

# Noble Energy

Weld County, CO (NAD 83)

Sec. 4-T9N-R58W (Rohn State 4 PAD)

Rohn State LD03-66-1HN

## Plan B

Design: Noble Flexishot and Sperry MWD Survey

# Sperry Drilling Services

## Final Survey Report

22 September, 2014

Well Coordinates: 1,532,165.00 N, 3,453,745.70 E (40° 46' 57.61" N, 103° 51' 41.29" W)

Ground Level: 4,705.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Rohn State LD03-66-1HN

RKB=24 @ 4729.00usft (H&P 273)

N

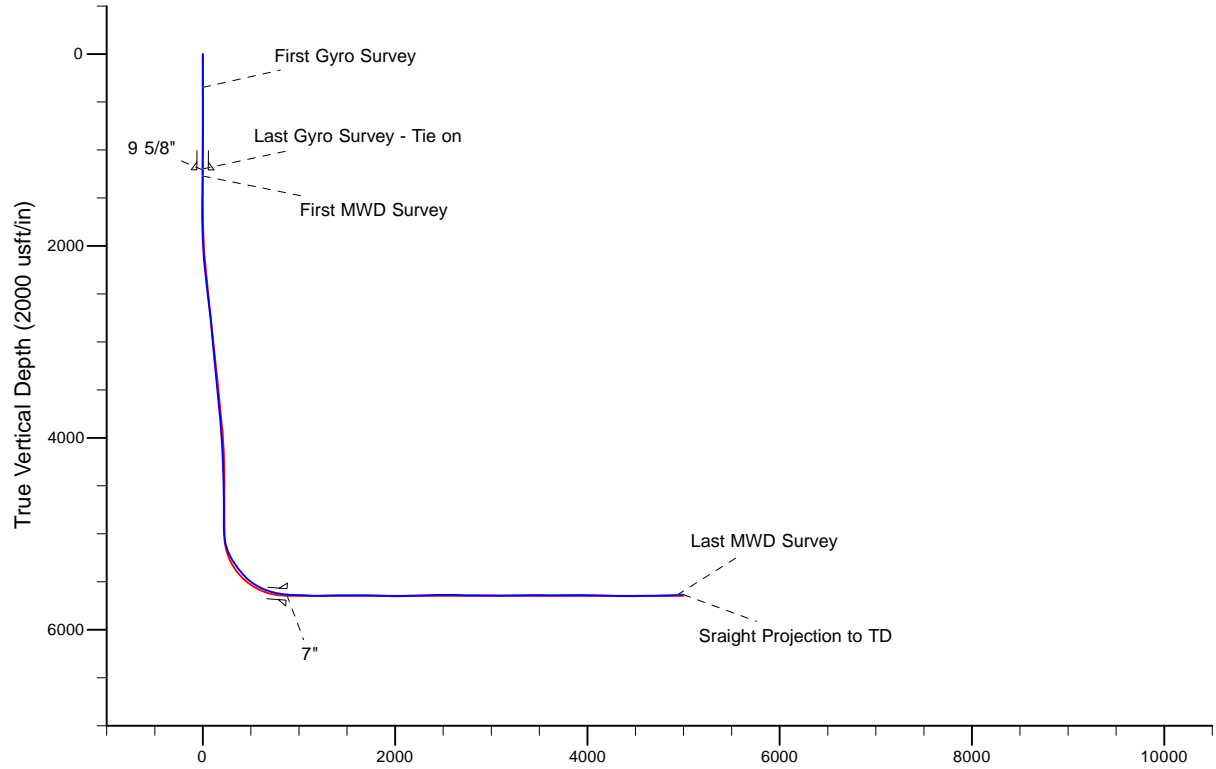
Grid

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

Project: Weld County, CO (NAD 83)  
Site: Sec. 4-T9N-R58W (Rohn State 4 PAD)  
Well: Rohn State LD03-66-1HN  
Wellbore: Plan B  
Design: Noble Flexishot and Sperry MWD Survey

# Noble Energy



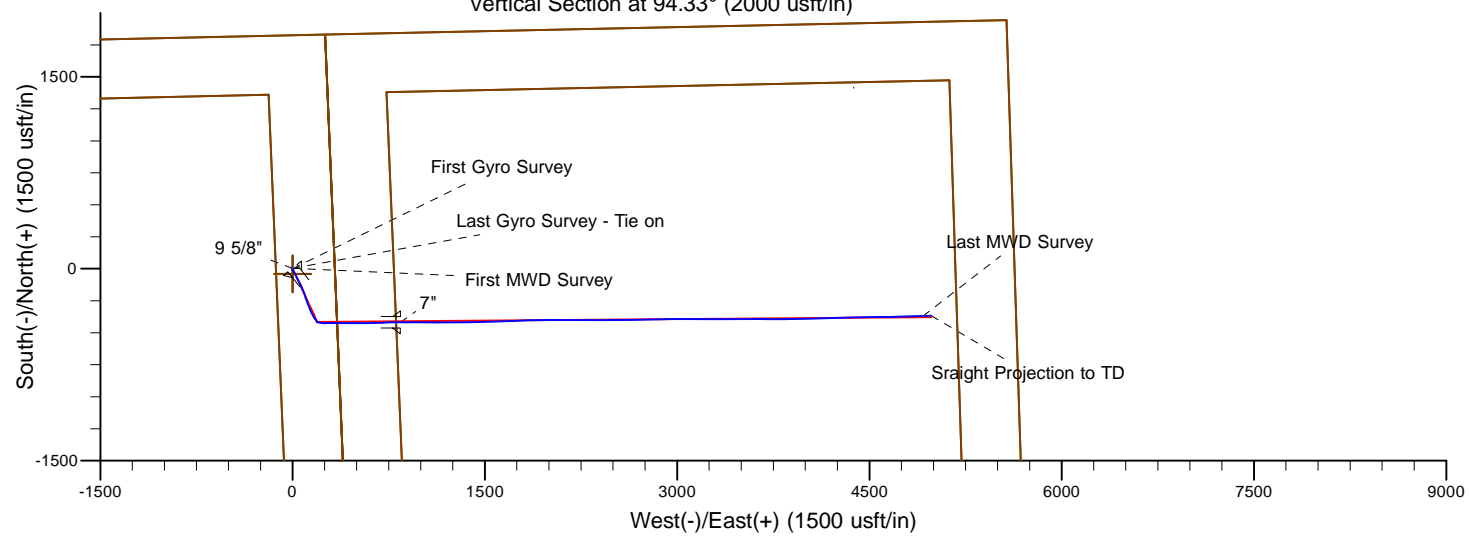
Platted SHL: 1825 FNL, 330 FEL  
Platted Lat/Long: 40.782670 N, 103.861470 W  
Location: Sec. 3-T9N-R58W

~7" Casing: 2265' FNL, 484' FWL  
Lat/Long: 40° 46' 53.323" N, 103° 51' 30.438" W  
State Planes - CO Northern: 1531746.43N, 3454588.57E  
Location: Sec. 3-T9N-R58W

Platted BHL: 2310' FNL, 660' FEL  
Lat/Long: 40.781380 N, 103.8435 W  
State Planes - CO Northern: 1531787.57 N, 3458730.20 E  
Location: Sec. 3-T9N-R58W

**LEGEND**

—○— Rohn State LD03-66-1HN, Plan B, Rev B0 Proposal V0  
—□— Noble Flexishot and Sperry MWD Survey



WELL DETAILS: Rohn State LD03-66-1HN	
Ground Level: 4705.00 RKB=24 @ 4729.00usft (H&P 273)	
Created By: Gordy Roth	Created On: 08/27/2014

## Design Report for Rohn State LD03-66-1HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
350.00	0.20	31.59	350.00	0.52	0.32	0.28	0.06
<b>First Gyro Survey</b>							
750.00	0.00	193.99	750.00	1.12	0.69	0.60	0.05
1,200.00	0.60	327.59	1,199.99	3.10	-0.58	-0.81	0.13
<b>Last Gyro Survey - Tie on</b>							
1,273.00	0.73	288.10	1,272.99	3.57	-1.22	-1.49	0.64
<b>First MWD Survey</b>							
1,458.00	0.74	288.73	1,457.97	4.32	-3.48	-3.79	0.01
1,551.00	0.61	281.62	1,550.96	4.61	-4.53	-4.86	0.17
1,644.00	0.86	177.88	1,643.96	4.02	-4.99	-5.28	1.25
1,737.00	1.80	149.49	1,736.93	2.06	-4.22	-4.36	1.21
1,832.00	2.60	146.93	1,831.86	-1.03	-2.29	-2.20	0.85
1,926.00	4.36	151.45	1,925.69	-5.96	0.58	1.03	1.89
2,021.00	6.09	152.96	2,020.29	-13.62	4.60	5.62	1.83
2,116.00	8.08	151.10	2,114.56	-23.95	10.12	11.90	2.11
2,210.00	9.60	150.29	2,207.44	-36.54	17.20	19.91	1.62
2,305.00	11.20	151.49	2,300.88	-51.53	25.53	29.34	1.70
2,400.00	11.76	153.22	2,393.97	-68.28	34.29	39.35	0.69
2,494.00	13.04	152.21	2,485.78	-86.22	43.55	49.94	1.38
2,589.00	13.07	153.24	2,578.32	-105.29	53.39	61.18	0.25
2,684.00	11.95	152.30	2,671.07	-123.59	62.80	71.95	1.20
2,779.00	13.19	156.20	2,763.79	-142.22	71.74	82.27	1.58
2,873.00	11.41	156.23	2,855.63	-160.54	79.82	91.71	1.89
2,968.00	11.85	161.22	2,948.68	-178.37	86.75	99.97	1.16
3,063.00	13.57	163.71	3,041.35	-198.31	93.01	107.72	1.90
3,158.00	14.36	163.37	3,133.54	-220.29	99.51	115.86	0.84
3,253.00	13.37	160.34	3,225.77	-241.93	106.58	124.54	1.29
3,347.00	13.85	160.01	3,317.13	-262.73	114.08	133.59	0.52
3,442.00	13.60	157.54	3,409.42	-283.74	122.23	143.31	0.67
3,537.00	14.06	156.47	3,501.67	-304.64	131.11	153.74	0.55
3,632.00	11.63	157.46	3,594.28	-324.07	139.39	163.46	2.57
3,727.00	10.29	155.60	3,687.55	-340.64	146.56	171.87	1.46
3,822.00	8.25	152.91	3,781.30	-354.44	153.17	179.50	2.19
3,916.00	7.77	151.49	3,874.39	-366.03	159.28	186.46	0.55
4,010.00	6.80	149.35	3,967.63	-376.40	165.15	193.10	1.07
4,105.00	5.79	146.09	4,062.05	-385.22	170.69	199.29	1.13
4,200.00	4.48	144.18	4,156.67	-392.20	175.53	204.65	1.39
4,295.00	3.38	141.76	4,251.45	-397.41	179.44	208.93	1.17
4,389.00	2.47	138.31	4,345.32	-401.10	182.50	212.26	0.99
4,484.00	1.97	150.42	4,440.25	-404.05	184.67	214.65	0.72
4,579.00	2.29	156.67	4,535.19	-407.21	186.23	216.44	0.42
4,674.00	2.24	157.14	4,630.11	-410.66	187.70	218.17	0.06
4,769.00	1.18	155.62	4,725.07	-413.27	188.82	219.49	1.12
4,863.00	1.14	148.67	4,819.05	-414.95	189.71	220.50	0.16
4,936.00	0.89	143.39	4,892.04	-416.02	190.43	221.29	0.37
4,956.00	0.99	143.76	4,912.03	-416.28	190.62	221.51	0.50
5,003.00	0.72	145.53	4,959.03	-416.86	191.03	221.96	0.58
5,051.00	2.34	101.79	5,007.01	-417.30	192.16	223.12	3.93
5,098.00	7.22	96.19	5,053.83	-417.82	196.03	227.02	10.42

## Design Report for Rohn State LD03-66-1HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,146.00	13.46	100.86	5,101.03	-419.20	204.53	235.60	13.11
5,193.00	18.39	102.20	5,146.21	-421.80	217.15	248.38	10.52
5,240.00	23.65	95.85	5,190.08	-424.33	233.79	265.16	12.18
5,287.00	27.26	88.34	5,232.52	-424.98	253.94	285.30	10.29
5,335.00	30.07	88.31	5,274.63	-424.30	276.95	308.20	5.85
5,382.00	33.86	88.18	5,314.50	-423.54	301.82	332.94	8.07
5,430.00	37.13	89.66	5,353.57	-423.03	329.68	360.68	7.04
5,477.00	39.11	92.04	5,390.55	-423.47	358.68	389.63	5.25
5,525.00	42.80	92.35	5,426.79	-424.68	390.12	421.07	7.70
5,572.00	45.74	90.94	5,460.45	-425.61	422.91	453.84	6.60
5,619.00	49.93	88.62	5,491.99	-425.45	457.73	488.55	9.64
5,666.00	55.86	88.36	5,520.33	-424.46	495.19	525.82	12.62
5,714.00	61.90	89.91	5,545.13	-423.86	536.25	566.73	12.88
5,761.00	63.91	91.60	5,566.54	-424.42	578.09	608.48	5.34
5,809.00	69.25	89.26	5,585.61	-424.73	622.11	652.40	11.99
5,856.00	74.31	87.29	5,600.30	-423.38	666.72	696.78	11.48
5,904.00	75.73	86.37	5,612.71	-420.81	713.01	742.75	3.49
5,951.00	77.64	88.08	5,623.53	-418.60	758.69	788.13	5.39
5,994.00	83.46	90.80	5,630.59	-418.19	801.08	830.37	14.90
6,085.00	87.38	89.60	5,637.86	-418.51	891.77	920.83	4.50
6,177.00	87.87	90.87	5,641.67	-418.89	983.69	1,012.51	1.48
6,270.00	87.26	90.20	5,645.62	-419.75	1,076.60	1,105.22	0.97
6,363.00	89.82	89.94	5,647.99	-419.87	1,169.56	1,197.93	2.77
6,455.00	91.88	89.75	5,646.63	-419.62	1,261.55	1,289.63	2.25
6,550.00	91.51	88.75	5,643.82	-418.37	1,356.50	1,384.22	1.12
6,645.00	90.55	88.69	5,642.11	-416.25	1,451.46	1,478.74	1.01
6,739.00	90.40	88.34	5,641.33	-413.82	1,545.42	1,572.26	0.41
6,834.00	88.86	88.00	5,641.94	-410.78	1,640.37	1,666.70	1.66
6,929.00	88.27	87.82	5,644.32	-407.32	1,735.28	1,761.08	0.65
7,024.00	88.52	87.20	5,646.98	-403.19	1,830.15	1,855.37	0.70
7,119.00	87.78	88.96	5,650.05	-400.01	1,925.04	1,949.75	2.01
7,213.00	90.65	90.24	5,651.34	-399.36	2,019.02	2,043.41	3.34
7,308.00	91.91	90.72	5,649.21	-400.15	2,113.99	2,138.17	1.42
7,403.00	92.90	90.07	5,645.23	-400.81	2,208.90	2,232.86	1.25
7,498.00	92.22	89.64	5,640.98	-400.57	2,303.81	2,327.47	0.85
7,592.00	90.77	89.79	5,638.53	-400.10	2,397.77	2,421.14	1.55
7,687.00	91.11	90.06	5,636.97	-399.97	2,492.76	2,515.84	0.46
7,781.00	87.81	89.14	5,637.86	-399.32	2,586.74	2,609.50	3.64
7,876.00	88.00	89.17	5,641.33	-397.92	2,681.66	2,704.05	0.20
7,971.00	90.06	89.34	5,642.94	-396.68	2,776.64	2,798.66	2.18
8,065.00	89.38	88.79	5,643.40	-395.15	2,870.62	2,892.26	0.93
8,160.00	89.78	88.04	5,644.10	-392.52	2,965.58	2,986.75	0.89
8,255.00	89.72	91.05	5,644.51	-391.77	3,060.57	3,081.41	3.17
8,350.00	90.86	91.25	5,644.03	-393.67	3,155.54	3,176.26	1.22
8,445.00	90.99	89.72	5,642.50	-394.48	3,250.53	3,271.03	1.62
8,540.00	90.77	88.99	5,641.04	-393.41	3,345.51	3,365.66	0.80
8,635.00	89.88	89.68	5,640.50	-392.31	3,440.50	3,460.30	1.19
8,730.00	88.86	90.01	5,641.54	-392.05	3,535.49	3,555.00	1.13
8,825.00	89.97	90.62	5,642.51	-392.57	3,630.48	3,649.76	1.33
8,920.00	91.36	90.74	5,641.41	-393.70	3,725.47	3,744.56	1.47
9,015.00	89.45	89.09	5,640.74	-393.56	3,820.46	3,839.27	2.66

## Design Report for Rohn State LD03-66-1HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,109.00	89.82	89.49	5,641.34	-392.39	3,914.45	3,932.90	0.58
9,203.00	88.89	88.46	5,642.40	-390.71	4,008.42	4,026.48	1.48
9,298.00	89.32	88.31	5,643.88	-388.04	4,103.38	4,120.96	0.48
9,393.00	88.18	88.24	5,645.95	-385.18	4,198.31	4,215.41	1.20
9,488.00	87.90	87.71	5,649.20	-381.82	4,293.19	4,309.77	0.63
9,583.00	90.25	89.43	5,650.74	-379.45	4,388.14	4,404.26	3.07
9,678.00	91.51	89.72	5,649.28	-378.75	4,483.12	4,498.92	1.36
9,772.00	90.43	88.71	5,647.68	-377.46	4,577.10	4,592.53	1.57
9,867.00	90.71	88.46	5,646.74	-375.11	4,672.07	4,687.05	0.40
9,962.00	90.99	88.28	5,645.33	-372.41	4,767.02	4,781.53	0.35
10,057.00	92.59	88.26	5,642.36	-369.55	4,861.92	4,875.95	1.68
10,115.00	93.79	88.99	5,639.14	-368.16	4,919.82	4,933.57	2.42
<b>Last MWD Survey</b>							
10,179.00	93.79	88.99	5,634.91	-367.03	4,983.67	4,997.15	0.00
<b>Straight Projection to TD</b>							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
350.00	350.00	0.52	0.32	First Gyro Survey
1,200.00	1,199.99	3.10	-0.58	Last Gyro Survey - Tie on
1,273.00	1,272.99	3.57	-1.22	First MWD Survey
10,115.00	5,639.14	-368.16	4,919.82	Last MWD Survey
10,179.00	5,634.91	-367.03	4,983.67	Straight Projection to TD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Rohn State LD03-66-1HN BHL	94.33	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
350.00	1,200.00	Surface Surveys	Flexi-Shot
1,273.00	5,994.00	Intermediate Surveys	MWD
6,085.00	10,179.00	Production Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,210.00	1,209.99	9 5/8"	9-5/8	13-3/4
6,036.00	5,634.72	7"	7	8-3/4

## Design Report for Rohn State LD03-66-1HN - Actual Surveys

**Wellbore Targets**

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Rohn State LD03-66-1	0.00	0.00	0.00	0.01	0.00	1,532,165.01	3,453,745.70	40° 46' 57.612 N	103° 51' 41.292 W
- actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Rohn State LD03-65HI	0.00	0.00	-2.00	-40.05	0.74	1,532,124.95	3,453,746.44	40° 46' 57.216 N	103° 51' 41.292 W
- actual wellpath misses target center by 40.10usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-2.00	1,306.69	-4,481.08	1,533,431.64	3,449,265.36	
Point 2				-2.00	-3,048.17	-4,330.55	1,529,076.78	3,449,415.89	
Point 3				-2.00	-2,965.64	-6.00	1,529,159.31	3,453,740.44	
Point 4				-2.00	1,400.65	-187.40	1,533,525.60	3,453,559.04	
Point 5				-2.00	1,306.69	-4,481.08	1,533,431.64	3,449,265.36	
Rohn State LD03-65HI	0.00	0.00	-2.00	-40.05	0.74	1,532,124.95	3,453,746.44	40° 46' 57.216 N	103° 51' 41.292 W
- actual wellpath misses target center by 40.10usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-2.00	-2,945.49	913.96	1,529,179.46	3,454,660.40	
Point 2				-2.00	-2,837.50	5,262.44	1,529,287.45	3,459,008.88	
Point 3				-2.00	1,514.25	5,123.82	1,533,639.20	3,458,870.26	
Point 4				-2.00	1,420.53	732.57	1,533,545.48	3,454,479.01	
Point 5				-2.00	-2,945.49	913.96	1,529,179.46	3,454,660.40	
Rohn State LD03-65HI	0.00	0.00	-2.00	-40.05	0.74	1,532,124.95	3,453,746.44	40° 46' 57.216 N	103° 51' 41.292 W
- actual wellpath misses target center by 40.10usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-2.00	1,756.39	-4,956.90	1,533,881.34	3,448,789.54	
Point 2				-2.00	-3,516.73	-4,774.63	1,528,608.22	3,448,971.81	
Point 3				-2.00	-3,416.58	473.13	1,528,708.37	3,454,219.57	
Point 4				-2.00	1,870.41	253.48	1,533,995.36	3,453,999.92	
Point 5				-2.00	-3,416.58	473.13	1,528,708.37	3,454,219.57	
Point 6				-2.00	-3,285.86	5,736.95	1,528,839.09	3,459,483.39	
Point 7				-2.00	1,983.86	5,569.10	1,534,108.81	3,459,315.54	
Point 8				-2.00	1,870.41	253.48	1,533,995.36	3,453,999.92	
Rohn State LD03-66-1	0.00	0.00	5,647.00	-377.43	4,984.50	1,531,787.57	3,458,730.20	40° 46' 52.968 N	103° 50' 36.600 W
- actual wellpath misses target center by 15.97usft at 10178.85usft MD (5634.92 TVD, -367.03 N, 4983.52 E)									
- Point									

**Directional Difficulty Index**

Average Dogleg over Survey:	1.88 °/100usft	Maximum Dogleg over Survey:	14.90 °/100usft at 5,994.00 usft
Net Tortosity applicable to Plans:	0.75 °/100usft	Directional Difficulty Index:	6.260

**Audit Info**

North Reference Sheet for Sec. 4-T9N-R58W (Rohn State 4 PAD) - Rohn State  
LD03-66-1HN - Plan B

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.

Vertical Depths are relative to RKB=24 @ 4729.00usft (H&P 273). Northing and Easting are relative to Rohn State LD03-66-1HN

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is 105° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:40° 47' 0.000 N°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99999989

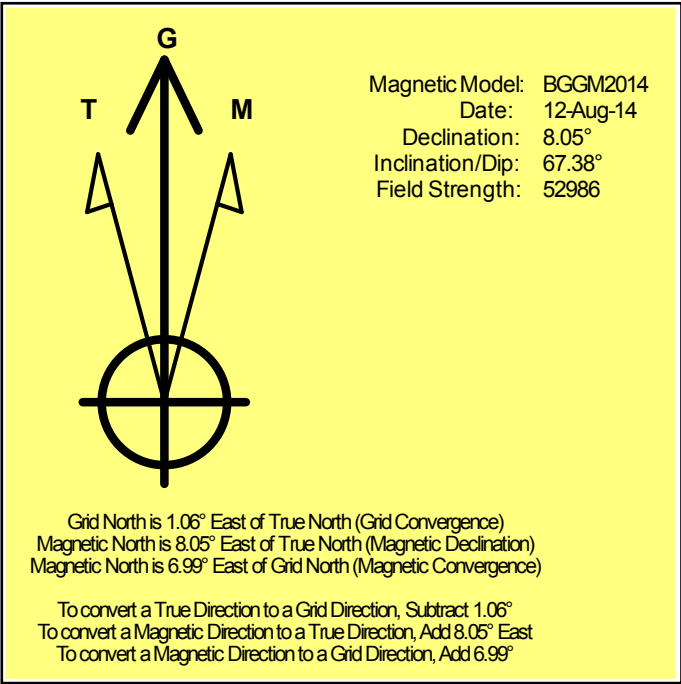
Grid Coordinates of Well: 1,532,165.00 usft N, 3,453,745.70 usft E

Geographical Coordinates of Well: 40° 46' 57.61" N, 103° 51' 41.29" W

Grid Convergence at Surface is: 1.06°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,179.00usft  
the Bottom Hole Displacement is 4,997.16usft in the Direction of 94.21° (Grid).

Magnetic Convergence at surface is: -6.99° (12 August 2014, , BGGM2014)



# Noble Energy

Weld County, CO (NAD 83)

Sec. 4-T9N-R58W (Rohn State 4 PAD)

Rohn State LD03-66-1HN

Plan B

Design: Actual Surveys

## Sperry Drilling Services

### Geodetic Report

23 September, 2014

Well Coordinates: 1,532,165.00 N, 3,453,745.70 E (40° 46' 57.61" N, 103° 51' 41.29" W)

Ground Level: 4,705.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Rohn State LD03-66-1HN

RKB=24 @ 4729.00usft (H&P 273)

N

Grid

API - US Survey Feet - Custom

**HALLIBURTON**



## Design Report for Rohn State LD03-66-1HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
0.00	0.00	0.00	0.00	0.00	0.00	40° 46' 57.612 N	103° 51' 41.292 W	1,532,165.00	3,453,745.70
350.00	0.20	31.59	350.00	0.52	0.32	40° 46' 57.617 N	103° 51' 41.288 W	1,532,165.52	3,453,746.02
750.00	0.00	193.99	750.00	1.12	0.69	40° 46' 57.623 N	103° 51' 41.283 W	1,532,166.12	3,453,746.38
1,200.00	0.60	327.59	1,199.99	3.10	-0.58	40° 46' 57.642 N	103° 51' 41.299 W	1,532,168.10	3,453,745.12
1,273.00	0.73	288.10	1,272.99	3.57	-1.22	40° 46' 57.647 N	103° 51' 41.307 W	1,532,168.57	3,453,744.47
1,458.00	0.74	288.73	1,457.97	4.32	-3.48	40° 46' 57.655 N	103° 51' 41.336 W	1,532,169.32	3,453,742.22
1,551.00	0.61	281.62	1,550.96	4.61	-4.53	40° 46' 57.658 N	103° 51' 41.350 W	1,532,169.61	3,453,741.17
1,644.00	0.86	177.88	1,643.96	4.02	-4.99	40° 46' 57.652 N	103° 51' 41.356 W	1,532,169.02	3,453,740.71
1,737.00	1.80	149.49	1,736.93	2.06	-4.22	40° 46' 57.633 N	103° 51' 41.346 W	1,532,167.06	3,453,741.48
1,832.00	2.60	146.93	1,831.86	-1.03	-2.29	40° 46' 57.602 N	103° 51' 41.322 W	1,532,163.97	3,453,743.41
1,926.00	4.36	151.45	1,925.69	-5.96	0.58	40° 46' 57.553 N	103° 51' 41.286 W	1,532,159.04	3,453,746.28
2,021.00	6.09	152.96	2,020.29	-13.62	4.60	40° 46' 57.476 N	103° 51' 41.235 W	1,532,151.38	3,453,750.30
2,116.00	8.08	151.10	2,114.56	-23.95	10.12	40° 46' 57.373 N	103° 51' 41.166 W	1,532,141.05	3,453,755.82
2,210.00	9.60	150.29	2,207.44	-36.54	17.20	40° 46' 57.248 N	103° 51' 41.077 W	1,532,128.46	3,453,762.89
2,305.00	11.20	151.49	2,300.88	-51.53	25.53	40° 46' 57.098 N	103° 51' 40.973 W	1,532,113.47	3,453,771.22
2,400.00	11.76	153.22	2,393.97	-68.28	34.29	40° 46' 56.931 N	103° 51' 40.863 W	1,532,096.72	3,453,779.99
2,494.00	13.04	152.21	2,485.78	-86.22	43.55	40° 46' 56.752 N	103° 51' 40.747 W	1,532,078.78	3,453,789.25
2,589.00	13.07	153.24	2,578.32	-105.29	53.39	40° 46' 56.562 N	103° 51' 40.623 W	1,532,059.71	3,453,799.08
2,684.00	11.95	152.30	2,671.07	-123.59	62.80	40° 46' 56.379 N	103° 51' 40.506 W	1,532,041.41	3,453,808.49
2,779.00	13.19	156.20	2,763.79	-142.22	71.74	40° 46' 56.194 N	103° 51' 40.394 W	1,532,022.78	3,453,817.44
2,873.00	11.41	156.23	2,855.63	-160.54	79.82	40° 46' 56.011 N	103° 51' 40.293 W	1,532,004.46	3,453,825.51
2,968.00	11.85	161.22	2,948.68	-178.37	86.75	40° 46' 55.834 N	103° 51' 40.207 W	1,531,986.63	3,453,832.44
3,063.00	13.57	163.71	3,041.35	-198.31	93.01	40° 46' 55.636 N	103° 51' 40.131 W	1,531,966.69	3,453,838.71
3,158.00	14.36	163.37	3,133.54	-220.29	99.51	40° 46' 55.417 N	103° 51' 40.052 W	1,531,944.71	3,453,845.21
3,253.00	13.37	160.34	3,225.77	-241.93	106.58	40° 46' 55.202 N	103° 51' 39.965 W	1,531,923.07	3,453,852.27
3,347.00	13.85	160.01	3,317.13	-262.73	114.08	40° 46' 54.995 N	103° 51' 39.872 W	1,531,902.27	3,453,859.78
3,442.00	13.60	157.54	3,409.42	-283.74	122.23	40° 46' 54.786 N	103° 51' 39.771 W	1,531,881.26	3,453,867.93
3,537.00	14.06	156.47	3,501.67	-304.64	131.11	40° 46' 54.578 N	103° 51' 39.661 W	1,531,860.36	3,453,876.81
3,632.00	11.63	157.46	3,594.28	-324.07	139.39	40° 46' 54.385 N	103° 51' 39.558 W	1,531,840.93	3,453,885.08
3,727.00	10.29	155.60	3,687.55	-340.64	146.56	40° 46' 54.220 N	103° 51' 39.469 W	1,531,824.36	3,453,892.26
3,822.00	8.25	152.91	3,781.30	-354.44	153.17	40° 46' 54.082 N	103° 51' 39.386 W	1,531,810.56	3,453,898.87
3,916.00	7.77	151.49	3,874.39	-366.03	159.28	40° 46' 53.967 N	103° 51' 39.310 W	1,531,798.97	3,453,904.97
4,010.00	6.80	149.35	3,967.63	-376.40	165.15	40° 46' 53.863 N	103° 51' 39.236 W	1,531,788.60	3,453,910.84
4,105.00	5.79	146.09	4,062.05	-385.22	170.69	40° 46' 53.775 N	103° 51' 39.166 W	1,531,779.79	3,453,916.38
4,200.00	4.48	144.18	4,156.67	-392.20	175.53	40° 46' 53.705 N	103° 51' 39.105 W	1,531,772.80	3,453,921.23
4,295.00	3.38	141.76	4,251.45	-397.41	179.44	40° 46' 53.653 N	103° 51' 39.055 W	1,531,767.59	3,453,925.13
4,389.00	2.47	138.31	4,345.32	-401.10	182.50	40° 46' 53.616 N	103° 51' 39.016 W	1,531,763.90	3,453,928.20
4,484.00	1.97	150.42	4,440.25	-404.05	184.67	40° 46' 53.586 N	103° 51' 38.989 W	1,531,760.95	3,453,930.36
4,579.00	2.29	156.67	4,535.19	-407.21	186.23	40° 46' 53.555 N	103° 51' 38.969 W	1,531,757.79	3,453,931.92
4,674.00	2.24	157.14	4,630.11	-410.66	187.70	40° 46' 53.520 N	103° 51' 38.951 W	1,531,754.34	3,453,933.40
4,769.00	1.18	155.62	4,725.07	-413.27	188.82	40° 46' 53.494 N	103° 51' 38.937 W	1,531,751.74	3,453,934.52
4,863.00	1.14	148.67	4,819.05	-414.95	189.71	40° 46' 53.478 N	103° 51' 38.926 W	1,531,750.06	3,453,935.41

## Design Report for Rohn State LD03-66-1HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
4,936.00	0.89	143.39	4,892.04	-416.02	190.43	40° 46' 53.467 N	103° 51' 38.917 W	1,531,748.98	3,453,936.12
4,956.00	0.99	143.76	4,912.03	-416.28	190.62	40° 46' 53.464 N	103° 51' 38.915 W	1,531,748.72	3,453,936.32
5,003.00	0.72	145.53	4,959.03	-416.86	191.03	40° 46' 53.459 N	103° 51' 38.909 W	1,531,748.14	3,453,936.72
5,051.00	2.34	101.79	5,007.01	-417.30	192.16	40° 46' 53.454 N	103° 51' 38.895 W	1,531,747.70	3,453,937.85
5,098.00	7.22	96.19	5,053.83	-417.82	196.03	40° 46' 53.448 N	103° 51' 38.845 W	1,531,747.18	3,453,941.73
5,146.00	13.46	100.86	5,101.03	-419.20	204.53	40° 46' 53.433 N	103° 51' 38.734 W	1,531,745.80	3,453,950.23
5,193.00	18.39	102.20	5,146.21	-421.80	217.15	40° 46' 53.405 N	103° 51' 38.571 W	1,531,743.20	3,453,962.85
5,240.00	23.65	95.85	5,190.08	-424.33	233.79	40° 46' 53.377 N	103° 51' 38.355 W	1,531,740.67	3,453,979.49
5,287.00	27.26	88.34	5,232.52	-424.98	253.94	40° 46' 53.367 N	103° 51' 38.094 W	1,531,740.02	3,453,999.64
5,335.00	30.07	88.31	5,274.63	-424.30	276.95	40° 46' 53.369 N	103° 51' 37.794 W	1,531,740.70	3,454,022.65
5,382.00	33.86	88.18	5,314.50	-423.54	301.82	40° 46' 53.372 N	103° 51' 37.471 W	1,531,741.46	3,454,047.52
5,430.00	37.13	89.66	5,353.57	-423.03	329.68	40° 46' 53.372 N	103° 51' 37.109 W	1,531,741.97	3,454,075.38
5,477.00	39.11	92.04	5,390.55	-423.47	358.68	40° 46' 53.363 N	103° 51' 36.732 W	1,531,741.53	3,454,104.38
5,525.00	42.80	92.35	5,426.79	-424.68	390.12	40° 46' 53.345 N	103° 51' 36.324 W	1,531,740.32	3,454,135.81
5,572.00	45.74	90.94	5,460.45	-425.61	422.91	40° 46' 53.330 N	103° 51' 35.898 W	1,531,739.39	3,454,168.60
5,619.00	49.93	88.62	5,491.99	-425.45	457.73	40° 46' 53.325 N	103° 51' 35.445 W	1,531,739.55	3,454,203.43
5,666.00	55.86	88.36	5,520.33	-424.46	495.19	40° 46' 53.328 N	103° 51' 34.958 W	1,531,740.54	3,454,240.88
5,714.00	61.90	89.91	5,545.13	-423.86	536.25	40° 46' 53.326 N	103° 51' 34.424 W	1,531,741.14	3,454,281.95
5,761.00	63.91	91.60	5,566.54	-424.42	578.09	40° 46' 53.313 N	103° 51' 33.881 W	1,531,740.58	3,454,323.78
5,809.00	69.25	89.26	5,585.61	-424.73	622.11	40° 46' 53.302 N	103° 51' 33.309 W	1,531,740.27	3,454,367.81
5,856.00	74.31	87.29	5,600.30	-423.38	666.72	40° 46' 53.307 N	103° 51' 32.728 W	1,531,741.62	3,454,412.41
5,904.00	75.73	86.37	5,612.71	-420.81	713.01	40° 46' 53.324 N	103° 51' 32.126 W	1,531,744.19	3,454,458.71
5,951.00	77.64	88.08	5,623.53	-418.60	758.69	40° 46' 53.338 N	103° 51' 31.532 W	1,531,746.40	3,454,504.39
5,994.00	83.46	90.80	5,630.59	-418.19	801.08	40° 46' 53.334 N	103° 51' 30.981 W	1,531,746.81	3,454,546.78
6,085.00	87.38	89.60	5,637.86	-418.51	891.77	40° 46' 53.314 N	103° 51' 29.802 W	1,531,746.49	3,454,637.47
6,177.00	87.87	90.87	5,641.67	-418.89	983.69	40° 46' 53.294 N	103° 51' 28.608 W	1,531,746.12	3,454,729.39
6,270.00	87.26	90.20	5,645.62	-419.75	1,076.60	40° 46' 53.268 N	103° 51' 27.400 W	1,531,745.25	3,454,822.30
6,363.00	89.82	89.94	5,647.99	-419.87	1,169.56	40° 46' 53.250 N	103° 51' 26.192 W	1,531,745.13	3,454,915.26
6,455.00	91.88	89.75	5,646.63	-419.62	1,261.55	40° 46' 53.236 N	103° 51' 24.997 W	1,531,745.38	3,455,007.25
6,550.00	91.51	88.75	5,643.82	-418.37	1,356.50	40° 46' 53.230 N	103° 51' 23.762 W	1,531,746.63	3,455,102.19
6,645.00	90.55	88.69	5,642.11	-416.25	1,451.46	40° 46' 53.234 N	103° 51' 22.528 W	1,531,748.75	3,455,197.15
6,739.00	90.40	88.34	5,641.33	-413.82	1,545.42	40° 46' 53.241 N	103° 51' 21.306 W	1,531,751.18	3,455,291.12
6,834.00	88.86	88.00	5,641.94	-410.78	1,640.37	40° 46' 53.253 N	103° 51' 20.071 W	1,531,754.22	3,455,386.07
6,929.00	88.27	87.82	5,644.32	-407.32	1,735.28	40° 46' 53.270 N	103° 51' 18.837 W	1,531,757.68	3,455,480.97
7,024.00	88.52	87.20	5,646.98	-403.19	1,830.15	40° 46' 53.294 N	103° 51' 17.603 W	1,531,761.81	3,455,575.85
7,119.00	87.78	88.96	5,650.05	-400.01	1,925.04	40° 46' 53.308 N	103° 51' 16.369 W	1,531,764.99	3,455,670.74
7,213.00	90.65	90.24	5,651.34	-399.36	2,019.02	40° 46' 53.297 N	103° 51' 15.147 W	1,531,765.64	3,455,764.72
7,308.00	91.91	90.72	5,649.21	-400.15	2,113.99	40° 46' 53.272 N	103° 51' 13.913 W	1,531,764.85	3,455,859.69
7,403.00	92.90	90.07	5,645.23	-400.81	2,208.90	40° 46' 53.248 N	103° 51' 12.680 W	1,531,764.19	3,455,954.60
7,498.00	92.22	89.64	5,640.98	-400.57	2,303.81	40° 46' 53.233 N	103° 51' 11.446 W	1,531,764.43	3,456,049.50
7,592.00	90.77	89.79	5,638.53	-400.10	2,397.77	40° 46' 53.220 N	103° 51' 10.225 W	1,531,764.90	3,456,143.47
7,687.00	91.11	90.06	5,636.97	-399.97	2,492.76	40° 46' 53.204 N	103° 51' 8.990 W	1,531,765.03	3,456,238.45

## Design Report for Rohn State LD03-66-1HN - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
7,781.00	87.81	89.14	5,637.86	-399.32	2,586.74	40° 46' 53.193 N	103° 51' 7.769 W	1,531,765.68	3,456,332.43
7,876.00	88.00	89.17	5,641.33	-397.92	2,681.66	40° 46' 53.190 N	103° 51' 6.534 W	1,531,767.08	3,456,427.36
7,971.00	90.06	89.34	5,642.94	-396.68	2,776.64	40° 46' 53.184 N	103° 51' 5.300 W	1,531,768.32	3,456,522.33
8,065.00	89.38	88.79	5,643.40	-395.15	2,870.62	40° 46' 53.182 N	103° 51' 4.078 W	1,531,769.85	3,456,616.32
8,160.00	89.78	88.04	5,644.10	-392.52	2,965.58	40° 46' 53.191 N	103° 51' 2.843 W	1,531,772.48	3,456,711.28
8,255.00	89.72	91.05	5,644.51	-391.77	3,060.57	40° 46' 53.181 N	103° 51' 1.608 W	1,531,773.23	3,456,806.26
8,350.00	90.86	91.25	5,644.03	-393.67	3,155.54	40° 46' 53.144 N	103° 51' 0.374 W	1,531,771.33	3,456,901.24
8,445.00	90.99	89.72	5,642.50	-394.48	3,250.53	40° 46' 53.119 N	103° 50' 59.140 W	1,531,770.52	3,456,996.22
8,540.00	90.77	88.99	5,641.04	-393.41	3,345.51	40° 46' 53.112 N	103° 50' 57.905 W	1,531,771.59	3,457,091.20
8,635.00	89.88	89.68	5,640.50	-392.31	3,440.50	40° 46' 53.105 N	103° 50' 56.671 W	1,531,772.69	3,457,186.20
8,730.00	88.86	90.01	5,641.54	-392.05	3,535.49	40° 46' 53.091 N	103° 50' 55.436 W	1,531,772.95	3,457,281.19
8,825.00	89.97	90.62	5,642.51	-392.57	3,630.48	40° 46' 53.068 N	103° 50' 54.202 W	1,531,772.43	3,457,376.18
8,920.00	91.36	90.74	5,641.41	-393.70	3,725.47	40° 46' 53.039 N	103° 50' 52.967 W	1,531,771.30	3,457,471.16
9,015.00	89.45	89.09	5,640.74	-393.56	3,820.46	40° 46' 53.023 N	103° 50' 51.733 W	1,531,771.44	3,457,566.15
9,109.00	89.82	89.49	5,641.34	-392.39	3,914.45	40° 46' 53.017 N	103° 50' 50.511 W	1,531,772.61	3,457,660.14
9,203.00	88.89	88.46	5,642.40	-390.71	4,008.42	40° 46' 53.017 N	103° 50' 49.289 W	1,531,774.29	3,457,754.12
9,298.00	89.32	88.31	5,643.88	-388.04	4,103.38	40° 46' 53.026 N	103° 50' 48.054 W	1,531,776.97	3,457,849.07
9,393.00	88.18	88.24	5,645.95	-385.18	4,198.31	40° 46' 53.036 N	103° 50' 46.820 W	1,531,779.82	3,457,944.00
9,488.00	87.90	87.71	5,649.20	-381.82	4,293.19	40° 46' 53.052 N	103° 50' 45.586 W	1,531,783.18	3,458,038.89
9,583.00	90.25	89.43	5,650.74	-379.45	4,388.14	40° 46' 53.058 N	103° 50' 44.351 W	1,531,785.55	3,458,133.84
9,678.00	91.51	89.72	5,649.28	-378.75	4,483.12	40° 46' 53.047 N	103° 50' 43.117 W	1,531,786.25	3,458,228.82
9,772.00	90.43	88.71	5,647.68	-377.46	4,577.10	40° 46' 53.043 N	103° 50' 41.895 W	1,531,787.54	3,458,322.80
9,867.00	90.71	88.46	5,646.74	-375.11	4,672.07	40° 46' 53.049 N	103° 50' 40.660 W	1,531,789.89	3,458,417.76
9,962.00	90.99	88.28	5,645.33	-372.41	4,767.02	40° 46' 53.058 N	103° 50' 39.425 W	1,531,792.59	3,458,512.71
10,057.00	92.59	88.26	5,642.36	-369.55	4,861.92	40° 46' 53.068 N	103° 50' 38.191 W	1,531,795.46	3,458,607.62
10,115.00	93.79	88.99	5,639.14	-368.16	4,919.82	40° 46' 53.072 N	103° 50' 37.438 W	1,531,796.85	3,458,665.51
10,179.00	93.79	88.99	5,634.91	-367.03	4,983.67	40° 46' 53.071 N	103° 50' 36.608 W	1,531,797.97	3,458,729.36

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
350.00	350.00	0.52	0.32	First Gyro Survey
1,200.00	1,199.99	3.10	-0.58	Last Gyro Survey - Tie on
1,273.00	1,272.99	3.57	-1.22	First MWD Survey
10,115.00	5,639.14	-368.16	4,919.82	Last MWD Survey
10,179.00	5,634.91	-367.03	4,983.67	Straight Projection to TD

## Design Report for Rohn State LD03-66-1HN - Actual Surveys

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Rohn State LD03-66-1HN BHL	94.33	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
350.00	1,200.00	Surface Surveys	Flexi-Shot
1,273.00	5,994.00	Intermediate Surveys	MWD
6,085.00	10,179.00	Production Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,210.00	1,209.99	9 5/8"	9-5/8	13-3/4
6,036.00	5,634.72	7"	7	8-3/4

Design Targets

Shape	Target Name	TVD (usft)	Northing (usft)	Easting (usft)	+N/-S usft	+E/-W usft	Created	Updated
Polygon	Rohn State LD03-65HN_4	-2.00	1,532,124.95	3,453,746.44	-40.05	0.74	8/5/2014	8/12/2014
Polygon	Rohn State LD03-65HN_S	-2.00	1,532,124.95	3,453,746.44	-40.05	0.74	8/5/2014	8/12/2014
Polygon	Rohn State LD03-65HN_4	-2.00	1,532,124.95	3,453,746.44	-40.05	0.74	8/5/2014	8/12/2014

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Design Report for Rohn State LD03-66-1HN - Actual Surveys

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Directional Difficulty Index

Average Dogleg over Survey:	1.88 °/100usft	Maximum Dogleg over Survey:	14.90 °/100usft at 5,994.00 usft
Net Tortosity applicable to Plans:	0.75 °/100usft	Directional Difficulty Index:	6.260

Audit Info

**North Reference Sheet for Sec. 4-T9N-R58W (Rohn State 4 PAD) - Rohn State LD03-66-1HN - Plan B**

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.

Vertical Depths are relative to RKB=24 @ 4729.00usft (H&P 273). Northing and Easting are relative to Rohn State LD03-66-1HN

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is 105° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:40° 47' 0.000 N°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99999989

Grid Coordinates of Well: 1,532,165.00 usft N, 3,453,745.70 usft E

Geographical Coordinates of Well: 40° 46' 57.61" N, 103° 51' 41.29" W

Grid Convergence at Surface is: 1.06°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,179.00usft

the Bottom Hole Displacement is 4,997.16usft in the Direction of 94.21° (Grid).

Magnetic Convergence at surface is: -6.99° (12 August 2014, , BGGM2014)

