

PETROLEUM DEVELOPMENT CORP Weld County CO

Well Name: **Thornton 28S-223**

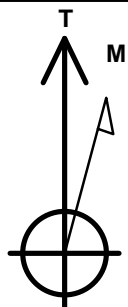
Surface Location: Thornton 28SW-HZ Pad Sec.28-T7N-R66W
North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone
Ground Elevation: 4935.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1442374.79	3200942.57	40.545470	-104.776950	

RKB-15' WELL @ 4950.0ft (RKB-15')

WELLBORE TARGET DETAILS

Name	TVD	+N/-S	+E/-W	Shape
BHL 2140'FNL & 812'FEL, SEC.33	7212.0	-4634.2	-122.3	Point



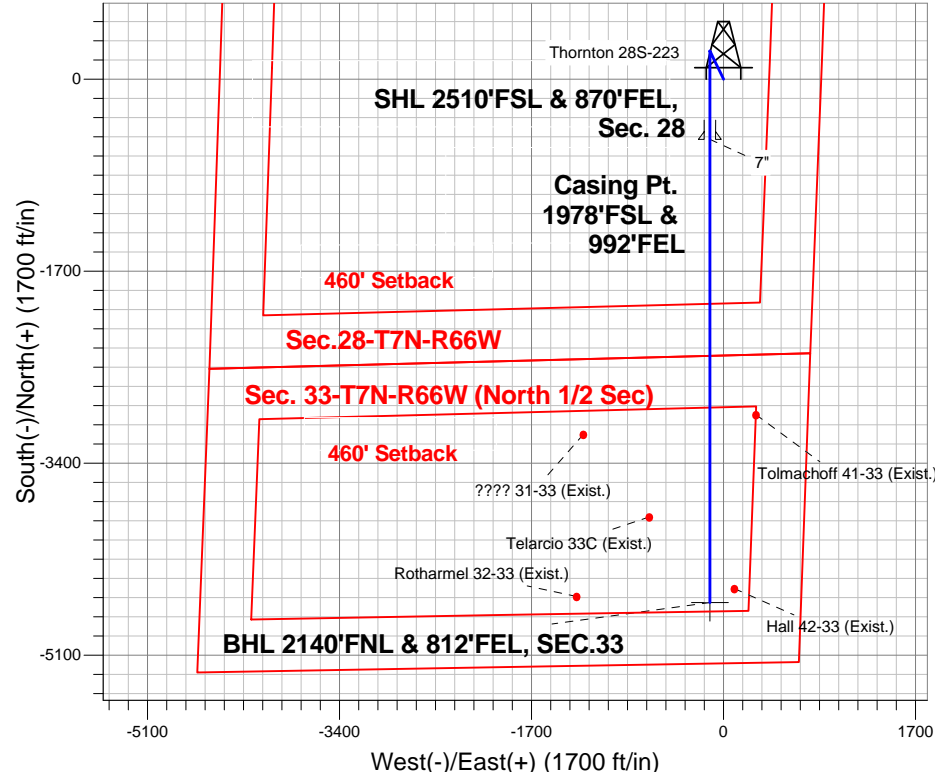
Azimuths to True North
Magnetic North: 8.62°

Magnetic Field
Strength: 52997.5snT
Dip Angle: 67.10°
Date: 6/4/2013
Model: IGRF2010

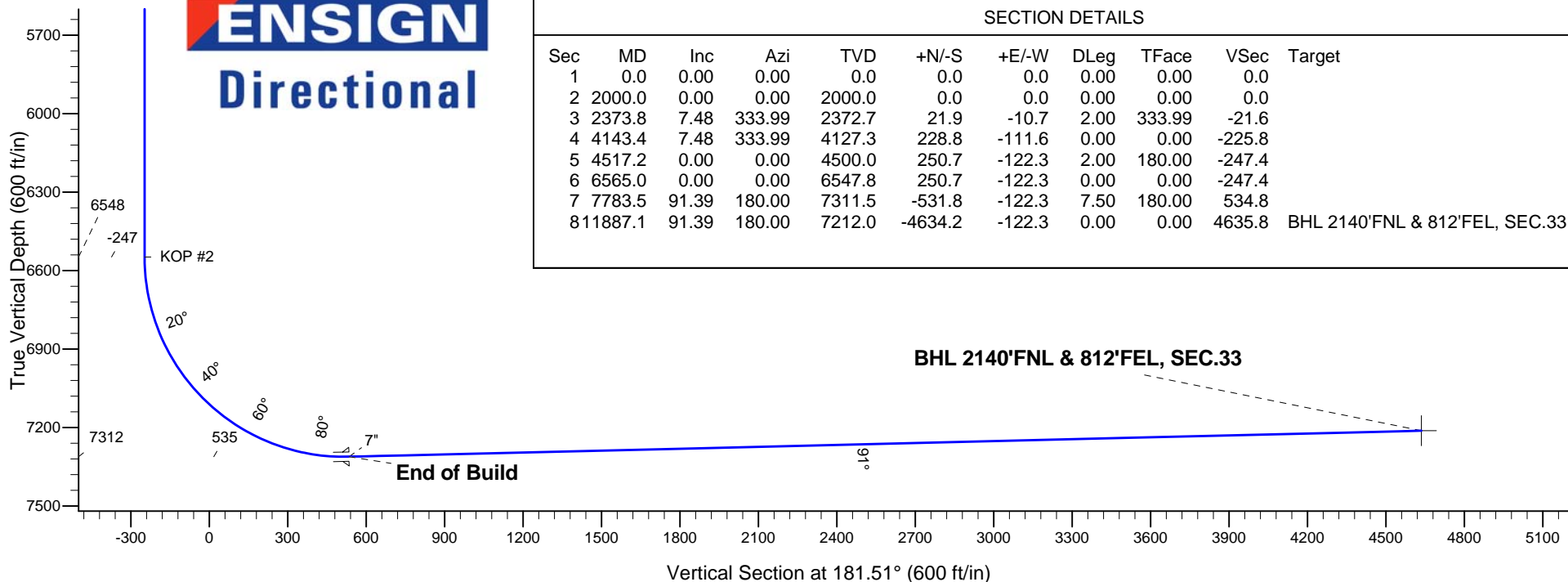
Thornton 28SW-HZ Pad Sec.28-T7N-R66W
Thornton 28S-223
Plan #1 (06-04-13)
10:44, June 11 2013

ANNOTATIONS

TVD	MD	Annotation
2000.0	2000.0	KOP #1
6547.8	6565.0	KOP #2
7311.5	7783.5	End of Build



ENSIGN
Directional



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	2373.8	7.48	333.99	2372.7	21.9	-10.7	2.00	333.99	-21.6	
4	4143.4	7.48	333.99	4127.3	228.8	-111.6	0.00	0.00	-225.8	
5	4517.2	0.00	0.00	4500.0	250.7	-122.3	2.00	180.00	-247.4	
6	6565.0	0.00	0.00	6547.8	250.7	-122.3	0.00	0.00	-247.4	
7	7783.5	91.39	180.00	7311.5	-531.8	-122.3	7.50	180.00	534.8	
8	11887.1	91.39	180.00	7212.0	-4634.2	-122.3	0.00	0.00	4635.8	BHL 2140'FNL & 812'FEL, SEC.33



PETROLEUM DEVELOPMENT CORP Weld County CO

SEC.28-T7N-R66W

Thornton 28SW-HZ Pad Sec.28-T7N-R66W

Thornton 28S-223

Wellbore #1

Plan: Plan #1 (06-04-13)

Standard Planning Report

10 June, 2013

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	
2,373.8	7.48	333.99	2,372.7	21.9	-10.7	2.00	2.00	0.00	333.99	
4,143.4	7.48	333.99	4,127.3	228.8	-111.6	0.00	0.00	0.00	0.00	
4,517.2	0.00	0.00	4,500.0	250.7	-122.3	2.00	-2.00	0.00	180.00	
6,565.0	0.00	0.00	6,547.8	250.7	-122.3	0.00	0.00	0.00	0.00	
7,783.5	91.39	180.00	7,311.5	-531.8	-122.3	7.50	7.50	0.00	180.00	
11,887.1	91.39	180.00	7,212.0	-4,634.2	-122.3	0.00	0.00	0.00	0.00	BHL 2140'FNL & 81

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 28S-223
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Project:	SEC.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	North Reference:	True
Well:	Thornton 28S-223	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (06-04-13)		

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
31.0	0.00	0.00	31.0	0.0	0.0	0.0	0.00	0.00	0.00
Tolmachoff 41-33 (Exist.) 1500' Target Circle - ??? 31-33 (Exist.) 1500' Target Circle									
40.0	0.00	0.00	40.0	0.0	0.0	0.0	0.00	0.00	0.00
45.0	0.00	0.00	45.0	0.0	0.0	0.0	0.00	0.00	0.00
Hall 42-33 (Exist.) 1500' Target Circle									
48.0	0.00	0.00	48.0	0.0	0.0	0.0	0.00	0.00	0.00
Telarcio 33C (Exist.) 1500' Target Circle									
80.0	0.00	0.00	80.0	0.0	0.0	0.0	0.00	0.00	0.00
93.0	0.00	0.00	93.0	0.0	0.0	0.0	0.00	0.00	0.00
Rotharmel 32-33 (Exist.) 1500' Target Circle									
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

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 28S-223
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Project:	SEC.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	North Reference:	True
Well:	Thornton 28S-223	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (06-04-13)		

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)
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	333.99	2,040.0	0.3	-0.1	-0.2	2.00	2.00	0.00
2,080.0	1.60	333.99	2,080.0	1.0	-0.5	-1.0	2.00	2.00	0.00
2,120.0	2.40	333.99	2,120.0	2.3	-1.1	-2.2	2.00	2.00	0.00
2,160.0	3.20	333.99	2,159.9	4.0	-2.0	-4.0	2.00	2.00	0.00
2,200.0	4.00	333.99	2,199.8	6.3	-3.1	-6.2	2.00	2.00	0.00
2,240.0	4.80	333.99	2,239.7	9.0	-4.4	-8.9	2.00	2.00	0.00
2,280.0	5.60	333.99	2,279.6	12.3	-6.0	-12.1	2.00	2.00	0.00
2,320.0	6.40	333.99	2,319.3	16.0	-7.8	-15.8	2.00	2.00	0.00
2,360.0	7.20	333.99	2,359.1	20.3	-9.9	-20.0	2.00	2.00	0.00
2,373.8	7.48	333.99	2,372.7	21.9	-10.7	-21.6	2.00	2.00	0.00
2,400.0	7.48	333.99	2,398.7	24.9	-12.2	-24.6	0.00	0.00	0.00
2,440.0	7.48	333.99	2,438.4	29.6	-14.5	-29.2	0.00	0.00	0.00
2,480.0	7.48	333.99	2,478.0	34.3	-16.7	-33.9	0.00	0.00	0.00
2,520.0	7.48	333.99	2,517.7	39.0	-19.0	-38.5	0.00	0.00	0.00
2,560.0	7.48	333.99	2,557.4	43.7	-21.3	-43.1	0.00	0.00	0.00
2,600.0	7.48	333.99	2,597.0	48.3	-23.6	-47.7	0.00	0.00	0.00
2,640.0	7.48	333.99	2,636.7	53.0	-25.9	-52.3	0.00	0.00	0.00
2,680.0	7.48	333.99	2,676.3	57.7	-28.1	-56.9	0.00	0.00	0.00
2,720.0	7.48	333.99	2,716.0	62.4	-30.4	-61.5	0.00	0.00	0.00
2,760.0	7.48	333.99	2,755.7	67.0	-32.7	-66.2	0.00	0.00	0.00
2,800.0	7.48	333.99	2,795.3	71.7	-35.0	-70.8	0.00	0.00	0.00
2,840.0	7.48	333.99	2,835.0	76.4	-37.3	-75.4	0.00	0.00	0.00
2,880.0	7.48	333.99	2,874.6	81.1	-39.6	-80.0	0.00	0.00	0.00
2,920.0	7.48	333.99	2,914.3	85.8	-41.8	-84.6	0.00	0.00	0.00
2,960.0	7.48	333.99	2,954.0	90.4	-44.1	-89.2	0.00	0.00	0.00
3,000.0	7.48	333.99	2,993.6	95.1	-46.4	-93.8	0.00	0.00	0.00
3,040.0	7.48	333.99	3,033.3	99.8	-48.7	-98.5	0.00	0.00	0.00
3,080.0	7.48	333.99	3,072.9	104.5	-51.0	-103.1	0.00	0.00	0.00
3,120.0	7.48	333.99	3,112.6	109.1	-53.2	-107.7	0.00	0.00	0.00
3,160.0	7.48	333.99	3,152.3	113.8	-55.5	-112.3	0.00	0.00	0.00
3,200.0	7.48	333.99	3,191.9	118.5	-57.8	-116.9	0.00	0.00	0.00
3,240.0	7.48	333.99	3,231.6	123.2	-60.1	-121.5	0.00	0.00	0.00
3,280.0	7.48	333.99	3,271.2	127.8	-62.4	-126.2	0.00	0.00	0.00
3,320.0	7.48	333.99	3,310.9	132.5	-64.7	-130.8	0.00	0.00	0.00
3,360.0	7.48	333.99	3,350.6	137.2	-66.9	-135.4	0.00	0.00	0.00
3,400.0	7.48	333.99	3,390.2	141.9	-69.2	-140.0	0.00	0.00	0.00
3,440.0	7.48	333.99	3,429.9	146.6	-71.5	-144.6	0.00	0.00	0.00
3,480.0	7.48	333.99	3,469.5	151.2	-73.8	-149.2	0.00	0.00	0.00
3,520.0	7.48	333.99	3,509.2	155.9	-76.1	-153.8	0.00	0.00	0.00
3,560.0	7.48	333.99	3,548.9	160.6	-78.3	-158.5	0.00	0.00	0.00
3,600.0	7.48	333.99	3,588.5	165.3	-80.6	-163.1	0.00	0.00	0.00
3,640.0	7.48	333.99	3,628.2	169.9	-82.9	-167.7	0.00	0.00	0.00
3,680.0	7.48	333.99	3,667.8	174.6	-85.2	-172.3	0.00	0.00	0.00
3,720.0	7.48	333.99	3,707.5	179.3	-87.5	-176.9	0.00	0.00	0.00
3,760.0	7.48	333.99	3,747.2	184.0	-89.8	-181.5	0.00	0.00	0.00

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 28S-223
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Project:	SEC.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	North Reference:	True
Well:	Thornton 28S-223	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (06-04-13)		

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)
3,800.0	7.48	333.99	3,786.8	188.6	-92.0	-186.2	0.00	0.00	0.00
3,840.0	7.48	333.99	3,826.5	193.3	-94.3	-190.8	0.00	0.00	0.00
3,880.0	7.48	333.99	3,866.1	198.0	-96.6	-195.4	0.00	0.00	0.00
3,920.0	7.48	333.99	3,905.8	202.7	-98.9	-200.0	0.00	0.00	0.00
3,960.0	7.48	333.99	3,945.5	207.4	-101.2	-204.6	0.00	0.00	0.00
4,000.0	7.48	333.99	3,985.1	212.0	-103.4	-209.2	0.00	0.00	0.00
4,040.0	7.48	333.99	4,024.8	216.7	-105.7	-213.8	0.00	0.00	0.00
4,080.0	7.48	333.99	4,064.4	221.4	-108.0	-218.5	0.00	0.00	0.00
4,120.0	7.48	333.99	4,104.1	226.1	-110.3	-223.1	0.00	0.00	0.00
4,143.4	7.48	333.99	4,127.3	228.8	-111.6	-225.8	0.00	0.00	0.00
4,160.0	7.14	333.99	4,143.8	230.7	-112.6	-227.6	2.00	-2.00	0.00
4,200.0	6.34	333.99	4,183.5	234.9	-114.6	-231.8	2.00	-2.00	0.00
4,240.0	5.54	333.99	4,223.3	238.6	-116.4	-235.5	2.00	-2.00	0.00
4,280.0	4.74	333.99	4,263.1	241.9	-118.0	-238.7	2.00	-2.00	0.00
4,320.0	3.94	333.99	4,303.0	244.6	-119.3	-241.4	2.00	-2.00	0.00
4,360.0	3.14	333.99	4,342.9	246.8	-120.4	-243.5	2.00	-2.00	0.00
4,400.0	2.34	333.99	4,382.9	248.5	-121.2	-245.2	2.00	-2.00	0.00
4,440.0	1.54	333.99	4,422.9	249.7	-121.8	-246.4	2.00	-2.00	0.00
4,480.0	0.74	333.99	4,462.8	250.5	-122.2	-247.2	2.00	-2.00	0.00
4,517.2	0.00	0.00	4,500.0	250.7	-122.3	-247.4	2.00	-2.00	0.00
4,520.0	0.00	0.00	4,502.8	250.7	-122.3	-247.4	0.00	0.00	0.00
4,560.0	0.00	0.00	4,542.8	250.7	-122.3	-247.4	0.00	0.00	0.00
4,600.0	0.00	0.00	4,582.8	250.7	-122.3	-247.4	0.00	0.00	0.00
4,640.0	0.00	0.00	4,622.8	250.7	-122.3	-247.4	0.00	0.00	0.00
4,680.0	0.00	0.00	4,662.8	250.7	-122.3	-247.4	0.00	0.00	0.00
4,720.0	0.00	0.00	4,702.8	250.7	-122.3	-247.4	0.00	0.00	0.00
4,760.0	0.00	0.00	4,742.8	250.7	-122.3	-247.4	0.00	0.00	0.00
4,800.0	0.00	0.00	4,782.8	250.7	-122.3	-247.4	0.00	0.00	0.00
4,840.0	0.00	0.00	4,822.8	250.7	-122.3	-247.4	0.00	0.00	0.00
4,880.0	0.00	0.00	4,862.8	250.7	-122.3	-247.4	0.00	0.00	0.00
4,920.0	0.00	0.00	4,902.8	250.7	-122.3	-247.4	0.00	0.00	0.00
4,960.0	0.00	0.00	4,942.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,000.0	0.00	0.00	4,982.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,040.0	0.00	0.00	5,022.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,080.0	0.00	0.00	5,062.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,120.0	0.00	0.00	5,102.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,160.0	0.00	0.00	5,142.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,200.0	0.00	0.00	5,182.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,240.0	0.00	0.00	5,222.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,280.0	0.00	0.00	5,262.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,320.0	0.00	0.00	5,302.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,360.0	0.00	0.00	5,342.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,400.0	0.00	0.00	5,382.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,440.0	0.00	0.00	5,422.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,480.0	0.00	0.00	5,462.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,520.0	0.00	0.00	5,502.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,560.0	0.00	0.00	5,542.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,600.0	0.00	0.00	5,582.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,640.0	0.00	0.00	5,622.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,680.0	0.00	0.00	5,662.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,720.0	0.00	0.00	5,702.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,760.0	0.00	0.00	5,742.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,800.0	0.00	0.00	5,782.8	250.7	-122.3	-247.4	0.00	0.00	0.00

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 28S-223
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Project:	SEC.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	North Reference:	True
Well:	Thornton 28S-223	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (06-04-13)		

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)
5,840.0	0.00	0.00	5,822.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,880.0	0.00	0.00	5,862.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,920.0	0.00	0.00	5,902.8	250.7	-122.3	-247.4	0.00	0.00	0.00
5,960.0	0.00	0.00	5,942.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,000.0	0.00	0.00	5,982.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,040.0	0.00	0.00	6,022.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,080.0	0.00	0.00	6,062.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,120.0	0.00	0.00	6,102.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,160.0	0.00	0.00	6,142.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,200.0	0.00	0.00	6,182.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,240.0	0.00	0.00	6,222.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,280.0	0.00	0.00	6,262.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,320.0	0.00	0.00	6,302.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,360.0	0.00	0.00	6,342.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,400.0	0.00	0.00	6,382.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,440.0	0.00	0.00	6,422.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,480.0	0.00	0.00	6,462.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,520.0	0.00	0.00	6,502.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,560.0	0.00	0.00	6,542.8	250.7	-122.3	-247.4	0.00	0.00	0.00
6,565.0	0.00	0.00	6,547.8	250.7	-122.3	-247.4	0.00	0.00	0.00
KOP #2									
6,600.0	2.63	180.00	6,582.8	249.9	-122.3	-246.6	7.50	7.50	0.00
6,640.0	5.63	180.00	6,622.7	247.0	-122.3	-243.7	7.50	7.50	0.00
6,680.0	8.63	180.00	6,662.4	242.0	-122.3	-238.7	7.50	7.50	0.00
6,720.0	11.63	180.00	6,701.8	235.0	-122.3	-231.7	7.50	7.50	0.00
6,760.0	14.63	180.00	6,740.7	225.9	-122.3	-222.6	7.50	7.50	0.00
6,800.0	17.63	180.00	6,779.2	214.8	-122.3	-211.5	7.50	7.50	0.00
6,840.0	20.63	180.00	6,816.9	201.7	-122.3	-198.4	7.50	7.50	0.00
6,880.0	23.63	180.00	6,854.0	186.6	-122.3	-183.4	7.50	7.50	0.00
6,920.0	26.63	180.00	6,890.2	169.7	-122.3	-166.4	7.50	7.50	0.00
6,960.0	29.63	180.00	6,925.5	150.8	-122.3	-147.5	7.50	7.50	0.00
7,000.0	32.63	180.00	6,959.7	130.1	-122.3	-126.9	7.50	7.50	0.00
7,040.0	35.63	180.00	6,992.8	107.7	-122.3	-104.4	7.50	7.50	0.00
7,080.0	38.63	180.00	7,024.7	83.6	-122.3	-80.3	7.50	7.50	0.00
7,120.0	41.63	180.00	7,055.3	57.8	-122.3	-54.5	7.50	7.50	0.00
7,160.0	44.63	180.00	7,084.5	30.4	-122.3	-27.2	7.50	7.50	0.00
7,200.0	47.63	180.00	7,112.2	1.6	-122.3	1.6	7.50	7.50	0.00
7,240.0	50.63	180.00	7,138.4	-28.6	-122.3	31.9	7.50	7.50	0.00
7,280.0	53.63	180.00	7,162.9	-60.2	-122.3	63.4	7.50	7.50	0.00
7,320.0	56.63	180.00	7,185.8	-93.0	-122.3	96.2	7.50	7.50	0.00
7,360.0	59.63	180.00	7,206.9	-127.0	-122.3	130.2	7.50	7.50	0.00
7,400.0	62.63	180.00	7,226.2	-162.0	-122.3	165.2	7.50	7.50	0.00
7,440.0	65.63	180.00	7,243.7	-198.0	-122.3	201.2	7.50	7.50	0.00
7,480.0	68.63	180.00	7,259.2	-234.8	-122.3	238.0	7.50	7.50	0.00
7,520.0	71.63	180.00	7,272.8	-272.5	-122.3	275.6	7.50	7.50	0.00
7,560.0	74.63	180.00	7,284.4	-310.7	-122.3	313.8	7.50	7.50	0.00
7,600.0	77.63	180.00	7,294.0	-349.6	-122.3	352.7	7.50	7.50	0.00
7,640.0	80.63	180.00	7,301.6	-388.8	-122.3	391.9	7.50	7.50	0.00
7,680.0	83.63	180.00	7,307.0	-428.5	-122.3	431.5	7.50	7.50	0.00
7,720.0	86.63	180.00	7,310.4	-468.3	-122.3	471.4	7.50	7.50	0.00
7,760.0	89.63	180.00	7,311.8	-508.3	-122.3	511.3	7.50	7.50	0.00
7,783.5	91.39	180.00	7,311.5	-531.8	-122.3	534.8	7.50	7.50	0.00
End of Build - 7"									

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 28S-223
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Project:	SEC.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	North Reference:	True
Well:	Thornton 28S-223	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (06-04-13)		

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)
7,800.0	91.39	180.00	7,311.1	-548.3	-122.3	551.3	0.01	0.01	0.00
7,840.0	91.39	180.00	7,310.2	-588.3	-122.3	591.3	0.00	0.00	0.00
7,880.0	91.39	180.00	7,309.2	-628.3	-122.3	631.3	0.00	0.00	0.00
7,920.0	91.39	180.00	7,308.2	-668.2	-122.3	671.2	0.00	0.00	0.00
7,960.0	91.39	180.00	7,307.3	-708.2	-122.3	711.2	0.00	0.00	0.00
8,000.0	91.39	180.00	7,306.3	-748.2	-122.3	751.2	0.00	0.00	0.00
8,040.0	91.39	180.00	7,305.3	-788.2	-122.3	791.2	0.00	0.00	0.00
8,080.0	91.39	180.00	7,304.4	-828.2	-122.3	831.1	0.00	0.00	0.00
8,120.0	91.39	180.00	7,303.4	-868.2	-122.3	871.1	0.00	0.00	0.00
8,160.0	91.39	180.00	7,302.4	-908.2	-122.3	911.1	0.00	0.00	0.00
8,200.0	91.39	180.00	7,301.4	-948.2	-122.3	951.1	0.00	0.00	0.00
8,240.0	91.39	180.00	7,300.5	-988.1	-122.3	991.0	0.00	0.00	0.00
8,280.0	91.39	180.00	7,299.5	-1,028.1	-122.3	1,031.0	0.00	0.00	0.00
8,320.0	91.39	180.00	7,298.5	-1,068.1	-122.3	1,071.0	0.00	0.00	0.00
8,360.0	91.39	180.00	7,297.6	-1,108.1	-122.3	1,110.9	0.00	0.00	0.00
8,400.0	91.39	180.00	7,296.6	-1,148.1	-122.3	1,150.9	0.00	0.00	0.00
8,440.0	91.39	180.00	7,295.6	-1,188.1	-122.3	1,190.9	0.00	0.00	0.00
8,480.0	91.39	180.00	7,294.6	-1,228.1	-122.3	1,230.9	0.00	0.00	0.00
8,520.0	91.39	180.00	7,293.7	-1,268.1	-122.3	1,270.8	0.00	0.00	0.00
8,560.0	91.39	180.00	7,292.7	-1,308.1	-122.3	1,310.8	0.00	0.00	0.00
8,600.0	91.39	180.00	7,291.7	-1,348.0	-122.3	1,350.8	0.00	0.00	0.00
8,640.0	91.39	180.00	7,290.8	-1,388.0	-122.3	1,390.8	0.00	0.00	0.00
8,680.0	91.39	180.00	7,289.8	-1,428.0	-122.3	1,430.7	0.00	0.00	0.00
8,720.0	91.39	180.00	7,288.8	-1,468.0	-122.3	1,470.7	0.00	0.00	0.00
8,760.0	91.39	180.00	7,287.9	-1,508.0	-122.3	1,510.7	0.00	0.00	0.00
8,800.0	91.39	180.00	7,286.9	-1,548.0	-122.3	1,550.7	0.00	0.00	0.00
8,840.0	91.39	180.00	7,285.9	-1,588.0	-122.3	1,590.6	0.00	0.00	0.00
8,880.0	91.39	180.00	7,284.9	-1,628.0	-122.3	1,630.6	0.00	0.00	0.00
8,920.0	91.39	180.00	7,284.0	-1,667.9	-122.3	1,670.6	0.00	0.00	0.00
8,960.0	91.39	180.00	7,283.0	-1,707.9	-122.3	1,710.6	0.00	0.00	0.00
8,971.2	91.39	180.00	7,282.7	-1,719.1	-122.3	1,721.7	0.00	0.00	0.00
WP1									
9,000.0	91.39	180.00	7,282.0	-1,747.9	-122.3	1,750.5	0.00	0.00	0.00
9,040.0	91.39	180.00	7,281.1	-1,787.9	-122.3	1,790.5	0.00	0.00	0.00
9,080.0	91.39	180.00	7,280.1	-1,827.9	-122.3	1,830.5	0.00	0.00	0.00
9,120.0	91.39	180.00	7,279.1	-1,867.9	-122.3	1,870.5	0.00	0.00	0.00
9,160.0	91.39	180.00	7,278.2	-1,907.9	-122.3	1,910.4	0.00	0.00	0.00
9,200.0	91.39	180.00	7,277.2	-1,947.9	-122.3	1,950.4	0.00	0.00	0.00
9,240.0	91.39	180.00	7,276.2	-1,987.8	-122.3	1,990.4	0.00	0.00	0.00
9,280.0	91.39	180.00	7,275.2	-2,027.8	-122.3	2,030.4	0.00	0.00	0.00
9,320.0	91.39	180.00	7,274.3	-2,067.8	-122.3	2,070.3	0.00	0.00	0.00
9,360.0	91.39	180.00	7,273.3	-2,107.8	-122.3	2,110.3	0.00	0.00	0.00
9,400.0	91.39	180.00	7,272.3	-2,147.8	-122.3	2,150.3	0.00	0.00	0.00
9,440.0	91.39	180.00	7,271.4	-2,187.8	-122.3	2,190.3	0.00	0.00	0.00
9,480.0	91.39	180.00	7,270.4	-2,227.8	-122.3	2,230.2	0.00	0.00	0.00
9,520.0	91.39	180.00	7,269.4	-2,267.8	-122.3	2,270.2	0.00	0.00	0.00
9,560.0	91.39	180.00	7,268.4	-2,307.8	-122.3	2,310.2	0.00	0.00	0.00
9,600.0	91.39	180.00	7,267.5	-2,347.7	-122.3	2,350.2	0.00	0.00	0.00
9,640.0	91.39	180.00	7,266.5	-2,387.7	-122.3	2,390.1	0.00	0.00	0.00
9,680.0	91.39	180.00	7,265.5	-2,427.7	-122.3	2,430.1	0.00	0.00	0.00
9,720.0	91.39	180.00	7,264.6	-2,467.7	-122.3	2,470.1	0.00	0.00	0.00
9,760.0	91.39	180.00	7,263.6	-2,507.7	-122.3	2,510.1	0.00	0.00	0.00

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 28S-223
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Project:	SEC.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	North Reference:	True
Well:	Thornton 28S-223	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (06-04-13)		

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)
9,800.0	91.39	180.00	7,262.6	-2,547.7	-122.3	2,550.0	0.00	0.00	0.00
9,840.0	91.39	180.00	7,261.7	-2,587.7	-122.3	2,590.0	0.00	0.00	0.00
9,880.0	91.39	180.00	7,260.7	-2,627.7	-122.3	2,630.0	0.00	0.00	0.00
9,920.0	91.39	180.00	7,259.7	-2,667.6	-122.3	2,669.9	0.00	0.00	0.00
9,960.0	91.39	180.00	7,258.7	-2,707.6	-122.3	2,709.9	0.00	0.00	0.00
10,000.0	91.39	180.00	7,257.8	-2,747.6	-122.3	2,749.9	0.00	0.00	0.00
10,040.0	91.39	180.00	7,256.8	-2,787.6	-122.3	2,789.9	0.00	0.00	0.00
10,080.0	91.39	180.00	7,255.8	-2,827.6	-122.3	2,829.8	0.00	0.00	0.00
10,120.0	91.39	180.00	7,254.9	-2,867.6	-122.3	2,869.8	0.00	0.00	0.00
10,160.0	91.39	180.00	7,253.9	-2,907.6	-122.3	2,909.8	0.00	0.00	0.00
10,200.0	91.39	180.00	7,252.9	-2,947.6	-122.3	2,949.8	0.00	0.00	0.00
10,240.0	91.39	180.00	7,252.0	-2,987.6	-122.3	2,989.7	0.00	0.00	0.00
10,280.0	91.39	180.00	7,251.0	-3,027.5	-122.3	3,029.7	0.00	0.00	0.00
10,320.0	91.39	180.00	7,250.0	-3,067.5	-122.3	3,069.7	0.00	0.00	0.00
10,360.0	91.39	180.00	7,249.0	-3,107.5	-122.3	3,109.7	0.00	0.00	0.00
10,400.0	91.39	180.00	7,248.1	-3,147.5	-122.3	3,149.6	0.00	0.00	0.00
10,440.0	91.39	180.00	7,247.1	-3,187.5	-122.3	3,189.6	0.00	0.00	0.00
10,480.0	91.39	180.00	7,246.1	-3,227.5	-122.3	3,229.6	0.00	0.00	0.00
10,520.0	91.39	180.00	7,245.2	-3,267.5	-122.3	3,269.6	0.00	0.00	0.00
10,560.0	91.39	180.00	7,244.2	-3,307.5	-122.3	3,309.5	0.00	0.00	0.00
10,600.0	91.39	180.00	7,243.2	-3,347.4	-122.3	3,349.5	0.00	0.00	0.00
10,640.0	91.39	180.00	7,242.3	-3,387.4	-122.3	3,389.5	0.00	0.00	0.00
10,680.0	91.39	180.00	7,241.3	-3,427.4	-122.3	3,429.5	0.00	0.00	0.00
10,720.0	91.39	180.00	7,240.3	-3,467.4	-122.3	3,469.4	0.00	0.00	0.00
10,760.0	91.39	180.00	7,239.3	-3,507.4	-122.3	3,509.4	0.00	0.00	0.00
10,800.0	91.39	180.00	7,238.4	-3,547.4	-122.3	3,549.4	0.00	0.00	0.00
10,840.0	91.39	180.00	7,237.4	-3,587.4	-122.3	3,589.4	0.00	0.00	0.00
10,880.0	91.39	180.00	7,236.4	-3,627.4	-122.3	3,629.3	0.00	0.00	0.00
10,920.0	91.39	180.00	7,235.5	-3,667.4	-122.3	3,669.3	0.00	0.00	0.00
10,960.0	91.39	180.00	7,234.5	-3,707.3	-122.3	3,709.3	0.00	0.00	0.00
11,000.0	91.39	180.00	7,233.5	-3,747.3	-122.3	3,749.3	0.00	0.00	0.00
11,040.0	91.39	180.00	7,232.5	-3,787.3	-122.3	3,789.2	0.00	0.00	0.00
11,080.0	91.39	180.00	7,231.6	-3,827.3	-122.3	3,829.2	0.00	0.00	0.00
11,120.0	91.39	180.00	7,230.6	-3,867.3	-122.3	3,869.2	0.00	0.00	0.00
11,160.0	91.39	180.00	7,229.6	-3,907.3	-122.3	3,909.2	0.00	0.00	0.00
11,200.0	91.39	180.00	7,228.7	-3,947.3	-122.3	3,949.1	0.00	0.00	0.00
11,240.0	91.39	180.00	7,227.7	-3,987.3	-122.3	3,989.1	0.00	0.00	0.00
11,280.0	91.39	180.00	7,226.7	-4,027.2	-122.3	4,029.1	0.00	0.00	0.00
11,320.0	91.39	180.00	7,225.8	-4,067.2	-122.3	4,069.0	0.00	0.00	0.00
11,360.0	91.39	180.00	7,224.8	-4,107.2	-122.3	4,109.0	0.00	0.00	0.00
11,400.0	91.39	180.00	7,223.8	-4,147.2	-122.3	4,149.0	0.00	0.00	0.00
11,440.0	91.39	180.00	7,222.8	-4,187.2	-122.3	4,189.0	0.00	0.00	0.00
11,480.0	91.39	180.00	7,221.9	-4,227.2	-122.3	4,228.9	0.00	0.00	0.00
11,520.0	91.39	180.00	7,220.9	-4,267.2	-122.3	4,268.9	0.00	0.00	0.00
11,560.0	91.39	180.00	7,219.9	-4,307.2	-122.3	4,308.9	0.00	0.00	0.00
11,600.0	91.39	180.00	7,219.0	-4,347.2	-122.3	4,348.9	0.00	0.00	0.00
11,640.0	91.39	180.00	7,218.0	-4,387.1	-122.3	4,388.8	0.00	0.00	0.00
11,680.0	91.39	180.00	7,217.0	-4,427.1	-122.3	4,428.8	0.00	0.00	0.00
11,720.0	91.39	180.00	7,216.1	-4,467.1	-122.3	4,468.8	0.00	0.00	0.00
11,760.0	91.39	180.00	7,215.1	-4,507.1	-122.3	4,508.8	0.00	0.00	0.00
11,800.0	91.39	180.00	7,214.1	-4,547.1	-122.3	4,548.7	0.00	0.00	0.00
11,840.0	91.39	180.00	7,213.1	-4,587.1	-122.3	4,588.7	0.00	0.00	0.00
11,880.0	91.39	180.00	7,212.2	-4,627.1	-122.3	4,628.7	0.00	0.00	0.00

Database:	Landmark	Local Co-ordinate Reference:	Well Thornton 28S-223
Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Project:	SEC.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	North Reference:	True
Well:	Thornton 28S-223	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan #1 (06-04-13)		

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)
11,887.1	91.39	180.00	7,212.0	-4,634.2	-122.3	4,635.8	0.00	0.00	0.00
BHL 2140'FNL & 812'FEL, SEC.33									

Casing Points				
Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,783.5	7,311.5	7"	7	7-1/2

Plan Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
2,000.0	2,000.0	0.0	0.0	KOP #1
6,565.0	6,547.8	250.7	-122.3	KOP #2
7,783.5	7,311.5	-531.8	-122.3	End of Build



PETROLEUM DEVELOPMENT CORP Weld County CO

SEC.28-T7N-R66W

Thornton 28SW-HZ Pad Sec.28-T7N-R66W

Thornton 28S-223

Wellbore #1

Plan #1 (06-04-13)

Anticollision Report

10 June, 2013

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 28S-223
Project:	SEC.28-T7N-R66W	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 28S-223	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 (06-04-13)	Offset TVD Reference:	Offset Datum

Offset Design Existing Wells - Telarcio 33C (Exist.) - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 ft
Survey Program: 7500-UNKNOWN													Offset Well Error:	0.0 ft
Reference	Offset	Semi Major Axis		Distance										Warning
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		
10,300.0	7,250.5	7,203.5	7,203.5	61.6	144.1	92.15	-3,876.4	-658.8	987.3	781.8	205.45	4.806		
10,400.0	7,248.1	7,201.1	7,201.1	63.4	144.0	91.89	-3,876.4	-658.8	905.0	697.7	207.29	4.366		
10,500.0	7,245.6	7,198.6	7,198.6	65.3	144.0	91.63	-3,876.4	-658.8	826.6	617.5	209.14	3.953		
10,600.0	7,243.2	7,196.2	7,196.2	67.1	143.9	91.37	-3,876.4	-658.8	753.4	542.4	210.98	3.571		
10,700.0	7,240.8	7,193.8	7,193.8	69.0	143.9	91.11	-3,876.4	-658.8	686.9	474.0	212.82	3.227		
10,800.0	7,238.4	7,191.4	7,191.4	70.9	143.8	90.85	-3,876.4	-658.8	629.3	414.6	214.67	2.932		
10,900.0	7,235.9	7,188.9	7,188.9	72.8	143.8	90.59	-3,876.4	-658.8	583.3	366.8	216.51	2.694		
11,000.0	7,233.5	7,186.5	7,186.5	74.6	143.7	90.33	-3,876.4	-658.8	551.8	333.4	218.35	2.527		
11,100.0	7,231.1	7,184.1	7,184.1	76.5	143.7	90.08	-3,876.4	-658.8	537.3	317.1	220.18	2.440		
11,129.1	7,230.4	7,183.4	7,183.4	77.1	143.7	90.00	-3,876.4	-658.8	536.5	315.8	220.72	2.431 CC, ES, SF		
11,200.0	7,228.7	7,181.7	7,181.7	78.4	143.6	89.82	-3,876.4	-658.8	541.1	319.1	222.02	2.437		
11,300.0	7,226.2	7,179.2	7,179.2	80.3	143.6	89.56	-3,876.4	-658.8	563.0	339.2	223.85	2.515		
11,400.0	7,223.8	7,176.8	7,176.8	82.2	143.5	89.30	-3,876.4	-658.8	601.0	375.3	225.68	2.663		
11,500.0	7,221.4	7,174.4	7,174.4	84.1	143.5	89.04	-3,876.4	-658.8	652.2	424.6	227.51	2.867		
11,600.0	7,219.0	7,172.0	7,172.0	85.9	143.4	88.78	-3,876.4	-658.8	713.8	484.4	229.33	3.112		
11,700.0	7,216.5	7,169.5	7,169.5	87.8	143.4	88.52	-3,876.4	-658.8	783.3	552.2	231.15	3.389		
11,800.0	7,214.1	7,167.1	7,167.1	89.7	143.3	88.26	-3,876.4	-658.8	858.9	625.9	232.97	3.687		
11,887.1	7,212.0	7,165.0	7,165.0	91.4	143.3	88.04	-3,876.4	-658.8	928.5	693.9	234.55	3.959		

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 28S-223
Project:	SEC.28-T7N-R66W	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 28S-223	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 (06-04-13)	Offset TVD Reference:	Offset Datum

Offset Design Existing Wells - Tolmachoff 41-33 (Exist.) - Wellbore #1 - Wellbore #1													Offset Site Error:	0.0 ft
Survey Program: 7500-UNKNOWN													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	
9,400.0	7,272.3	7,242.3	7,242.3	45.1	144.8	-92.79	-2,969.2	286.3	917.4	727.8	189.67	4.837		
9,500.0	7,269.9	7,239.9	7,239.9	46.9	144.8	-92.45	-2,969.2	286.3	829.1	637.6	191.48	4.330		
9,600.0	7,267.5	7,237.5	7,237.5	48.7	144.7	-92.11	-2,969.2	286.3	743.8	550.5	193.28	3.848		
9,700.0	7,265.1	7,235.1	7,235.1	50.5	144.7	-91.77	-2,969.2	286.3	662.5	467.4	195.09	3.396		
9,800.0	7,262.6	7,232.6	7,232.6	52.3	144.7	-91.43	-2,969.2	286.3	587.1	390.2	196.90	2.982		
9,900.0	7,260.2	7,230.2	7,230.2	54.2	144.6	-91.09	-2,969.2	286.3	520.0	321.2	198.71	2.617		
10,000.0	7,257.8	7,227.8	7,227.8	56.0	144.6	-90.75	-2,969.2	286.3	464.8	264.3	200.52	2.318		
10,100.0	7,255.4	7,225.4	7,225.4	57.8	144.5	-90.41	-2,969.2	286.3	426.3	224.0	202.33	2.107		
10,200.0	7,252.9	7,222.9	7,222.9	59.7	144.5	-90.07	-2,969.2	286.3	409.2	205.0	204.13	2.004		
10,221.7	7,252.4	7,222.4	7,222.4	60.1	144.4	-90.00	-2,969.2	286.3	408.6	204.1	204.52	1.998 CC, ES, SF		
10,300.0	7,250.5	7,220.5	7,220.5	61.6	144.4	-89.73	-2,969.2	286.3	416.0	210.1	205.94	2.020		
10,400.0	7,248.1	7,218.1	7,218.1	63.4	144.4	-89.39	-2,969.2	286.3	445.8	238.1	207.74	2.146		
10,500.0	7,245.6	7,215.6	7,215.6	65.3	144.3	-89.05	-2,969.2	286.3	494.4	284.8	209.53	2.359		
10,600.0	7,243.2	7,213.2	7,213.2	67.1	144.3	-88.71	-2,969.2	286.3	556.8	345.5	211.33	2.635		
10,700.0	7,240.8	7,210.8	7,210.8	69.0	144.2	-88.37	-2,969.2	286.3	629.0	415.9	213.12	2.951		
10,800.0	7,238.4	7,208.4	7,208.4	70.9	144.2	-88.03	-2,969.2	286.3	708.0	493.1	214.90	3.294		
10,900.0	7,235.9	7,205.9	7,205.9	72.8	144.1	-87.69	-2,969.2	286.3	791.7	575.1	216.68	3.654		
11,000.0	7,233.5	7,203.5	7,203.5	74.6	144.1	-87.36	-2,969.2	286.3	878.9	660.4	218.45	4.023		
11,100.0	7,231.1	7,201.1	7,201.1	76.5	144.0	-87.02	-2,969.2	286.3	968.5	748.3	220.22	4.398		

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 28S-223
Project:	SEC.28-T7N-R66W	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 28S-223	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 (06-04-13)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28S-403 - Wellbore #1 - Plan #1 (06-04-13)													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
0.0	0.0	0.0	0.0	0.0	0.0	-90.03	-90.03	0.0	-30.6	30.6				
100.0	100.0	100.0	100.0	0.1	0.1	-90.03	-90.03	0.0	-30.6	30.6	30.3	0.22	136.014	
200.0	200.0	200.0	200.0	0.3	0.3	-90.03	-90.03	0.0	-30.6	30.6	29.9	0.67	45.338	
300.0	300.0	300.0	300.0	0.6	0.6	-90.03	-90.03	0.0	-30.6	30.6	29.4	1.12	27.203	
400.0	400.0	400.0	400.0	0.8	0.8	-90.03	-90.03	0.0	-30.6	30.6	29.0	1.57	19.431	
500.0	500.0	500.0	500.0	1.0	1.0	-90.03	-90.03	0.0	-30.6	30.6	28.5	2.02	15.113	
600.0	600.0	600.0	600.0	1.2	1.2	-90.03	-90.03	0.0	-30.6	30.6	28.1	2.47	12.365	
700.0	700.0	700.0	700.0	1.5	1.5	-90.03	-90.03	0.0	-30.6	30.6	27.6	2.92	10.463	
800.0	800.0	800.0	800.0	1.7	1.7	-90.03	-90.03	0.0	-30.6	30.6	27.2	3.37	9.068	
900.0	900.0	900.0	900.0	1.9	1.9	-90.03	-90.03	0.0	-30.6	30.6	26.8	3.82	8.001	
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	-90.03	-90.03	0.0	-30.6	30.6	26.3	4.27	7.159 CC, ES	
1,100.0	1,100.0	1,099.1	1,099.0	2.4	2.4	-88.43	-88.43	0.9	-32.0	32.1	27.3	4.71	6.804	
1,200.0	1,200.0	1,197.9	1,197.7	2.6	2.6	-84.43	-84.43	3.5	-36.4	36.6	31.5	5.15	7.114	
1,300.0	1,300.0	1,296.2	1,295.7	2.8	2.8	-79.65	-79.65	8.0	-43.6	44.6	39.0	5.59	7.966	
1,400.0	1,400.0	1,394.2	1,393.0	3.0	3.0	-75.28	-75.28	14.1	-53.6	55.9	49.8	6.04	9.251	
1,500.0	1,500.0	1,493.4	1,491.3	3.3	3.3	-72.12	-72.12	20.9	-64.7	68.6	62.1	6.49	10.563	
1,600.0	1,600.0	1,592.5	1,589.5	3.5	3.6	-69.96	-69.96	27.7	-75.8	81.4	74.4	6.94	11.719	
1,700.0	1,700.0	1,691.6	1,687.8	3.7	3.9	-68.38	-68.38	34.4	-86.9	94.2	86.8	7.40	12.737	
1,800.0	1,800.0	1,790.8	1,786.1	3.9	4.1	-67.18	-67.18	41.2	-98.0	107.2	99.3	7.86	13.637	
1,900.0	1,900.0	1,889.9	1,884.4	4.2	4.4	-66.24	-66.24	48.0	-109.1	120.2	111.8	8.32	14.436	
2,000.0	2,000.0	1,989.0	1,982.7	4.4	4.7	-65.49	-65.49	54.8	-120.1	133.2	124.4	8.79	15.150	
2,100.0	2,100.0	2,088.3	2,081.1	4.6	5.0	-39.15	-39.15	61.6	-131.2	144.8	135.7	9.18	15.782	
2,200.0	2,199.8	2,187.9	2,179.8	4.8	5.3	-39.70	-39.70	68.4	-142.4	153.8	144.2	9.63	15.980	
2,300.0	2,299.5	2,287.6	2,278.7	5.1	5.7	-41.01	-41.01	75.2	-153.5	160.2	150.1	10.08	15.902	
2,400.0	2,398.7	2,387.4	2,377.6	5.3	6.0	-43.05	-43.05	82.0	-164.7	164.2	153.7	10.53	15.589	
2,500.0	2,497.9	2,487.1	2,476.4	5.5	6.3	-45.26	-45.26	88.9	-175.8	167.7	156.7	11.01	15.230	
2,600.0	2,597.0	2,586.8	2,575.3	5.8	6.6	-47.38	-47.38	95.7	-187.0	171.5	160.0	11.50	14.908	
2,700.0	2,696.2	2,686.6	2,674.2	6.0	6.9	-49.40	-49.40	102.5	-198.1	175.5	163.5	12.01	14.616	
2,800.0	2,795.3	2,786.3	2,773.1	6.3	7.2	-51.33	-51.33	109.3	-209.3	179.7	167.2	12.52	14.351	
2,900.0	2,894.5	2,886.0	2,871.9	6.6	7.6	-53.17	-53.17	116.1	-220.4	184.1	171.0	13.05	14.110	
3,000.0	2,993.6	2,985.8	2,970.8	6.9	7.9	-54.92	-54.92	123.0	-231.6	188.7	175.1	13.58	13.890	
3,100.0	3,092.8	3,085.5	3,069.7	7.1	8.2	-56.59	-56.59	129.8	-242.7	193.4	179.3	14.13	13.689	
3,200.0	3,191.9	3,185.2	3,168.6	7.4	8.5	-58.18	-58.18	136.6	-253.9	198.3	183.6	14.68	13.504	
3,300.0	3,291.1	3,285.0	3,267.4	7.7	8.9	-59.69	-59.69	143.4	-265.0	203.4	188.1	15.25	13.335	
3,400.0	3,390.2	3,384.7	3,366.3	8.0	9.2	-61.12	-61.12	150.3	-276.2	208.5	192.7	15.82	13.179	
3,500.0	3,489.4	3,484.4	3,465.2	8.3	9.5	-62.49	-62.49	157.1	-287.4	213.8	197.4	16.40	13.036	
3,600.0	3,588.5	3,584.2	3,564.0	8.6	9.8	-63.79	-63.79	163.9	-298.5	219.3	202.3	16.99	12.905	
3,700.0	3,687.7	3,683.9	3,662.9	8.9	10.2	-65.02	-65.02	170.7	-309.7	224.8	207.2	17.58	12.783	
3,800.0	3,786.8	3,783.6	3,761.8	9.2	10.5	-66.20	-66.20	177.6	-320.8	230.4	212.2	18.18	12.671	
3,900.0	3,886.0	3,883.4	3,860.7	9.5	10.8	-67.32	-67.32	184.4	-332.0	236.1	217.3	18.79	12.567	
4,000.0	3,985.1	3,983.1	3,959.5	9.8	11.1	-68.39	-68.39	191.2	-343.1	241.9	222.5	19.40	12.472	
4,100.0	4,084.3	4,082.8	4,058.4	10.1	11.5	-69.40	-69.40	198.0	-354.3	247.8	227.8	20.01	12.383	
4,200.0	4,183.5	4,182.6	4,157.3	10.4	11.8	-70.32	-70.32	204.8	-365.4	254.0	233.4	20.61	12.325	
4,300.0	4,283.0	4,282.3	4,256.1	10.6	12.1	-70.61	-70.61	211.7	-376.6	261.2	240.1	21.11	12.375	
4,400.0	4,382.9	4,381.9	4,354.9	10.8	12.5	-70.21	-70.21	218.5	-387.7	269.6	248.1	21.55	12.511	
4,500.0	4,482.8	4,481.3	4,453.4	11.0	12.8	-69.20	-69.20	225.3	-398.8	279.3	257.3	21.93	12.733	
4,600.0	4,582.8	4,580.4	4,551.7	11.2	13.1	-93.70	-93.70	232.1	-409.9	289.9	267.6	22.29	13.004	
4,700.0	4,682.8	4,682.0	4,652.4	11.4	13.4	-92.25	-92.25	238.9	-421.1	300.6	277.9	22.67	13.259	
4,800.0	4,782.8	4,791.3	4,761.1	11.6	13.7	-91.10	-91.10	244.8	-430.7	309.2	286.2	23.04	13.423	
4,900.0	4,882.8	4,901.2	4,870.8	11.8	13.9	-90.40	-90.40	248.5	-436.7	314.7	291.2	23.41	13.443	
5,000.0	4,982.8	5,011.5	4,981.1	12.0	14.1	-90.13	-90.13	250.0	-439.1	316.9	293.1	23.78	13.322	

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

Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28S-403 - Wellbore #1 - Plan #1 (06-04-13)													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	Measured	Vertical	Reference	Offset	Highside	Offset Wellbore Centre		Between	Between	Minimum	Separation	Warning	
Depth (ft)	Depth (ft)	Depth (ft)	Depth (ft)	(ft)	(ft)	Tooface (")	+N/-S (ft)	+E/-W (ft)	Centres (ft)	Ellipses (ft)	Separation (ft)	Factor		
5,100.0	5,082.8	5,113.3	5,082.8	12.2	14.2	-90.13	250.0	-439.2	316.9	292.7	24.17	13.111		
5,200.0	5,182.8	5,213.3	5,182.8	12.4	14.4	-90.13	250.0	-439.2	316.9	292.3	24.57	12.898		
5,300.0	5,282.8	5,313.3	5,282.8	12.6	14.6	-90.13	250.0	-439.2	316.9	291.9	24.97	12.691		
5,400.0	5,382.8	5,413.3	5,382.8	12.8	14.8	-90.13	250.0	-439.2	316.9	291.5	25.37	12.489		
5,500.0	5,482.8	5,513.3	5,482.8	13.0	14.9	-90.13	250.0	-439.2	316.9	291.1	25.78	12.294		
5,600.0	5,582.8	5,613.3	5,582.8	13.2	15.1	-90.13	250.0	-439.2	316.9	290.7	26.18	12.103		
5,700.0	5,682.8	5,713.3	5,682.8	13.4	15.3	-90.13	250.0	-439.2	316.9	290.3	26.59	11.918		
5,800.0	5,782.8	5,813.3	5,782.8	13.6	15.5	-90.13	250.0	-439.2	316.9	289.9	27.00	11.738		
5,900.0	5,882.8	5,913.3	5,882.8	13.8	15.6	-90.13	250.0	-439.2	316.9	289.5	27.41	11.562		
6,000.0	5,982.8	6,013.3	5,982.8	14.0	15.8	-90.13	250.0	-439.2	316.9	289.1	27.82	11.391		
6,100.0	6,082.8	6,113.3	6,082.8	14.2	16.0	-90.13	250.0	-439.2	316.9	288.7	28.23	11.225		
6,200.0	6,182.8	6,213.3	6,182.8	14.4	16.2	-90.13	250.0	-439.2	316.9	288.3	28.64	11.063		
6,300.0	6,282.8	6,313.3	6,282.8	14.6	16.4	-90.13	250.0	-439.2	316.9	287.8	29.06	10.905		
6,400.0	6,382.8	6,413.3	6,382.8	14.9	16.6	-90.13	250.0	-439.2	316.9	287.4	29.47	10.752		
6,500.0	6,482.8	6,513.3	6,482.8	15.1	16.8	-90.13	250.0	-439.2	316.9	287.0	29.89	10.602		
6,583.2	6,566.1	6,596.5	6,566.1	15.2	16.9	90.16	250.0	-439.2	316.9	286.7	30.21	10.488		
6,600.0	6,582.8	6,613.3	6,582.8	15.3	16.9	90.02	250.0	-439.2	316.9	286.6	30.29	10.462		
6,700.0	6,682.1	6,713.1	6,682.7	15.4	17.1	91.83	249.0	-439.2	317.1	286.6	30.51	10.394		
6,800.0	6,779.2	6,814.5	6,783.3	15.4	17.2	94.05	237.0	-439.2	317.7	287.1	30.58	10.390		
6,900.0	6,872.2	6,917.7	6,883.1	15.5	17.3	96.21	211.3	-439.2	318.8	288.2	30.57	10.427		
7,000.0	6,959.7	7,022.6	6,980.1	15.5	17.3	98.26	171.7	-439.2	320.3	289.7	30.54	10.486		
7,100.0	7,040.2	7,129.2	7,072.3	15.5	17.3	100.17	118.1	-439.2	322.0	291.5	30.55	10.540		
7,200.0	7,112.2	7,237.5	7,157.3	15.6	17.3	101.89	51.2	-439.2	323.9	293.2	30.67	10.560		
7,300.0	7,174.6	7,347.4	7,233.0	15.8	17.4	103.39	-28.4	-439.2	325.8	294.8	30.99	10.514		
7,400.0	7,226.2	7,458.8	7,297.2	16.2	17.5	104.64	-119.1	-439.2	327.6	296.0	31.58	10.373		
7,500.0	7,266.3	7,571.2	7,348.1	16.8	17.8	105.62	-219.4	-439.2	329.1	296.6	32.51	10.122		
7,600.0	7,294.0	7,684.6	7,383.9	17.5	18.4	106.30	-326.9	-439.2	330.2	296.4	33.80	9.768		
7,700.0	7,309.0	7,798.0	7,403.4	18.5	19.4	106.68	-438.4	-439.2	330.8	295.4	35.46	9.330		
7,800.0	7,311.1	7,900.6	7,413.7	19.5	20.4	107.90	-540.5	-439.2	333.2	296.0	37.15	8.969		
7,900.0	7,308.7	8,009.0	7,416.9	20.7	21.6	108.85	-648.8	-439.2	334.9	295.6	39.27	8.527		
8,000.0	7,306.3	8,109.0	7,416.4	22.0	22.9	109.15	-748.8	-439.2	335.5	293.9	41.62	8.060		
8,100.0	7,303.9	8,209.0	7,415.9	23.4	24.2	109.46	-848.8	-439.2	336.1	292.0	44.13	7.616		
8,200.0	7,301.4	8,309.0	7,415.3	24.8	25.6	109.77	-948.8	-439.2	336.7	290.0	46.78	7.199		
8,300.0	7,299.0	8,408.9	7,414.8	26.3	27.0	110.07	-1,048.7	-439.2	337.4	287.9	49.54	6.811		
8,400.0	7,296.6	8,508.9	7,414.3	27.9	28.6	110.37	-1,148.7	-439.2	338.0	285.7	52.38	6.454		
8,500.0	7,294.2	8,608.9	7,413.8	29.5	30.1	110.67	-1,248.7	-439.2	338.7	283.4	55.30	6.125		
8,600.0	7,291.7	8,708.9	7,413.2	31.1	31.7	110.97	-1,348.7	-439.2	339.4	281.1	58.28	5.823		
8,700.0	7,289.3	8,808.9	7,412.7	32.8	33.4	111.27	-1,448.7	-439.2	340.1	278.8	61.31	5.547		
8,800.0	7,286.9	8,908.8	7,412.2	34.5	35.0	111.57	-1,548.6	-439.2	340.8	276.4	64.38	5.293		
8,900.0	7,284.5	9,008.8	7,411.7	36.2	36.7	111.87	-1,648.6	-439.2	341.5	274.0	67.48	5.060		
9,000.0	7,282.0	9,108.8	7,411.1	38.0	38.4	112.16	-1,748.6	-439.2	342.2	271.6	70.61	4.846		
9,100.0	7,279.6	9,208.8	7,410.6	39.7	40.2	112.46	-1,848.6	-439.2	342.9	269.2	73.76	4.649		
9,200.0	7,277.2	9,308.8	7,410.1	41.5	41.9	112.75	-1,948.6	-439.2	343.6	266.7	76.92	4.467		
9,300.0	7,274.8	9,408.8	7,409.6	43.3	43.7	113.04	-2,048.5	-439.2	344.4	264.3	80.10	4.299		
9,400.0	7,272.3	9,508.7	7,409.1	45.1	45.5	113.33	-2,148.5	-439.2	345.1	261.8	83.28	4.144		
9,500.0	7,269.9	9,608.7	7,408.5	46.9	47.2	113.62	-2,248.5	-439.2	345.9	259.4	86.48	4.000		
9,600.0	7,267.5	9,708.7	7,408.0	48.7	49.0	113.91	-2,348.5	-439.2	346.7	257.0	89.67	3.866		
9,700.0	7,265.1	9,808.7	7,407.5	50.5	50.8	114.20	-2,448.5	-439.2	347.4	254.6	92.87	3.741		
9,800.0	7,262.6	9,908.7	7,407.0	52.3	52.7	114.48	-2,548.4	-439.2	348.2	252.1	96.07	3.625		
9,900.0	7,260.2	10,008.6	7,406.4	54.2	54.5	114.77	-2,648.4	-439.2	349.0	249.7	99.27	3.516		
10,000.0	7,257.8	10,108.6	7,405.9	56.0	56.3	115.05	-2,748.4	-439.2	349.8	247.3	102.46	3.414		

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 28S-223
Project:	SEC.28-T7N-R66W	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 28S-223	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 (06-04-13)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28S-403 - Wellbore #1 - Plan #1 (06-04-13)													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
10,100.0	7,255.4	10,208.6	7,405.4	57.8	58.1	115.33	115.33	-2,848.4	-439.2	350.6	245.0	105.65	3.319	
10,200.0	7,252.9	10,308.6	7,404.9	59.7	60.0	115.61	115.61	-2,948.4	-439.2	351.4	242.6	108.83	3.229	
10,300.0	7,250.5	10,408.6	7,404.3	61.6	61.8	115.89	115.89	-3,048.3	-439.2	352.3	240.2	112.01	3.145	
10,400.0	7,248.1	10,508.6	7,403.8	63.4	63.7	116.17	116.17	-3,148.3	-439.2	353.1	237.9	115.19	3.065	
10,500.0	7,245.6	10,608.5	7,403.3	65.3	65.5	116.45	116.45	-3,248.3	-439.2	353.9	235.6	118.35	2.991	
10,600.0	7,243.2	10,708.5	7,402.8	67.1	67.4	116.72	116.72	-3,348.3	-439.2	354.8	233.3	121.51	2.920	
10,700.0	7,240.8	10,808.5	7,402.2	69.0	69.3	116.99	116.99	-3,448.3	-439.2	355.6	231.0	124.66	2.853	
10,800.0	7,238.4	10,908.5	7,401.7	70.9	71.1	117.27	117.27	-3,548.2	-439.2	356.5	228.7	127.80	2.790	
10,900.0	7,235.9	11,008.5	7,401.2	72.8	73.0	117.54	117.54	-3,648.2	-439.2	357.4	226.5	130.93	2.730	
11,000.0	7,233.5	11,108.4	7,400.7	74.6	74.9	117.81	117.81	-3,748.2	-439.2	358.3	224.2	134.04	2.673	
11,100.0	7,231.1	11,208.4	7,400.2	76.5	76.7	118.08	118.08	-3,848.2	-439.2	359.2	222.0	137.15	2.619	
11,200.0	7,228.7	11,308.4	7,399.6	78.4	78.6	118.34	118.34	-3,948.2	-439.2	360.1	219.8	140.25	2.567	
11,300.0	7,226.2	11,408.4	7,399.1	80.3	80.5	118.61	118.61	-4,048.1	-439.2	361.0	217.6	143.34	2.518	
11,400.0	7,223.8	11,508.4	7,398.6	82.2	82.4	118.87	118.87	-4,148.1	-439.2	361.9	215.5	146.41	2.472	
11,500.0	7,221.4	11,608.4	7,398.1	84.1	84.2	119.14	119.14	-4,248.1	-439.2	362.8	213.3	149.48	2.427	
11,600.0	7,219.0	11,708.3	7,397.5	85.9	86.1	119.40	119.40	-4,348.1	-439.2	363.7	211.2	152.53	2.385	
11,700.0	7,216.5	11,808.3	7,397.0	87.8	88.0	119.66	119.66	-4,448.1	-439.2	364.7	209.1	155.57	2.344	
11,800.0	7,214.1	11,908.3	7,396.5	89.7	89.9	119.92	119.92	-4,548.1	-439.2	365.6	207.0	158.59	2.305	
11,887.1	7,212.0	11,995.4	7,396.0	91.4	91.5	120.14	120.14	-4,635.1	-439.2	366.4	205.2	161.22	2.273 SF	

Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28W-103 - Wellbore #1 - Plan #1 (06-04-13)													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)			
0.0	0.0	0.0	0.0	0.0	0.0	86.43	3.6	58.4	58.5					
100.0	100.0	100.0	100.0	0.1	0.1	86.43	3.6	58.4	58.5	58.3	0.22	260.168		
200.0	200.0	200.0	200.0	0.3	0.3	86.43	3.6	58.4	58.5	57.8	0.67	86.723		
300.0	300.0	300.0	300.0	0.6	0.6	86.43	3.6	58.4	58.5	57.4	1.12	52.034		
400.0	400.0	400.0	400.0	0.8	0.8	86.43	3.6	58.4	58.5	56.9	1.57	37.167		
500.0	500.0	500.0	500.0	1.0	1.0	86.43	3.6	58.4	58.5	56.5	2.02	28.908		
600.0	600.0	600.0	600.0	1.2	1.2	86.43	3.6	58.4	58.5	56.0	2.47	23.652		
700.0	700.0	700.0	700.0	1.5	1.5	86.43	3.6	58.4	58.5	55.6	2.92	20.013		
800.0	800.0	800.0	800.0	1.7	1.7	86.43	3.6	58.4	58.5	55.1	3.37	17.345		
900.0	900.0	900.0	900.0	1.9	1.9	86.43	3.6	58.4	58.5	54.7	3.82	15.304		
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	86.43	3.6	58.4	58.5	54.2	4.27	13.693 CC, ES		
1,100.0	1,100.0	1,098.2	1,098.1	2.4	2.4	85.72	4.5	59.8	60.0	55.3	4.71	12.745		
1,200.0	1,200.0	1,196.1	1,195.9	2.6	2.6	83.78	7.0	64.2	64.7	59.5	5.14	12.575		
1,300.0	1,300.0	1,293.6	1,293.1	2.8	2.8	81.13	11.1	71.4	72.6	67.0	5.58	12.999		
1,400.0	1,400.0	1,391.7	1,390.5	3.0	3.0	78.31	16.8	81.2	83.4	77.4	6.03	13.830		
1,500.0	1,500.0	1,491.0	1,489.1	3.3	3.3	76.05	22.7	91.5	94.9	88.4	6.49	14.623		
1,600.0	1,600.0	1,590.3	1,587.7	3.5	3.5	74.27	28.6	101.7	106.4	99.5	6.95	15.322		
1,700.0	1,700.0	1,689.5	1,686.2	3.7	3.8	72.85	34.6	112.0	118.0	110.6	7.41	15.939		
1,800.0	1,800.0	1,788.8	1,784.8	3.9	4.1	71.68	40.5	122.3	129.7	121.9	7.87	16.487		
1,900.0	1,900.0	1,888.1	1,883.4	4.2	4.4	70.70	46.4	132.6	141.5	133.1	8.33	16.975		
2,000.0	2,000.0	1,987.4	1,981.9	4.4	4.7	69.87	52.4	142.9	153.2	144.4	8.80	17.414		
2,100.0	2,100.0	2,086.7	2,080.5	4.6	4.9	95.54	58.3	153.2	165.2	156.0	9.16	18.027		
2,200.0	2,199.8	2,185.8	2,179.0	4.8	5.2	96.33	64.2	163.4	177.5	167.9	9.61	18.463		
2,300.0	2,299.5	2,284.8	2,277.2	5.1	5.5	98.02	70.1	173.7	190.4	180.3	10.07	18.902		
2,400.0	2,398.7	2,383.5	2,375.2	5.3	5.8	100.46	76.0	183.9	204.0	193.4	10.54	19.357		
2,500.0	2,497.9	2,482.0	2,473.0	5.5	6.1	103.01	81.9	194.1	218.2	207.2	11.02	19.801		
2,600.0	2,597.0	2,580.6	2,570.9	5.8	6.4	105.24	87.8	204.3	232.8	221.2	11.51	20.220		
2,700.0	2,696.2	2,679.1	2,668.7	6.0	6.7	107.21	93.7	214.5	247.6	235.6	12.01	20.616		
2,800.0	2,795.3	2,777.7	2,766.5	6.3	7.0	108.96	99.6	224.7	262.8	250.3	12.52	20.987		
2,900.0	2,894.5	2,876.2	2,864.4	6.6	7.3	110.51	105.4	234.9	278.1	265.1	13.04	21.335		
3,000.0	2,993.6	2,974.8	2,962.2	6.9	7.6	111.90	111.3	245.1	293.7	280.1	13.56	21.662		
3,100.0	3,092.8	3,073.3	3,060.1	7.1	7.9	113.15	117.2	255.3	309.4	295.3	14.08	21.968		
3,200.0	3,191.9	3,171.8	3,157.9	7.4	8.2	114.29	123.1	265.6	325.2	310.6	14.61	22.254		
3,300.0	3,291.1	3,270.4	3,255.7	7.7	8.5	115.31	129.0	275.8	341.1	326.0	15.14	22.523		
3,400.0	3,390.2	3,368.9	3,353.6	8.0	8.8	116.25	134.9	286.0	357.1	341.5	15.68	22.776		
3,500.0	3,489.4	3,467.5	3,451.4	8.3	9.1	117.10	140.8	296.2	373.3	357.0	16.22	23.014		
3,600.0	3,588.5	3,566.0	3,549.3	8.6	9.4	117.89	146.6	306.4	389.4	372.7	16.76	23.238		
3,700.0	3,687.7	3,664.6	3,647.1	8.9	9.8	118.61	152.5	316.6	405.7	388.4	17.30	23.449		
3,800.0	3,786.8	3,763.1	3,744.9	9.2	10.1	119.27	158.4	326.8	422.0	404.2	17.85	23.648		
3,900.0	3,886.0	3,861.7	3,842.8	9.5	10.4	119.89	164.3	337.0	438.4	420.0	18.39	23.836		
4,000.0	3,985.1	3,960.2	3,940.6	9.8	10.7	120.46	170.2	347.2	454.8	435.8	18.94	24.014		
4,100.0	4,084.3	4,058.8	4,038.5	10.1	11.0	120.99	176.1	357.4	471.2	451.7	19.49	24.183		
4,200.0	4,183.5	4,157.4	4,136.4	10.4	11.3	121.59	182.0	367.6	487.4	467.4	20.03	24.331		
4,300.0	4,283.0	4,256.3	4,234.6	10.6	11.6	121.94	187.9	377.9	502.0	481.5	20.53	24.450		
4,400.0	4,382.9	4,355.5	4,333.0	10.8	11.9	121.93	193.8	388.1	514.8	493.8	21.00	24.510		
4,500.0	4,482.8	4,454.7	4,431.6	11.0	12.2	121.56	199.7	398.4	525.7	504.3	21.44	24.518		
4,600.0	4,582.8	4,554.0	4,530.2	11.2	12.5	94.85	205.6	408.7	535.5	513.7	21.87	24.489		
4,700.0	4,682.8	4,653.3	4,628.7	11.4	12.8	94.13	211.6	419.0	545.4	523.1	22.32	24.440		
4,800.0	4,782.8	4,752.6	4,727.3	11.6	13.2	93.44	217.5	429.3	555.4	532.6	22.76	24.398		
4,900.0	4,882.8	4,851.9	4,825.9	11.8	13.5	92.78	223.4	439.6	565.4	542.2	23.21	24.362		
5,000.0	4,982.8	4,951.1	4,924.4	12.0	13.8	92.13	229.4	449.8	575.5	551.9	23.65	24.330		

COMPASS 2003.21 Build 46

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 28S-223
Project:	SEC.28-T7N-R66W	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 28S-223	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 (06-04-13)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28W-103 - Wellbore #1 - Plan #1 (06-04-13)													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	
5,100.0	5,082.8	5,050.4	5,023.0	12.2	14.1	91.51	235.3	460.1	585.7	561.6	24.10	24.302		
5,200.0	5,182.8	5,149.7	5,121.6	12.4	14.4	90.91	241.2	470.4	595.9	571.4	24.55	24.279		
5,300.0	5,282.8	5,263.1	5,234.3	12.6	14.7	90.30	247.5	481.3	605.5	580.5	24.99	24.232		
5,400.0	5,382.8	5,365.3	5,336.2	12.8	14.9	89.89	251.8	488.8	611.7	586.3	25.42	24.068		
5,500.0	5,482.8	5,508.1	5,478.9	13.0	15.1	89.73	253.6	491.9	614.2	588.4	25.83	23.776		
5,600.0	5,582.8	5,612.0	5,582.8	13.2	15.3	89.72	253.6	492.0	614.3	588.0	26.23	23.419		
5,700.0	5,682.8	5,712.0	5,682.8	13.4	15.5	89.72	253.6	492.0	614.3	587.6	26.63	23.064		
5,800.0	5,782.8	5,812.0	5,782.8	13.6	15.7	89.72	253.6	492.0	614.3	587.2	27.04	22.718		
5,900.0	5,882.8	5,912.0	5,882.8	13.8	15.8	89.72	253.6	492.0	614.3	586.8	27.45	22.381		
6,000.0	5,982.8	6,012.0	5,982.8	14.0	16.0	89.72	253.6	492.0	614.3	586.4	27.85	22.053		
6,100.0	6,082.8	6,112.0	6,082.8	14.2	16.2	89.72	253.6	492.0	614.3	586.0	28.26	21.733		
6,200.0	6,182.8	6,212.0	6,182.8	14.4	16.4	89.72	253.6	492.0	614.3	585.6	28.67	21.422		
6,300.0	6,282.8	6,312.0	6,282.8	14.6	16.6	89.72	253.6	492.0	614.3	585.2	29.09	21.119		
6,400.0	6,382.8	6,412.0	6,382.8	14.9	16.7	89.72	253.6	492.0	614.3	584.8	29.50	20.823		
6,500.0	6,482.8	6,512.1	6,482.9	15.1	16.9	89.99	250.8	492.0	614.3	584.4	29.89	20.554		
6,501.7	6,484.5	6,513.8	6,484.5	15.1	16.9	-90.00	250.7	492.0	614.3	584.4	29.89	20.550		
6,600.0	6,582.8	6,610.3	6,579.8	15.3	17.0	-88.71	236.2	492.0	614.4	584.2	30.21	20.336		
6,700.0	6,682.1	6,706.1	6,672.0	15.4	17.0	-87.19	210.0	492.0	615.0	584.6	30.41	20.226		
6,800.0	6,779.2	6,800.0	6,758.3	15.4	17.0	-85.73	173.4	492.0	616.0	585.5	30.51	20.193		
6,900.0	6,872.2	6,892.5	6,838.4	15.5	17.1	-84.36	127.2	492.0	617.3	586.8	30.55	20.204		
7,000.0	6,959.7	6,983.4	6,911.1	15.5	17.1	-83.08	72.7	492.0	618.9	588.2	30.61	20.218		
7,100.0	7,040.2	7,073.0	6,975.9	15.5	17.1	-81.92	10.9	492.0	620.5	589.8	30.73	20.190		
7,200.0	7,112.2	7,161.5	7,032.5	15.6	17.2	-80.89	-57.1	492.0	622.2	591.2	31.01	20.065		
7,300.0	7,174.6	7,250.0	7,080.7	15.8	17.3	-80.00	-131.3	492.0	623.8	592.3	31.50	19.805		
7,400.0	7,226.2	7,336.0	7,119.1	16.2	17.6	-79.27	-208.1	492.0	625.2	593.0	32.27	19.378		
7,500.0	7,266.3	7,422.2	7,148.7	16.8	18.0	-78.70	-289.1	492.0	626.4	593.1	33.35	18.784		
7,600.0	7,294.0	7,508.1	7,168.8	17.5	18.7	-78.30	-372.5	492.0	627.3	592.6	34.76	18.049		
7,700.0	7,309.0	7,593.6	7,179.5	18.5	19.4	-78.07	-457.4	492.0	627.8	591.4	36.47	17.214		
7,800.0	7,311.1	7,681.6	7,180.8	19.5	20.3	-78.01	-545.2	492.0	628.0	589.5	38.48	16.320		
7,900.0	7,308.7	7,781.6	7,178.4	20.7	21.5	-78.02	-645.2	492.0	627.9	587.1	40.81	15.387		
8,000.0	7,306.3	7,881.6	7,176.1	22.0	22.7	-78.03	-745.2	492.0	627.9	584.6	43.34	14.489		
8,100.0	7,303.9	7,981.6	7,173.8	23.4	24.1	-78.04	-845.2	492.0	627.9	581.9	46.04	13.639		
8,200.0	7,301.4	8,081.6	7,171.5	24.8	25.5	-78.05	-945.1	492.0	627.9	579.0	48.88	12.845		
8,300.0	7,299.0	8,181.6	7,169.2	26.3	26.9	-78.06	-1,045.1	492.0	627.9	576.0	51.84	12.111		
8,400.0	7,296.6	8,281.6	7,166.8	27.9	28.5	-78.07	-1,145.1	492.0	627.8	572.9	54.91	11.435		
8,500.0	7,294.2	8,381.6	7,164.5	29.5	30.0	-78.08	-1,245.1	492.0	627.8	569.8	58.05	10.814		
8,600.0	7,291.7	8,481.6	7,162.2	31.1	31.7	-78.09	-1,345.0	492.0	627.8	566.5	61.27	10.246		
8,700.0	7,289.3	8,581.6	7,159.9	32.8	33.3	-78.10	-1,445.0	492.0	627.8	563.2	64.55	9.725		
8,800.0	7,286.9	8,681.6	7,157.6	34.5	35.0	-78.11	-1,545.0	492.0	627.8	559.9	67.89	9.247		
8,900.0	7,284.5	8,781.6	7,155.2	36.2	36.7	-78.12	-1,644.9	492.0	627.7	556.5	71.26	8.809		
9,000.0	7,282.0	8,881.6	7,152.9	38.0	38.4	-78.13	-1,744.9	492.0	627.7	553.0	74.68	8.406		
9,100.0	7,279.6	8,981.6	7,150.6	39.7	40.1	-78.14	-1,844.9	492.0	627.7	549.6	78.13	8.034		
9,200.0	7,277.2	9,081.6	7,148.3	41.5	41.9	-78.14	-1,944.9	492.0	627.7	546.1	81.61	7.692		
9,300.0	7,274.8	9,181.6	7,145.9	43.3	43.6	-78.15	-2,044.8	492.0	627.7	542.5	85.11	7.375		
9,400.0	7,272.3	9,281.6	7,143.6	45.1	45.4	-78.16	-2,144.8	492.0	627.6	539.0	88.64	7.081		
9,500.0	7,269.9	9,381.6	7,141.3	46.9	47.2	-78.17	-2,244.8	492.0	627.6	535.4	92.18	6.808		
9,600.0	7,267.5	9,481.6	7,139.0	48.7	49.0	-78.18	-2,344.8	492.0	627.6	531.8	95.75	6.555		
9,700.0	7,265.1	9,581.6	7,136.7	50.5	50.8	-78.19	-2,444.7	492.0	627.6	528.2	99.33	6.318		
9,800.0	7,262.6	9,681.6	7,134.3	52.3	52.6	-78.20	-2,544.7	492.0	627.6	524.6	102.93	6.097		
9,900.0	7,260.2	9,781.6	7,132.0	54.2	54.5	-78.21	-2,644.7	492.0	627.5	521.0	106.54	5.890		
10,000.0	7,257.8	9,881.6	7,129.7	56.0	56.3	-78.22	-2,744.6	492.0	627.5	517.4	110.16	5.697		

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 28S-223
Project:	SEC.28-T7N-R66W	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 28S-223	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 (06-04-13)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28W-103 - Wellbore #1 - Plan #1 (06-04-13)													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)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning	
10,100.0	7,255.4	9,981.6	7,127.4	57.8	58.1	-78.23	-2,844.6	492.0	627.5	513.7	113.79	5.515		
10,200.0	7,252.9	10,081.6	7,125.1	59.7	60.0	-78.24	-2,944.6	492.0	627.5	510.0	117.43	5.343		
10,300.0	7,250.5	10,181.6	7,122.7	61.6	61.8	-78.25	-3,044.6	492.0	627.4	506.4	121.08	5.182		
10,400.0	7,248.1	10,281.6	7,120.4	63.4	63.7	-78.26	-3,144.5	492.0	627.4	502.7	124.74	5.030		
10,500.0	7,245.6	10,381.6	7,118.1	65.3	65.5	-78.27	-3,244.5	492.0	627.4	499.0	128.40	4.886		
10,600.0	7,243.2	10,481.6	7,115.8	67.1	67.4	-78.28	-3,344.5	492.0	627.4	495.3	132.07	4.750		
10,700.0	7,240.8	10,581.6	7,113.5	69.0	69.2	-78.29	-3,444.5	492.0	627.4	491.6	135.75	4.621		
10,800.0	7,238.4	10,681.6	7,111.1	70.9	71.1	-78.29	-3,544.4	492.0	627.3	487.9	139.43	4.499		
10,900.0	7,235.9	10,781.6	7,108.8	72.8	73.0	-78.30	-3,644.4	492.0	627.3	484.2	143.12	4.383		
11,000.0	7,233.5	10,881.6	7,106.5	74.6	74.9	-78.31	-3,744.4	492.0	627.3	480.5	146.82	4.273		
11,100.0	7,231.1	10,981.6	7,104.2	76.5	76.7	-78.32	-3,844.4	492.0	627.3	476.8	150.52	4.168		
11,200.0	7,228.7	11,081.6	7,101.8	78.4	78.6	-78.33	-3,944.3	492.0	627.3	473.0	154.22	4.067		
11,300.0	7,226.2	11,181.6	7,099.5	80.3	80.5	-78.34	-4,044.3	492.0	627.2	469.3	157.93	3.972		
11,400.0	7,223.8	11,281.6	7,097.2	82.2	82.4	-78.35	-4,144.3	492.0	627.2	465.6	161.64	3.880		
11,500.0	7,221.4	11,381.6	7,094.9	84.1	84.2	-78.36	-4,244.2	492.0	627.2	461.9	165.35	3.793		
11,600.0	7,219.0	11,481.6	7,092.6	85.9	86.1	-78.37	-4,344.2	492.0	627.2	458.1	169.07	3.710		
11,700.0	7,216.5	11,581.6	7,090.2	87.8	88.0	-78.38	-4,444.2	492.0	627.2	454.4	172.79	3.630		
11,800.0	7,214.1	11,681.6	7,087.9	89.7	89.9	-78.39	-4,544.2	492.0	627.1	450.6	176.51	3.553		
11,862.9	7,212.6	11,744.4	7,086.5	90.9	91.1	-78.39	-4,607.0	492.0	627.1	448.3	178.86	3.506		
11,887.1	7,212.0	11,764.3	7,086.0	91.4	91.5	-78.40	-4,626.9	492.0	627.1	447.5	179.68	3.490 SF		

Offset Design		Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28W-443 - Wellbore #1 - Plan #1 (06-04-13)											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)				
0.0	0.0	0.0	0.0	0.0	0.0	82.54	3.6	27.8	28.0						
100.0	100.0	100.0	100.0	0.1	0.1	82.54	3.6	27.8	28.0	27.8	0.22	124.705			
200.0	200.0	200.0	200.0	0.3	0.3	82.54	3.6	27.8	28.0	27.4	0.67	41.568			
300.0	300.0	300.0	300.0	0.6	0.6	82.54	3.6	27.8	28.0	26.9	1.12	24.941			
400.0	400.0	400.0	400.0	0.8	0.8	82.54	3.6	27.8	28.0	26.5	1.57	17.815			
500.0	500.0	500.0	500.0	1.0	1.0	82.54	3.6	27.8	28.0	26.0	2.02	13.856			
600.0	600.0	600.0	600.0	1.2	1.2	82.54	3.6	27.8	28.0	25.6	2.47	11.337			
700.0	700.0	700.0	700.0	1.5	1.5	82.54	3.6	27.8	28.0	25.1	2.92	9.593			
800.0	800.0	800.0	800.0	1.7	1.7	82.54	3.6	27.8	28.0	24.7	3.37	8.314			
900.0	900.0	900.0	900.0	1.9	1.9	82.54	3.6	27.8	28.0	24.2	3.82	7.336			
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	82.54	3.6	27.8	28.0	23.8	4.27	6.563			
1,100.0	1,100.0	1,100.0	1,100.0	2.4	2.4	82.54	3.6	27.8	28.0	23.3	4.72	5.938			
1,200.0	1,200.0	1,200.0	1,200.0	2.6	2.6	82.54	3.6	27.8	28.0	22.9	5.17	5.422			
1,300.0	1,300.0	1,300.0	1,300.0	2.8	2.8	82.54	3.6	27.8	28.0	22.4	5.62	4.988			
1,400.0	1,400.0	1,400.0	1,400.0	3.0	3.0	82.54	3.6	27.8	28.0	22.0	6.07	4.619			
1,500.0	1,500.0	1,500.0	1,500.0	3.3	3.3	82.54	3.6	27.8	28.0	21.5	6.52	4.300 CC, ES			
1,600.0	1,600.0	1,599.4	1,599.4	3.5	3.5	79.70	5.2	28.6	29.0	22.1	6.96	4.168			
1,700.0	1,700.0	1,698.6	1,698.4	3.7	3.7	72.34	9.8	30.8	32.4	25.0	7.41	4.373			
1,800.0	1,800.0	1,797.4	1,796.8	3.9	3.9	63.20	17.5	34.6	38.9	31.0	7.85	4.951			
1,900.0	1,900.0	1,896.8	1,895.8	4.2	4.2	55.79	26.6	39.1	47.4	39.1	8.31	5.709			
2,000.0	2,000.0	1,996.3	1,994.8	4.4	4.4	50.69	35.7	43.5	56.5	47.8	8.76	6.450			
2,100.0	2,100.0	2,095.9	2,093.8	4.6	4.6	74.32	44.7	48.0	65.4	56.2	9.20	7.111			
2,200.0	2,199.8	2,195.6	2,193.0	4.8	4.9	75.09	53.9	52.5	73.5	63.8	9.65	7.612			
2,300.0	2,299.5	2,295.2	2,292.1	5.1	5.1	78.11	63.0	57.0	80.7	70.6	10.11	7.986			
2,400.0	2,398.7	2,394.7	2,391.1	5.3	5.4	82.80	72.1	61.4	87.7	77.1	10.58	8.289			
2,500.0	2,497.9	2,494.2	2,490.0	5.5	5.7	87.43	81.1	65.9	95.2	84.1	11.07	8.598			
2,600.0	2,597.0	2,593.6	2,588.9	5.8	5.9	91.37	90.2	70.4	103.2	91.6	11.57	8.917			
2,700.0	2,696.2	2,693.0	2,687.9	6.0	6.2	94.74	99.3	74.8	111.6	99.5	12.08	9.237			
2,800.0	2,795.3	2,792.5	2,786.8	6.3	6.5	97.62	108.4	79.3	120.3	107.7	12.60	9.551			
2,900.0	2,894.5	2,891.9	2,885.7	6.6	6.7	100.11	117.5	83.8	129.4	116.2	13.13	9.854			
3,000.0	2,993.6	2,991.4	2,984.6	6.9	7.0	102.27	126.6	88.3	138.6	124.9	13.66	10.145			
3,100.0	3,092.8	3,090.8	3,083.6	7.1	7.3	104.17	135.7	92.7	148.0	133.8	14.20	10.423			
3,200.0	3,191.9	3,190.3	3,182.5	7.4	7.5	105.83	144.7	97.2	157.5	142.8	14.74	10.687			
3,300.0	3,291.1	3,289.7	3,281.4	7.7	7.8	107.31	153.8	101.7	167.1	151.9	15.28	10.937			
3,400.0	3,390.2	3,389.2	3,380.4	8.0	8.1	108.62	162.9	106.1	176.9	161.0	15.83	11.175			
3,500.0	3,489.4	3,488.6	3,479.3	8.3	8.4	109.79	172.0	110.6	186.7	170.3	16.38	11.399			
3,600.0	3,588.5	3,588.1	3,578.2	8.6	8.6	110.85	181.1	115.1	196.6	179.7	16.93	11.611			
3,700.0	3,687.7	3,687.5	3,677.2	8.9	8.9	111.81	190.2	119.5	206.6	189.1	17.49	11.812			
3,800.0	3,786.8	3,787.0	3,776.1	9.2	9.2	112.67	199.3	124.0	216.6	198.5	18.04	12.003			
3,900.0	3,886.0	3,886.4	3,875.0	9.5	9.5	113.47	208.4	128.5	226.6	208.0	18.60	12.183			
4,000.0	3,985.1	3,985.9	3,973.9	9.8	9.8	114.19	217.4	132.9	236.7	217.6	19.16	12.354			
4,100.0	4,084.3	4,085.3	4,072.9	10.1	10.0	114.85	226.5	137.4	246.8	227.1	19.72	12.516			
4,200.0	4,183.5	4,184.8	4,171.8	10.4	10.3	115.45	235.6	141.9	256.8	236.5	20.27	12.665			
4,300.0	4,283.0	4,287.1	4,273.7	10.6	10.6	115.59	244.3	146.1	265.0	244.3	20.75	12.769			
4,400.0	4,382.9	4,391.3	4,377.7	10.8	10.8	115.64	250.0	148.9	270.3	249.1	21.16	12.770			
4,500.0	4,482.8	4,495.7	4,482.1	11.0	11.0	115.66	252.3	150.1	272.4	250.8	21.52	12.654			
4,600.0	4,582.8	4,596.5	4,582.8	11.2	11.2	89.65	252.3	150.1	272.4	250.5	21.88	12.449			
4,700.0	4,682.8	4,696.5	4,682.8	11.4	11.4	89.65	252.3	150.1	272.4	250.1	22.28	12.224			
4,800.0	4,782.8	4,796.5	4,782.8	11.6	11.6	89.65	252.3	150.1	272.4	249.7	22.69	12.006			
4,900.0	4,882.8	4,896.5	4,882.8	11.8	11.8	89.65	252.3	150.1	272.4	249.3	23.09	11.795			
5,000.0	4,982.8	4,996.5	4,982.8	12.0	12.0	89.65	252.3	150.1	272.4	248.9	23.50	11.590			

COMPASS 2003.21 Build 46

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 28S-223
Project:	SEC.28-T7N-R66W	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 28S-223	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 (06-04-13)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28W-443 - Wellbore #1 - Plan #1 (06-04-13)													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)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
5,100.0	5,082.8	5,096.5	5,082.8	12.2	12.2	89.65	89.65	252.3	150.1	272.4	248.5	23.91	11.392	
5,200.0	5,182.8	5,196.5	5,182.8	12.4	12.4	89.65	89.65	252.3	150.1	272.4	248.1	24.32	11.200	
5,300.0	5,282.8	5,296.5	5,282.8	12.6	12.6	89.65	89.65	252.3	150.1	272.4	247.7	24.73	11.013	
5,400.0	5,382.8	5,396.5	5,382.8	12.8	12.8	89.65	89.65	252.3	150.1	272.4	247.3	25.15	10.832	
5,500.0	5,482.8	5,496.5	5,482.8	13.0	13.0	89.65	89.65	252.3	150.1	272.4	246.8	25.56	10.657	
5,600.0	5,582.8	5,596.5	5,582.8	13.2	13.2	89.65	89.65	252.3	150.1	272.4	246.4	25.98	10.486	
5,700.0	5,682.8	5,696.5	5,682.8	13.4	13.4	89.65	89.65	252.3	150.1	272.4	246.0	26.39	10.321	
5,800.0	5,782.8	5,796.5	5,782.8	13.6	13.6	89.65	89.65	252.3	150.1	272.4	245.6	26.81	10.160	
5,900.0	5,882.8	5,896.5	5,882.8	13.8	13.8	89.65	89.65	252.3	150.1	272.4	245.2	27.23	10.003	
6,000.0	5,982.8	5,996.5	5,982.8	14.0	14.0	89.65	89.65	252.3	150.1	272.4	244.8	27.65	9.852	
6,100.0	6,082.8	6,096.5	6,082.8	14.2	14.2	89.65	89.65	252.3	150.1	272.4	244.3	28.07	9.704	
6,200.0	6,182.8	6,196.5	6,182.8	14.4	14.4	89.65	89.65	252.3	150.1	272.4	243.9	28.49	9.560	
6,300.0	6,282.8	6,296.5	6,282.8	14.6	14.6	89.65	89.65	252.3	150.1	272.4	243.5	28.92	9.421	
6,400.0	6,382.8	6,396.5	6,382.8	14.9	14.8	89.65	89.65	252.3	150.1	272.4	243.1	29.34	9.285	
6,500.0	6,482.8	6,496.5	6,482.8	15.1	15.1	89.65	89.65	252.3	150.1	272.4	242.6	29.76	9.152	
6,547.3	6,530.2	6,543.8	6,530.2	15.2	15.1	-90.45	-90.45	252.3	150.1	272.4	242.5	29.96	9.093	
6,600.0	6,582.8	6,596.5	6,582.8	15.3	15.3	-90.51	-90.51	252.3	150.1	272.4	242.2	30.18	9.027	
6,700.0	6,682.1	6,696.4	6,682.8	15.4	15.5	-92.62	-92.62	251.3	150.1	272.7	242.2	30.49	8.945	
6,800.0	6,779.2	6,798.2	6,783.7	15.4	15.6	-95.21	-95.21	239.4	150.1	273.5	242.9	30.65	8.926	
6,900.0	6,872.2	6,901.6	6,883.9	15.5	15.6	-97.71	-97.71	213.7	150.1	274.9	244.2	30.70	8.956	
7,000.0	6,959.7	7,006.9	6,981.2	15.5	15.7	-100.07	-100.07	173.8	150.1	276.7	246.0	30.68	9.019	
7,100.0	7,040.2	7,113.9	7,073.6	15.5	15.7	-102.25	-102.25	120.0	150.1	278.8	248.1	30.66	9.093	
7,200.0	7,112.2	7,222.6	7,158.8	15.6	15.8	-104.19	-104.19	52.7	150.1	281.0	250.3	30.72	9.148	
7,300.0	7,174.6	7,332.8	7,234.6	15.8	15.8	-105.87	-105.87	-27.2	150.1	283.3	252.3	30.97	9.147	
7,400.0	7,226.2	7,444.5	7,298.9	16.2	16.2	-107.24	-107.24	-118.4	150.1	285.3	253.8	31.49	9.060	
7,500.0	7,266.3	7,557.3	7,349.6	16.8	16.8	-108.30	-108.30	-219.0	150.1	286.9	254.6	32.38	8.861	
7,600.0	7,294.0	7,670.9	7,385.1	17.5	17.6	-109.01	-109.01	-326.8	150.1	288.1	254.4	33.70	8.550	
7,700.0	7,309.0	7,784.1	7,404.3	18.5	18.6	-109.38	-109.38	-438.3	150.1	288.8	253.3	35.43	8.151	
7,800.0	7,311.1	7,886.9	7,414.5	19.5	19.7	-110.74	-110.74	-540.6	150.1	291.5	254.3	37.20	7.835	
7,900.0	7,308.7	7,995.2	7,417.5	20.7	21.0	-111.77	-111.77	-648.8	150.1	293.3	254.0	39.30	7.464	
8,000.0	7,306.3	8,095.2	7,417.0	22.0	22.3	-112.11	-112.11	-748.8	150.1	294.0	252.4	41.62	7.064	
8,100.0	7,303.9	8,195.2	7,416.5	23.4	23.6	-112.45	-112.45	-848.8	150.1	294.8	250.7	44.10	6.684	
8,200.0	7,301.4	8,295.2	7,415.9	24.8	25.1	-112.79	-112.79	-948.8	150.1	295.5	248.8	46.70	6.327	
8,300.0	7,299.0	8,395.1	7,415.4	26.3	26.6	-113.13	-113.13	-1,048.8	150.1	296.2	246.8	49.41	5.995	
8,400.0	7,296.6	8,495.1	7,414.8	27.9	28.1	-113.46	-113.46	-1,148.7	150.1	297.0	244.8	52.20	5.689	
8,500.0	7,294.2	8,595.1	7,414.3	29.5	29.7	-113.79	-113.79	-1,248.7	150.1	297.7	242.7	55.05	5.408	
8,600.0	7,291.7	8,695.1	7,413.8	31.1	31.3	-114.13	-114.13	-1,348.7	150.1	298.5	240.5	57.96	5.150	
8,700.0	7,289.3	8,795.1	7,413.2	32.8	33.0	-114.46	-114.46	-1,448.7	150.1	299.3	238.3	60.92	4.913	
8,800.0	7,286.9	8,895.1	7,412.7	34.5	34.7	-114.78	-114.78	-1,548.7	150.1	300.0	236.1	63.90	4.695	
8,900.0	7,284.5	8,995.0	7,412.1	36.2	36.4	-115.11	-115.11	-1,648.6	150.1	300.8	233.9	66.92	4.495	
9,000.0	7,282.0	9,095.0	7,411.6	38.0	38.1	-115.43	-115.43	-1,748.6	150.1	301.6	231.7	69.96	4.312	
9,100.0	7,279.6	9,195.0	7,411.1	39.7	39.9	-115.76	-115.76	-1,848.6	150.1	302.5	229.4	73.02	4.142	
9,200.0	7,277.2	9,295.0	7,410.5	41.5	41.6	-116.08	-116.08	-1,948.6	150.1	303.3	227.2	76.08	3.986	
9,300.0	7,274.8	9,395.0	7,410.0	43.3	43.4	-116.39	-116.39	-2,048.6	150.1	304.1	225.0	79.16	3.842	
9,400.0	7,272.3	9,494.9	7,409.4	45.1	45.2	-116.71	-116.71	-2,148.5	150.1	305.0	222.7	82.24	3.708	
9,500.0	7,269.9	9,594.9	7,408.9	46.9	47.0	-117.03	-117.03	-2,248.5	150.1	305.8	220.5	85.33	3.584	
9,600.0	7,267.5	9,694.9	7,408.3	48.7	48.8	-117.34	-117.34	-2,348.5	150.1	306.7	218.3	88.41	3.469	
9,700.0	7,265.1	9,794.9	7,407.8	50.5	50.6	-117.65	-117.65	-2,448.5	150.1	307.5	216.0	91.49	3.361	
9,800.0	7,262.6	9,894.9	7,407.3	52.3	52.5	-117.96	-117.96	-2,548.5	150.1	308.4	213.8	94.58	3.261	
9,900.0	7,260.2	9,994.9	7,406.7	54.2	54.3	-118.27	-118.27	-2,648.4	150.1	309.3	211.7	97.65	3.167	
10,000.0	7,257.8	10,094.8	7,406.2	56.0	56.1	-118.58	-118.58	-2,748.4	150.1	310.2	209.5	100.72	3.080	

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 28S-223
Project:	SEC.28-T7N-R66W	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 28S-223	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 (06-04-13)	Offset TVD Reference:	Offset Datum

Offset Design Thornton 28SW-HZ Pad Sec.28-T7N-R66W - Thornton 28W-443 - Wellbore #1 - Plan #1 (06-04-13)													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)	Between Centres (ft)	Between Ellipses (ft)	Minimum Separation (ft)	Separation Factor	Warning
10,100.0	7,255.4	10,194.8	7,405.6	57.8	58.0	-118.88	-2,848.4	150.1	311.1	207.3	103.79	2.998		
10,200.0	7,252.9	10,294.8	7,405.1	59.7	59.8	-119.19	-2,948.4	150.1	312.0	205.2	106.84	2.920		
10,300.0	7,250.5	10,394.8	7,404.6	61.6	61.7	-119.49	-3,048.4	150.1	313.0	203.1	109.89	2.848		
10,400.0	7,248.1	10,494.8	7,404.0	63.4	63.6	-119.79	-3,148.4	150.1	313.9	201.0	112.93	2.780		
10,500.0	7,245.6	10,594.8	7,403.5	65.3	65.4	-120.08	-3,248.3	150.1	314.8	198.9	115.96	2.715		
10,600.0	7,243.2	10,694.7	7,402.9	67.1	67.3	-120.38	-3,348.3	150.1	315.8	196.8	118.97	2.654		
10,700.0	7,240.8	10,794.7	7,402.4	69.0	69.1	-120.67	-3,448.3	150.1	316.7	194.8	121.98	2.597		
10,800.0	7,238.4	10,894.7	7,401.9	70.9	71.0	-120.97	-3,548.3	150.1	317.7	192.7	124.97	2.542		
10,900.0	7,235.9	10,994.7	7,401.3	72.8	72.9	-121.26	-3,648.3	150.1	318.7	190.7	127.95	2.491		
11,000.0	7,233.5	11,094.7	7,400.8	74.6	74.8	-121.55	-3,748.2	150.1	319.7	188.7	130.92	2.442		
11,100.0	7,231.1	11,194.6	7,400.2	76.5	76.7	-121.83	-3,848.2	150.1	320.6	186.8	133.88	2.395		
11,200.0	7,228.7	11,294.6	7,399.7	78.4	78.5	-122.12	-3,948.2	150.1	321.6	184.8	136.82	2.351		
11,300.0	7,226.2	11,394.6	7,399.2	80.3	80.4	-122.40	-4,048.2	150.1	322.7	182.9	139.75	2.309		
11,400.0	7,223.8	11,494.6	7,398.6	82.2	82.3	-122.68	-4,148.2	150.1	323.7	181.0	142.67	2.269		
11,500.0	7,221.4	11,594.6	7,398.1	84.1	84.2	-122.96	-4,248.1	150.1	324.7	179.1	145.57	2.230		
11,600.0	7,219.0	11,694.6	7,397.5	85.9	86.1	-123.24	-4,348.1	150.1	325.7	177.3	148.46	2.194		
11,700.0	7,216.5	11,794.5	7,397.0	87.8	88.0	-123.52	-4,448.1	150.1	326.8	175.4	151.33	2.159		
11,800.0	7,214.1	11,894.5	7,396.4	89.7	89.9	-123.79	-4,548.1	150.1	327.8	173.6	154.19	2.126		
11,887.1	7,212.0	11,976.9	7,396.0	91.4	91.4	-124.02	-4,630.5	150.1	328.7	172.1	156.61	2.099 SF		

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 28S-223
Project:	SEC.28-T7N-R66W	TVD Reference:	WELL @ 4950.0ft (RKB-15')
Reference Site:	Thornton 28SW-HZ Pad Sec.28-T7N-R66W	MD Reference:	WELL @ 4950.0ft (RKB-15')
Site Error:	0.0ft	North Reference:	True
Reference Well:	Thornton 28S-223	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 (06-04-13)	Offset TVD Reference:	Offset Datum

Reference Depths are relative to WELL @ 4950.0ft (RKB-15')
Offset Depths are relative to Offset Datum
Central Meridian is -105.500000 °

Coordinates are relative to: Thornton 28S-223
Coordinate System is US State Plane 1983, Colorado Northern Zone
Grid Convergence at Surface is: 0.47°



Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 28S-223
Project:	SEC.28-T7N-R66W	TVD Reference:	WELL @ 4950.0ft (RKB-15')
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