

PETROLEUM DEVELOPMENT CORP Weld County CO

Well Name: **Thornton 21K-443**

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

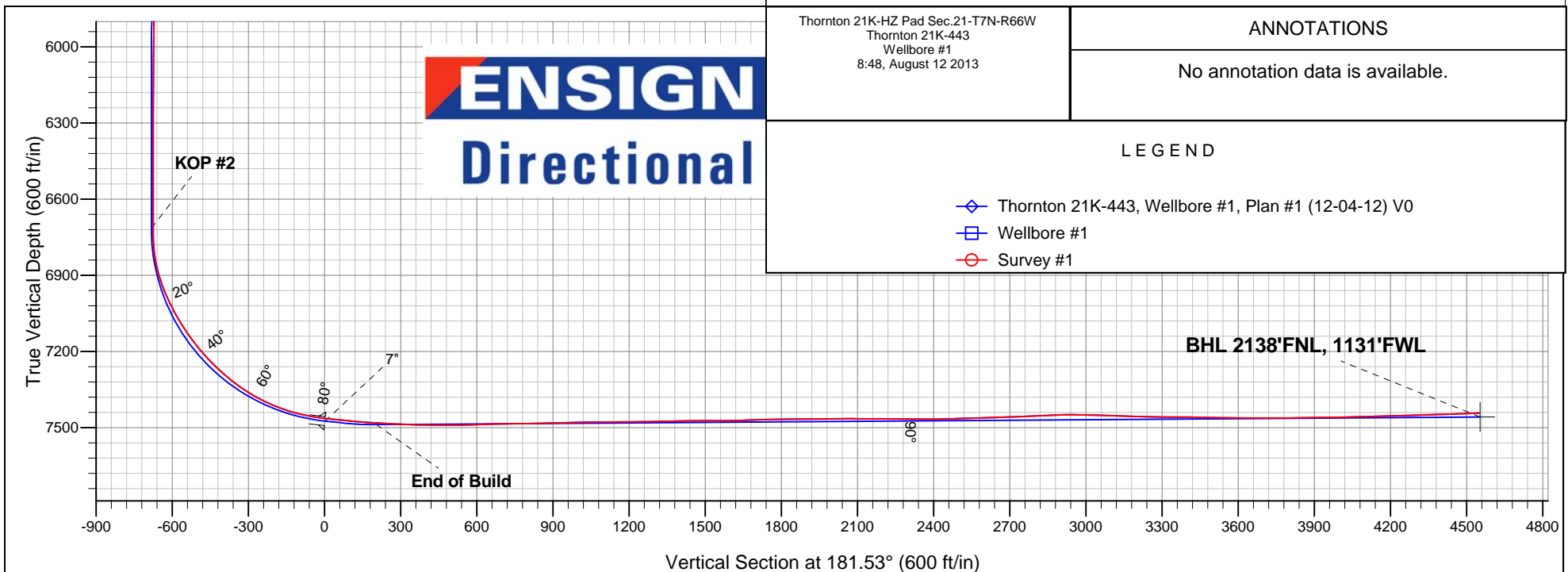
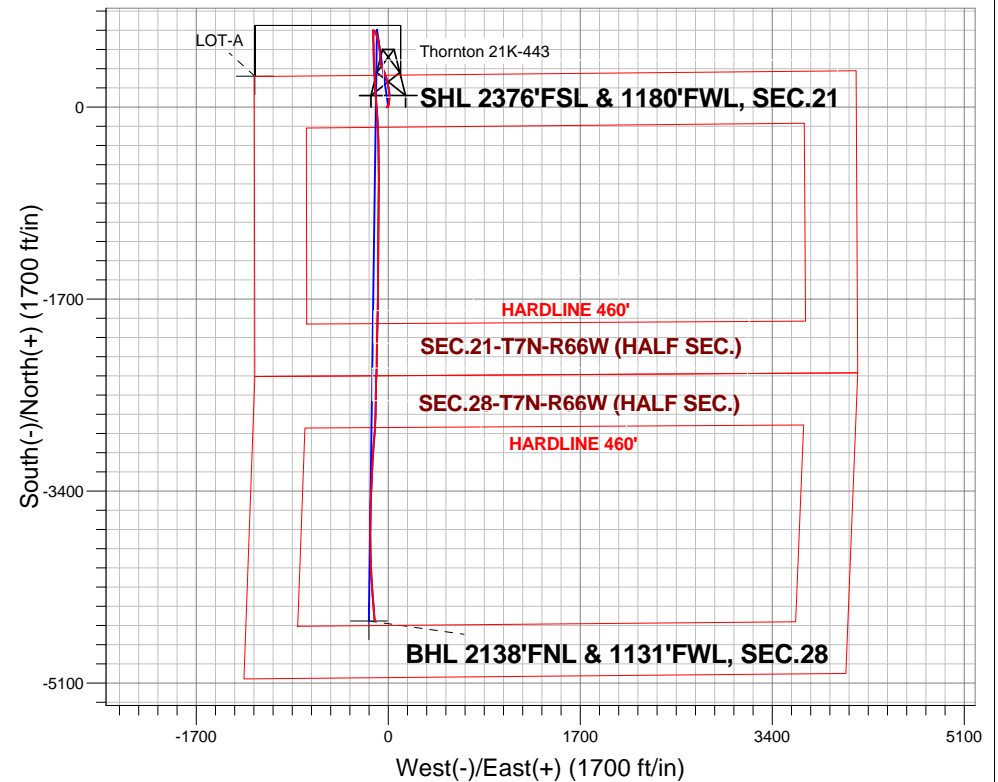
Ground Elevation: 4963.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1447514.79	3197716.34	40.559650	-104.788410	

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

FINAL SURVEY

Projected Bottom Hole Location
12433' MD 7443' TVD 4549' S & 122' W of SHL
92.1 degree Incl @ 175.6 degree AZM



Thornton 21K-HZ Pad Sec.21-T7N-R66W
Thornton 21K-443
Wellbore #1
8:48, August 12 2013

ANNOTATIONS

No annotation data is available.

LEGEND

- Thornton 21K-443, Wellbore #1, Plan #1 (12-04-12) V0
- Wellbore #1
- Survey #1



PETROLEUM DEVELOPMENT CORP Weld County CO

SEC.21-T7N-R66W

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

Thornton 21K-443

Wellbore #1

Survey: Survey #1

Standard Survey Report

12 August, 2013

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

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
1,003.0	1.00	197.50	1,002.9	2.3	-13.1	-1.9	0.56	0.08	-34.27
1,094.0	0.90	196.40	1,093.9	0.8	-13.5	-0.4	0.11	-0.11	-1.21
1,186.0	0.70	212.80	1,185.9	-0.4	-14.0	0.7	0.33	-0.22	17.83
1,282.0	1.30	110.70	1,281.8	-1.2	-13.3	1.6	1.67	0.63	-106.35
1,378.0	1.90	54.40	1,377.8	-0.7	-11.0	1.0	1.67	0.63	-58.65
1,474.0	3.20	40.60	1,473.7	2.3	-8.0	-2.1	1.49	1.35	-14.38
1,570.0	3.00	35.60	1,569.6	6.3	-4.8	-6.2	0.35	-0.21	-5.21
1,665.0	3.10	37.90	1,664.4	10.4	-1.7	-10.3	0.17	0.11	2.42
1,760.0	3.60	18.90	1,759.3	15.2	0.8	-15.3	1.27	0.53	-20.00
1,855.0	4.50	14.10	1,854.0	21.7	2.7	-21.7	1.01	0.95	-5.05
1,951.0	5.10	10.90	1,949.7	29.5	4.4	-29.6	0.68	0.63	-3.33
2,047.0	6.40	4.90	2,045.2	39.0	5.7	-39.2	1.49	1.35	-6.25
2,142.0	7.30	6.80	2,139.5	50.3	6.8	-50.5	0.98	0.95	2.00
2,237.0	8.60	10.40	2,233.6	63.3	8.8	-63.5	1.46	1.37	3.79
2,332.0	9.10	5.00	2,327.5	77.8	10.8	-78.0	1.02	0.53	-5.68
2,427.0	10.20	0.60	2,421.2	93.7	11.5	-93.9	1.39	1.16	-4.63
2,521.0	11.10	354.70	2,513.5	111.0	10.8	-111.2	1.50	0.96	-6.28
2,616.0	11.80	353.10	2,606.6	129.7	8.7	-129.9	0.81	0.74	-1.68
2,711.0	11.50	351.20	2,699.7	148.7	6.1	-148.9	0.51	-0.32	-2.00
2,805.0	11.30	349.00	2,791.8	167.0	2.9	-167.1	0.51	-0.21	-2.34
2,901.0	11.00	347.10	2,886.0	185.2	-0.9	-185.1	0.49	-0.31	-1.98
2,996.0	12.40	348.50	2,979.0	204.0	-5.0	-203.8	1.50	1.47	1.47
3,091.0	12.30	345.80	3,071.8	223.8	-9.5	-223.5	0.62	-0.11	-2.84
3,187.0	11.60	345.20	3,165.8	243.1	-14.5	-242.6	0.74	-0.73	-0.63
3,282.0	11.20	342.80	3,258.9	261.1	-19.6	-260.5	0.65	-0.42	-2.53
3,377.0	11.90	344.50	3,352.0	279.4	-25.0	-278.6	0.82	0.74	1.79
3,473.0	11.30	342.20	3,446.0	297.9	-30.5	-297.0	0.79	-0.63	-2.40
3,568.0	11.20	333.20	3,539.2	315.0	-37.5	-313.9	1.85	-0.11	-9.47
3,664.0	10.60	335.40	3,633.5	331.3	-45.4	-330.0	0.76	-0.63	2.29
3,759.0	11.20	333.60	3,726.7	347.5	-53.1	-346.0	0.73	0.63	-1.89
3,853.0	10.80	335.30	3,819.0	363.7	-60.8	-362.0	0.55	-0.43	1.81
3,948.0	10.90	341.90	3,912.3	380.3	-67.4	-378.4	1.31	0.11	6.95
4,043.0	10.90	358.60	4,005.6	397.9	-70.4	-395.8	3.31	0.00	17.58
4,138.0	11.40	359.10	4,098.8	416.2	-70.7	-414.2	0.54	0.53	0.53
4,232.0	11.50	358.10	4,191.0	434.9	-71.2	-432.8	0.24	0.11	-1.06
4,327.0	11.30	356.70	4,284.1	453.6	-72.0	-451.6	0.36	-0.21	-1.47
4,422.0	10.60	355.20	4,377.4	471.6	-73.3	-469.5	0.80	-0.74	-1.58
4,517.0	10.20	353.70	4,470.8	488.7	-75.0	-486.5	0.51	-0.42	-1.58
4,612.0	9.50	352.70	4,564.4	504.8	-76.9	-502.6	0.76	-0.74	-1.05
4,708.0	10.00	354.70	4,659.0	521.0	-78.7	-518.7	0.63	0.52	2.08
4,803.0	10.00	353.70	4,752.6	537.4	-80.3	-535.1	0.18	0.00	-1.05
4,898.0	9.10	352.90	4,846.3	553.1	-82.2	-550.7	0.96	-0.95	-0.84
4,994.0	9.90	347.80	4,940.9	568.7	-84.8	-566.2	1.21	0.83	-5.31
5,089.0	9.50	345.90	5,034.6	584.3	-88.5	-581.7	0.54	-0.42	-2.00
5,184.0	9.00	345.70	5,128.3	599.1	-92.2	-596.4	0.53	-0.53	-0.21
5,279.0	9.00	343.30	5,222.2	613.4	-96.2	-610.6	0.40	0.00	-2.53
5,374.0	8.30	342.40	5,316.1	627.0	-100.4	-624.1	0.75	-0.74	-0.95
5,469.0	7.40	340.20	5,410.2	639.3	-104.5	-636.3	1.00	-0.95	-2.32
5,564.0	6.50	338.60	5,504.5	650.1	-108.6	-646.9	0.97	-0.95	-1.68
5,660.0	4.70	337.90	5,600.0	658.8	-112.0	-655.6	1.88	-1.88	-0.73
5,755.0	4.30	334.20	5,694.8	665.6	-115.1	-662.3	0.52	-0.42	-3.89
5,850.0	4.00	323.60	5,789.5	671.5	-118.6	-668.1	0.87	-0.32	-11.16
5,945.0	2.70	297.00	5,884.3	675.2	-122.5	-671.6	2.10	-1.37	-28.00
6,040.0	1.40	290.10	5,979.3	676.6	-125.6	-673.0	1.39	-1.37	-7.26

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

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
6,136.0	0.80	292.20	6,075.3	677.2	-127.3	-673.6	0.63	-0.63	2.19
6,231.0	0.70	304.50	6,170.3	677.8	-128.4	-674.1	0.20	-0.11	12.95
6,326.0	0.70	290.90	6,265.2	678.3	-129.5	-674.6	0.17	0.00	-14.32
6,421.0	0.40	284.40	6,360.2	678.6	-130.3	-674.9	0.32	-0.32	-6.84
6,516.0	0.70	258.60	6,455.2	678.6	-131.2	-674.9	0.40	0.32	-27.16
6,611.0	0.70	274.90	6,550.2	678.5	-132.4	-674.8	0.21	0.00	17.16
6,707.0	1.00	276.00	6,646.2	678.7	-133.8	-674.9	0.31	0.31	1.15
6,740.0	1.10	266.10	6,679.2	678.7	-134.4	-674.8	0.63	0.30	-30.00
6,772.0	1.10	276.60	6,711.2	678.7	-135.0	-674.8	0.63	0.00	32.81
6,804.0	1.30	222.30	6,743.2	678.5	-135.5	-674.6	3.47	0.63	-169.69
6,835.0	3.10	178.00	6,774.2	677.4	-135.7	-673.5	7.59	5.81	-142.90
6,867.0	6.30	167.50	6,806.1	674.8	-135.3	-670.9	10.31	10.00	-32.81
6,899.0	9.90	168.60	6,837.7	670.4	-134.4	-666.5	11.26	11.25	3.44
6,931.0	13.40	171.10	6,869.1	664.0	-133.3	-660.2	11.05	10.94	7.81
6,963.0	16.50	174.90	6,900.0	655.8	-132.3	-652.0	10.16	9.69	11.88
6,994.0	19.20	178.60	6,929.5	646.3	-131.8	-642.6	9.44	8.71	11.94
7,026.0	21.70	181.10	6,959.5	635.2	-131.8	-631.4	8.27	7.81	7.81
7,058.0	24.30	181.40	6,988.9	622.7	-132.1	-618.9	8.13	8.13	0.94
7,089.0	26.40	181.60	7,017.0	609.4	-132.4	-605.6	6.78	6.77	0.65
7,121.0	28.90	179.00	7,045.3	594.5	-132.5	-590.8	8.67	7.81	-8.13
7,153.0	30.50	178.20	7,073.1	578.7	-132.1	-575.0	5.15	5.00	-2.50
7,184.0	32.70	178.20	7,099.5	562.5	-131.6	-558.7	7.10	7.10	0.00
7,217.0	34.60	178.80	7,127.0	544.2	-131.1	-540.5	5.85	5.76	1.82
7,248.0	36.50	179.60	7,152.2	526.2	-130.8	-522.5	6.31	6.13	2.58
7,280.0	38.70	178.50	7,177.5	506.6	-130.5	-503.0	7.19	6.88	-3.44
7,312.0	40.90	177.80	7,202.1	486.2	-129.9	-482.5	7.02	6.88	-2.19
7,343.0	43.00	177.20	7,225.2	465.5	-128.9	-461.9	6.90	6.77	-1.94
7,375.0	45.10	176.90	7,248.2	443.3	-127.8	-439.7	6.59	6.56	-0.94
7,406.0	47.00	177.60	7,269.7	421.0	-126.7	-417.4	6.34	6.13	2.26
7,438.0	49.00	178.30	7,291.1	397.2	-125.9	-393.7	6.46	6.25	2.19
7,470.0	51.10	179.10	7,311.6	372.7	-125.3	-369.2	6.84	6.56	2.50
7,501.0	53.60	178.80	7,330.6	348.1	-124.9	-344.7	8.10	8.06	-0.97
7,533.0	56.20	178.30	7,349.0	322.0	-124.2	-318.5	8.22	8.13	-1.56
7,565.0	58.80	178.50	7,366.2	295.0	-123.5	-291.6	8.14	8.13	0.63
7,597.0	61.40	178.00	7,382.1	267.3	-122.6	-263.9	8.24	8.13	-1.56
7,628.0	64.20	177.10	7,396.3	239.7	-121.4	-236.4	9.39	9.03	-2.90
7,660.0	66.80	175.30	7,409.6	210.7	-119.5	-207.4	9.60	8.13	-5.63
7,692.0	69.50	174.60	7,421.5	181.1	-116.9	-177.9	8.68	8.44	-2.19
7,723.0	72.20	175.10	7,431.6	151.9	-114.3	-148.8	8.84	8.71	1.61
7,755.0	74.80	175.30	7,440.7	121.4	-111.7	-118.3	8.15	8.13	0.63
7,786.0	77.40	175.10	7,448.2	91.4	-109.2	-88.4	8.41	8.39	-0.65
7,818.0	79.50	175.50	7,454.6	60.1	-106.6	-57.3	6.68	6.56	1.25
7,850.0	81.70	176.10	7,459.8	28.6	-104.3	-25.8	7.12	6.88	1.88
7,915.0	84.30	176.60	7,467.7	-35.7	-100.2	38.4	4.07	4.00	0.77
7,945.0	84.40	176.70	7,470.7	-65.5	-98.4	68.1	0.47	0.33	0.33
7,976.0	84.80	176.60	7,473.6	-96.4	-96.6	98.9	1.33	1.29	-0.32
8,006.0	85.20	177.10	7,476.2	-126.2	-95.0	128.7	2.13	1.33	1.67
8,037.0	85.70	177.40	7,478.7	-157.1	-93.5	159.5	1.88	1.61	0.97
8,067.0	86.20	177.60	7,480.8	-187.0	-92.2	189.4	1.79	1.67	0.67
8,098.0	87.10	178.00	7,482.6	-217.9	-91.0	220.2	3.18	2.90	1.29
8,128.0	87.40	178.00	7,484.0	-247.8	-90.0	250.1	1.00	1.00	0.00
8,158.0	87.70	178.30	7,485.3	-277.8	-89.0	280.1	1.41	1.00	1.00
8,189.0	87.90	178.30	7,486.5	-308.7	-88.1	311.0	0.65	0.65	0.00

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8,219.0	87.90	178.40	7,487.6	-338.7	-87.2	340.9	0.33	0.00	0.33
8,250.0	88.20	180.00	7,488.7	-369.7	-86.8	371.9	5.25	0.97	5.16
8,281.0	88.70	179.50	7,489.5	-400.7	-86.7	402.9	2.28	1.61	-1.61
8,311.0	89.70	180.20	7,489.9	-430.7	-86.6	432.8	4.07	3.33	2.33
8,341.0	90.10	179.00	7,490.0	-460.7	-86.4	462.8	4.22	1.33	-4.00
8,372.0	90.40	178.90	7,489.8	-491.7	-85.8	493.8	1.02	0.97	-0.32
8,403.0	90.70	178.90	7,489.5	-522.7	-85.2	524.8	0.97	0.97	0.00
8,433.0	91.20	179.30	7,489.0	-552.7	-84.7	554.7	2.13	1.67	1.33
8,464.0	91.60	180.00	7,488.3	-583.6	-84.5	585.7	2.60	1.29	2.26
8,494.0	92.10	179.60	7,487.3	-613.6	-84.4	615.7	2.13	1.67	-1.33
8,525.0	91.50	179.70	7,486.3	-644.6	-84.2	646.6	1.96	-1.94	0.32
8,555.0	91.40	179.10	7,485.6	-674.6	-83.9	676.6	2.03	-0.33	-2.00
8,586.0	91.40	179.30	7,484.8	-705.6	-83.5	707.6	0.64	0.00	0.65
8,616.0	91.10	179.10	7,484.2	-735.6	-83.1	737.5	1.20	-1.00	-0.67
8,647.0	90.40	180.10	7,483.8	-766.6	-82.9	768.5	3.94	-2.26	3.23
8,678.0	90.10	179.70	7,483.6	-797.6	-82.8	799.5	1.61	-0.97	-1.29
8,709.0	90.50	179.50	7,483.5	-828.6	-82.6	830.5	1.44	1.29	-0.65
8,739.0	91.10	180.20	7,483.1	-858.6	-82.5	860.5	3.07	2.00	2.33
8,769.0	91.70	180.50	7,482.3	-888.6	-82.7	890.5	2.24	2.00	1.00
8,800.0	92.00	180.90	7,481.3	-919.5	-83.1	921.4	1.61	0.97	1.29
8,830.0	91.80	181.90	7,480.3	-949.5	-83.8	951.4	3.40	-0.67	3.33
8,860.0	91.30	182.40	7,479.5	-979.5	-84.9	981.4	2.36	-1.67	1.67
8,891.0	90.60	182.20	7,479.0	-1,010.5	-86.2	1,012.4	2.35	-2.26	-0.65
8,921.0	90.70	181.80	7,478.7	-1,040.4	-87.2	1,042.4	1.37	0.33	-1.33
8,952.0	90.70	181.50	7,478.3	-1,071.4	-88.1	1,073.4	0.97	0.00	-0.97
8,982.0	90.50	180.90	7,478.0	-1,101.4	-88.7	1,103.4	2.11	-0.67	-2.00
9,012.0	90.80	180.60	7,477.6	-1,131.4	-89.1	1,133.4	1.41	1.00	-1.00
9,043.0	90.40	181.00	7,477.3	-1,162.4	-89.6	1,164.4	1.82	-1.29	1.29
9,073.0	90.30	180.20	7,477.1	-1,192.4	-89.9	1,194.4	2.69	-0.33	-2.67
9,104.0	90.50	179.90	7,476.9	-1,223.4	-89.9	1,225.4	1.16	0.65	-0.97
9,134.0	90.60	180.50	7,476.6	-1,253.4	-90.0	1,255.4	2.03	0.33	2.00
9,164.0	90.60	180.90	7,476.3	-1,283.4	-90.4	1,285.3	1.33	0.00	1.33
9,196.0	91.10	180.30	7,475.8	-1,315.4	-90.7	1,317.3	2.44	1.56	-1.88
9,228.0	91.60	180.60	7,475.1	-1,347.4	-91.0	1,349.3	1.82	1.56	0.94
9,260.0	92.20	180.10	7,474.0	-1,379.4	-91.2	1,381.3	2.44	1.88	-1.56
9,291.0	91.40	179.10	7,473.0	-1,410.3	-91.0	1,412.3	4.13	-2.58	-3.23
9,323.0	90.00	179.20	7,472.6	-1,442.3	-90.5	1,444.2	4.39	-4.38	0.31
9,355.0	89.70	179.50	7,472.7	-1,474.3	-90.1	1,476.2	1.33	-0.94	0.94
9,386.0	89.90	179.50	7,472.8	-1,505.3	-89.8	1,507.2	0.65	0.65	0.00
9,418.0	90.00	179.50	7,472.9	-1,537.3	-89.6	1,539.2	0.31	0.31	0.00
9,450.0	90.30	180.00	7,472.8	-1,569.3	-89.4	1,571.2	1.82	0.94	1.56
9,481.0	91.10	181.00	7,472.4	-1,600.3	-89.7	1,602.2	4.13	2.58	3.23
9,513.0	91.70	181.30	7,471.6	-1,632.3	-90.3	1,634.1	2.10	1.88	0.94
9,545.0	92.10	181.40	7,470.6	-1,664.3	-91.1	1,666.1	1.29	1.25	0.31
9,577.0	92.50	181.50	7,469.3	-1,696.2	-91.9	1,698.1	1.29	1.25	0.31
9,608.0	91.90	181.10	7,468.1	-1,727.2	-92.6	1,729.1	2.33	-1.94	-1.29
9,640.0	91.20	181.30	7,467.2	-1,759.2	-93.3	1,761.1	2.27	-2.19	0.63
9,672.0	90.20	181.00	7,466.8	-1,791.2	-93.9	1,793.1	3.26	-3.13	-0.94
9,703.0	89.90	180.90	7,466.8	-1,822.2	-94.4	1,824.1	1.02	-0.97	-0.32
9,735.0	90.00	180.10	7,466.8	-1,854.2	-94.7	1,856.1	2.52	0.31	-2.50
9,766.0	90.30	180.80	7,466.7	-1,885.2	-95.0	1,887.0	2.46	0.97	2.26
9,798.0	90.90	181.60	7,466.4	-1,917.2	-95.6	1,919.0	3.12	1.88	2.50
9,830.0	91.50	181.90	7,465.7	-1,949.2	-96.6	1,951.0	2.10	1.88	0.94

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

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
9,861.0	91.10	181.90	7,465.0	-1,980.1	-97.6	1,982.0	1.29	-1.29	0.00
9,893.0	90.30	181.80	7,464.6	-2,012.1	-98.7	2,014.0	2.52	-2.50	-0.31
9,925.0	89.70	180.60	7,464.6	-2,044.1	-99.3	2,046.0	4.19	-1.88	-3.75
9,957.0	89.90	180.50	7,464.8	-2,076.1	-99.6	2,078.0	0.70	0.63	-0.31
9,989.0	89.70	181.10	7,464.9	-2,108.1	-100.1	2,110.0	1.98	-0.63	1.88
10,020.0	90.20	180.50	7,464.9	-2,139.1	-100.5	2,141.0	2.52	1.61	-1.94
10,052.0	90.30	180.30	7,464.8	-2,171.1	-100.7	2,173.0	0.70	0.31	-0.63
10,084.0	89.90	180.90	7,464.7	-2,203.1	-101.1	2,205.0	2.25	-1.25	1.88
10,115.0	88.70	180.60	7,465.1	-2,234.1	-101.5	2,236.0	3.99	-3.87	-0.97
10,147.0	88.70	180.40	7,465.8	-2,266.1	-101.8	2,268.0	0.62	0.00	-0.63
10,178.0	89.90	182.20	7,466.2	-2,297.1	-102.5	2,299.0	6.98	3.87	5.81
10,210.0	89.80	182.00	7,466.3	-2,329.0	-103.6	2,331.0	0.70	-0.31	-0.63
10,242.0	89.90	182.20	7,466.4	-2,361.0	-104.8	2,363.0	0.70	0.31	0.63
10,273.0	90.30	181.90	7,466.3	-2,392.0	-105.9	2,394.0	1.61	1.29	-0.97
10,305.0	90.40	181.80	7,466.1	-2,424.0	-106.9	2,426.0	0.44	0.31	-0.31
10,336.0	91.40	181.50	7,465.6	-2,455.0	-107.8	2,457.0	3.37	3.23	-0.97
10,368.0	92.50	181.70	7,464.5	-2,486.9	-108.7	2,488.9	3.49	3.44	0.63
10,399.0	91.40	180.80	7,463.5	-2,517.9	-109.4	2,519.9	4.58	-3.55	-2.90
10,430.0	91.20	181.30	7,462.8	-2,548.9	-110.0	2,550.9	1.74	-0.65	1.61
10,463.0	91.90	182.30	7,461.9	-2,581.9	-111.0	2,583.9	3.70	2.12	3.03
10,494.0	92.10	180.50	7,460.8	-2,612.8	-111.8	2,614.9	5.84	0.65	-5.81
10,526.0	92.10	180.80	7,459.6	-2,644.8	-112.1	2,646.9	0.94	0.00	0.94
10,557.0	92.00	181.50	7,458.5	-2,675.8	-112.8	2,677.8	2.28	-0.32	2.26
10,589.0	92.10	181.50	7,457.4	-2,707.8	-113.6	2,709.8	0.31	0.31	0.00
10,621.0	92.40	180.20	7,456.1	-2,739.7	-114.1	2,741.8	4.17	0.94	-4.06
10,653.0	92.10	181.10	7,454.9	-2,771.7	-114.4	2,773.8	2.96	-0.94	2.81
10,685.0	92.20	182.50	7,453.7	-2,803.7	-115.4	2,805.7	4.38	0.31	4.38
10,717.0	92.80	184.40	7,452.3	-2,835.6	-117.4	2,837.7	6.22	1.88	5.94
10,748.0	92.70	184.80	7,450.8	-2,866.4	-119.8	2,868.6	1.33	-0.32	1.29
10,780.0	92.40	184.50	7,449.3	-2,898.3	-122.4	2,900.5	1.33	-0.94	-0.94
10,812.0	90.10	184.40	7,448.7	-2,930.2	-124.9	2,932.5	7.19	-7.19	-0.31
10,843.0	89.00	184.50	7,448.9	-2,961.1	-127.3	2,963.4	3.56	-3.55	0.32
10,875.0	88.30	183.90	7,449.6	-2,993.0	-129.7	2,995.4	2.88	-2.19	-1.88
10,906.0	88.40	183.80	7,450.5	-3,023.9	-131.7	3,026.4	0.46	0.32	-0.32
10,938.0	88.40	183.50	7,451.4	-3,055.8	-133.8	3,058.3	0.94	0.00	-0.94
10,969.0	88.00	183.20	7,452.4	-3,086.8	-135.6	3,089.3	1.61	-1.29	-0.97
11,001.0	88.10	182.80	7,453.5	-3,118.7	-137.3	3,121.3	1.29	0.31	-1.25
11,032.0	88.10	183.10	7,454.5	-3,149.6	-138.9	3,152.2	0.97	0.00	0.97
11,064.0	88.40	183.10	7,455.5	-3,181.6	-140.6	3,184.2	0.94	0.94	0.00
11,096.0	88.40	182.70	7,456.4	-3,213.5	-142.2	3,216.2	1.25	0.00	-1.25
11,127.0	88.90	182.60	7,457.1	-3,244.5	-143.6	3,247.2	1.64	1.61	-0.32
11,159.0	89.20	182.90	7,457.7	-3,276.4	-145.2	3,279.2	1.33	0.94	0.94
11,191.0	89.40	182.90	7,458.0	-3,308.4	-146.8	3,311.1	0.63	0.63	0.00
11,223.0	89.50	183.30	7,458.4	-3,340.4	-148.5	3,343.1	1.29	0.31	1.25
11,255.0	89.90	183.30	7,458.5	-3,372.3	-150.4	3,375.1	1.25	1.25	0.00
11,287.0	89.80	182.70	7,458.6	-3,404.3	-152.0	3,407.1	1.90	-0.31	-1.88
11,319.0	89.30	182.00	7,458.9	-3,436.2	-153.4	3,439.1	2.69	-1.56	-2.19
11,350.0	89.10	182.30	7,459.3	-3,467.2	-154.5	3,470.1	1.16	-0.65	0.97
11,381.0	89.00	182.40	7,459.8	-3,498.2	-155.8	3,501.1	0.46	-0.32	0.32
11,414.0	88.90	181.40	7,460.4	-3,531.2	-156.9	3,534.1	3.04	-0.30	-3.03
11,445.0	89.10	181.40	7,460.9	-3,562.1	-157.6	3,565.1	0.65	0.65	0.00
11,477.0	89.20	181.20	7,461.4	-3,594.1	-158.4	3,597.1	0.70	0.31	-0.63
11,509.0	89.70	181.20	7,461.7	-3,626.1	-159.0	3,629.1	1.56	1.56	0.00
11,540.0	90.00	180.90	7,461.8	-3,657.1	-159.6	3,660.1	1.37	0.97	-0.97

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

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,572.0	89.80	180.80	7,461.9	-3,689.1	-160.1	3,692.1	0.70	-0.63	-0.31
11,604.0	89.70	180.20	7,462.0	-3,721.1	-160.4	3,724.1	1.90	-0.31	-1.88
11,635.0	90.20	180.10	7,462.0	-3,752.1	-160.4	3,755.1	1.64	1.61	-0.32
11,667.0	90.20	180.10	7,461.9	-3,784.1	-160.5	3,787.0	0.00	0.00	0.00
11,698.0	90.50	179.10	7,461.7	-3,815.1	-160.3	3,818.0	3.37	0.97	-3.23
11,730.0	90.70	179.40	7,461.4	-3,847.1	-159.9	3,850.0	1.13	0.63	0.94
11,762.0	90.70	179.30	7,461.0	-3,879.1	-159.5	3,882.0	0.31	0.00	-0.31
11,794.0	90.60	178.20	7,460.6	-3,911.1	-158.8	3,913.9	3.45	-0.31	-3.44
11,826.0	90.80	178.10	7,460.3	-3,943.1	-157.8	3,945.9	0.70	0.63	-0.31
11,857.0	91.40	177.70	7,459.7	-3,974.0	-156.6	3,976.8	2.33	1.94	-1.29
11,890.0	91.30	177.40	7,458.9	-4,007.0	-155.2	4,009.7	0.96	-0.30	-0.91
11,921.0	91.30	177.50	7,458.2	-4,038.0	-153.8	4,040.6	0.32	0.00	0.32
11,953.0	91.30	177.70	7,457.5	-4,069.9	-152.5	4,072.5	0.62	0.00	0.63
11,985.0	91.70	177.30	7,456.6	-4,101.9	-151.1	4,104.5	1.77	1.25	-1.25
12,016.0	91.90	177.20	7,455.6	-4,132.8	-149.6	4,135.4	0.72	0.65	-0.32
12,048.0	91.70	176.80	7,454.6	-4,164.8	-147.9	4,167.2	1.40	-0.63	-1.25
12,080.0	91.60	176.20	7,453.7	-4,196.7	-146.0	4,199.1	1.90	-0.31	-1.88
12,112.0	91.70	176.20	7,452.8	-4,228.6	-143.9	4,231.0	0.31	0.31	0.00
12,144.0	91.70	176.30	7,451.8	-4,260.5	-141.8	4,262.8	0.31	0.00	0.31
12,176.0	91.60	176.40	7,450.9	-4,292.5	-139.7	4,294.7	0.44	-0.31	0.31
12,208.0	91.70	175.60	7,450.0	-4,324.4	-137.5	4,326.5	2.52	0.31	-2.50
12,239.0	91.90	176.60	7,449.0	-4,355.3	-135.4	4,357.3	3.29	0.65	3.23
12,272.0	92.00	176.00	7,447.9	-4,388.2	-133.3	4,390.2	1.84	0.30	-1.82
12,303.0	91.60	175.80	7,446.9	-4,419.1	-131.1	4,421.0	1.44	-1.29	-0.65
12,335.0	92.00	175.70	7,445.9	-4,451.0	-128.7	4,452.8	1.29	1.25	-0.31
12,367.0	91.90	176.00	7,444.8	-4,482.9	-126.4	4,484.7	0.99	-0.31	0.94
12,430.4	92.09	175.62	7,442.6	-4,546.1	-121.7	4,547.7	0.68	0.30	-0.61
BHL 2140'FNL, 1080'FWL									
12,433.0	92.10	175.60	7,442.5	-4,548.7	-121.5	4,550.3	0.68	0.30	-0.61

Design Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
LOT-A	0.00	0.00	1.0	273.3	-1,180.9	1,447,778.57	3,196,533.31	40.560400	-104.792660
- hit/miss target									
- Shape									
- survey misses target center by 1212.1ft at 1.2ft MD (1.2 TVD, 0.0 N, 0.0 E)									
- Polygon									
Point 1			1.0	0.0	0.0	1,447,778.57	3,196,533.31		
Point 2			1.0	449.0	0.0	1,448,227.54	3,196,529.71		
Point 3			1.0	449.0	1,289.0	1,448,237.89	3,197,818.63		
Point 4			1.0	0.0	1,289.0	1,447,788.91	3,197,822.23		
Point 5			1.0	449.0	1,289.0	1,448,237.89	3,197,818.63		
Point 6			1.0	449.0	0.0	1,448,227.54	3,196,529.71		
BHL 2140'FNL, 1080'I	0.00	0.00	7,458.0	-4,550.4	-172.3	1,442,963.32	3,197,580.55	40.547160	-104.789030
- survey misses target center by 53.0ft at 12430.4ft MD (7442.6 TVD, -4546.1 N, -121.7 E)									
- Point									

Checked By: _____	Approved By: _____	Date: _____
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