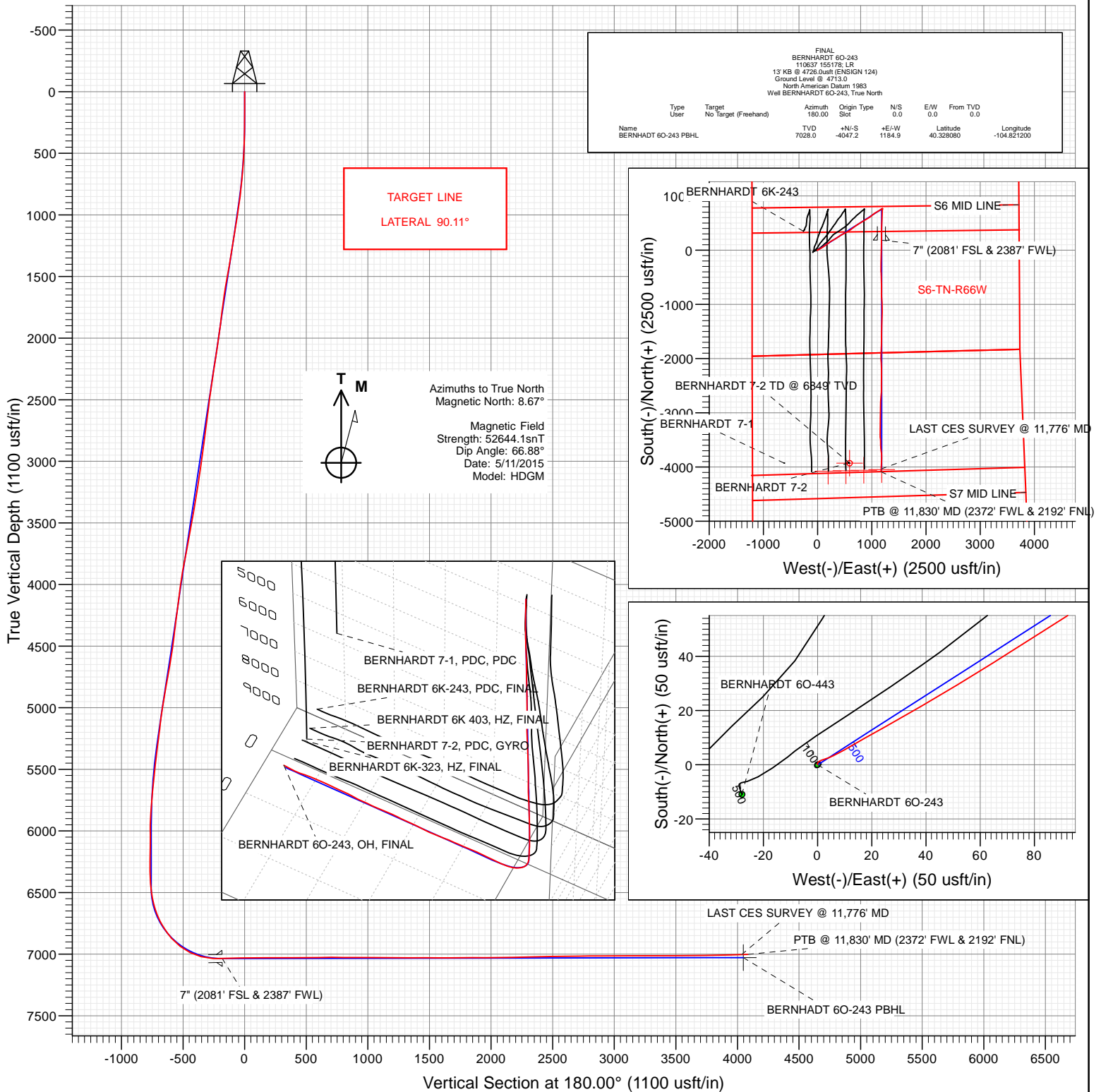




Petroleum Development Corporation

Project: Weld County
Site: S6-T4N-R66W
Well: BERNHARDT 60-243
Wellbore: OH
Design: FINAL



WELL DETAILS: BERNHARDT 60-243

+N/-S 0.0 +E/-W 0.0 Northing 1367122.83 Ground Level: 4713.0 Easting 3188035.86 Latitude 40.339190 Longitude -104.825450



Survey Report

Company:	Petroleum Development Corp.	Local Co-ordinate Reference:	Well BERNHARDT 60-243
Project:	Weld County	TVD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Site:	S6-T4N-R66W	MD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Well:	BERNHARDT 60-243	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Project	Weld County		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		S6-T4N-R66W			
Site Position:		Northing:	1,367,096.68 usft	Latitude:	40.339120
From:	Lat/Long	Easting:	3,187,949.64 usft	Longitude:	-104.825760
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.44 °

Well	BERNHARDT 60-243					
Well Position	+N/-S	0.0 usft	Northing:	1,367,122.83 usft	Latitude:	40.339190
	+E/-W	0.0 usft	Easting:	3,188,035.86 usft	Longitude:	-104.825450
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	4,713.0 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	5/11/2015	8.67	66.88	52,644

Design	FINAL				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	180.00	

Survey Program	Date	7/14/2015			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
161.0	11,830.0	Survey #1 (OH)	MWD	Geolink MWD	

Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00		
161.0	0.30	347.00	161.0	0.4	-0.1	-0.4	0.19	0.19		
253.0	0.90	48.10	253.0	1.1	0.4	-1.1	0.87	0.65		
345.0	2.50	73.20	345.0	2.2	2.8	-2.2	1.88	1.74		
437.0	4.40	62.30	436.8	4.4	7.9	-4.4	2.18	2.07		
530.0	6.40	59.40	529.4	8.7	15.5	-8.7	2.17	2.15		
623.0	9.50	61.30	621.5	15.0	26.7	-15.0	3.34	3.33		
715.0	10.60	59.40	712.0	23.0	40.7	-23.0	1.25	1.20		
808.0	12.10	58.60	803.2	32.4	56.3	-32.4	1.62	1.61		
887.0	13.90	57.60	880.2	41.8	71.4	-41.8	2.30	2.28		
941.0	14.80	57.70	932.5	49.0	82.7	-49.0	1.67	1.67		
1,034.0	16.80	57.30	1,022.0	62.6	104.1	-62.6	2.15	2.15		
1,127.0	15.70	54.80	1,111.3	77.1	125.7	-77.1	1.40	-1.18		

Survey Report

Company:	Petroleum Development Corp.	Local Co-ordinate Reference:	Well BERNHARDT 6O-243
Project:	Weld County	TVD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Site:	S6-T4N-R66W	MD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Well:	BERNHARDT 6O-243	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
1,220.0	16.20	56.40	1,200.7	91.5	146.8	-91.5	0.72	0.54	
1,312.0	15.30	56.10	1,289.2	105.4	167.5	-105.4	0.98	-0.98	
1,405.0	15.20	53.80	1,379.0	119.5	187.5	-119.5	0.66	-0.11	
1,498.0	16.00	51.70	1,468.5	134.6	207.4	-134.6	1.05	0.86	
1,590.0	17.00	52.00	1,556.8	150.7	228.0	-150.7	1.09	1.09	
1,683.0	15.20	60.60	1,646.1	165.1	249.3	-165.1	3.21	-1.94	
1,775.0	15.80	58.60	1,734.8	177.5	270.5	-177.5	0.87	0.65	
1,867.0	14.50	62.50	1,823.6	189.4	291.4	-189.4	1.79	-1.41	
1,959.0	14.20	60.90	1,912.7	200.2	311.5	-200.2	0.54	-0.33	
2,050.0	15.30	60.20	2,000.7	211.6	331.7	-211.6	1.22	1.21	
2,143.0	15.70	56.80	2,090.3	224.6	352.9	-224.6	1.07	0.43	
2,235.0	15.50	54.80	2,178.9	238.5	373.3	-238.5	0.62	-0.22	
2,327.0	15.60	54.60	2,267.6	252.7	393.5	-252.7	0.12	0.11	
2,419.0	15.00	59.10	2,356.3	266.0	413.8	-266.0	1.45	-0.65	
2,514.0	14.10	56.50	2,448.3	278.7	434.0	-278.7	1.17	-0.95	
2,610.0	15.40	63.60	2,541.1	290.8	455.1	-290.8	2.32	1.35	
2,705.0	16.70	63.70	2,632.4	302.5	478.7	-302.5	1.37	1.37	
2,801.0	15.80	63.30	2,724.6	314.5	502.7	-314.5	0.94	-0.94	
2,896.0	14.50	60.70	2,816.3	326.1	524.6	-326.1	1.54	-1.37	
2,992.0	16.50	60.70	2,908.8	338.7	547.0	-338.7	2.08	2.08	
3,087.0	14.80	60.90	3,000.2	351.2	569.4	-351.2	1.79	-1.79	
3,183.0	15.10	57.40	3,093.0	363.9	590.6	-363.9	0.99	0.31	
3,278.0	15.10	52.10	3,184.7	378.1	610.8	-378.1	1.45	0.00	
3,373.0	15.30	54.70	3,276.4	393.0	630.8	-393.0	0.75	0.21	
3,469.0	15.20	53.90	3,369.0	407.7	651.3	-407.7	0.24	-0.10	
3,564.0	17.50	51.10	3,460.2	424.0	672.5	-424.0	2.56	2.42	
3,660.0	16.30	55.40	3,552.0	440.7	694.8	-440.7	1.80	-1.25	
3,755.0	18.70	57.00	3,642.6	456.6	718.6	-456.6	2.58	2.53	
3,851.0	18.90	55.70	3,733.5	473.7	744.3	-473.7	0.48	0.21	
3,946.0	18.60	55.50	3,823.5	491.0	769.5	-491.0	0.32	-0.32	
4,041.0	16.30	55.80	3,914.1	507.1	793.0	-507.1	2.42	-2.42	
4,137.0	13.90	55.70	4,006.8	521.2	813.7	-521.2	2.50	-2.50	
4,232.0	14.30	63.20	4,098.9	532.9	833.6	-532.9	1.97	0.42	
4,328.0	15.90	60.60	4,191.6	544.7	855.6	-544.7	1.81	1.67	
4,423.0	13.90	58.70	4,283.4	557.0	876.7	-557.0	2.17	-2.11	
4,518.0	15.90	61.90	4,375.2	569.1	898.0	-569.1	2.28	2.11	
4,614.0	14.60	61.00	4,467.8	581.1	920.1	-581.1	1.38	-1.35	
4,709.0	14.50	59.10	4,559.8	593.0	940.8	-593.0	0.51	-0.11	
4,805.0	15.20	53.70	4,652.6	606.6	961.3	-606.6	1.61	0.73	
4,900.0	15.50	48.90	4,744.2	622.4	980.9	-622.4	1.37	0.32	
4,995.0	16.40	50.70	4,835.5	639.2	1,000.8	-639.2	1.08	0.95	
5,091.0	16.50	52.90	4,927.6	656.0	1,022.2	-656.0	0.66	0.10	
5,186.0	12.60	49.50	5,019.5	670.9	1,040.8	-670.9	4.20	-4.11	
5,281.0	12.30	60.10	5,112.3	682.7	1,057.5	-682.7	2.42	-0.32	
5,377.0	14.40	58.70	5,205.7	694.0	1,076.5	-694.0	2.21	2.19	
5,472.0	13.00	56.20	5,298.0	706.0	1,095.5	-706.0	1.60	-1.47	
5,568.0	13.20	60.20	5,391.5	717.5	1,114.0	-717.5	0.97	0.21	
5,663.0	12.40	57.30	5,484.1	728.4	1,132.0	-728.4	1.08	-0.84	
5,758.0	11.40	61.10	5,577.1	738.4	1,148.8	-738.4	1.34	-1.05	
5,854.0	8.40	54.40	5,671.7	747.1	1,162.8	-747.1	3.34	-3.12	
5,949.0	8.00	52.90	5,765.7	755.1	1,173.7	-755.1	0.48	-0.42	
6,045.0	6.60	53.90	5,860.9	762.4	1,183.5	-762.4	1.46	-1.46	
6,140.0	3.30	72.50	5,955.5	766.5	1,190.5	-766.5	3.82	-3.47	

Survey Report

Company:	Petroleum Development Corp.	Local Co-ordinate Reference:	Well BERNHARDT 6O-243
Project:	Weld County	TVD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Site:	S6-T4N-R66W	MD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Well:	BERNHARDT 6O-243	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
6,236.0	1.10	85.60	6,051.5	767.4	1,194.1	-767.4	2.34	-2.29	
6,331.0	1.10	85.70	6,146.5	767.5	1,195.9	-767.5	0.00	0.00	
6,426.0	1.10	85.10	6,241.4	767.6	1,197.7	-767.6	0.01	0.00	
6,522.0	1.10	108.50	6,337.4	767.4	1,199.5	-767.4	0.46	0.00	
6,586.0	2.30	169.80	6,401.4	766.0	1,200.3	-766.0	3.15	1.87	
6,618.0	4.00	184.00	6,433.3	764.2	1,200.4	-764.2	5.81	5.31	
6,665.0	7.80	187.90	6,480.1	759.4	1,199.8	-759.4	8.13	8.09	
6,714.0	9.20	193.20	6,528.6	752.3	1,198.5	-752.3	3.27	2.86	
6,761.0	13.40	187.20	6,574.6	743.3	1,196.9	-743.3	9.27	8.94	
6,809.0	17.30	182.60	6,620.9	730.6	1,195.9	-730.6	8.51	8.12	
6,856.0	21.00	186.10	6,665.3	715.2	1,194.7	-715.2	8.24	7.87	
6,905.0	24.30	185.00	6,710.5	696.5	1,192.9	-696.5	6.79	6.73	
6,952.0	28.10	182.80	6,752.7	675.8	1,191.5	-675.8	8.34	8.09	
7,000.0	32.30	180.70	6,794.2	651.6	1,190.8	-651.6	9.02	8.75	
7,047.0	37.10	180.40	6,832.8	624.9	1,190.5	-624.9	10.22	10.21	
7,096.0	41.80	182.10	6,870.6	593.8	1,189.8	-593.8	9.84	9.59	
7,191.0	52.10	182.20	6,935.4	524.5	1,187.2	-524.5	10.84	10.84	
7,286.0	63.20	181.60	6,986.1	444.4	1,184.6	-444.4	11.70	11.68	
7,381.0	75.10	181.60	7,019.9	355.8	1,182.1	-355.8	12.53	12.53	
7,477.0	86.80	180.70	7,035.0	261.2	1,180.2	-261.2	12.22	12.19	
7,517.0	91.20	180.00	7,035.7	221.2	1,180.0	-221.2	11.14	11.00	
7,597.0	91.40	181.20	7,033.8	141.3	1,179.1	-141.3	1.52	0.25	
7,682.0	91.30	180.90	7,031.8	56.3	1,177.6	-56.3	0.37	-0.12	
7,777.0	90.00	180.70	7,030.8	-38.7	1,176.3	38.7	1.38	-1.37	
7,873.0	90.50	181.50	7,030.3	-134.7	1,174.4	134.7	0.98	0.52	
7,968.0	90.70	181.10	7,029.4	-229.6	1,172.3	229.6	0.47	0.21	
8,064.0	89.50	180.30	7,029.2	-325.6	1,171.1	325.6	1.50	-1.25	
8,159.0	90.60	177.00	7,029.1	-420.6	1,173.3	420.6	3.66	1.16	
8,255.0	90.60	179.30	7,028.1	-516.5	1,176.4	516.5	2.40	0.00	
8,350.0	91.10	177.10	7,026.7	-611.5	1,179.4	611.5	2.37	0.53	
8,445.0	89.30	180.70	7,026.4	-706.4	1,181.2	706.4	4.24	-1.89	
8,541.0	89.50	179.90	7,027.4	-802.4	1,180.7	802.4	0.86	0.21	
8,636.0	90.40	175.90	7,027.4	-897.3	1,184.2	897.3	4.32	0.95	
8,732.0	90.40	178.50	7,026.8	-993.2	1,188.9	993.2	2.71	0.00	
8,827.0	88.70	178.00	7,027.5	-1,088.2	1,191.8	1,088.2	1.87	-1.79	
8,922.0	89.30	179.00	7,029.2	-1,183.1	1,194.3	1,183.1	1.23	0.63	
9,018.0	90.00	184.10	7,029.8	-1,279.0	1,191.7	1,279.0	5.36	0.73	
9,113.0	90.40	184.30	7,029.4	-1,373.8	1,184.7	1,373.8	0.47	0.42	
9,209.0	89.30	180.70	7,029.7	-1,469.7	1,180.6	1,469.7	3.92	-1.15	
9,304.0	89.80	179.70	7,030.4	-1,564.7	1,180.2	1,564.7	1.18	0.53	
9,399.0	90.30	179.90	7,030.3	-1,659.7	1,180.6	1,659.7	0.57	0.53	
9,495.0	90.70	182.60	7,029.5	-1,755.6	1,178.5	1,755.6	2.84	0.42	
9,590.0	90.40	183.70	7,028.6	-1,850.5	1,173.2	1,850.5	1.20	-0.32	
9,685.0	89.70	179.30	7,028.5	-1,945.4	1,170.8	1,945.4	4.69	-0.74	
9,781.0	90.50	177.10	7,028.3	-2,041.4	1,173.8	2,041.4	2.44	0.83	
9,876.0	91.10	177.90	7,027.0	-2,136.3	1,177.9	2,136.3	1.05	0.63	
9,971.0	91.40	178.70	7,024.9	-2,231.2	1,180.7	2,231.2	0.90	0.32	
10,067.0	91.50	181.40	7,022.5	-2,327.2	1,180.6	2,327.2	2.81	0.10	
10,162.0	90.80	180.90	7,020.6	-2,422.1	1,178.7	2,422.1	0.91	-0.74	
10,258.0	91.30	177.40	7,018.8	-2,518.1	1,180.2	2,518.1	3.68	0.52	
10,353.0	91.30	184.30	7,016.7	-2,613.0	1,178.8	2,613.0	7.26	0.00	
10,449.0	90.10	185.20	7,015.5	-2,708.7	1,170.8	2,708.7	1.56	-1.25	
10,544.0	90.40	182.20	7,015.1	-2,803.4	1,164.7	2,803.4	3.17	0.32	

Survey Report

Company:	Petroleum Development Corp.	Local Co-ordinate Reference:	Well BERNHARDT 60-243
Project:	Weld County	TVD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Site:	S6-T4N-R66W	MD Reference:	13' KB @ 4726.0usft (ENSIGN 124)
Well:	BERNHARDT 60-243	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
10,640.0	90.00	179.70	7,014.8	-2,899.4	1,163.1	2,899.4	2.64	-0.42	
10,735.0	90.60	182.00	7,014.3	-2,994.4	1,161.7	2,994.4	2.50	0.63	
10,830.0	90.00	181.80	7,013.8	-3,089.4	1,158.5	3,089.4	0.67	-0.63	
10,926.0	89.90	177.70	7,013.9	-3,185.3	1,158.9	3,185.3	4.27	-0.10	
11,022.0	90.50	182.70	7,013.5	-3,281.3	1,158.6	3,281.3	5.25	0.62	
11,117.0	90.80	181.40	7,012.4	-3,376.2	1,155.2	3,376.2	1.40	0.32	
11,212.0	90.20	173.60	7,011.6	-3,471.1	1,159.4	3,471.1	8.23	-0.63	
11,308.0	90.00	180.70	7,011.4	-3,566.9	1,164.1	3,566.9	7.40	-0.21	
11,403.0	90.10	173.40	7,011.4	-3,661.7	1,169.0	3,661.7	7.68	0.11	
11,499.0	91.00	172.40	7,010.4	-3,756.9	1,180.9	3,756.9	1.40	0.94	
11,594.0	91.10	183.40	7,008.7	-3,851.7	1,184.3	3,851.7	11.58	0.11	
11,689.0	91.80	182.50	7,006.3	-3,946.6	1,179.5	3,946.6	1.20	0.74	
11,776.0	91.90	183.70	7,003.5	-4,033.4	1,174.8	4,033.4	1.38	0.11	LAST CES SURVEY @ 11,776' MD
11,830.0	91.90	183.70	7,001.7	-4,087.2	1,171.3	4,087.2	0.00	0.00	PTB @ 11,830' MD (2372' FWL & 2192' FNL)

Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
BERNHADT 60-243 PB	0.00	0.00	7,028.0	-4,047.2	1,184.9	1,363,084.72	3,189,251.54	40.328080	-104.821200
- actual wellpath misses target center by 29.9usft at 11776.0usft MD (7003.5 TVD, -4033.4 N, 1174.8 E)									
- Point									

Casing Points					
Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")	
7,555.0	7,034.8	7" (2081' FSL & 2387' FWL)	0	0	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
11,776.0	7,003.5	-4,033.4	1,174.8	LAST CES SURVEY @ 11,776' MD	
11,830.0	7,001.7	-4,087.2	1,171.3	PTB @ 11,830' MD (2372' FWL & 2192' FNL)	

Checked By: _____	Approved By: _____	Date: _____
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