

PETROLEUM DEVELOPMENT CORP Weld County CO

Well Name: **Thornton 15E-432**

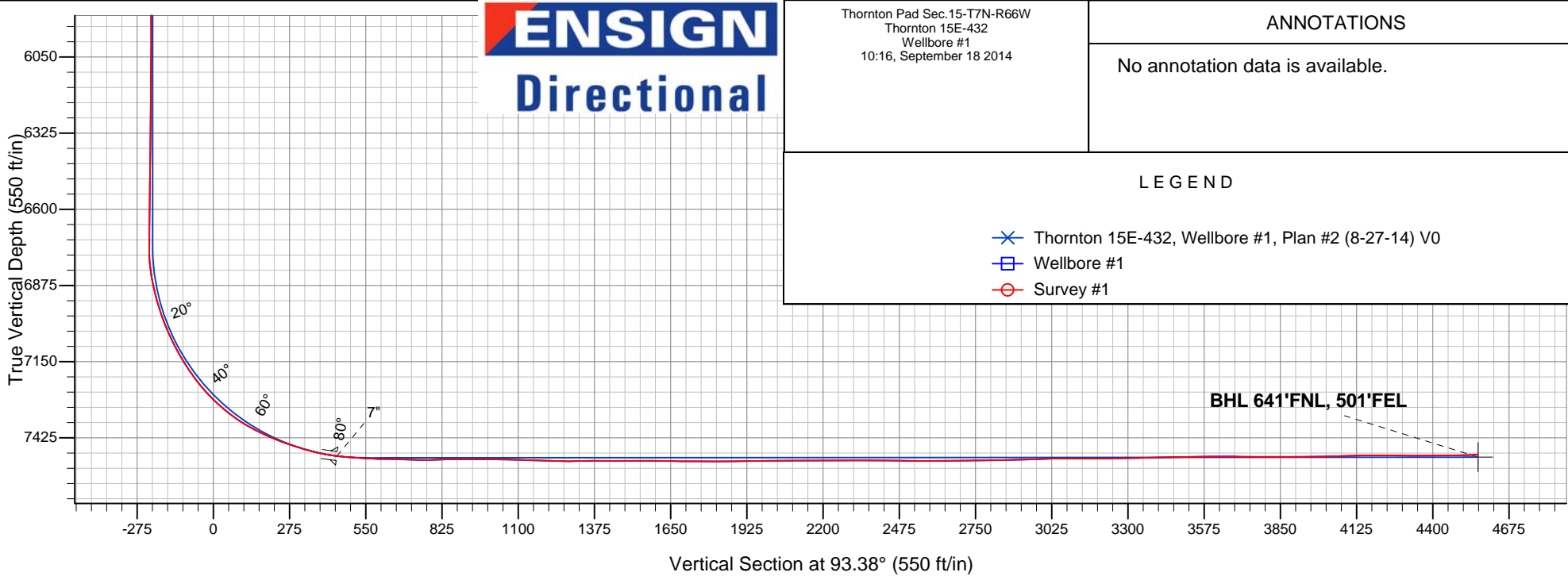
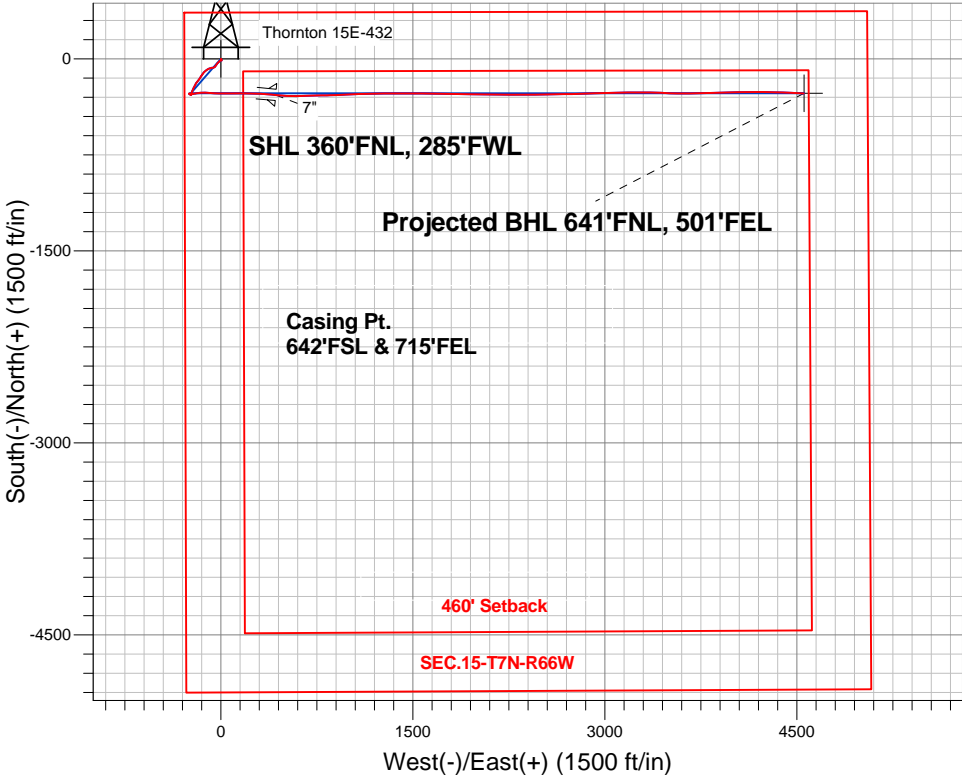
Surface Location: Thornton Pad Sec.15-T7N-R66W
North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone

Ground Elevation: 4970.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1455510.61	3202071.55	40.581500	-104.772500	
Ensign Rig # 14 - RKB - 15' WELL @ 4985.0ft (Ensign Rig # 14 - RKB - 15')						

FINAL SURVEY

Projected Bottom Hole Location
11996'MD 7486'TVD 270'S & 4555'E of SHL
91.5 degree Incl @ 92.5 degree AZM



Thornton Pad Sec.15-T7N-R66W
Thornton 15E-432
Wellbore #1
10:16, September 18 2014

ANNOTATIONS

No annotation data is available.

LEGEND

- Thornton 15E-432, Wellbore #1, Plan #2 (8-27-14) V0
- Wellbore #1
- Survey #1



PETROLEUM DEVELOPMENT CORP Weld County CO

SEC.15-T7N-R66W

Thornton Pad Sec.15-T7N-R66W

Thornton 15E-432

Wellbore #1

Survey: Survey #1

Standard Survey Report

18 September, 2014

Company:	PETROLEUM DEVELOPMENT CORP Weld County CO	Local Co-ordinate Reference:	Well Thornton 15E-432
Project:	SEC.15-T7N-R66W	TVD Reference:	WELL @ 4985.0ft (Ensign Rig # 14 - RKB - 15')
Site:	Thornton Pad Sec.15-T7N-R66W	MD Reference:	WELL @ 4985.0ft (Ensign Rig # 14 - RKB - 15')
Well:	Thornton 15E-432	North Reference:	True
Wellbore:	Wellbore #1	Survey Calculation Method:	Minimum Curvature
Design:	Wellbore #1	Database:	Landmark

Project	SEC.15-T7N-R66W, Weld County, Colorado		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		Using Well Reference Point
Map Zone:	Colorado Northern Zone		Using geodetic scale factor

Site		Thornton Pad Sec.15-T7N-R66W			
Site Position:		Northing:	1,455,601.69ft	Latitude:	40.581750
From:	Lat/Long	Easting:	3,202,070.80ft	Longitude:	-104.772500
Position Uncertainty:	0.0 ft	Slot Radius:	"	Grid Convergence:	0.47 °

Well	Thornton 15E-432					
Well Position	+N-S	0.0 ft	Northing:	1,455,510.61 ft	Latitude:	40.581500
	+E-W	0.0 ft	Easting:	3,202,071.55 ft	Longitude:	-104.772500
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,970.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	8/27/2014	8.45	67.08	52,887

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.0	0.0	0.0	93.38	

Survey Program	Date	9/18/2014			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
121.0	11,996.5	Survey #1 (Wellbore #1)	MWD	MWD - Standard	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
1.0	0.00	142.40	1.0	0.0	0.0	0.0	0.41	0.41	0.00	
SHL 360°FNL, 285°FWL										
121.0	0.50	142.40	121.0	-0.4	0.3	0.3	0.41	0.41	0.00	
216.0	0.40	158.40	216.0	-1.1	0.7	0.8	0.17	-0.11	16.84	
344.0	0.90	156.60	344.0	-2.4	1.3	1.4	0.39	0.39	-1.41	
470.0	1.40	141.00	470.0	-4.5	2.6	2.9	0.46	0.40	-12.38	
596.0	0.40	205.90	595.9	-6.1	3.4	3.8	1.02	-0.79	51.51	
721.0	0.30	151.00	720.9	-6.8	3.4	3.8	0.27	-0.08	-43.92	
853.0	1.10	142.90	852.9	-8.1	4.3	4.8	0.61	0.61	-6.14	
973.0	1.70	161.20	972.9	-10.7	5.6	6.2	0.62	0.50	15.25	
1,099.0	1.00	331.40	1,098.9	-11.5	5.6	6.3	2.14	-0.56	135.08	

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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)
1,224.0	1.00	8.50	1,223.9	-9.5	5.3	5.8	0.51	0.00	29.68
1,350.0	1.10	259.60	1,349.9	-8.6	4.3	4.8	1.36	0.08	-86.43
1,470.0	3.20	238.20	1,469.8	-10.6	0.3	0.9	1.84	1.75	-17.83
1,592.0	4.70	229.80	1,591.5	-15.6	-6.4	-5.5	1.31	1.23	-6.89
1,745.0	6.60	224.10	1,743.7	-25.9	-17.3	-15.8	1.29	1.24	-3.73
1,927.0	4.40	225.90	1,924.9	-38.3	-29.6	-27.3	1.21	-1.21	0.99
2,109.0	4.30	205.70	2,106.4	-49.3	-37.6	-34.6	0.84	-0.05	-11.10
2,292.0	4.90	223.80	2,288.8	-61.1	-46.0	-42.3	0.85	0.33	9.89
2,474.0	4.30	254.90	2,470.2	-68.5	-58.0	-53.8	1.39	-0.33	17.09
2,662.0	5.20	263.20	2,657.6	-71.4	-73.2	-68.9	0.60	0.48	4.41
2,852.0	7.00	248.00	2,846.5	-76.7	-92.5	-87.8	1.27	0.95	-8.00
3,041.0	8.00	234.20	3,033.9	-88.7	-113.9	-108.4	1.09	0.53	-7.30
3,231.0	7.90	216.20	3,222.1	-107.0	-132.3	-125.8	1.31	-0.05	-9.47
3,420.0	8.00	217.60	3,409.3	-127.9	-148.0	-140.2	0.12	0.05	0.74
3,610.0	6.70	213.40	3,597.7	-147.6	-162.2	-153.2	0.74	-0.68	-2.21
3,799.0	6.10	215.90	3,785.5	-165.0	-174.1	-164.1	0.35	-0.32	1.32
3,990.0	7.60	215.50	3,975.2	-183.5	-187.4	-176.3	0.79	0.79	-0.21
4,179.0	9.80	209.90	4,162.0	-207.6	-202.7	-190.1	1.25	1.16	-2.96
4,305.0	10.00	207.30	4,286.1	-226.6	-213.1	-199.3	0.39	0.16	-2.06
4,432.0	7.40	199.00	4,411.6	-244.2	-220.8	-206.0	2.27	-2.05	-6.54
4,558.0	5.80	197.10	4,536.8	-257.9	-225.3	-209.7	1.28	-1.27	-1.51
4,716.0	4.00	203.70	4,694.2	-270.6	-229.9	-213.5	1.19	-1.14	4.18
4,874.0	1.30	180.70	4,852.0	-277.4	-232.1	-215.3	1.80	-1.71	-14.56
5,064.0	1.10	160.00	5,042.0	-281.3	-231.5	-214.5	0.25	-0.11	-10.89
5,253.0	1.60	293.60	5,231.0	-282.0	-233.3	-216.3	1.32	0.26	70.69
5,442.0	1.10	307.30	5,419.9	-279.8	-237.1	-220.2	0.31	-0.26	7.25
5,632.0	1.30	291.60	5,609.9	-277.9	-240.6	-223.8	0.20	0.11	-8.26
5,823.0	0.60	84.60	5,800.9	-277.0	-241.6	-224.9	0.97	-0.37	80.10
6,013.0	0.50	5.30	5,990.9	-276.1	-240.6	-223.9	0.37	-0.05	-41.74
6,203.0	0.80	273.70	6,180.9	-275.2	-241.8	-225.2	0.50	0.16	-48.21
6,393.0	0.60	324.00	6,370.8	-274.3	-243.7	-227.1	0.33	-0.11	26.47
6,583.0	0.70	281.60	6,560.8	-273.3	-245.4	-228.9	0.25	0.05	-22.32
6,708.0	1.00	305.00	6,685.8	-272.5	-247.1	-230.6	0.36	0.24	18.72
6,740.0	0.80	257.50	6,717.8	-272.4	-247.5	-231.0	2.34	-0.63	-148.44
6,772.0	0.40	104.60	6,749.8	-272.4	-247.6	-231.1	3.66	-1.25	-477.81
6,803.0	3.50	97.90	6,780.8	-272.6	-246.6	-230.1	10.01	10.00	-21.61
6,835.0	6.90	94.80	6,812.7	-272.9	-243.7	-227.2	10.66	10.63	-9.69
6,867.0	9.80	97.60	6,844.3	-273.4	-239.1	-222.5	9.15	9.06	8.75
6,898.0	12.00	99.20	6,874.8	-274.3	-233.3	-216.7	7.16	7.10	5.16
6,930.0	14.00	90.40	6,905.9	-274.8	-226.1	-209.5	8.78	6.25	-27.50
6,961.0	16.30	80.70	6,935.9	-274.2	-218.1	-201.5	11.02	7.42	-31.29
6,993.0	19.00	78.60	6,966.4	-272.4	-208.6	-192.1	8.67	8.44	-6.56
7,025.0	21.00	80.50	6,996.4	-270.4	-197.8	-181.5	6.57	6.25	5.94
7,056.0	23.00	82.30	7,025.2	-268.7	-186.3	-170.1	6.81	6.45	5.81
7,088.0	24.40	83.70	7,054.5	-267.1	-173.5	-157.5	4.71	4.38	4.38
7,119.0	26.30	85.40	7,082.5	-265.9	-160.3	-144.4	6.56	6.13	5.48
7,151.0	28.60	87.70	7,110.9	-265.0	-145.6	-129.7	7.91	7.19	7.19
7,182.0	31.10	90.40	7,137.8	-264.8	-130.2	-114.3	9.15	8.06	8.71
7,214.0	32.70	92.80	7,164.9	-265.2	-113.3	-97.4	6.38	5.00	7.50
7,245.0	34.70	93.50	7,190.7	-266.2	-96.1	-80.2	6.57	6.45	2.26
7,277.0	36.80	93.40	7,216.7	-267.3	-77.5	-61.5	6.57	6.56	-0.31
7,309.0	39.90	92.80	7,241.8	-268.4	-57.6	-41.7	9.76	9.69	-1.88
7,340.0	43.40	91.40	7,264.9	-269.1	-37.0	-21.1	11.68	11.29	-4.52
7,372.0	46.30	90.70	7,287.6	-269.5	-14.5	1.4	9.19	9.06	-2.19

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Well:	Thornton 15E-432	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)
7,403.0	48.20	90.00	7,308.7	-269.7	8.3	24.2	6.35	6.13	-2.26
7,435.0	50.70	90.40	7,329.5	-269.8	32.6	48.4	7.87	7.81	1.25
7,466.0	53.60	90.20	7,348.5	-269.9	57.1	72.9	9.37	9.35	-0.65
7,498.0	56.80	90.00	7,366.8	-269.9	83.3	99.1	10.01	10.00	-0.63
7,529.0	60.40	89.50	7,382.9	-269.8	109.8	125.5	11.69	11.61	-1.61
7,561.0	63.10	89.80	7,398.0	-269.6	138.0	153.6	8.48	8.44	0.94
7,592.0	65.10	90.40	7,411.6	-269.7	165.9	181.5	6.68	6.45	1.94
7,624.0	67.30	90.40	7,424.5	-269.9	195.1	210.7	6.88	6.88	0.00
7,656.0	69.30	90.70	7,436.3	-270.2	224.9	240.4	6.31	6.25	0.94
7,687.0	70.70	91.90	7,446.9	-270.8	254.0	269.5	5.80	4.52	3.87
7,719.0	72.20	92.30	7,457.1	-272.0	284.3	299.9	4.83	4.69	1.25
7,750.0	74.20	92.80	7,466.1	-273.3	314.0	329.5	6.63	6.45	1.61
7,782.0	75.60	93.40	7,474.4	-275.0	344.8	360.4	4.73	4.38	1.88
7,813.0	77.90	94.80	7,481.5	-277.1	374.9	390.6	8.62	7.42	4.52
7,829.0	79.20	95.30	7,484.7	-278.5	390.5	406.3	8.68	8.13	3.13
7,849.0	81.50	95.40	7,488.0	-280.3	410.1	426.0	11.51	11.50	0.50
7,869.0	83.05	95.46	7,490.7	-282.2	429.9	445.8	7.75	7.74	0.32
7"									
7,880.0	83.90	95.50	7,492.0	-283.3	440.8	456.7	7.75	7.74	0.32
7,912.0	85.30	94.40	7,495.0	-286.0	472.5	488.5	5.55	4.38	-3.44
7,944.0	86.20	93.50	7,497.4	-288.2	504.3	520.5	3.97	2.81	-2.81
7,975.0	87.10	92.10	7,499.2	-289.7	535.2	551.4	5.36	2.90	-4.52
8,007.0	87.70	90.50	7,500.6	-290.4	567.2	583.3	5.34	1.88	-5.00
8,038.0	88.80	90.00	7,501.6	-290.6	598.2	614.3	3.90	3.55	-1.61
8,070.0	89.40	88.80	7,502.1	-290.2	630.2	646.2	4.19	1.88	-3.75
8,102.0	88.30	87.70	7,502.7	-289.3	662.2	678.1	4.86	-3.44	-3.44
8,133.0	88.00	87.70	7,503.7	-288.0	693.1	708.9	0.97	-0.97	0.00
8,165.0	88.50	87.60	7,504.7	-286.7	725.1	740.7	1.59	1.56	-0.31
8,228.0	92.40	89.80	7,504.2	-285.3	788.0	803.5	7.11	6.19	3.49
8,291.0	90.60	88.10	7,502.6	-284.1	851.0	866.3	3.93	-2.86	-2.70
8,354.0	90.10	87.90	7,502.2	-281.9	914.0	929.0	0.85	-0.79	-0.32
8,418.0	89.20	87.40	7,502.6	-279.3	977.9	992.7	1.61	-1.41	-0.78
8,481.0	88.60	87.00	7,503.8	-276.2	1,040.8	1,055.3	1.14	-0.95	-0.63
8,544.0	89.20	88.30	7,505.0	-273.6	1,103.7	1,118.0	2.27	0.95	2.06
8,607.0	87.50	87.90	7,506.8	-271.5	1,166.7	1,180.7	2.77	-2.70	-0.63
8,671.0	88.70	89.10	7,508.9	-269.9	1,230.6	1,244.4	2.65	1.88	1.88
8,734.0	90.70	90.50	7,509.2	-269.7	1,293.6	1,307.3	3.88	3.17	2.22
8,798.0	91.20	90.90	7,508.2	-270.4	1,357.6	1,371.2	1.00	0.78	0.63
8,860.0	89.00	89.10	7,508.1	-270.4	1,419.6	1,433.1	4.58	-3.55	-2.90
8,924.0	90.10	90.40	7,508.6	-270.2	1,483.6	1,496.9	2.66	1.72	2.03
8,987.0	90.70	91.20	7,508.1	-271.0	1,546.6	1,559.9	1.59	0.95	1.27
9,050.0	88.50	89.70	7,508.6	-271.5	1,609.6	1,622.8	4.23	-3.49	-2.38
9,113.0	89.70	90.70	7,509.6	-271.8	1,672.6	1,685.7	2.48	1.90	1.59
9,176.0	89.80	90.90	7,509.8	-272.6	1,735.6	1,748.6	0.35	0.16	0.32
9,239.0	90.10	91.40	7,509.9	-273.9	1,798.5	1,811.6	0.93	0.48	0.79
9,302.0	90.40	91.20	7,509.6	-275.3	1,861.5	1,874.5	0.57	0.48	-0.32
9,365.0	90.80	91.80	7,509.0	-277.0	1,924.5	1,937.5	1.14	0.63	0.95
9,428.0	90.70	90.90	7,508.1	-278.5	1,987.5	2,000.4	1.44	-0.16	-1.43
9,492.0	90.90	90.70	7,507.2	-279.4	2,051.5	2,064.4	0.44	0.31	-0.31
9,555.0	89.70	89.10	7,506.9	-279.2	2,114.5	2,127.3	3.17	-1.90	-2.54
9,618.0	90.00	89.50	7,507.1	-278.5	2,177.5	2,190.1	0.79	0.48	0.63
9,681.0	90.50	90.50	7,506.8	-278.5	2,240.5	2,253.0	1.77	0.79	1.59
9,744.0	89.80	89.80	7,506.6	-278.6	2,303.5	2,315.9	1.57	-1.11	-1.11

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9,807.0	90.40	90.00	7,506.5	-278.5	2,366.5	2,378.8	1.00	0.95	0.32
9,870.0	89.00	89.50	7,506.9	-278.3	2,429.5	2,441.6	2.36	-2.22	-0.79
9,934.0	89.50	89.80	7,507.7	-277.9	2,493.4	2,505.5	0.91	0.78	0.47
9,996.0	89.30	89.00	7,508.3	-277.2	2,555.4	2,567.3	1.33	-0.32	-1.29
10,060.0	91.20	89.30	7,508.1	-276.3	2,619.4	2,631.2	3.01	2.97	0.47
10,123.0	90.00	89.10	7,507.4	-275.4	2,682.4	2,694.0	1.93	-1.90	-0.32
10,186.0	90.70	88.60	7,507.0	-274.1	2,745.4	2,756.8	1.37	1.11	-0.79
10,250.0	91.00	88.40	7,506.1	-272.4	2,809.4	2,820.6	0.56	0.47	-0.31
10,313.0	91.50	88.30	7,504.7	-270.6	2,872.3	2,883.3	0.81	0.79	-0.16
10,376.0	91.90	88.10	7,502.8	-268.7	2,935.3	2,946.0	0.71	0.63	-0.32
10,439.0	92.20	89.10	7,500.6	-267.1	2,998.2	3,008.7	1.66	0.48	1.59
10,503.0	89.30	87.20	7,499.7	-265.0	3,062.2	3,072.5	5.42	-4.53	-2.97
10,565.0	89.70	89.00	7,500.3	-263.0	3,124.1	3,134.2	2.97	0.65	2.90
10,629.0	90.50	90.00	7,500.2	-262.4	3,188.1	3,198.1	2.00	1.25	1.56
10,692.0	91.00	90.50	7,499.3	-262.7	3,251.1	3,261.0	1.12	0.79	0.79
10,756.0	91.70	90.90	7,497.8	-263.5	3,315.1	3,324.9	1.26	1.09	0.63
10,819.0	90.90	91.20	7,496.4	-264.6	3,378.1	3,387.8	1.36	-1.27	0.48
10,882.0	91.50	91.80	7,495.1	-266.3	3,441.0	3,450.7	1.35	0.95	0.95
10,945.0	90.50	91.60	7,494.0	-268.2	3,504.0	3,513.7	1.62	-1.59	-0.32
11,009.0	90.90	91.60	7,493.2	-269.9	3,568.0	3,577.7	0.63	0.63	0.00
11,072.0	90.30	89.80	7,492.5	-270.7	3,631.0	3,640.6	3.01	-0.95	-2.86
11,135.0	89.10	88.10	7,492.9	-269.6	3,693.9	3,703.4	3.30	-1.90	-2.70
11,198.0	89.70	88.40	7,493.5	-267.6	3,756.9	3,766.1	1.06	0.95	0.48
11,261.0	90.00	88.40	7,493.7	-265.9	3,819.9	3,828.9	0.48	0.48	0.00
11,325.0	90.10	89.00	7,493.6	-264.4	3,883.9	3,892.7	0.95	0.16	0.94
11,388.0	90.60	89.30	7,493.3	-263.5	3,946.9	3,955.5	0.93	0.79	0.48
11,451.0	91.20	89.00	7,492.3	-262.6	4,009.8	4,018.3	1.06	0.95	-0.48
11,514.0	91.90	89.10	7,490.6	-261.5	4,072.8	4,081.1	1.12	1.11	0.16
11,577.0	91.40	88.40	7,488.7	-260.1	4,135.8	4,143.9	1.37	-0.79	-1.11
11,640.0	89.60	89.10	7,488.2	-258.8	4,198.7	4,206.7	3.07	-2.86	1.11
11,703.0	89.10	91.60	7,488.9	-259.2	4,261.7	4,269.6	4.05	-0.79	3.97
11,766.0	89.80	91.80	7,489.5	-261.0	4,324.7	4,332.6	1.16	1.11	0.32
11,829.0	90.30	91.90	7,489.5	-263.1	4,387.7	4,395.5	0.81	0.79	0.16
11,893.0	91.10	92.10	7,488.7	-265.3	4,451.6	4,459.5	1.29	1.25	0.31
11,946.0	91.50	92.50	7,487.5	-267.4	4,504.6	4,512.5	1.07	0.75	0.75
11,996.5	91.50	92.50	7,486.2	-269.6	4,555.0	4,563.0	0.00	0.00	0.00

BHL 640'FNL, 500'FEL

Casing Points				
Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,869.0	7,490.7	7"	7	7-1/2

Checked By: _____ Approved By: _____ Date: _____