

SEC.21-T7N-R66W

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

Thornton 21R-403

Wellbore #1

Plan #1 (11-29-12)

Anticollision Report

30 November, 2012



Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21R-403
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Reference Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21R-403	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 (11-29-12)	Offset TVD Reference:	Offset Datum

Reference	Plan #1 (11-29-12)		
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	11/30/2012		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
0.0	12,009.8	Plan #1 (11-29-12) (Wellbore #1)	MWD	MWD - Standard	

Summary						
Site Name Offset Well - Wellbore - Design	Reference Measured Depth (ft)	Offset Measured Depth (ft)	Distance Between Centres (ft)	Distance Between Ellipses (ft)	Separation Factor	Warning
Thornton 21R-HZ Pad Sec.21-T7N-R66W						
Thornton 21R-223 - Wellbore #1 - Plan #1 (11-29-12)	1,000.0	1,000.0	76.8	72.5	17.982	CC, ES
Thornton 21R-223 - Wellbore #1 - Plan #1 (11-29-12)	12,009.8	11,847.4	470.8	302.9	2.803	SF
Thornton 21R-243 - Wellbore #1 - Plan #1 (11-29-12)	1,200.0	1,200.0	76.8	71.6	14.854	CC, ES
Thornton 21R-243 - Wellbore #1 - Plan #1 (11-29-12)	12,009.8	11,854.4	473.4	306.2	2.831	SF
Thornton 21U-203 - Wellbore #1 - Plan #1 (11-29-12)	200.0	200.0	123.0	122.4	182.451	CC, ES
Thornton 21U-203 - Wellbore #1 - Plan #1 (11-29-12)	4,400.0	4,252.9	984.0	961.2	43.224	SF
Thornton 21U-443 - Wellbore #1 - Plan #1 (11-29-12)	800.0	800.0	99.4	96.1	29.494	CC, ES
Thornton 21U-443 - Wellbore #1 - Plan #1 (11-29-12)	12,009.8	12,074.3	880.9	703.7	4.971	SF

Offset Design		Thornton 21R-HZ Pad Sec.21-T7N-R66W - Thornton 21R-223 - Wellbore #1 - Plan #1 (11-29-12)										Offset Site Error:		0.0 ft
Survey Program:		0-MWD										Offset Well Error:		0.0 ft
Reference		Offset		Semi Major Axis			Distance							
Measured Depth	Vertical Depth	Measured Depth	Vertical Depth	Reference	Offset	Highside Toolface	Offset Wellbore Centre		Between Centres	Between Ellipses	Minimum Separation	Separation Factor	Warning	
(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(°)	+N/-S (ft)	+E/-W (ft)	(ft)	(ft)	(ft)			
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	341.667		
200.0	200.0	200.0	200.0	0.3	0.3	40.63	58.3	50.0	76.8	76.1	0.67	113.889		
300.0	300.0	300.0	300.0	0.6	0.6	40.63	58.3	50.0	76.8	75.7	1.12	68.333		
400.0	400.0	400.0	400.0	0.8	0.8	40.63	58.3	50.0	76.8	75.2	1.57	48.810		
500.0	500.0	500.0	500.0	1.0	1.0	40.63	58.3	50.0	76.8	74.8	2.02	37.963		
600.0	600.0	600.0	600.0	1.2	1.2	40.63	58.3	50.0	76.8	74.3	2.47	31.061		
700.0	700.0	700.0	700.0	1.5	1.5	40.63	58.3	50.0	76.8	73.9	2.92	26.282		
800.0	800.0	800.0	800.0	1.7	1.7	40.63	58.3	50.0	76.8	73.4	3.37	22.778		
900.0	900.0	900.0	900.0	1.9	1.9	40.63	58.3	50.0	76.8	73.0	3.82	20.098		
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	17.982	CC, ES	
1,100.0	1,100.0	1,097.5	1,097.5	2.4	2.3	41.04	59.1	51.4	78.4	73.7	4.71	16.651		
1,200.0	1,200.0	1,194.8	1,194.6	2.6	2.6	42.15	61.6	55.7	83.2	78.1	5.15	16.179		
1,300.0	1,300.0	1,291.6	1,291.1	2.8	2.8	43.74	65.7	62.9	91.4	85.8	5.59	16.349		
1,400.0	1,400.0	1,387.7	1,386.6	3.0	3.0	45.53	71.4	72.7	102.8	96.7	6.04	17.022		
1,500.0	1,500.0	1,486.1	1,483.9	3.3	3.3	47.25	78.3	84.7	116.5	110.0	6.50	17.931		
1,600.0	1,600.0	1,585.0	1,581.9	3.5	3.5	48.63	85.3	96.9	130.4	123.4	6.96	18.732		
1,700.0	1,700.0	1,684.0	1,679.9	3.7	3.8	49.74	92.3	109.0	144.3	136.9	7.42	19.435		

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 21R-403
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Reference Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21R-403	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 (11-29-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21R-HZ Pad Sec.21-T7N-R66W - Thornton 21R-223 - Wellbore #1 - Plan #1 (11-29-12)													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
1,800.0	1,800.0	1,783.0	1,777.9	3.9	4.1	50.66		99.3	121.2	158.3	150.4	7.89	20.053	
1,900.0	1,900.0	1,882.0	1,875.8	4.2	4.4	51.42		106.4	133.3	172.3	163.9	8.36	20.602	
2,000.0	2,000.0	1,981.0	1,973.8	4.4	4.7	52.08		113.4	145.5	186.3	177.5	8.83	21.092	
2,100.0	2,100.0	2,080.2	2,072.0	4.6	5.1	32.92		120.4	157.7	198.9	189.7	9.18	21.656	
2,200.0	2,199.8	2,179.6	2,170.4	4.8	5.4	34.08		127.4	169.9	208.7	199.0	9.63	21.662	
2,300.0	2,299.5	2,279.1	2,269.0	5.1	5.7	35.68		134.5	182.1	215.7	205.6	10.07	21.407	
2,387.6	2,386.4	2,366.3	2,355.3	5.3	6.0	37.47		140.7	192.8	219.7	209.2	10.46	21.001	
2,400.0	2,398.7	2,378.7	2,367.5	5.3	6.0	37.76		141.5	194.3	220.1	209.6	10.52	20.929	
2,500.0	2,497.8	2,478.2	2,466.1	5.5	6.3	40.01		148.6	206.6	223.8	212.9	10.98	20.380	
2,600.0	2,596.9	2,577.8	2,564.6	5.8	6.7	42.19		155.6	218.8	227.9	216.4	11.46	19.890	
2,700.0	2,696.0	2,677.3	2,663.1	6.0	7.0	44.29		162.7	231.0	232.3	220.3	11.94	19.450	
2,800.0	2,795.1	2,776.9	2,761.7	6.3	7.3	46.30		169.8	243.2	236.9	224.5	12.44	19.053	
2,900.0	2,894.1	2,876.4	2,860.2	6.6	7.7	48.24		176.8	255.5	241.9	229.0	12.94	18.693	
3,000.0	2,993.2	2,976.0	2,958.8	6.9	8.0	50.10		183.9	267.7	247.1	233.7	13.46	18.365	
3,100.0	3,092.3	3,075.5	3,057.3	7.1	8.3	51.88		190.9	279.9	252.6	238.6	13.98	18.066	
3,200.0	3,191.4	3,175.1	3,155.8	7.4	8.7	53.58		198.0	292.1	258.3	243.8	14.52	17.793	
3,300.0	3,290.5	3,274.6	3,254.4	7.7	9.0	55.21		205.0	304.4	264.2	249.2	15.06	17.542	
3,400.0	3,389.6	3,374.2	3,352.9	8.0	9.4	56.77		212.1	316.6	270.4	254.8	15.62	17.311	
3,500.0	3,488.7	3,473.7	3,451.5	8.3	9.7	58.26		219.1	328.8	276.7	260.5	16.18	17.098	
3,600.0	3,587.7	3,573.3	3,550.0	8.6	10.0	59.68		226.2	341.0	283.2	266.5	16.76	16.903	
3,700.0	3,686.8	3,672.8	3,648.6	8.9	10.4	61.03		233.2	353.2	289.9	272.5	17.33	16.722	
3,800.0	3,785.9	3,772.4	3,747.1	9.2	10.7	62.33		240.3	365.5	296.7	278.8	17.92	16.555	
3,900.0	3,885.0	3,871.9	3,845.6	9.5	11.1	63.56		247.3	377.7	303.7	285.2	18.52	16.401	
4,000.0	3,984.1	3,971.4	3,944.2	9.8	11.4	64.74		254.4	389.9	310.8	291.7	19.12	16.258	
4,100.0	4,083.2	4,071.0	4,042.7	10.1	11.7	65.87		261.4	402.1	318.0	298.3	19.72	16.125	
4,200.0	4,182.3	4,170.5	4,141.3	10.4	12.1	66.95		268.5	414.4	325.3	305.0	20.33	16.002	
4,300.0	4,281.3	4,270.1	4,239.8	10.8	12.4	67.98		275.5	426.6	332.8	311.9	20.95	15.889	
4,400.0	4,380.4	4,369.6	4,338.3	11.1	12.8	68.96		282.6	438.8	340.4	318.8	21.57	15.783	
4,500.0	4,479.5	4,469.2	4,436.9	11.4	13.1	69.90		289.6	451.0	348.0	325.8	22.19	15.685	
4,600.0	4,578.6	4,568.7	4,535.4	11.7	13.4	70.80		296.7	463.3	355.8	332.9	22.81	15.593	
4,700.0	4,677.7	4,668.3	4,634.0	12.0	13.8	71.67		303.7	475.5	363.6	340.1	23.44	15.508	
4,800.0	4,776.8	4,767.8	4,732.5	12.3	14.1	72.49		310.8	487.7	371.5	347.4	24.08	15.429	
4,837.2	4,813.6	4,804.8	4,769.1	12.5	14.3	72.79		313.4	492.3	374.4	350.1	24.31	15.401	
4,900.0	4,875.9	4,867.4	4,831.1	12.6	14.5	73.28		317.9	499.9	379.7	355.0	24.68	15.381	
5,000.0	4,975.5	4,966.9	4,929.6	12.9	14.8	73.66		324.9	512.2	388.8	363.6	25.20	15.429	
5,100.0	5,075.3	5,066.4	5,028.1	13.1	15.2	73.56		332.0	524.4	398.9	373.3	25.66	15.549	
5,200.0	5,175.3	5,165.6	5,126.3	13.2	15.5	73.03		339.0	536.6	410.1	384.0	26.05	15.740	
5,224.7	5,200.0	5,190.1	5,150.6	13.3	15.6	92.69		340.7	539.6	413.0	386.8	26.16	15.787	
5,300.0	5,275.3	5,269.1	5,228.7	13.4	15.8	91.89		346.2	549.1	421.9	395.4	26.44	15.959	
5,400.0	5,375.3	5,383.0	5,341.9	13.6	16.1	91.01		352.5	559.9	431.3	404.5	26.81	16.089	
5,500.0	5,475.3	5,497.7	5,456.3	13.8	16.3	90.46		356.5	566.9	437.3	410.1	27.18	16.092	
5,600.0	5,575.3	5,612.9	5,571.5	14.0	16.5	90.23		358.2	569.9	439.9	412.4	27.55	15.968	
5,700.0	5,675.3	5,716.6	5,675.3	14.2	16.7	90.22		358.3	570.0	440.0	412.1	27.92	15.757	
5,800.0	5,775.3	5,816.6	5,775.3	14.4	16.8	90.22		358.3	570.0	440.0	411.7	28.31	15.543	
5,900.0	5,875.3	5,916.6	5,875.3	14.5	17.0	90.22		358.3	570.0	440.0	411.3	28.69	15.334	
6,000.0	5,975.3	6,016.6	5,975.3	14.7	17.2	90.22		358.3	570.0	440.0	410.9	29.08	15.130	
6,100.0	6,075.3	6,116.6	6,075.3	14.9	17.3	90.22		358.3	570.0	440.0	410.5	29.47	14.930	
6,200.0	6,175.3	6,216.6	6,175.3	15.1	17.5	90.22		358.3	570.0	440.0	410.1	29.86	14.734	
6,300.0	6,275.3	6,316.6	6,275.3	15.3	17.7	90.22		358.3	570.0	440.0	409.8	30.26	14.543	
6,400.0	6,375.3	6,416.6	6,375.3	15.5	17.9	90.22		358.3	570.0	440.0	409.4	30.65	14.356	
6,500.0	6,475.3	6,516.6	6,475.3	15.7	18.0	90.22		358.3	570.0	440.0	409.0	31.05	14.173	

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 21R-403
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Reference Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21R-403	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 (11-29-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21R-HZ Pad Sec.21-T7N-R66W - Thornton 21R-223 - Wellbore #1 - Plan #1 (11-29-12)													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
6,600.0	6,575.3	6,616.6	6,575.3	15.9	18.2	90.22	90.22	358.3	570.0	440.0	408.6	31.44	13.994	
6,604.4	6,579.7	6,621.1	6,579.7	15.9	18.2	90.22	90.22	358.3	570.0	440.0	408.6	31.46	13.986	
6,700.0	6,675.3	6,715.8	6,674.2	16.1	18.3	90.90	90.90	353.1	570.0	440.1	408.3	31.83	13.826	
6,783.0	6,758.3	6,796.0	6,753.2	16.3	18.4	92.66	92.66	339.5	570.1	440.6	408.4	32.17	13.696	
6,800.0	6,775.3	6,812.1	6,768.9	16.3	18.4	-86.63	-86.63	335.8	570.1	440.8	408.6	32.22	13.681	
6,850.0	6,825.2	6,858.9	6,814.0	16.4	18.4	-85.25	-85.25	323.2	570.2	441.6	409.2	32.38	13.638	
6,900.0	6,874.8	6,905.2	6,857.7	16.4	18.4	-83.90	-83.90	308.0	570.2	442.6	410.1	32.50	13.619	
6,950.0	6,923.9	6,950.0	6,899.0	16.5	18.4	-82.62	-82.62	290.8	570.3	443.8	411.3	32.58	13.624	
7,000.0	6,972.3	6,996.2	6,940.5	16.5	18.4	-81.32	-81.32	270.6	570.4	445.3	412.7	32.62	13.650	
7,050.0	7,019.9	7,040.9	6,979.5	16.5	18.4	-80.10	-80.10	248.6	570.4	446.9	414.3	32.63	13.696	
7,100.0	7,066.2	7,085.2	7,016.7	16.4	18.4	-78.92	-78.92	224.6	570.5	448.6	416.0	32.60	13.760	
7,150.0	7,111.3	7,129.1	7,052.2	16.4	18.3	-77.79	-77.79	198.8	570.6	450.5	417.9	32.55	13.838	
7,200.0	7,154.9	7,172.6	7,085.9	16.4	18.3	-76.72	-76.72	171.3	570.8	452.4	419.9	32.48	13.927	
7,250.0	7,196.7	7,215.7	7,117.6	16.4	18.3	-75.71	-75.71	142.1	570.9	454.4	422.0	32.40	14.023	
7,300.0	7,236.7	7,258.6	7,147.5	16.3	18.3	-74.76	-74.76	111.4	571.0	456.3	424.0	32.32	14.121	
7,350.0	7,274.6	7,300.0	7,174.7	16.3	18.3	-73.89	-73.89	80.1	571.1	458.3	426.1	32.24	14.215	
7,400.0	7,310.3	7,343.3	7,201.3	16.3	18.3	-73.05	-73.05	45.9	571.3	460.3	428.1	32.19	14.298	
7,450.0	7,343.7	7,385.3	7,225.2	16.3	18.4	-72.29	-72.29	11.4	571.4	462.1	429.9	32.18	14.359	
7,500.0	7,374.5	7,427.1	7,247.0	16.3	18.4	-71.60	-71.60	-24.2	571.5	463.9	431.7	32.21	14.402	
7,550.0	7,402.7	7,468.7	7,266.8	16.4	18.5	-70.97	-70.97	-60.8	571.7	465.6	433.3	32.30	14.415	
7,600.0	7,428.2	7,510.1	7,284.4	16.5	18.5	-70.42	-70.42	-98.2	571.8	467.1	434.6	32.46	14.392	
7,650.0	7,450.8	7,550.0	7,299.5	16.7	18.7	-69.95	-69.95	-135.2	572.0	468.5	435.8	32.69	14.331	
7,700.0	7,470.4	7,592.4	7,313.5	16.9	18.8	-69.52	-69.52	-175.3	572.1	469.7	436.7	33.03	14.219	
7,750.0	7,486.9	7,633.4	7,324.8	17.2	19.0	-69.18	-69.18	-214.7	572.3	470.7	437.2	33.46	14.066	
7,800.0	7,500.4	7,674.3	7,333.9	17.5	19.2	-68.90	-68.90	-254.5	572.5	471.5	437.5	34.00	13.869	
7,850.0	7,510.7	7,715.2	7,340.9	17.8	19.5	-68.70	-68.70	-294.8	572.6	472.1	437.5	34.63	13.634	
7,903.0	7,518.0	7,758.4	7,346.0	18.2	19.8	-68.57	-68.57	-337.7	572.8	472.6	437.1	35.41	13.346	
7,977.0	7,525.7	7,818.6	7,349.0	18.9	20.4	-68.19	-68.19	-397.8	573.0	474.0	437.5	36.50	12.987	
8,000.0	7,527.9	7,839.0	7,349.0	19.1	20.5	-67.94	-67.94	-418.2	573.1	474.8	438.0	36.89	12.873	
8,104.9	7,532.0	7,943.8	7,348.6	20.2	21.6	-67.37	-67.37	-523.0	573.5	476.5	437.5	39.04	12.205	
8,200.0	7,531.3	8,038.9	7,348.3	21.3	22.7	-67.40	-67.40	-618.1	573.9	476.4	435.2	41.16	11.574	
8,300.0	7,530.7	8,138.9	7,347.9	22.6	24.0	-67.44	-67.44	-718.1	574.3	476.2	432.7	43.56	10.932	
8,400.0	7,530.0	8,238.9	7,347.6	23.9	25.3	-67.48	-67.48	-818.1	574.7	476.1	430.0	46.13	10.321	
8,500.0	7,529.3	8,338.9	7,347.2	25.3	26.7	-67.51	-67.51	-918.1	575.1	475.9	427.1	48.83	9.748	
8,600.0	7,528.6	8,438.9	7,346.9	26.8	28.2	-67.55	-67.55	-1,018.1	575.5	475.8	424.1	51.64	9.214	
8,700.0	7,527.9	8,538.9	7,346.5	28.4	29.7	-67.59	-67.59	-1,118.0	575.9	475.6	421.1	54.54	8.720	
8,800.0	7,527.2	8,638.9	7,346.2	30.0	31.2	-67.63	-67.63	-1,218.0	576.3	475.5	418.0	57.53	8.265	
8,900.0	7,526.5	8,738.9	7,345.9	31.6	32.8	-67.66	-67.66	-1,318.0	576.7	475.3	414.7	60.59	7.845	
9,000.0	7,525.8	8,838.9	7,345.5	33.2	34.5	-67.70	-67.70	-1,418.0	577.1	475.2	411.5	63.71	7.459	
9,100.0	7,525.1	8,938.9	7,345.2	34.9	36.1	-67.74	-67.74	-1,518.0	577.5	475.0	408.2	66.88	7.103	
9,200.0	7,524.4	9,038.9	7,344.8	36.6	37.8	-67.78	-67.78	-1,618.0	577.9	474.9	404.8	70.09	6.775	
9,300.0	7,523.7	9,138.9	7,344.5	38.3	39.5	-67.81	-67.81	-1,718.0	578.3	474.7	401.4	73.34	6.473	
9,400.0	7,523.0	9,238.9	7,344.1	40.1	41.2	-67.85	-67.85	-1,818.0	578.7	474.6	398.0	76.63	6.193	
9,500.0	7,522.4	9,338.9	7,343.8	41.8	43.0	-67.89	-67.89	-1,918.0	579.1	474.4	394.5	79.95	5.934	
9,600.0	7,521.7	9,438.9	7,343.4	43.6	44.8	-67.92	-67.92	-2,018.0	579.5	474.3	391.0	83.30	5.694	
9,700.0	7,521.0	9,538.9	7,343.1	45.4	46.5	-67.96	-67.96	-2,118.0	579.9	474.2	387.5	86.67	5.471	
9,800.0	7,520.3	9,638.9	7,342.7	47.2	48.3	-68.00	-68.00	-2,218.0	580.3	474.0	383.9	90.06	5.263	
9,900.0	7,519.6	9,738.9	7,342.4	49.0	50.1	-68.04	-68.04	-2,318.0	580.7	473.9	380.4	93.47	5.070	
10,000.0	7,518.9	9,838.9	7,342.0	50.8	51.9	-68.07	-68.07	-2,418.0	581.1	473.7	376.8	96.90	4.889	
10,100.0	7,518.2	9,938.9	7,341.7	52.7	53.7	-68.11	-68.11	-2,518.0	581.5	473.6	373.2	100.35	4.719	
10,200.0	7,517.5	10,038.9	7,341.3	54.5	55.5	-68.15	-68.15	-2,618.0	581.9	473.4	369.6	103.80	4.561	

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 21R-403
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Reference Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21R-403	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 (11-29-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21R-HZ Pad Sec.21-T7N-R66W - Thornton 21R-223 - Wellbore #1 - Plan #1 (11-29-12)													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
10,300.0	7,516.8	10,138.9	7,341.0	56.3	57.4	-68.19	-2,718.0	582.3	473.3	366.0	107.28	4.412		
10,400.0	7,516.1	10,238.9	7,340.6	58.2	59.2	-68.22	-2,818.0	582.7	473.1	362.4	110.76	4.272		
10,500.0	7,515.4	10,338.9	7,340.3	60.0	61.0	-68.26	-2,918.0	583.1	473.0	358.7	114.26	4.140		
10,600.0	7,514.7	10,438.9	7,339.9	61.9	62.9	-68.30	-3,018.0	583.5	472.8	355.1	117.76	4.015		
10,700.0	7,514.1	10,538.9	7,339.6	63.7	64.7	-68.34	-3,118.0	583.9	472.7	351.4	121.28	3.898		
10,800.0	7,513.4	10,638.9	7,339.2	65.6	66.6	-68.38	-3,218.0	584.3	472.6	347.8	124.80	3.786		
10,900.0	7,512.7	10,738.9	7,338.9	67.4	68.4	-68.41	-3,318.0	584.7	472.4	344.1	128.34	3.681		
11,000.0	7,512.0	10,838.9	7,338.5	69.3	70.3	-68.45	-3,418.0	585.1	472.3	340.4	131.88	3.581		
11,100.0	7,511.3	10,938.9	7,338.2	71.2	72.1	-68.49	-3,518.0	585.5	472.1	336.7	135.43	3.486		
11,200.0	7,510.6	11,038.9	7,337.8	73.1	74.0	-68.53	-3,618.0	585.9	472.0	333.0	138.98	3.396		
11,300.0	7,509.9	11,138.9	7,337.5	74.9	75.9	-68.56	-3,718.0	586.3	471.8	329.3	142.54	3.310		
11,400.0	7,509.2	11,238.9	7,337.1	76.8	77.8	-68.60	-3,818.0	586.7	471.7	325.6	146.11	3.228		
11,500.0	7,508.5	11,338.9	7,336.8	78.7	79.6	-68.64	-3,918.0	587.1	471.5	321.9	149.68	3.150		
11,600.0	7,507.8	11,438.9	7,336.4	80.6	81.5	-68.68	-4,018.0	587.5	471.4	318.1	153.26	3.076		
11,700.0	7,507.1	11,538.9	7,336.1	82.5	83.4	-68.72	-4,118.0	587.9	471.3	314.4	156.84	3.005		
11,800.0	7,506.5	11,638.9	7,335.7	84.4	85.3	-68.75	-4,218.0	588.3	471.1	310.7	160.43	2.937		
11,900.0	7,505.8	11,738.9	7,335.4	86.2	87.2	-68.79	-4,318.0	588.7	471.0	307.0	164.03	2.871		
11,994.8	7,505.1	11,833.6	7,335.0	88.0	88.9	-68.83	-4,412.8	589.0	470.8	303.4	167.44	2.812		
12,009.8	7,505.0	11,847.4	7,335.0	88.3	89.2	-68.83	-4,426.5	589.1	470.8	302.9	167.95	2.803 SF		

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21R-403
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Reference Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21R-403	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 (11-29-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21R-HZ Pad Sec.21-T7N-R66W - Thornton 21R-243 - Wellbore #1 - Plan #1 (11-29-12)													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 (ft)	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
0.0	0.0	0.0	0.0	0.0	0.0	-40.64	-40.64	58.3	-50.0	76.8				
100.0	100.0	100.0	100.0	0.1	0.1	-40.64	-40.64	58.3	-50.0	76.8	76.6	0.22	341.640	
200.0	200.0	200.0	200.0	0.3	0.3	-40.64	-40.64	58.3	-50.0	76.8	76.1	0.67	113.880	
300.0	300.0	300.0	300.0	0.6	0.6	-40.64	-40.64	58.3	-50.0	76.8	75.7	1.12	68.328	
400.0	400.0	400.0	400.0	0.8	0.8	-40.64	-40.64	58.3	-50.0	76.8	75.2	1.57	48.806	
500.0	500.0	500.0	500.0	1.0	1.0	-40.64	-40.64	58.3	-50.0	76.8	74.8	2.02	37.960	
600.0	600.0	600.0	600.0	1.2	1.2	-40.64	-40.64	58.3	-50.0	76.8	74.3	2.47	31.058	
700.0	700.0	700.0	700.0	1.5	1.5	-40.64	-40.64	58.3	-50.0	76.8	73.9	2.92	26.280	
800.0	800.0	800.0	800.0	1.7	1.7	-40.64	-40.64	58.3	-50.0	76.8	73.4	3.37	22.776	
900.0	900.0	900.0	900.0	1.9	1.9	-40.64	-40.64	58.3	-50.0	76.8	73.0	3.82	20.096	
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	-40.64	-40.64	58.3	-50.0	76.8	72.5	4.27	17.981	
1,100.0	1,100.0	1,100.0	1,100.0	2.4	2.4	-40.64	-40.64	58.3	-50.0	76.8	72.1	4.72	16.269	
1,200.0	1,200.0	1,200.0	1,200.0	2.6	2.6	-40.64	-40.64	58.3	-50.0	76.8	71.6	5.17	14.854 CC, ES	
1,300.0	1,300.0	1,297.4	1,297.3	2.8	2.8	-40.64	-40.64	59.5	-51.1	78.5	72.9	5.61	13.991	
1,400.0	1,400.0	1,394.5	1,394.3	3.0	3.0	-40.66	-40.66	63.3	-54.3	83.6	77.5	6.05	13.818	
1,500.0	1,500.0	1,491.2	1,490.7	3.3	3.2	-40.68	-40.68	69.4	-59.7	92.0	85.6	6.49	14.186	
1,600.0	1,600.0	1,588.2	1,587.0	3.5	3.5	-40.71	-40.71	78.0	-67.1	103.7	96.8	6.93	14.962	
1,700.0	1,700.0	1,687.4	1,685.4	3.7	3.7	-40.73	-40.73	87.4	-75.3	116.3	108.9	7.38	15.755	
1,800.0	1,800.0	1,786.6	1,783.8	3.9	4.0	-40.75	-40.75	96.8	-83.4	128.8	121.0	7.83	16.454	
1,900.0	1,900.0	1,885.8	1,882.3	4.2	4.3	-40.76	-40.76	106.2	-91.6	141.4	133.1	8.28	17.071	
2,000.0	2,000.0	1,985.0	1,980.7	4.4	4.5	-40.77	-40.77	115.6	-99.7	153.9	145.2	8.74	17.620	
2,100.0	2,100.0	2,084.3	2,079.2	4.6	4.8	-60.96	-60.96	125.1	-107.9	165.6	156.4	9.18	18.043	
2,200.0	2,199.8	2,183.7	2,177.8	4.8	5.1	-62.26	-62.26	134.5	-116.1	175.7	166.1	9.63	18.250	
2,300.0	2,299.5	2,283.0	2,276.4	5.1	5.4	-64.39	-64.39	143.9	-124.2	184.4	174.3	10.08	18.293	
2,387.6	2,386.4	2,369.9	2,362.6	5.3	5.7	-66.87	-66.87	152.1	-131.4	191.0	180.6	10.48	18.226	
2,400.0	2,398.7	2,382.3	2,374.8	5.3	5.7	-67.28	-67.28	153.3	-132.4	191.9	181.4	10.54	18.211	
2,500.0	2,497.8	2,481.4	2,473.2	5.5	6.0	-70.41	-70.41	162.7	-140.5	199.6	188.5	11.02	18.112	
2,600.0	2,596.9	2,580.5	2,571.5	5.8	6.3	-73.31	-73.31	172.1	-148.7	207.7	196.2	11.51	18.048	
2,700.0	2,696.0	2,679.6	2,669.8	6.0	6.6	-75.98	-75.98	181.5	-156.8	216.4	204.4	12.02	18.011	
2,800.0	2,795.1	2,778.8	2,768.2	6.3	6.9	-78.45	-78.45	190.9	-165.0	225.5	213.0	12.53	17.996	
2,900.0	2,894.1	2,877.9	2,866.5	6.6	7.2	-80.72	-80.72	200.3	-173.1	235.0	221.9	13.06	17.996	
3,000.0	2,993.2	2,977.0	2,964.9	6.9	7.5	-82.82	-82.82	209.7	-181.2	244.8	231.2	13.60	18.008	
3,100.0	3,092.3	3,076.2	3,063.2	7.1	7.8	-84.75	-84.75	219.1	-189.4	255.0	240.8	14.14	18.030	
3,200.0	3,191.4	3,175.3	3,161.6	7.4	8.1	-86.53	-86.53	228.5	-197.5	265.4	250.7	14.69	18.059	
3,300.0	3,290.5	3,274.4	3,259.9	7.7	8.4	-88.18	-88.18	237.9	-205.7	276.0	260.7	15.25	18.093	
3,400.0	3,389.6	3,373.6	3,358.3	8.0	8.7	-89.70	-89.70	247.3	-213.8	286.8	271.0	15.82	18.132	
3,500.0	3,488.7	3,472.7	3,456.6	8.3	9.1	-91.12	-91.12	256.7	-222.0	297.9	281.5	16.39	18.173	
3,600.0	3,587.7	3,571.8	3,555.0	8.6	9.4	-92.43	-92.43	266.1	-230.1	309.1	292.1	16.97	18.217	
3,700.0	3,686.8	3,670.9	3,653.3	8.9	9.7	-93.65	-93.65	275.5	-238.3	320.4	302.9	17.54	18.263	
3,800.0	3,785.9	3,770.1	3,751.7	9.2	10.0	-94.79	-94.79	284.9	-246.4	331.9	313.8	18.13	18.309	
3,900.0	3,885.0	3,869.2	3,850.0	9.5	10.3	-95.85	-95.85	294.3	-254.6	343.5	324.8	18.71	18.357	
4,000.0	3,984.1	3,968.3	3,948.4	9.8	10.6	-96.84	-96.84	303.7	-262.7	355.2	335.9	19.30	18.404	
4,100.0	4,083.2	4,067.5	4,046.7	10.1	10.9	-97.77	-97.77	313.1	-270.8	367.0	347.1	19.89	18.452	
4,200.0	4,182.3	4,166.6	4,145.0	10.4	11.2	-98.64	-98.64	322.5	-279.0	378.9	358.4	20.48	18.499	
4,300.0	4,281.3	4,265.7	4,243.4	10.8	11.6	-99.45	-99.45	331.9	-287.1	390.9	369.8	21.08	18.546	
4,400.0	4,380.4	4,365.0	4,341.9	11.1	11.9	-100.22	-100.22	341.3	-295.3	402.9	381.3	21.67	18.592	
4,500.0	4,479.5	4,476.3	4,452.5	11.4	12.1	-101.23	-101.23	350.2	-303.0	413.6	391.3	22.25	18.588	
4,600.0	4,578.6	4,587.7	4,563.7	11.7	12.4	-102.58	-102.58	355.8	-307.9	421.4	398.6	22.81	18.477	
4,700.0	4,677.7	4,699.0	4,675.0	12.0	12.6	-104.27	-104.27	358.2	-309.9	426.7	403.3	23.35	18.272	
4,800.0	4,776.8	4,800.8	4,776.8	12.3	12.7	-106.04	-106.04	358.3	-310.0	430.3	406.4	23.88	18.023	
4,837.2	4,813.6	4,837.7	4,813.6	12.5	12.8	-106.67	-106.67	358.3	-310.0	431.7	407.7	24.07	17.933	

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 21R-403
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Reference Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21R-403	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 (11-29-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21R-HZ Pad Sec.21-T7N-R66W - Thornton 21R-243 - Wellbore #1 - Plan #1 (11-29-12)													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
4,900.0	4,875.9	4,900.0	4,875.9	12.6	12.9	-107.69		358.3	-310.0	434.0	409.7	24.39	17.794	
5,000.0	4,975.5	4,999.5	4,975.5	12.9	13.1	-108.94		358.3	-310.0	437.1	412.2	24.84	17.595	
5,100.0	5,075.3	5,099.3	5,075.3	13.1	13.3	-109.73		358.3	-310.0	439.1	413.8	25.25	17.388	
5,200.0	5,175.3	5,199.3	5,175.3	13.2	13.5	-110.07		358.3	-310.0	440.0	414.3	25.63	17.166	
5,224.7	5,200.0	5,224.1	5,200.0	13.3	13.5	-90.23		358.3	-310.0	440.0	414.3	25.72	17.110	
5,300.0	5,275.3	5,299.3	5,275.3	13.4	13.6	-90.23		358.3	-310.0	440.0	414.0	25.99	16.928	
5,400.0	5,375.3	5,399.3	5,375.3	13.6	13.8	-90.23		358.3	-310.0	440.0	413.6	26.38	16.678	
5,500.0	5,475.3	5,499.3	5,475.3	13.8	14.0	-90.23		358.3	-310.0	440.0	413.2	26.77	16.435	
5,600.0	5,575.3	5,599.3	5,575.3	14.0	14.2	-90.23		358.3	-310.0	440.0	412.8	27.17	16.197	
5,700.0	5,675.3	5,699.3	5,675.3	14.2	14.4	-90.23		358.3	-310.0	440.0	412.5	27.56	15.966	
5,800.0	5,775.3	5,799.3	5,775.3	14.4	14.6	-90.23		358.3	-310.0	440.0	412.1	27.96	15.740	
5,900.0	5,875.3	5,899.3	5,875.3	14.5	14.8	-90.23		358.3	-310.0	440.0	411.7	28.35	15.519	
6,000.0	5,975.3	5,999.3	5,975.3	14.7	15.0	-90.23		358.3	-310.0	440.0	411.3	28.75	15.304	
6,100.0	6,075.3	6,099.3	6,075.3	14.9	15.2	-90.23		358.3	-310.0	440.0	410.9	29.15	15.093	
6,200.0	6,175.3	6,199.3	6,175.3	15.1	15.4	-90.23		358.3	-310.0	440.0	410.5	29.55	14.888	
6,300.0	6,275.3	6,299.3	6,275.3	15.3	15.6	-90.23		358.3	-310.0	440.0	410.1	29.96	14.688	
6,400.0	6,375.3	6,399.3	6,375.3	15.5	15.8	-90.23		358.3	-310.0	440.0	409.7	30.36	14.492	
6,500.0	6,475.3	6,499.3	6,475.3	15.7	16.0	-90.23		358.3	-310.0	440.0	409.2	30.77	14.301	
6,600.0	6,575.3	6,599.3	6,575.3	15.9	16.1	-90.23		358.3	-310.0	440.0	408.8	31.18	14.114	
6,642.7	6,618.0	6,642.0	6,618.0	16.0	16.2	-90.24		358.2	-310.0	440.0	408.7	31.35	14.037	
6,700.0	6,675.3	6,699.1	6,675.0	16.1	16.3	-90.64		355.1	-310.0	440.0	408.5	31.55	13.949	
6,783.0	6,758.3	6,780.3	6,755.3	16.3	16.4	-92.16		343.4	-310.0	440.3	408.5	31.80	13.847	
6,800.0	6,775.3	6,796.6	6,771.2	16.3	16.4	87.66		340.1	-309.9	440.4	408.6	31.84	13.831	
6,850.0	6,825.2	6,844.2	6,817.3	16.4	16.4	86.42		328.3	-309.9	440.9	409.0	31.93	13.809	
6,900.0	6,874.8	6,891.3	6,862.1	16.4	16.4	85.21		313.9	-309.8	441.6	409.6	31.98	13.808	
6,950.0	6,923.9	6,937.8	6,905.5	16.5	16.4	84.03		296.9	-309.8	442.5	410.5	32.01	13.827	
7,000.0	6,972.3	6,983.9	6,947.3	16.5	16.4	82.87		277.6	-309.7	443.6	411.6	32.00	13.862	
7,050.0	7,019.9	7,029.5	6,987.4	16.5	16.4	81.76		255.9	-309.6	444.8	412.8	31.97	13.913	
7,100.0	7,066.2	7,074.7	7,025.8	16.4	16.4	80.68		232.2	-309.5	446.1	414.2	31.92	13.975	
7,150.0	7,111.3	7,119.4	7,062.5	16.4	16.4	79.65		206.5	-309.4	447.5	415.7	31.86	14.046	
7,200.0	7,154.9	7,163.9	7,097.3	16.4	16.4	78.67		178.9	-309.3	449.0	417.2	31.80	14.122	
7,250.0	7,196.7	7,207.9	7,130.2	16.4	16.4	77.73		149.6	-309.2	450.6	418.9	31.73	14.199	
7,300.0	7,236.7	7,250.0	7,159.9	16.3	16.4	76.88		119.9	-309.1	452.2	420.5	31.68	14.273	
7,350.0	7,274.6	7,295.1	7,190.0	16.3	16.3	76.02		86.2	-309.0	453.8	422.1	31.65	14.336	
7,400.0	7,310.3	7,338.3	7,216.9	16.3	16.3	75.26		52.4	-308.8	455.3	423.7	31.65	14.385	
7,450.0	7,343.7	7,381.2	7,241.6	16.3	16.3	74.54		17.3	-308.7	456.9	425.2	31.69	14.416	
7,500.0	7,374.5	7,424.0	7,264.3	16.3	16.4	73.89		-18.9	-308.6	458.3	426.5	31.78	14.423	
7,550.0	7,402.7	7,466.5	7,284.8	16.4	16.4	73.30		-56.1	-308.4	459.7	427.8	31.93	14.399	
7,600.0	7,428.2	7,508.8	7,303.1	16.5	16.6	72.78		-94.3	-308.3	461.0	428.9	32.14	14.345	
7,650.0	7,450.8	7,550.0	7,318.8	16.7	16.8	72.32		-132.3	-308.1	462.2	429.7	32.41	14.259	
7,700.0	7,470.4	7,593.0	7,333.1	16.9	17.1	71.91		-172.9	-308.0	463.2	430.4	32.78	14.129	
7,750.0	7,486.9	7,635.0	7,344.8	17.2	17.4	71.58		-213.2	-307.8	464.1	430.8	33.23	13.965	
7,800.0	7,500.4	7,676.8	7,354.2	17.5	17.7	71.30		-254.0	-307.7	464.8	431.0	33.76	13.766	
7,850.0	7,510.7	7,718.6	7,361.4	17.8	18.1	71.10		-295.1	-307.5	465.4	431.0	34.38	13.536	
7,903.0	7,518.0	7,762.8	7,366.5	18.2	18.5	70.95		-339.0	-307.4	465.8	430.7	35.13	13.261	
7,977.0	7,525.7	7,824.3	7,369.4	18.9	19.1	70.54		-400.4	-307.1	467.2	431.0	36.24	12.891	
8,000.0	7,527.9	7,844.8	7,369.3	19.1	19.3	70.27		-420.9	-307.0	468.0	431.4	36.61	12.783	
8,104.9	7,532.0	7,949.5	7,368.4	20.2	20.5	69.62		-525.7	-306.6	469.8	431.1	38.66	12.151	
8,200.0	7,531.3	8,044.6	7,367.6	21.3	21.6	69.60		-620.7	-306.3	469.8	429.1	40.79	11.518	
8,300.0	7,530.7	8,144.6	7,366.8	22.6	22.9	69.59		-720.7	-305.9	469.9	426.7	43.22	10.873	
8,400.0	7,530.0	8,244.6	7,365.9	23.9	24.3	69.57		-820.7	-305.5	470.0	424.2	45.81	10.261	

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 21R-403
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Reference Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21R-403	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 (11-29-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21R-HZ Pad Sec.21-T7N-R66W - Thornton 21R-243 - Wellbore #1 - Plan #1 (11-29-12)													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 (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
8,500.0	7,529.3	8,344.6	7,365.0	25.3	25.8	69.55	-920.7	-305.1	470.1	421.6	48.53	9.687		
8,600.0	7,528.6	8,444.6	7,364.2	26.8	27.3	69.54	-1,020.7	-304.8	470.2	418.8	51.37	9.154		
8,700.0	7,527.9	8,544.6	7,363.3	28.4	28.9	69.52	-1,120.7	-304.4	470.3	416.0	54.30	8.661		
8,800.0	7,527.2	8,644.6	7,362.5	30.0	30.5	69.50	-1,220.7	-304.0	470.4	413.1	57.31	8.208		
8,900.0	7,526.5	8,744.6	7,361.6	31.6	32.1	69.49	-1,320.7	-303.6	470.5	410.1	60.39	7.790		
9,000.0	7,525.8	8,844.6	7,360.8	33.2	33.8	69.47	-1,420.7	-303.2	470.6	407.0	63.53	7.407		
9,100.0	7,525.1	8,944.6	7,359.9	34.9	35.5	69.45	-1,520.7	-302.9	470.7	404.0	66.73	7.054		
9,200.0	7,524.4	9,044.6	7,359.1	36.6	37.2	69.43	-1,620.7	-302.5	470.8	400.8	69.96	6.729		
9,300.0	7,523.7	9,144.6	7,358.2	38.3	38.9	69.42	-1,720.7	-302.1	470.9	397.6	73.23	6.430		
9,400.0	7,523.0	9,244.6	7,357.3	40.1	40.7	69.40	-1,820.7	-301.7	471.0	394.4	76.53	6.154		
9,500.0	7,522.4	9,344.6	7,356.5	41.8	42.5	69.38	-1,920.7	-301.3	471.1	391.2	79.86	5.898		
9,600.0	7,521.7	9,444.6	7,355.6	43.6	44.2	69.37	-2,020.7	-301.0	471.1	387.9	83.22	5.661		
9,700.0	7,521.0	9,544.6	7,354.8	45.4	46.0	69.35	-2,120.7	-300.6	471.2	384.6	86.60	5.442		
9,800.0	7,520.3	9,644.6	7,353.9	47.2	47.8	69.33	-2,220.7	-300.2	471.3	381.3	90.00	5.237		
9,900.0	7,519.6	9,744.6	7,353.1	49.0	49.7	69.31	-2,320.7	-299.8	471.4	378.0	93.41	5.047		
10,000.0	7,518.9	9,844.6	7,352.2	50.8	51.5	69.30	-2,420.6	-299.4	471.5	374.7	96.84	4.869		
10,100.0	7,518.2	9,944.6	7,351.4	52.7	53.3	69.28	-2,520.6	-299.1	471.6	371.3	100.28	4.703		
10,200.0	7,517.5	10,044.6	7,350.5	54.5	55.1	69.26	-2,620.6	-298.7	471.7	368.0	103.74	4.547		
10,300.0	7,516.8	10,144.6	7,349.7	56.3	57.0	69.25	-2,720.6	-298.3	471.8	364.6	107.20	4.401		
10,400.0	7,516.1	10,244.6	7,348.8	58.2	58.8	69.23	-2,820.6	-297.9	471.9	361.2	110.68	4.264		
10,500.0	7,515.4	10,344.6	7,347.9	60.0	60.7	69.21	-2,920.6	-297.5	472.0	357.8	114.17	4.134		
10,600.0	7,514.7	10,444.6	7,347.1	61.9	62.5	69.20	-3,020.6	-297.1	472.1	354.4	117.66	4.012		
10,700.0	7,514.1	10,544.6	7,346.2	63.7	64.4	69.18	-3,120.6	-296.8	472.2	351.0	121.16	3.897		
10,800.0	7,513.4	10,644.6	7,345.4	65.6	66.3	69.16	-3,220.6	-296.4	472.3	347.6	124.66	3.788		
10,900.0	7,512.7	10,744.6	7,344.5	67.4	68.1	69.15	-3,320.6	-296.0	472.4	344.2	128.18	3.685		
11,000.0	7,512.0	10,844.6	7,343.7	69.3	70.0	69.13	-3,420.6	-295.6	472.5	340.8	131.70	3.587		
11,100.0	7,511.3	10,944.6	7,342.8	71.2	71.9	69.11	-3,520.6	-295.2	472.5	337.3	135.22	3.495		
11,200.0	7,510.6	11,044.6	7,342.0	73.1	73.7	69.09	-3,620.6	-294.9	472.6	333.9	138.75	3.407		
11,300.0	7,509.9	11,144.6	7,341.1	74.9	75.6	69.08	-3,720.6	-294.5	472.7	330.5	142.28	3.323		
11,400.0	7,509.2	11,244.6	7,340.2	76.8	77.5	69.06	-3,820.6	-294.1	472.8	327.0	145.81	3.243		
11,500.0	7,508.5	11,344.6	7,339.4	78.7	79.4	69.04	-3,920.6	-293.7	472.9	323.6	149.35	3.167		
11,600.0	7,507.8	11,444.6	7,338.5	80.6	81.3	69.03	-4,020.6	-293.3	473.0	320.1	152.89	3.094		
11,700.0	7,507.1	11,544.6	7,337.7	82.5	83.2	69.01	-4,120.6	-293.0	473.1	316.7	156.44	3.024		
11,800.0	7,506.5	11,644.6	7,336.8	84.4	85.0	68.99	-4,220.6	-292.6	473.2	313.2	159.99	2.958		
11,900.0	7,505.8	11,744.6	7,336.0	86.2	86.9	68.98	-4,320.6	-292.2	473.3	309.8	163.54	2.894		
12,009.8	7,505.0	11,854.4	7,335.0	88.3	88.8	68.96	-4,430.4	-291.8	473.4	306.2	167.24	2.831 SF		

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21R-403
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Reference Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21R-403	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 (11-29-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21R-HZ Pad Sec.21-T7N-R66W - Thornton 21U-203 - Wellbore #1 - Plan #1 (11-29-12)													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	61.73	61.73	58.3	108.4	123.0				
100.0	100.0	100.0	100.0	0.1	0.1	61.73	61.73	58.3	108.4	123.0	122.8	0.22	547.352	
200.0	200.0	200.0	200.0	0.3	0.3	61.73	61.73	58.3	108.4	123.0	122.4	0.67	182.451 CC, ES	
300.0	300.0	296.0	296.0	0.6	0.5	61.93	61.93	58.6	109.9	124.6	123.5	1.11	112.430	
400.0	400.0	391.8	391.6	0.8	0.8	62.50	62.50	59.7	114.6	129.5	127.9	1.55	83.500	
500.0	500.0	487.1	486.6	1.0	1.0	63.36	63.36	61.4	122.4	137.6	135.6	2.01	68.608	
600.0	600.0	581.8	580.7	1.2	1.3	64.39	64.39	63.8	133.2	148.9	146.4	2.47	60.206	
700.0	700.0	675.7	673.5	1.5	1.6	65.51	65.51	66.9	146.8	163.5	160.5	2.95	55.376	
800.0	800.0	768.6	764.9	1.7	1.9	66.63	66.63	70.6	163.2	181.3	177.8	3.44	52.631	
900.0	900.0	860.3	854.4	1.9	2.3	67.68	67.68	74.8	182.3	202.2	198.3	3.95	51.223	
1,000.0	1,000.0	950.6	942.0	2.1	2.7	68.66	68.66	79.6	203.8	226.3	221.9	4.46	50.712	
1,100.0	1,100.0	1,046.1	1,034.1	2.4	3.2	69.55	69.55	85.1	228.3	252.4	247.4	5.00	50.478	
1,200.0	1,200.0	1,142.5	1,127.2	2.6	3.7	70.29	70.29	90.7	253.0	278.5	272.9	5.53	50.313	
1,300.0	1,300.0	1,239.0	1,220.3	2.8	4.3	70.90	70.90	96.2	277.8	304.6	298.6	6.07	50.161	
1,400.0	1,400.0	1,335.5	1,313.4	3.0	4.8	71.41	71.41	101.8	302.6	330.8	324.2	6.61	50.025	
1,500.0	1,500.0	1,432.0	1,406.4	3.3	5.3	71.85	71.85	107.3	327.4	357.0	349.9	7.15	49.903	
1,600.0	1,600.0	1,528.4	1,499.5	3.5	5.8	72.23	72.23	112.9	352.2	383.2	375.5	7.70	49.796	
1,700.0	1,700.0	1,624.9	1,592.6	3.7	6.4	72.56	72.56	118.4	377.0	409.5	401.2	8.24	49.701	
1,800.0	1,800.0	1,721.4	1,685.6	3.9	6.9	72.85	72.85	123.9	401.7	435.7	426.9	8.78	49.616	
1,900.0	1,900.0	1,817.8	1,778.7	4.2	7.4	73.11	73.11	129.5	426.5	462.0	452.6	9.32	49.541	
2,000.0	2,000.0	1,914.3	1,871.8	4.4	8.0	73.34	73.34	135.0	451.3	488.2	478.3	9.87	49.473	
2,100.0	2,100.0	2,011.0	1,965.1	4.6	8.5	53.43	53.43	140.6	476.1	513.5	503.8	9.68	53.041	
2,200.0	2,199.8	2,108.1	2,058.7	4.8	9.1	53.69	53.69	146.2	501.1	536.8	526.6	10.18	52.715	
2,300.0	2,299.5	2,205.4	2,152.6	5.1	9.6	54.22	54.22	151.8	526.1	558.1	547.5	10.68	52.258	
2,387.6	2,386.4	2,290.8	2,235.0	5.3	10.1	54.89	54.89	156.7	548.0	575.4	564.2	11.12	51.753	
2,400.0	2,398.7	2,302.9	2,246.6	5.3	10.1	55.04	55.04	157.4	551.1	577.7	566.5	11.18	51.679	
2,500.0	2,497.8	2,400.4	2,340.7	5.5	10.7	56.17	56.17	163.0	576.2	596.7	585.0	11.68	51.093	
2,600.0	2,596.9	2,497.9	2,434.8	5.8	11.2	57.24	57.24	168.6	601.2	615.9	603.8	12.19	50.525	
2,700.0	2,696.0	2,595.4	2,528.8	6.0	11.8	58.24	58.24	174.2	626.3	635.4	622.7	12.71	49.975	
2,800.0	2,795.1	2,692.9	2,622.9	6.3	12.3	59.19	59.19	179.8	651.3	655.0	641.7	13.25	49.443	
2,900.0	2,894.1	2,790.4	2,716.9	6.6	12.9	60.08	60.08	185.4	676.4	674.8	661.0	13.79	48.928	
3,000.0	2,993.2	2,887.9	2,811.0	6.9	13.4	60.91	60.91	191.0	701.4	694.7	680.3	14.34	48.432	
3,100.0	3,092.3	2,985.4	2,905.1	7.1	14.0	61.71	61.71	196.6	726.4	714.7	699.8	14.90	47.953	
3,200.0	3,191.4	3,082.9	2,999.1	7.4	14.5	62.46	62.46	202.2	751.5	734.9	719.4	15.47	47.493	
3,300.0	3,290.5	3,180.4	3,093.2	7.7	15.1	63.17	63.17	207.9	776.5	755.2	739.2	16.05	47.051	
3,400.0	3,389.6	3,277.9	3,187.2	8.0	15.6	63.84	63.84	213.5	801.6	775.6	759.0	16.63	46.625	
3,500.0	3,488.7	3,375.4	3,281.3	8.3	16.2	64.48	64.48	219.1	826.6	796.1	778.9	17.23	46.217	
3,600.0	3,587.7	3,472.9	3,375.4	8.6	16.7	65.08	65.08	224.7	851.7	816.7	798.9	17.82	45.826	
3,700.0	3,686.8	3,570.4	3,469.4	8.9	17.2	65.66	65.66	230.3	876.7	837.4	818.9	18.42	45.451	
3,800.0	3,785.9	3,667.9	3,563.5	9.2	17.8	66.21	66.21	235.9	901.8	858.1	839.1	19.03	45.091	
3,900.0	3,885.0	3,765.4	3,657.5	9.5	18.3	66.73	66.73	241.5	926.8	878.9	859.3	19.64	44.746	
4,000.0	3,984.1	3,862.9	3,751.6	9.8	18.9	67.23	67.23	247.1	951.9	899.8	879.6	20.26	44.415	
4,100.0	4,083.2	3,960.4	3,845.7	10.1	19.4	67.71	67.71	252.7	976.9	920.8	899.9	20.88	44.098	
4,200.0	4,182.3	4,057.9	3,939.7	10.4	20.0	68.16	68.16	258.3	1,002.0	941.8	920.3	21.51	43.795	
4,300.0	4,281.3	4,155.4	4,033.8	10.8	20.5	68.60	68.60	263.9	1,027.0	962.9	940.7	22.13	43.503	
4,400.0	4,380.4	4,252.9	4,127.8	11.1	21.1	69.01	69.01	269.5	1,052.0	984.0	961.2	22.77	43.224 SF	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21R-403
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Reference Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21R-403	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 (11-29-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21R-HZ Pad Sec.21-T7N-R66W - Thornton 21U-443 - Wellbore #1 - Plan #1 (11-29-12)													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 (ft)	Offset (ft)	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	
0.0	0.0	0.0	0.0	0.0	0.0	54.12	58.3	80.6	99.4					
100.0	100.0	100.0	100.0	0.1	0.1	54.12	58.3	80.6	99.4	99.2	0.22	442.415		
200.0	200.0	200.0	200.0	0.3	0.3	54.12	58.3	80.6	99.4	98.8	0.67	147.472		
300.0	300.0	300.0	300.0	0.6	0.6	54.12	58.3	80.6	99.4	98.3	1.12	88.483		
400.0	400.0	400.0	400.0	0.8	0.8	54.12	58.3	80.6	99.4	97.9	1.57	63.202		
500.0	500.0	500.0	500.0	1.0	1.0	54.12	58.3	80.6	99.4	97.4	2.02	49.157		
600.0	600.0	600.0	600.0	1.2	1.2	54.12	58.3	80.6	99.4	97.0	2.47	40.220		
700.0	700.0	700.0	700.0	1.5	1.5	54.12	58.3	80.6	99.4	96.5	2.92	34.032		
800.0	800.0	800.0	800.0	1.7	1.7	54.12	58.3	80.6	99.4	96.1	3.37	29.494 CC, ES		
900.0	900.0	896.8	896.7	1.9	1.9	54.41	58.8	82.1	101.0	97.2	3.81	26.552		
1,000.0	1,000.0	993.3	993.2	2.1	2.1	55.21	60.3	86.8	105.9	101.6	4.24	24.987		
1,100.0	1,100.0	1,089.4	1,088.9	2.4	2.3	56.40	62.8	94.5	114.0	109.3	4.68	24.368		
1,200.0	1,200.0	1,184.9	1,183.7	2.6	2.6	57.80	66.2	105.1	125.3	120.2	5.13	24.449		
1,300.0	1,300.0	1,279.5	1,277.3	2.8	2.8	59.26	70.6	118.7	139.9	134.3	5.58	25.067		
1,400.0	1,400.0	1,373.1	1,369.2	3.0	3.1	60.67	75.8	134.9	157.8	151.8	6.05	26.085		
1,500.0	1,500.0	1,469.4	1,463.5	3.3	3.5	61.97	81.9	153.9	178.1	171.6	6.53	27.269		
1,600.0	1,600.0	1,567.2	1,559.2	3.5	3.8	63.03	88.2	173.2	198.6	191.6	7.02	28.294		
1,700.0	1,700.0	1,665.1	1,654.9	3.7	4.2	63.88	94.4	192.6	219.2	211.7	7.51	29.181		
1,800.0	1,800.0	1,762.9	1,750.6	3.9	4.6	64.60	100.7	211.9	239.8	231.8	8.01	29.950		
1,900.0	1,900.0	1,860.7	1,846.2	4.2	5.0	65.19	106.9	231.3	260.4	251.9	8.50	30.623		
2,000.0	2,000.0	1,958.5	1,941.9	4.4	5.4	65.71	113.1	250.6	281.1	272.1	9.00	31.217		
2,100.0	2,100.0	2,056.5	2,037.8	4.6	5.8	46.25	119.4	270.0	300.6	291.3	9.23	32.548		
2,200.0	2,199.8	2,154.9	2,134.0	4.8	6.3	47.06	125.7	289.5	317.8	308.1	9.70	32.760		
2,300.0	2,299.5	2,253.4	2,230.4	5.1	6.7	48.25	132.0	309.0	332.7	322.6	10.16	32.744		
2,387.6	2,386.4	2,339.8	2,314.9	5.3	7.1	49.56	137.5	326.1	344.2	333.6	10.57	32.567		
2,400.0	2,398.7	2,352.0	2,326.9	5.3	7.1	49.79	138.3	328.5	345.7	335.1	10.63	32.529		
2,500.0	2,497.8	2,450.7	2,423.3	5.5	7.5	51.55	144.6	348.0	358.1	347.0	11.11	32.239		
2,600.0	2,596.9	2,549.3	2,519.8	5.8	8.0	53.19	150.9	367.5	370.9	359.3	11.60	31.968		
2,700.0	2,696.0	2,647.9	2,616.3	6.0	8.4	54.73	157.1	387.1	383.9	371.8	12.10	31.713		
2,800.0	2,795.1	2,746.6	2,712.8	6.3	8.9	56.16	163.4	406.6	397.2	384.5	12.62	31.470		
2,900.0	2,894.1	2,845.2	2,809.3	6.6	9.3	57.50	169.7	426.1	410.7	397.5	13.15	31.239		
3,000.0	2,993.2	2,943.9	2,905.8	6.9	9.7	58.75	176.0	445.6	424.4	410.7	13.68	31.017		
3,100.0	3,092.3	3,042.5	3,002.2	7.1	10.2	59.93	182.3	465.1	438.3	424.0	14.23	30.805		
3,200.0	3,191.4	3,141.1	3,098.7	7.4	10.6	61.03	188.6	484.6	452.3	437.6	14.78	30.600		
3,300.0	3,290.5	3,239.8	3,195.2	7.7	11.1	62.07	194.9	504.1	466.6	451.2	15.35	30.404		
3,400.0	3,389.6	3,338.4	3,291.7	8.0	11.5	63.05	201.2	523.7	480.9	465.0	15.92	30.216		
3,500.0	3,488.7	3,437.0	3,388.2	8.3	12.0	63.97	207.5	543.2	495.4	478.9	16.50	30.035		
3,600.0	3,587.7	3,535.7	3,484.6	8.6	12.4	64.83	213.8	562.7	510.0	493.0	17.08	29.861		
3,700.0	3,686.8	3,634.3	3,581.1	8.9	12.8	65.65	220.1	582.2	524.8	507.1	17.67	29.695		
3,800.0	3,785.9	3,733.0	3,677.6	9.2	13.3	66.43	226.4	601.7	539.6	521.3	18.27	29.535		
3,900.0	3,885.0	3,831.6	3,774.1	9.5	13.7	67.16	232.7	621.2	554.5	535.6	18.87	29.382		
4,000.0	3,984.1	3,930.2	3,870.6	9.8	14.2	67.85	239.0	640.8	569.5	550.0	19.48	29.235		
4,100.0	4,083.2	4,028.9	3,967.1	10.1	14.6	68.51	245.3	660.3	584.6	564.5	20.09	29.094		
4,200.0	4,182.3	4,127.5	4,063.5	10.4	15.1	69.14	251.6	679.8	599.7	579.0	20.71	28.959		
4,300.0	4,281.3	4,226.1	4,160.0	10.8	15.5	69.74	257.9	699.3	615.0	593.6	21.33	28.830		
4,400.0	4,380.4	4,324.8	4,256.5	11.1	16.0	70.30	264.2	718.8	630.2	608.3	21.95	28.706		
4,500.0	4,479.5	4,423.4	4,353.0	11.4	16.4	70.84	270.5	738.3	645.6	623.0	22.58	28.587		
4,600.0	4,578.6	4,522.1	4,449.5	11.7	16.9	71.36	276.8	757.8	661.0	637.8	23.21	28.474		
4,700.0	4,677.7	4,620.7	4,546.0	12.0	17.3	71.85	283.1	777.4	676.4	652.6	23.85	28.365		
4,800.0	4,776.8	4,719.3	4,642.4	12.3	17.8	72.32	289.3	796.9	691.9	667.4	24.48	28.260		
4,837.2	4,813.6	4,756.0	4,678.3	12.5	17.9	72.49	291.7	804.1	697.7	672.9	24.72	28.222		

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 21R-403
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Reference Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21R-403	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 (11-29-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21R-HZ Pad Sec.21-T7N-R66W - Thornton 21U-443 - Wellbore #1 - Plan #1 (11-29-12)													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	
4,900.0	4,875.9	4,818.0	4,738.9	12.6	18.2	72.91	295.6	816.4	707.6	682.5	25.10	28.191		
5,000.0	4,975.5	4,916.6	4,835.3	12.9	18.7	73.36	301.9	835.9	724.3	698.7	25.64	28.250		
5,100.0	5,075.3	5,015.0	4,931.6	13.1	19.1	73.56	308.2	855.4	742.0	715.9	26.13	28.397		
5,200.0	5,175.3	5,113.1	5,027.6	13.2	19.6	73.54	314.5	874.8	760.7	734.1	26.57	28.630		
5,224.7	5,200.0	5,137.3	5,051.3	13.3	19.7	93.36	316.0	879.6	765.4	738.8	26.70	28.673		
5,300.0	5,275.3	5,210.9	5,123.3	13.4	20.0	92.94	320.7	894.1	780.1	753.1	26.99	28.898		
5,400.0	5,375.3	5,308.7	5,218.9	13.6	20.4	92.41	327.0	913.5	799.6	772.2	27.41	29.171		
5,500.0	5,475.3	5,406.5	5,314.6	13.8	20.9	91.91	333.2	932.8	819.2	791.4	27.83	29.436		
5,600.0	5,575.3	5,506.6	5,412.5	14.0	21.3	91.42	339.6	952.6	838.8	810.6	28.25	29.690		
5,700.0	5,675.3	5,643.2	5,546.9	14.2	21.8	90.87	347.2	976.2	856.0	827.3	28.70	29.827		
5,800.0	5,775.3	5,782.0	5,684.3	14.4	22.1	90.47	352.9	994.0	868.8	839.6	29.14	29.811		
5,900.0	5,875.3	5,922.2	5,824.1	14.5	22.4	90.22	356.6	1,005.4	876.9	847.4	29.58	29.650		
6,000.0	5,975.3	6,063.3	5,965.0	14.7	22.6	90.12	358.2	1,010.4	880.4	850.4	30.00	29.349		
6,100.0	6,075.3	6,173.5	6,075.3	14.9	22.8	90.11	358.3	1,010.6	880.6	850.2	30.38	28.981		
6,200.0	6,175.3	6,273.5	6,175.3	15.1	22.9	90.11	358.3	1,010.6	880.6	849.8	30.76	28.629		
6,300.0	6,275.3	6,373.5	6,275.3	15.3	23.0	90.11	358.3	1,010.6	880.6	849.4	31.13	28.283		
6,400.0	6,375.3	6,473.5	6,375.3	15.5	23.1	90.11	358.3	1,010.6	880.6	849.1	31.51	27.944		
6,500.0	6,475.3	6,573.5	6,475.3	15.7	23.3	90.11	358.3	1,010.6	880.6	848.7	31.89	27.612		
6,600.0	6,575.3	6,673.5	6,575.3	15.9	23.4	90.11	358.3	1,010.6	880.6	848.3	32.27	27.285		
6,700.0	6,675.3	6,773.5	6,675.3	16.1	23.5	90.11	358.3	1,010.6	880.6	847.9	32.66	26.965		
6,755.3	6,730.6	6,828.9	6,730.6	16.2	23.6	90.11	358.3	1,010.6	880.6	847.7	32.87	26.791		
6,783.0	6,758.3	6,856.5	6,758.2	16.3	23.7	90.11	358.3	1,010.6	880.6	847.6	32.97	26.704		
6,800.0	6,775.3	6,873.4	6,775.1	16.3	23.7	-89.65	358.1	1,010.6	880.6	847.6	33.01	26.678		
6,850.0	6,825.2	6,923.1	6,824.7	16.4	23.7	-89.65	355.4	1,010.6	880.6	847.4	33.14	26.572		
6,900.0	6,874.8	6,972.7	6,874.0	16.4	23.8	-89.65	349.5	1,010.6	880.6	847.3	33.23	26.498		
6,950.0	6,923.9	7,022.4	6,922.8	16.5	23.8	-89.66	340.3	1,010.6	880.6	847.3	33.29	26.452		
7,000.0	6,972.3	7,072.0	6,970.9	16.5	23.8	-89.66	328.1	1,010.7	880.6	847.3	33.32	26.431		
7,050.0	7,019.9	7,121.7	7,018.1	16.5	23.8	-89.67	312.7	1,010.8	880.6	847.3	33.32	26.431		
7,100.0	7,066.2	7,171.4	7,064.2	16.4	23.8	-89.68	294.3	1,010.8	880.6	847.3	33.30	26.447		
7,150.0	7,111.3	7,221.1	7,109.1	16.4	23.8	-89.69	272.9	1,010.9	880.6	847.3	33.26	26.473		
7,200.0	7,154.9	7,270.7	7,152.5	16.4	23.8	-89.70	248.7	1,011.0	880.6	847.3	33.23	26.503		
7,250.0	7,196.7	7,320.5	7,194.2	16.4	23.8	-89.71	221.7	1,011.1	880.6	847.4	33.19	26.528		
7,300.0	7,236.7	7,370.2	7,234.0	16.3	23.8	-89.72	192.0	1,011.3	880.6	847.4	33.18	26.542		
7,350.0	7,274.6	7,419.9	7,271.9	16.3	23.8	-89.74	159.8	1,011.4	880.6	847.4	33.18	26.536		
7,400.0	7,310.3	7,469.6	7,307.6	16.3	23.8	-89.75	125.2	1,011.5	880.6	847.3	33.23	26.501		
7,450.0	7,343.7	7,519.4	7,341.0	16.3	23.8	-89.77	88.3	1,011.7	880.6	847.2	33.32	26.429		
7,500.0	7,374.5	7,569.2	7,371.9	16.3	23.8	-89.79	49.3	1,011.9	880.6	847.1	33.46	26.314		
7,550.0	7,402.7	7,619.0	7,400.3	16.4	23.8	-89.81	8.3	1,012.0	880.6	846.9	33.67	26.150		
7,600.0	7,428.2	7,668.8	7,425.9	16.5	23.8	-89.83	-34.4	1,012.2	880.6	846.6	33.96	25.931		
7,650.0	7,450.8	7,718.6	7,448.7	16.7	23.9	-89.85	-78.7	1,012.4	880.6	846.2	34.32	25.657		
7,700.0	7,470.4	7,768.5	7,468.5	16.9	24.0	-89.87	-124.4	1,012.6	880.6	845.8	34.77	25.328		
7,750.0	7,486.9	7,818.4	7,485.3	17.2	24.1	-89.89	-171.4	1,012.8	880.6	845.3	35.30	24.947		
7,800.0	7,500.4	7,868.3	7,499.1	17.5	24.3	-89.91	-219.3	1,013.0	880.6	844.6	35.91	24.518		
7,850.0	7,510.7	7,918.2	7,509.7	17.8	24.4	-89.94	-268.1	1,013.2	880.6	843.9	36.62	24.049		
7,903.0	7,518.0	7,971.1	7,517.4	18.2	24.7	-89.96	-320.5	1,013.4	880.6	843.1	37.44	23.517		
7,929.6	7,520.8	7,997.7	7,520.2	18.5	24.8	-89.96	-346.9	1,013.5	880.6	842.7	37.90	23.232		
7,977.0	7,525.7	8,045.1	7,525.2	18.9	25.1	-89.96	-394.1	1,013.7	880.6	841.8	38.75	22.724		
7,986.8	7,526.7	8,054.9	7,526.2	19.0	25.1	-89.96	-403.8	1,013.8	880.6	841.6	38.93	22.616		
8,000.0	7,527.9	8,068.1	7,527.4	19.1	25.2	-89.97	-416.9	1,013.8	880.6	841.4	39.19	22.469		
8,104.9	7,532.0	8,173.0	7,532.0	20.2	26.0	-90.00	-521.6	1,014.3	880.6	839.2	41.36	21.291		
8,200.0	7,531.3	8,268.0	7,531.3	21.3	26.8	-90.00	-616.7	1,014.7	880.6	837.0	43.56	20.216		

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

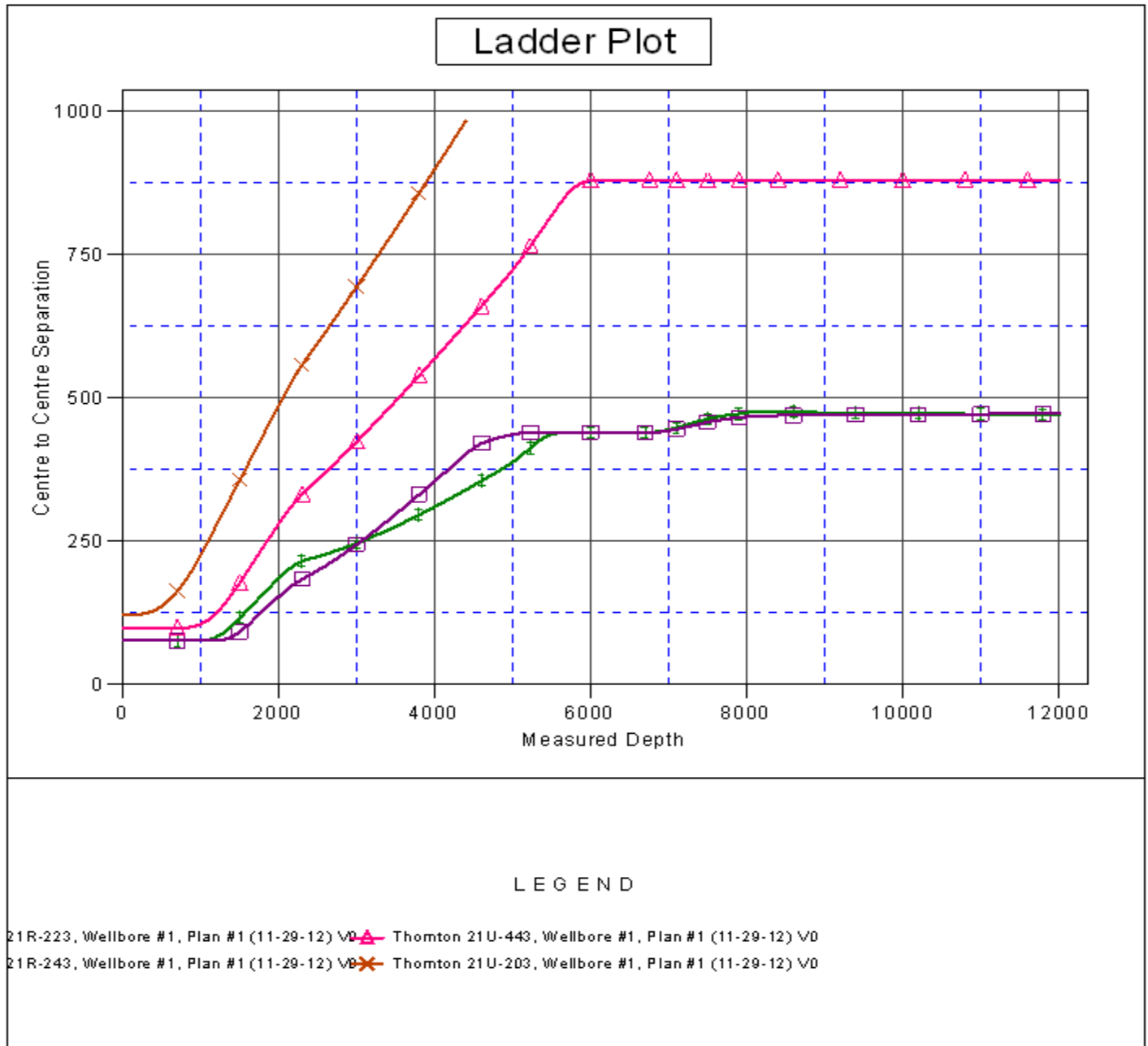
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21R-403
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Reference Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21R-403	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 (11-29-12)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 21R-HZ Pad Sec.21-T7N-R66W - Thornton 21U-443 - Wellbore #1 - Plan #1 (11-29-12)													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
8,300.0	7,530.7	8,368.0	7,530.7	22.6	27.8	-90.00	-90.00	-716.7	1,015.1	880.6	834.5	46.06	19.117	
8,400.0	7,530.0	8,468.0	7,530.0	23.9	28.9	-90.00	-90.00	-816.7	1,015.5	880.6	831.8	48.74	18.065	
8,500.0	7,529.3	8,568.0	7,529.3	25.3	30.1	-90.00	-90.00	-916.7	1,016.0	880.6	829.0	51.57	17.074	
8,600.0	7,528.6	8,668.0	7,528.6	26.8	31.3	-90.00	-90.00	-1,016.7	1,016.4	880.6	826.1	54.53	16.149	
8,700.0	7,527.9	8,768.0	7,527.9	28.4	32.7	-90.00	-90.00	-1,116.7	1,016.8	880.6	823.0	57.59	15.291	
8,800.0	7,527.2	8,868.0	7,527.2	30.0	34.1	-90.00	-90.00	-1,216.7	1,017.2	880.6	819.9	60.74	14.498	
8,900.0	7,526.5	8,968.0	7,526.5	31.6	35.5	-90.00	-90.00	-1,316.7	1,017.7	880.6	816.7	63.97	13.766	
9,000.0	7,525.8	9,068.0	7,525.8	33.2	37.0	-90.00	-90.00	-1,416.7	1,018.1	880.6	813.4	67.26	13.092	
9,100.0	7,525.1	9,168.0	7,525.1	34.9	38.6	-90.00	-90.00	-1,516.7	1,018.5	880.6	810.0	70.62	12.471	
9,200.0	7,524.4	9,268.0	7,524.4	36.6	40.2	-90.00	-90.00	-1,616.7	1,018.9	880.7	806.6	74.01	11.898	
9,300.0	7,523.7	9,368.0	7,523.7	38.3	41.8	-90.00	-90.00	-1,716.7	1,019.4	880.7	803.2	77.46	11.370	
9,400.0	7,523.0	9,468.0	7,523.0	40.1	43.4	-90.00	-90.00	-1,816.7	1,019.8	880.7	799.7	80.94	10.881	
9,500.0	7,522.4	9,568.0	7,522.3	41.8	45.0	-90.00	-90.00	-1,916.6	1,020.2	880.7	796.2	84.45	10.429	
9,600.0	7,521.7	9,668.0	7,521.7	43.6	46.7	-90.00	-90.00	-2,016.6	1,020.7	880.7	792.7	87.99	10.009	
9,700.0	7,521.0	9,768.0	7,521.0	45.4	48.4	-90.00	-90.00	-2,116.6	1,021.1	880.7	789.1	91.55	9.620	
9,800.0	7,520.3	9,868.0	7,520.3	47.2	50.1	-90.00	-90.00	-2,216.6	1,021.5	880.7	785.6	95.14	9.257	
9,900.0	7,519.6	9,968.0	7,519.6	49.0	51.8	-90.00	-90.00	-2,316.6	1,021.9	880.7	782.0	98.75	8.919	
10,000.0	7,518.9	10,068.0	7,518.9	50.8	53.6	-90.00	-90.00	-2,416.6	1,022.4	880.7	778.4	102.37	8.603	
10,100.0	7,518.2	10,168.0	7,518.2	52.7	55.3	-90.00	-90.00	-2,516.6	1,022.8	880.7	774.7	106.01	8.308	
10,200.0	7,517.5	10,268.0	7,517.5	54.5	57.1	-90.00	-90.00	-2,616.6	1,023.2	880.7	771.1	109.67	8.031	
10,300.0	7,516.8	10,368.0	7,516.8	56.3	58.9	-90.00	-90.00	-2,716.6	1,023.6	880.8	767.4	113.34	7.771	
10,400.0	7,516.1	10,468.0	7,516.1	58.2	60.7	-90.00	-90.00	-2,816.6	1,024.1	880.8	763.7	117.02	7.527	
10,500.0	7,515.4	10,568.0	7,515.4	60.0	62.5	-90.00	-90.00	-2,916.6	1,024.5	880.8	760.1	120.71	7.297	
10,600.0	7,514.7	10,668.0	7,514.7	61.9	64.3	-90.00	-90.00	-3,016.6	1,024.9	880.8	756.4	124.41	7.080	
10,700.0	7,514.1	10,768.0	7,514.0	63.7	66.1	-90.00	-90.00	-3,116.6	1,025.4	880.8	752.7	128.12	6.875	
10,800.0	7,513.4	10,868.0	7,513.3	65.6	67.9	-90.00	-90.00	-3,216.6	1,025.8	880.8	749.0	131.84	6.681	
10,900.0	7,512.7	10,968.0	7,512.7	67.4	69.7	-90.00	-90.00	-3,316.6	1,026.2	880.8	745.2	135.56	6.497	
11,000.0	7,512.0	11,068.0	7,512.0	69.3	71.5	-90.00	-90.00	-3,416.6	1,026.6	880.8	741.5	139.29	6.323	
11,100.0	7,511.3	11,168.0	7,511.3	71.2	73.3	-90.00	-90.00	-3,516.6	1,027.1	880.8	737.8	143.03	6.158	
11,200.0	7,510.6	11,268.0	7,510.6	73.1	75.2	-90.00	-90.00	-3,616.6	1,027.5	880.8	734.1	146.78	6.001	
11,300.0	7,509.9	11,368.0	7,509.9	74.9	77.0	-90.00	-90.00	-3,716.6	1,027.9	880.8	730.3	150.53	5.852	
11,400.0	7,509.2	11,468.0	7,509.2	76.8	78.9	-90.00	-90.00	-3,816.6	1,028.3	880.8	726.6	154.28	5.709	
11,500.0	7,508.5	11,568.0	7,508.5	78.7	80.7	-90.00	-90.00	-3,916.6	1,028.8	880.9	722.8	158.04	5.574	
11,600.0	7,507.8	11,668.0	7,507.8	80.6	82.6	-90.00	-90.00	-4,016.6	1,029.2	880.9	719.1	161.81	5.444	
11,700.0	7,507.1	11,768.0	7,507.1	82.5	84.4	-90.00	-90.00	-4,116.6	1,029.6	880.9	715.3	165.57	5.320	
11,800.0	7,506.5	11,868.0	7,506.4	84.4	86.3	-90.00	-90.00	-4,216.6	1,030.1	880.9	711.5	169.35	5.202	
11,900.0	7,505.8	11,968.0	7,505.7	86.2	88.1	-90.00	-90.00	-4,316.6	1,030.5	880.9	707.8	173.12	5.088	
11,965.2	7,505.3	12,033.2	7,505.3	87.5	89.3	-90.00	-90.00	-4,381.7	1,030.8	880.9	705.3	175.58	5.017	
12,009.8	7,505.0	12,074.3	7,505.0	88.3	90.1	-90.00	-90.00	-4,422.8	1,030.9	880.9	703.7	177.20	4.971 SF	

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 21R-403
Project:	SEC.21-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (RKB - 15')
Reference Site:	Thornton 21R-HZ Pad Sec.21-T7N-R66W	MD Reference:	WELL @ 4985.0ft (RKB - 15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 21R-403	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 (11-29-12)	Offset TVD Reference:	Offset Datum

Reference Depths are relative to WELL @ 4985.0ft (RKB - 15')
 Offset Depths are relative to Offset Datum
 Central Meridian is -105.500000 °

Coordinates are relative to: Thornton 21R-403
 Coordinate System is US State Plane 1983, Colorado Northern Zone
 Grid Convergence at Surface is: 0.47°



Coordinates are relative to: Thornton 21R-403
Coordinate System is US State Plane 1983, Colorado Northern Zone
Grid Convergence at Surface is: 0.47°

