

Project: Weld County, CO (NAD 83)
 Site: Sec. 2-T5N-R64W (Wolfpack 2 South PAD)
 Well: Wolfpack B02-63-1HN
 Wellbore: Plan A
 Design: Final Surveys

Noble Energy



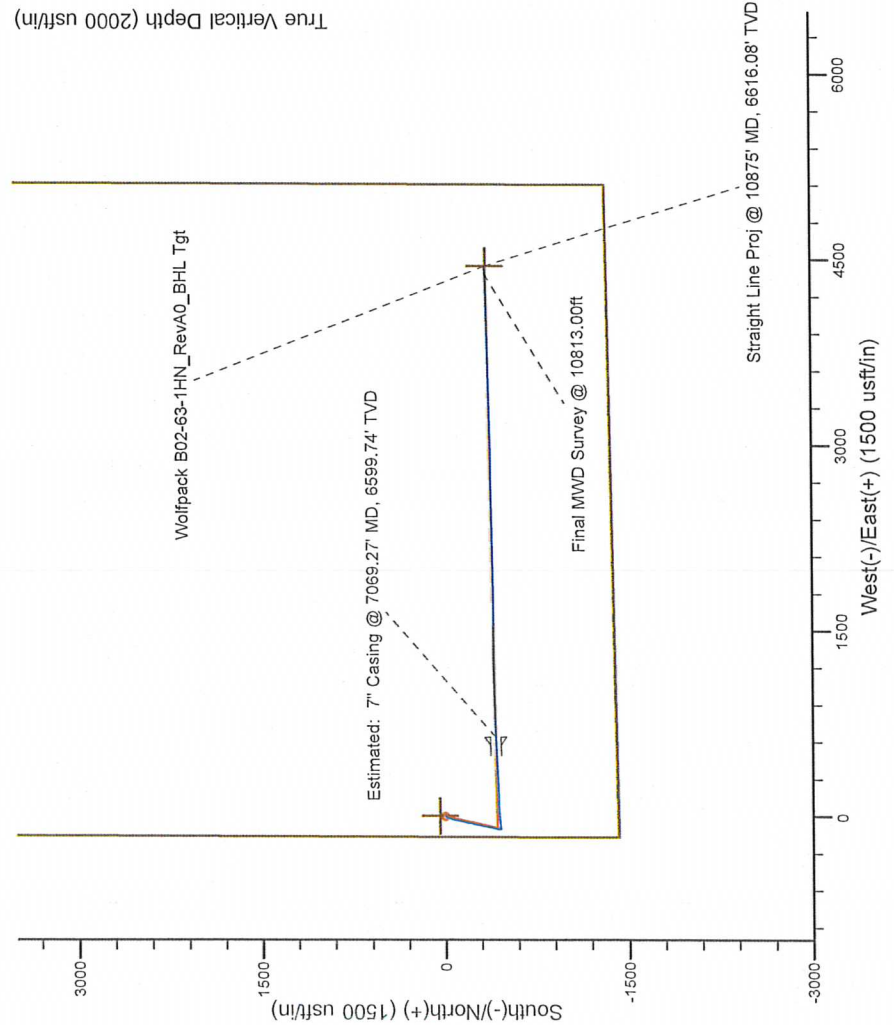
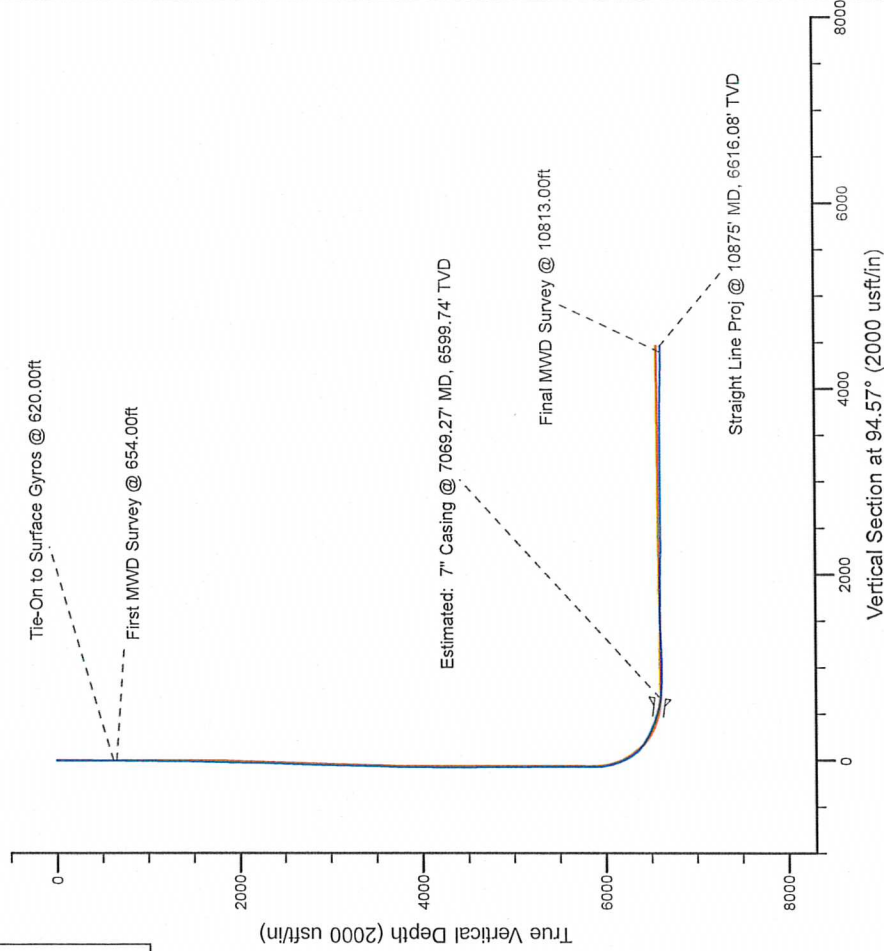
Platted SHL: 1418' FSL, 169' FWL
 Platted Lat/Long: 40.42497° N, 104.52636° W
 Location: Sec. 2-T5N-R64W

7" Casing: ~988.42' FSL, ~808.57' FWL
 Lat/Long: 40° 25' 25.701" N, 104° 31' 26.673" W
 State Planes - CO Northern: 1,398,727.95' N, 3,271,704.03' E
 Location: Sec. 2-T5N-R64W

BHL: ~996.44' FSL, ~661.39' FEL
 Lat/Long: 40° 25' 25.991" N, 104° 30' 37.489" W
 State Planes - CO Northern: 1,398,799.44' N, 3,275,507.20' E
 Location: Sec. 2-T5N-R64W

LEGEND

- Wolfpack B02-63-1HN, Plan A, Rev A0 Proposal V0
- Final Surveys



WELL DETAILS: Wolfpack B02-63-1HN

Ground Level: 4615.00
 KB=16 @ 4631.00usft (Precision 829)

Created By: Fred Hartmann
 Created On: 10/29/2013

Noble Energy

Weld County, CO (NAD 83)

Sec. 2-T5N-R64W (Wolfpack 2 South PAD)

Wolfpack B02-63-1HN - A3

Design: Final Surveys

Sperry Drilling Services

Final Survey Report

29 October, 2013

Well Coordinates: 1,399,145.05 N, 3,271,063.50 E (40° 25' 29.89" N, 104° 31' 34.90" W)

Ground Level: 4,615.00 usft

Local Coordinate Origin:

Centered on Well Wolfpack B02-63-1HN - Slot A3

Viewing Datum:

KB=16' @ 4631.00usft (Precision 829)

TVDs to System:

N

North Reference:

Grid

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

HALLIBURTON

Design Report for Wolfpack B02-63-1HN - Final 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
320.00	0.20	339.80	320.00	0.52	-0.19	-0.23	0.06
620.00	0.00	110.40	620.00	1.02	-0.37	-0.45	0.07
Tie-On to Surface Gyros @ 620.00ft							
654.00	0.21	136.42	654.00	0.97	-0.33	-0.41	0.62
First MWD Survey @ 654.00ft							
743.00	0.43	189.16	743.00	0.52	-0.27	-0.31	0.39
833.00	1.30	218.13	832.99	-0.61	-0.96	-0.90	1.05
922.00	1.23	216.78	921.96	-2.17	-2.15	-1.97	0.09
1,101.00	1.49	234.81	1,100.92	-5.05	-5.20	-4.78	0.28
1,292.00	0.74	268.50	1,291.88	-6.52	-8.47	-7.92	0.51
1,450.00	1.00	219.85	1,449.86	-7.60	-10.37	-9.73	0.48
1,544.00	2.47	198.97	1,543.82	-10.15	-11.55	-10.71	1.68
1,638.00	3.38	186.50	1,637.70	-14.82	-12.53	-11.31	1.18
1,732.00	4.74	196.82	1,731.46	-21.29	-13.96	-12.22	1.64
1,826.00	6.37	198.16	1,825.01	-29.96	-16.71	-14.27	1.74
1,921.00	7.65	199.66	1,919.30	-40.92	-20.48	-17.16	1.36
2,015.00	9.47	193.84	2,012.25	-54.32	-24.44	-20.04	2.14
2,109.00	11.33	193.29	2,104.70	-70.82	-28.41	-22.68	1.98
2,203.00	13.13	189.11	2,196.57	-90.35	-32.22	-24.93	2.13
2,279.00	12.40	186.77	2,270.69	-106.98	-34.55	-25.93	1.18
2,369.00	12.71	195.88	2,358.55	-126.10	-38.40	-28.24	2.22
2,459.00	12.39	196.00	2,446.40	-144.90	-43.77	-32.10	0.36
2,548.00	12.97	191.66	2,533.23	-163.86	-48.42	-35.22	1.25
2,638.00	13.60	190.39	2,620.82	-184.16	-52.37	-37.55	0.77
2,728.00	14.53	191.85	2,708.12	-205.62	-56.60	-40.05	1.11
2,817.00	12.12	196.89	2,794.72	-225.49	-61.61	-43.46	3.00
2,907.00	13.07	189.63	2,882.56	-244.57	-66.05	-46.38	2.05
2,996.00	13.06	191.34	2,969.26	-264.35	-69.71	-48.45	0.43
3,086.00	10.95	191.86	3,057.28	-282.68	-73.47	-50.74	2.35
3,176.00	9.06	192.73	3,145.91	-297.96	-76.79	-52.83	2.11
3,265.00	9.48	189.76	3,233.75	-312.02	-79.58	-54.49	0.72
3,355.00	9.81	188.64	3,322.48	-326.91	-81.99	-55.70	0.42
3,445.00	10.70	194.37	3,411.04	-342.58	-85.21	-57.67	1.50
3,535.00	12.25	193.26	3,499.24	-359.97	-89.47	-60.54	1.74
3,579.00	12.98	192.71	3,542.18	-369.33	-91.63	-61.94	1.68
3,669.00	11.94	193.29	3,630.05	-388.25	-96.00	-64.79	1.16
3,759.00	9.98	191.85	3,718.41	-404.95	-99.74	-67.19	2.20
3,848.00	7.55	189.92	3,806.36	-418.26	-102.33	-68.71	2.75
3,938.00	5.02	199.27	3,895.82	-427.80	-104.65	-70.26	3.02
4,027.00	3.32	197.00	3,984.58	-433.94	-106.69	-71.81	1.92
4,117.00	1.42	185.59	4,074.50	-437.54	-107.56	-72.39	2.16
4,207.00	1.98	190.92	4,164.46	-440.18	-107.96	-72.58	0.65
4,296.00	0.54	174.43	4,253.43	-442.11	-108.21	-72.68	1.65
4,565.00	0.80	105.21	4,522.42	-443.86	-106.28	-70.61	0.29
4,834.00	0.46	67.76	4,791.40	-443.95	-103.46	-67.80	0.19
5,103.00	0.28	117.08	5,060.40	-443.84	-101.88	-66.23	0.13
5,372.00	2.14	185.54	5,329.33	-449.14	-101.78	-65.70	0.76
5,641.00	0.55	308.85	5,598.27	-453.32	-103.27	-66.86	0.92
5,821.00	0.36	268.64	5,778.27	-452.80	-104.51	-68.13	0.20

Design Report for Wolfpack B02-63-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,910.00	0.71	115.17	5,867.27	-453.04	-104.29	-67.90	1.17
5,955.00	3.62	88.03	5,912.23	-453.11	-102.62	-66.22	6.68
6,000.00	6.79	82.73	5,957.04	-452.72	-98.56	-62.21	7.12
6,045.00	9.64	83.70	6,001.57	-451.97	-92.17	-55.90	6.34
6,090.00	12.48	86.95	6,045.73	-451.30	-83.57	-47.38	6.46
6,134.00	15.70	85.62	6,088.40	-450.59	-72.88	-36.78	7.35
6,179.00	19.23	84.11	6,131.32	-449.37	-59.44	-23.48	7.91
6,224.00	22.66	85.09	6,173.34	-447.86	-43.42	-7.64	7.66
6,269.00	26.08	85.04	6,214.33	-446.27	-24.93	10.68	7.60
6,314.00	30.21	85.45	6,254.00	-444.51	-3.78	31.62	9.19
6,359.00	34.87	84.74	6,291.92	-442.43	20.33	55.48	10.39
6,404.00	39.74	85.49	6,327.71	-440.12	47.50	82.38	10.87
6,448.00	44.66	88.57	6,360.30	-438.63	77.00	111.67	12.13
6,493.00	50.22	88.04	6,390.72	-437.64	110.12	144.60	12.39
6,538.00	55.78	89.34	6,417.79	-436.83	146.03	180.34	12.57
6,583.00	59.62	87.76	6,441.84	-435.86	184.05	218.16	9.03
6,628.00	63.24	87.19	6,463.35	-434.12	223.52	257.37	8.12
6,672.00	65.20	87.07	6,482.49	-432.13	263.09	296.65	4.46
6,717.00	65.93	86.67	6,501.10	-429.90	304.00	337.25	1.81
6,763.00	68.22	88.32	6,519.02	-428.05	346.32	379.29	5.97
6,808.00	69.35	86.93	6,535.30	-426.31	388.23	420.93	3.82
6,852.00	71.06	87.29	6,550.21	-424.22	429.58	461.98	3.96
6,897.00	73.67	87.71	6,563.84	-422.35	472.42	504.54	5.87
6,942.00	75.24	88.23	6,575.90	-420.82	515.74	547.60	3.66
6,987.00	76.98	88.03	6,586.70	-419.39	559.40	591.01	3.89
7,030.00	81.89	88.59	6,594.58	-418.15	601.64	633.02	11.49
7,069.27	83.02	88.37	6,599.74	-417.12	640.56	671.73	2.93
Estimated: 7" Casing @ 7069.27' MD, 6599.74' TVD							
7,253.00	88.31	87.38	6,613.62	-410.33	823.57	853.62	2.93
7,343.00	90.28	86.96	6,614.73	-405.89	913.45	942.86	2.24
7,433.00	90.25	88.18	6,614.31	-402.07	1,003.36	1,032.19	1.36
7,522.00	91.26	89.49	6,613.14	-400.26	1,092.33	1,120.73	1.86
7,612.00	93.05	89.18	6,609.75	-399.22	1,182.26	1,210.29	2.02
7,702.00	92.83	88.96	6,605.14	-397.76	1,272.13	1,299.76	0.35
7,791.00	91.97	89.84	6,601.41	-396.83	1,361.05	1,388.32	1.38
7,881.00	91.82	91.20	6,598.43	-397.64	1,450.99	1,478.04	1.52
7,970.00	89.54	90.60	6,597.38	-399.04	1,539.97	1,566.84	2.65
8,060.00	89.35	90.05	6,598.25	-399.55	1,629.96	1,656.59	0.65
8,150.00	90.65	90.25	6,598.25	-399.79	1,719.96	1,746.32	1.46
8,239.00	87.72	90.30	6,599.52	-400.21	1,808.94	1,835.06	3.29
8,329.00	89.20	89.59	6,601.93	-400.13	1,898.90	1,924.73	1.82
8,419.00	88.24	89.17	6,603.94	-399.15	1,988.87	2,014.34	1.16
8,508.00	89.11	88.93	6,606.00	-397.68	2,077.84	2,102.90	1.01
8,598.00	88.64	88.34	6,607.77	-395.54	2,167.79	2,192.40	0.84
8,688.00	89.66	87.63	6,609.10	-392.37	2,257.73	2,281.80	1.38
8,777.00	89.14	88.70	6,610.04	-389.52	2,346.68	2,370.23	1.34
8,867.00	90.06	89.79	6,610.66	-388.34	2,436.66	2,459.84	1.58
8,957.00	90.68	89.88	6,610.08	-388.08	2,526.66	2,549.53	0.70
9,046.00	89.26	89.54	6,610.13	-387.63	2,615.66	2,638.21	1.64
9,136.00	90.22	89.15	6,610.54	-386.60	2,705.65	2,727.84	1.15
9,225.00	91.23	88.78	6,609.41	-384.99	2,794.63	2,816.40	1.21

Design Report for Wolfpack B02-63-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,315.00	89.75	89.47	6,608.64	-383.62	2,884.61	2,905.99	1.81
9,405.00	90.28	89.58	6,608.62	-382.87	2,974.61	2,995.64	0.60
9,494.00	91.02	88.98	6,607.61	-381.75	3,063.59	3,084.26	1.07
9,584.00	90.09	89.34	6,606.74	-380.43	3,153.58	3,173.85	1.11
9,673.00	89.48	88.64	6,607.07	-378.86	3,242.56	3,262.43	1.04
9,763.00	89.57	87.94	6,607.82	-376.18	3,332.52	3,351.89	0.78
9,852.00	89.94	88.35	6,608.20	-373.30	3,421.47	3,440.33	0.62
9,942.00	90.12	88.61	6,608.15	-370.91	3,511.44	3,529.82	0.35
10,032.00	90.77	88.09	6,607.45	-368.32	3,601.40	3,619.29	0.92
10,121.00	89.48	89.34	6,607.26	-366.32	3,690.37	3,707.82	2.02
10,211.00	89.51	89.27	6,608.05	-365.23	3,780.36	3,797.44	0.08
10,301.00	90.59	89.08	6,607.97	-363.93	3,870.35	3,887.04	1.22
10,390.00	89.42	87.23	6,607.97	-361.07	3,959.30	3,975.48	2.46
10,480.00	87.97	87.98	6,610.01	-357.31	4,049.19	4,064.79	1.81
10,570.00	87.87	89.63	6,613.28	-355.43	4,139.11	4,154.27	1.84
10,659.00	88.98	89.09	6,615.73	-354.44	4,228.07	4,242.87	1.39
10,749.00	89.88	87.35	6,616.62	-351.64	4,318.02	4,332.31	2.18
10,813.00	90.37	87.23	6,616.48	-348.62	4,381.95	4,395.79	0.79
Final MWD Survey @ 10813.00ft							
10,875.00	90.37	87.23	6,616.08	-345.62	4,443.87	4,457.28	0.00
Straight Line Proj @ 10875' MD, 6616.08' TVD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
620.00	620.00	1.02	-0.37	Tie-On to Surface Gyros @ 620.00ft
654.00	654.00	0.97	-0.33	First MWD Survey @ 654.00ft
10,813.00	6,616.48	-348.62	4,381.95	Final MWD Survey @ 10813.00ft
10,875.00	6,616.08	-345.62	4,443.87	Straight Line Proj @ 10875' MD, 6616.08' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	+N/-S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Wolfpack B02-63-1HN_RevA0_BHL Tgt	94.57	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
320.00	620.00	Surface Gyros	Flexi-Shot
654.00	7,163.00	MWD Surveys - Vert/Build	MWD
7,253.00	10,813.00	MWD Survey - Lateral	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
7,069.27	6,599.74	Estimated: 7" Casing @ 7069.27' MD, 6599.74' TVD	7	8-3/4

Design Report for Wolfpack B02-63-1HN - Final 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
Wolfpack B02-64-1HN	0.00	0.00	-1.00	43.74	2.30	1,399,188.79	3,271,065.80	40° 25' 30.324 N	104° 31' 34.860 W
- actual wellpath misses target center by 43.82usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-1.00	-1,003.00	-633.00	1,398,185.83	3,270,432.83	
Point 2				-1.00	-1,089.00	-4,917.00	1,398,099.83	3,266,148.99	
Point 3				-1.00	3,266.00	-4,982.00	1,402,454.67	3,266,083.99	
Point 4				-1.00	3,375.00	-619.00	1,402,563.66	3,270,446.83	
Point 5				-1.00	-1,003.00	-633.00	1,398,185.83	3,270,432.83	
Wolfpack B02-64-1HN	0.00	0.00	-1.00	43.74	2.30	1,399,188.79	3,271,065.80	40° 25' 30.324 N	104° 31' 34.860 W
- actual wellpath misses target center by 43.82usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-1.00	-1,463.00	-173.00	1,397,725.85	3,270,892.81	
Point 2				-1.00	3,835.00	-159.00	1,403,023.64	3,270,906.81	
Point 3				-1.00	3,908.00	5,116.00	1,403,096.64	3,276,181.60	
Point 4				-1.00	-1,375.00	5,100.00	1,397,813.85	3,276,165.61	
Point 5				-1.00	-1,463.00	-173.00	1,397,725.85	3,270,892.81	
Wolfpack B02-64-1HN	0.00	0.00	-1.00	43.74	2.30	1,399,188.79	3,271,065.80	40° 25' 30.324 N	104° 31' 34.860 W
- actual wellpath misses target center by 43.82usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-1.00	-1,463.00	-173.00	1,397,725.85	3,270,892.81	
Point 2				-1.00	-1,549.00	-5,377.00	1,397,639.85	3,265,689.01	
Point 3				-1.00	3,726.00	-5,442.00	1,402,914.65	3,265,624.01	
Point 4				-1.00	3,835.00	-159.00	1,403,023.64	3,270,906.81	
Point 5				-1.00	-1,463.00	-173.00	1,397,725.85	3,270,892.81	
Wolfpack B02-64-1HN	0.00	0.00	-1.00	43.74	2.30	1,399,188.79	3,271,065.80	40° 25' 30.324 N	104° 31' 34.860 W
- actual wellpath misses target center by 43.82usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-1.00	-1,003.00	287.00	1,398,185.83	3,271,352.79	
Point 2				-1.00	3,375.00	301.00	1,402,563.66	3,271,366.79	
Point 3				-1.00	3,448.00	4,656.00	1,402,636.66	3,275,721.62	
Point 4				-1.00	-915.00	4,640.00	1,398,273.83	3,275,705.62	
Point 5				-1.00	-1,003.00	287.00	1,398,185.83	3,271,352.79	
Wolfpack B02-63-1HN	0.00	0.00	6,573.31	-355.17	4,447.80	1,398,789.89	3,275,511.13	40° 25' 25.896 N	104° 30' 37.440 W
- actual wellpath misses target center by 44.00usft at 10875.00usft MD (6616.08 TVD, -345.62 N, 4443.87 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.81 °/100usft	Maximum Dogleg over Survey:	12.57 °/100usft at 6,538.00 usft
Net Tortousity applicable to Plans:	0.74 °/100usft	Directional Difficulty Index:	6.213

Audit Info

North Reference Sheet for Sec. 2-T5N-R64W (Wolfpack 2 South PAD) - Wolfpack B02-63-1HN

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

Vertical Depths are relative to KB=16' @ 4631.00usft (Precision 829). Northing and Easting are relative to Wolfpack B02-63-1HN - Slot A3

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: 0.99996146

Grid Coordinates of Well: 1,399,145.05 usft N, 3,271,063.50 usft E

Geographical Coordinates of Well: 40° 25' 29.89" N, 104° 31' 34.90" W

Grid Convergence at Surface is: 0.63°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,875.00usft the Bottom Hole Displacement is 4,457.29usft in the Direction of 94.45° (Grid).

Magnetic Convergence at surface is: -7.86° (29 June 2013, , BGGM2013)

