

Project: Weld County, CO (NAD 83)  
 Site: Sec. 2-T5N-R64W (Wolfpack 2 South PAD)  
 Well: Wolfpack B02-64-1HN  
 Wellbore: Plan A  
 Design: MWD Survey

# Noble Energy



Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Wells Ranch AE20-63-1HN well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them the distances from BHL to section lines from that final survey to allow Noble Energy to meet its requirements under Colorado law. These distances are generated by a mathematical algorithm based on rough data collected after the well is drilled. Halliburton considers it to be a rough estimate only and it is not to be relied upon in any application where accurate data is required. In consideration for Halliburton releasing this data to Noble Energy, Noble Energy agrees to release Halliburton from any consequences of it or anyone else relying on such data.

Platted SHL: 1463' FSL, 170' FWL  
 Platted Lat/Long: 40.42509 N, 104.52635 W  
 Location: Sec. 2-T5N-R64W

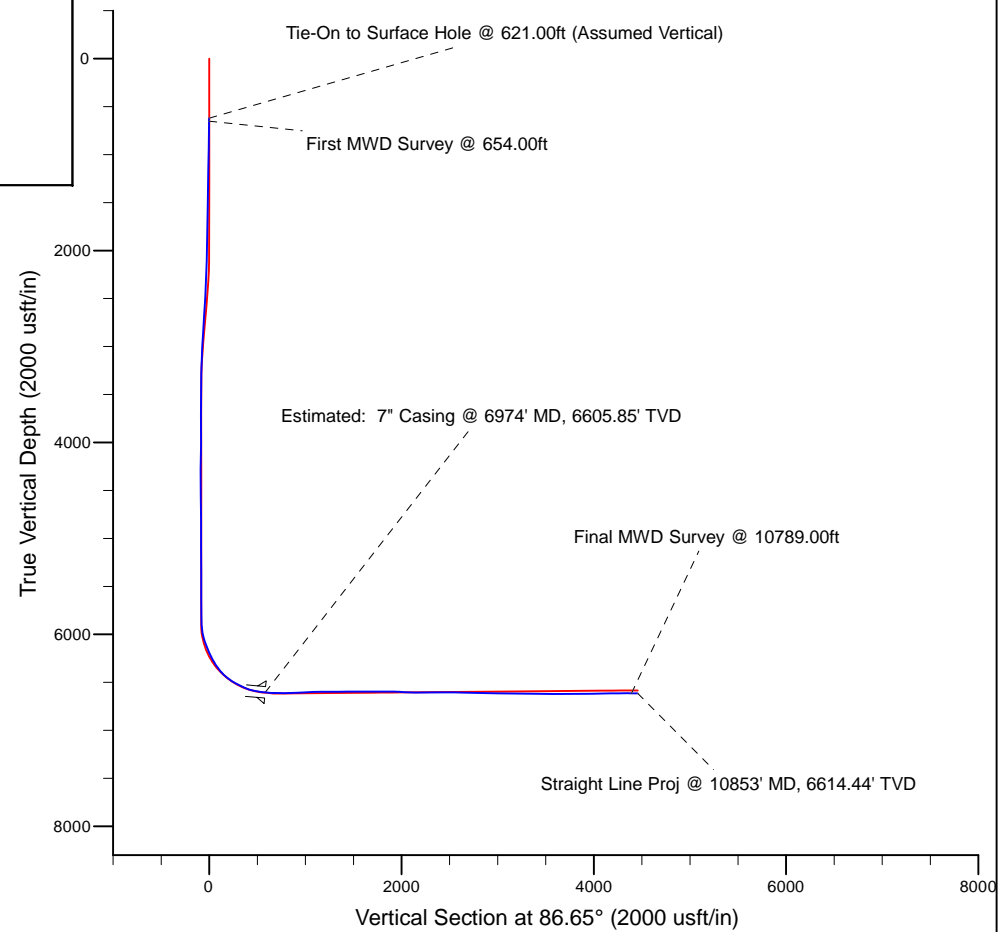
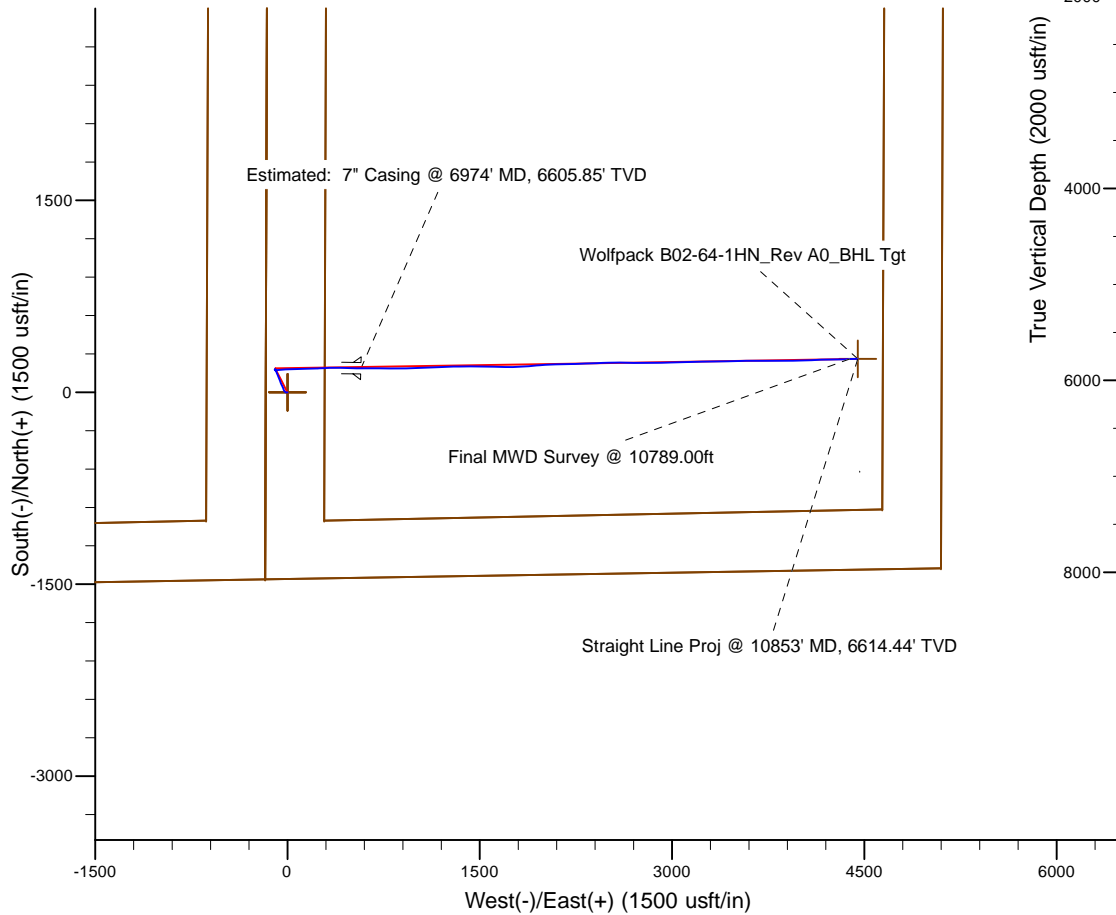
7" Casing: ~1638.5' FSL, ~741.87' FWL  
 Lat/Long: 40° 25' 32.122 N, 104° 31' 27.421 W  
 State Planes - CO Northern: 1,399,377.03' N, 3,271,639.05' E  
 Location: Sec. 2-T5N-R64W

BHL: ~1647.06' FSL, ~655.51' FEL  
 Lat/Long: 40° 25' 32.421 N, 104° 30' 37.294 W  
 State Planes - CO Northern: 1,399,450.28' N, 3,275,515.05' E  
 Location: Sec. 2-T5N-R64W

LEGEND

✗ Wolfpack B02-64-1HN, Plan A, RevA0 Proposal V0

☒ MWD Survey



WELL DETAILS: Wolfpack B02-64-1HN	
Ground Level: 4616.00 KB=16' @ 4632.00usft (Precision 829)	
Design: MWD Survey (Wolfpack B02-64-1HN/Plan A)	
Created By: Fred Hartmann	Date: 10/16/2013

# Noble Energy

Weld County, CO (NAD 83)

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

Wolfpack B02-64-1HN - A1

Design: MWD Survey

## Sperry Drilling Services

### Final Survey Report

21 October, 2013

Well Coordinates: 1,399,188.79 N, 3,271,065.80 E (40° 25' 30.32" N, 104° 31' 34.86" W)

Ground Level: 4,616.00 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 Wolfpack B02-64-1HN - Slot A1

KB=16' @ 4632.00usft (Precision 829)

N

Grid

API - US Survey Feet - Custom

**HALLIBURTON**

**Design Report for Wolfpack B02-64-1HN - MWD Survey**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
621.00	0.00	0.00	621.00	0.00	0.00	0.00	0.00
<b>Tie-On to Surface Hole @ 621.00ft (Assumed Vertical)</b>							
654.00	1.20	241.69	654.00	-0.16	-0.30	-0.31	3.64
<b>First MWD Survey @ 654.00ft</b>							
923.00	0.86	274.11	922.96	-1.36	-4.80	-4.87	0.25
1,164.00	1.00	274.02	1,163.92	-1.08	-8.70	-8.75	0.06
1,450.00	1.10	297.66	1,449.88	0.37	-13.62	-13.58	0.15
1,733.00	1.47	314.24	1,732.81	4.16	-18.63	-18.35	0.18
1,953.00	1.62	303.46	1,952.73	7.85	-23.24	-22.74	0.15
2,047.00	2.95	339.40	2,046.65	10.85	-25.20	-24.53	2.02
2,141.00	4.73	342.27	2,140.44	16.80	-27.23	-26.21	1.90
2,235.00	6.74	342.50	2,233.96	25.75	-30.07	-28.52	2.14
2,325.00	8.33	332.41	2,323.19	36.57	-34.68	-32.48	2.29
2,415.00	7.80	335.74	2,412.30	47.92	-40.21	-37.34	0.78
2,504.00	10.04	335.87	2,500.22	60.50	-45.86	-42.25	2.52
2,594.00	9.92	337.13	2,588.85	74.81	-52.08	-47.62	0.28
2,684.00	10.67	339.17	2,677.41	89.74	-58.06	-52.71	0.93
2,773.00	10.74	337.41	2,764.86	105.09	-64.18	-57.92	0.38
2,863.00	10.77	338.88	2,853.28	120.68	-70.43	-63.25	0.31
2,952.00	10.58	339.40	2,940.74	136.09	-76.30	-68.21	0.24
3,042.00	8.46	336.09	3,029.49	149.87	-81.89	-72.99	2.43
3,132.00	6.25	337.92	3,118.75	160.47	-86.41	-76.88	2.47
3,221.00	4.65	337.63	3,207.34	168.29	-89.61	-79.62	1.80
3,311.00	3.57	298.14	3,297.13	172.99	-93.47	-83.19	3.28
3,401.00	0.55	168.23	3,387.07	173.89	-95.85	-85.52	4.38
3,491.00	0.86	181.99	3,477.06	172.79	-95.79	-85.52	0.39
3,760.00	0.19	122.84	3,746.05	170.53	-95.48	-85.35	0.29
4,028.00	0.65	331.38	4,014.05	171.62	-95.84	-85.64	0.31
4,297.00	1.25	315.08	4,283.01	175.04	-98.64	-88.24	0.24
4,566.00	1.86	36.82	4,551.94	180.61	-98.10	-87.37	0.78
4,835.00	0.64	185.95	4,820.90	182.62	-95.63	-84.79	0.90
5,104.00	1.12	172.37	5,089.87	178.52	-95.44	-84.84	0.19
5,372.00	1.01	142.45	5,357.82	174.05	-93.65	-83.32	0.21
5,641.00	0.23	349.31	5,626.81	172.70	-92.31	-82.05	0.45
5,820.00	0.55	94.93	5,805.81	172.98	-91.52	-81.25	0.36
5,910.00	2.20	80.23	5,895.78	173.23	-89.39	-79.11	1.86
5,955.00	6.77	81.31	5,940.63	173.78	-85.91	-75.61	10.16
6,000.00	10.25	81.72	5,985.13	174.76	-79.33	-68.97	7.73
6,044.00	14.87	83.84	6,028.06	175.93	-69.83	-59.43	10.55
6,089.00	18.40	87.87	6,071.17	176.81	-56.99	-46.56	8.25
6,134.00	21.20	90.35	6,113.51	177.03	-41.75	-31.33	6.49
6,179.00	22.37	88.18	6,155.30	177.25	-25.06	-14.65	3.16
6,224.00	24.81	84.56	6,196.53	178.42	-7.10	3.35	6.30
6,269.00	26.51	85.85	6,237.09	180.04	12.32	22.82	3.98
6,313.00	28.68	88.08	6,276.09	181.10	32.67	43.20	5.46
6,358.00	33.08	88.02	6,314.70	181.89	55.75	66.28	9.78
6,403.00	36.68	87.31	6,351.61	182.94	81.45	92.01	8.05
6,448.00	39.33	88.54	6,387.07	183.94	109.14	119.71	6.12
6,493.00	45.79	88.67	6,420.19	184.68	139.55	150.11	14.36
6,538.00	51.89	88.67	6,449.80	185.46	173.41	183.95	13.56

**Design Report for Wolfpack B02-64-1HN - MWD Survey**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
6,582.00	55.51	88.92	6,475.84	186.21	208.85	219.38	8.24
6,627.00	58.83	87.79	6,500.23	187.30	246.64	257.17	7.67
6,672.00	62.29	87.15	6,522.35	189.03	285.79	296.35	7.79
6,717.00	64.99	87.21	6,542.33	191.02	326.06	336.67	6.00
6,762.00	66.72	89.88	6,560.74	192.05	367.10	377.70	6.64
6,806.00	72.25	91.84	6,576.15	191.42	408.29	418.78	13.24
6,851.00	77.67	90.86	6,587.83	190.40	451.72	462.07	12.23
6,896.00	80.52	90.47	6,596.34	189.89	495.90	506.15	6.39
6,935.00	83.25	91.67	6,601.84	189.17	534.49	544.64	7.63
6,974.00	84.94	91.04	6,605.85	188.25	573.27	583.30	4.63
<b>Estimated: 7" Casing @ 6974' MD, 6605.85' TVD</b>							
7,025.00	87.16	90.23	6,609.37	187.68	624.15	634.05	4.63
7,114.00	87.97	90.37	6,613.15	187.22	713.06	722.79	0.92
7,204.00	91.91	90.54	6,613.24	186.50	803.04	812.57	4.38
7,294.00	93.36	89.24	6,609.10	186.68	892.94	902.33	2.16
7,383.00	92.90	87.94	6,604.24	188.86	981.78	991.14	1.55
7,473.00	91.02	87.82	6,601.17	192.19	1,071.66	1,081.07	2.09
7,563.00	90.77	87.56	6,599.76	195.82	1,161.58	1,171.04	0.40
7,653.00	88.95	87.74	6,599.98	199.51	1,251.50	1,261.02	2.03
7,742.00	91.33	89.70	6,599.76	201.50	1,340.47	1,349.95	3.46
7,832.00	91.39	88.95	6,597.63	202.56	1,430.43	1,439.83	0.84
7,922.00	89.26	91.88	6,597.12	201.90	1,520.42	1,529.62	4.02
8,011.00	90.59	91.47	6,597.23	199.30	1,609.38	1,618.27	1.56
8,101.00	89.75	89.97	6,596.96	198.17	1,699.36	1,708.04	1.91
8,190.00	89.94	89.30	6,597.21	198.74	1,788.36	1,796.92	0.78
8,280.00	90.40	84.46	6,596.94	203.64	1,878.20	1,886.89	5.40
8,370.00	86.89	85.50	6,599.07	211.51	1,967.82	1,976.81	4.07
8,459.00	86.51	87.36	6,604.19	217.04	2,056.49	2,065.66	2.13
8,549.00	89.57	89.28	6,607.27	219.68	2,146.38	2,155.56	4.01
8,639.00	91.42	87.90	6,606.49	221.89	2,236.35	2,245.50	2.56
8,728.00	91.23	87.77	6,604.43	225.25	2,325.26	2,334.45	0.26
8,818.00	89.17	88.00	6,604.12	228.57	2,415.19	2,424.43	2.30
8,907.00	89.75	89.13	6,604.96	230.80	2,504.16	2,513.37	1.43
8,997.00	88.64	89.33	6,606.22	232.01	2,594.14	2,603.27	1.25
9,087.00	87.70	90.98	6,609.10	231.77	2,684.09	2,693.05	2.11
9,176.00	88.58	90.84	6,611.98	230.35	2,773.03	2,781.76	1.00
9,311.00	90.12	89.08	6,613.52	230.45	2,908.01	2,916.51	1.73
9,401.00	88.80	88.16	6,614.36	232.62	2,997.98	3,006.45	1.79
9,490.00	88.98	87.91	6,616.09	235.67	3,086.91	3,095.41	0.35
9,580.00	89.04	88.47	6,617.64	238.51	3,176.85	3,185.36	0.63
9,670.00	89.17	88.88	6,619.05	240.59	3,266.82	3,275.30	0.48
9,759.00	89.38	89.09	6,620.18	242.17	3,355.80	3,364.22	0.33
9,849.00	89.54	89.03	6,621.02	243.64	3,445.78	3,454.13	0.19
9,939.00	89.91	88.81	6,621.46	245.34	3,535.76	3,544.06	0.48
10,028.00	89.57	90.31	6,621.86	246.02	3,624.76	3,632.94	1.73
10,118.00	89.35	89.98	6,622.71	245.80	3,714.75	3,722.77	0.44
10,208.00	90.68	89.87	6,622.68	245.91	3,804.75	3,812.62	1.48
10,297.00	91.08	89.59	6,621.32	246.33	3,893.74	3,901.48	0.55
10,387.00	90.89	88.43	6,619.77	247.89	3,983.71	3,991.39	1.31
10,477.00	91.36	87.16	6,618.00	251.35	4,073.62	4,081.35	1.50
10,566.00	91.36	88.27	6,615.89	254.90	4,162.53	4,170.31	1.25

**Design Report for Wolfpack B02-64-1HN - MWD Survey**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,656.00	91.02	88.95	6,614.02	257.08	4,252.48	4,260.24	0.84
10,746.00	89.35	88.90	6,613.73	258.77	4,342.46	4,350.16	1.86
10,789.00	89.69	88.45	6,614.09	259.76	4,385.45	4,393.13	1.31
<b>Final MWD Survey @ 10789.00ft</b>							
10,853.00	89.69	88.45	6,614.44	261.49	4,449.42	4,457.10	0.00
<b>Straight Line Proj @ 10853' MD, 6614.44' TVD</b>							

**Design Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
621.00	621.00	0.00	0.00	Tie-On to Surface Hole @ 621.00ft (Assumed Vertical)
654.00	654.00	-0.16	-0.30	First MWD Survey @ 654.00ft
10,789.00	6,614.09	259.76	4,385.45	Final MWD Survey @ 10789.00ft
10,853.00	6,614.44	261.49	4,449.42	Straight Line Proj @ 10853' MD, 6614.44' TVD

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Wolfpack B02-64-1HN_Rev A0_BHL Tgt	86.65	Slot	0.00	0.00	0.00

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
621.00	6,935.00	Sperry MWD Surveys - Vert/Build	MWD
7,025.00	10,789.00	Sperry MWD Surveys - Lateral	MWD

**Casing Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,974.00	6,605.85	Estimated: 7" Casing @ 6974' MD, 6605.85' TVD	7	8-3/4



Design Report for Wolfpack B02-64-1HN - MWD Survey

Wellbore Targets

Table with columns: Target Name, Dip Angle, Dip Dir., TVD, +N/-S, +E/-W, Northing, Easting, Latitude, Longitude. Contains data for four wellbore target polygons with their respective points and coordinates.

Directional Difficulty Index

Summary table for Directional Difficulty Index with four rows: Average Dogleg over Survey, Net Tortosity applicable to Plans, Maximum Dogleg over Survey, and Directional Difficulty Index.

Audit Info

**North Reference Sheet for Sec. 2-T5N-R64W (Wolfpack 2 South PAD) - Wolfpack B02-64-1HN -**

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' @ 4632.00usft (Precision 829). Northing and Easting are relative to Wolfpack B02-64-1HN - Slot A1

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

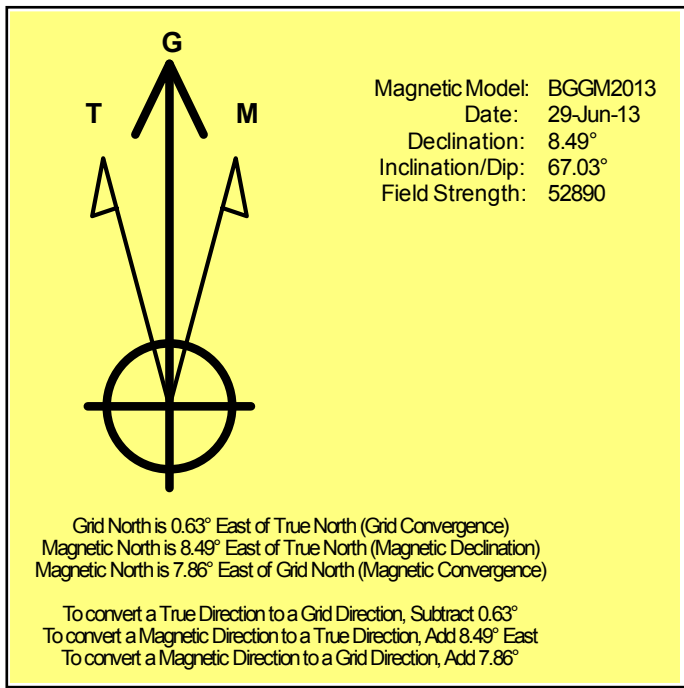
Grid Coordinates of Well: 1,399,188.79 usft N, 3,271,065.80 usft E

Geographical Coordinates of Well: 40° 25' 30.32" N, 104° 31' 34.86" W

Grid Convergence at Surface is: 0.63°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,853.00usft the Bottom Hole Displacement is 4,457.10usft in the Direction of 86.64° (Grid).

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



# Noble Energy

Weld County, CO (NAD 83)

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

Wolfpack B02-64-1HN - A1

Design: MWD Survey

## Sperry Drilling Services

### Geodetic Report

21 October, 2013

Well Coordinates: 1,399,188.79 N, 3,271,065.80 E (40° 25' 30.32" N, 104° 31' 34.86" W)

Ground Level: 4,616.00 usft

Local Coordinate Origin:

Centered on Well Wolfpack B02-64-1HN - Slot A1

Viewing Datum:

KB=16' @ 4632.00usft (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 B02-64-1HN - MWD Survey

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)
621.00	0.00	0.00	621.00	0.00	0.00	40° 25' 30.324 N	104° 31' 34.860 W	1,399,188.79	3,271,065.80
654.00	1.20	241.69	654.00	-0.16	-0.30	40° 25' 30.322 N	104° 31' 34.864 W	1,399,188.63	3,271,065.50
923.00	0.86	274.11	922.96	-1.36	-4.80	40° 25' 30.311 N	104° 31' 34.922 W	1,399,187.44	3,271,061.00
1,164.00	1.00	274.02	1,163.92	-1.08	-8.70	40° 25' 30.314 N	104° 31' 34.973 W	1,399,187.71	3,271,057.10
1,450.00	1.10	297.66	1,449.88	0.37	-13.62	40° 25' 30.329 N	104° 31' 35.036 W	1,399,189.16	3,271,052.18
1,733.00	1.47	314.24	1,732.81	4.16	-18.63	40° 25' 30.367 N	104° 31' 35.100 W	1,399,192.96	3,271,047.18
1,953.00	1.62	303.46	1,952.73	7.85	-23.24	40° 25' 30.404 N	104° 31' 35.159 W	1,399,196.64	3,271,042.56
2,047.00	2.95	339.40	2,046.65	10.85	-25.20	40° 25' 30.434 N	104° 31' 35.184 W	1,399,199.64	3,271,040.60
2,141.00	4.73	342.27	2,140.44	16.80	-27.23	40° 25' 30.493 N	104° 31' 35.210 W	1,399,205.59	3,271,038.57
2,235.00	6.74	342.50	2,233.96	25.75	-30.07	40° 25' 30.582 N	104° 31' 35.245 W	1,399,214.55	3,271,035.73
2,325.00	8.33	332.41	2,323.19	36.57	-34.68	40° 25' 30.689 N	104° 31' 35.303 W	1,399,225.36	3,271,031.12
2,415.00	7.80	335.74	2,412.30	47.92	-40.21	40° 25' 30.802 N	104° 31' 35.373 W	1,399,236.71	3,271,025.59
2,504.00	10.04	335.87	2,500.22	60.50	-45.86	40° 25' 30.927 N	104° 31' 35.444 W	1,399,249.29	3,271,019.94
2,594.00	9.92	337.13	2,588.85	74.81	-52.08	40° 25' 31.069 N	104° 31' 35.523 W	1,399,263.60	3,271,013.72
2,684.00	10.67	339.17	2,677.41	89.74	-58.06	40° 25' 31.217 N	104° 31' 35.598 W	1,399,278.53	3,271,007.74
2,773.00	10.74	337.41	2,764.86	105.09	-64.18	40° 25' 31.369 N	104° 31' 35.675 W	1,399,293.88	3,271,001.63
2,863.00	10.77	338.88	2,853.28	120.68	-70.43	40° 25' 31.524 N	104° 31' 35.753 W	1,399,309.47	3,270,995.38
2,952.00	10.58	339.40	2,940.74	136.09	-76.30	40° 25' 31.677 N	104° 31' 35.827 W	1,399,324.87	3,270,989.51
3,042.00	8.46	336.09	3,029.49	149.87	-81.89	40° 25' 31.814 N	104° 31' 35.897 W	1,399,338.66	3,270,983.92
3,132.00	6.25	337.92	3,118.75	160.47	-86.41	40° 25' 31.919 N	104° 31' 35.955 W	1,399,349.25	3,270,979.39
3,221.00	4.65	337.63	3,207.34	168.29	-89.61	40° 25' 31.997 N	104° 31' 35.995 W	1,399,357.08	3,270,976.20
3,311.00	3.57	298.14	3,297.13	172.99	-93.47	40° 25' 32.043 N	104° 31' 36.044 W	1,399,361.78	3,270,972.34
3,401.00	0.55	168.23	3,387.07	173.89	-95.85	40° 25' 32.053 N	104° 31' 36.075 W	1,399,362.67	3,270,969.95
3,491.00	0.86	181.99	3,477.06	172.79	-95.79	40° 25' 32.042 N	104° 31' 36.074 W	1,399,361.58	3,270,970.02
3,760.00	0.19	122.84	3,746.05	170.53	-95.48	40° 25' 32.019 N	104° 31' 36.070 W	1,399,359.32	3,270,970.32
4,028.00	0.65	331.38	4,014.05	171.62	-95.84	40° 25' 32.030 N	104° 31' 36.075 W	1,399,360.41	3,270,969.97
4,297.00	1.25	315.08	4,283.01	175.04	-98.64	40° 25' 32.064 N	104° 31' 36.111 W	1,399,363.83	3,270,967.17
4,566.00	1.86	36.82	4,551.94	180.61	-98.10	40° 25' 32.119 N	104° 31' 36.103 W	1,399,369.40	3,270,967.71
4,835.00	0.64	185.95	4,820.90	182.62	-95.63	40° 25' 32.139 N	104° 31' 36.071 W	1,399,371.40	3,270,970.17
5,104.00	1.12	172.37	5,089.87	178.52	-95.44	40° 25' 32.098 N	104° 31' 36.069 W	1,399,367.30	3,270,970.36
5,372.00	1.01	142.45	5,357.82	174.05	-93.65	40° 25' 32.054 N	104° 31' 36.046 W	1,399,362.83	3,270,972.15
5,641.00	0.23	349.31	5,626.81	172.70	-92.31	40° 25' 32.040 N	104° 31' 36.029 W	1,399,361.48	3,270,973.50
5,820.00	0.55	94.93	5,805.81	172.98	-91.52	40° 25' 32.043 N	104° 31' 36.019 W	1,399,361.76	3,270,974.29
5,910.00	2.20	80.23	5,895.78	173.23	-89.39	40° 25' 32.045 N	104° 31' 35.991 W	1,399,362.02	3,270,976.42
5,955.00	6.77	81.31	5,940.63	173.78	-85.91	40° 25' 32.050 N	104° 31' 35.946 W	1,399,362.57	3,270,979.89
6,000.00	10.25	81.72	5,985.13	174.76	-79.33	40° 25' 32.059 N	104° 31' 35.861 W	1,399,363.54	3,270,986.48
6,044.00	14.87	83.84	6,028.06	175.93	-69.83	40° 25' 32.070 N	104° 31' 35.738 W	1,399,364.71	3,270,995.97
6,089.00	18.40	87.87	6,071.17	176.81	-56.99	40° 25' 32.077 N	104° 31' 35.572 W	1,399,365.60	3,271,008.81
6,134.00	21.20	90.35	6,113.51	177.03	-41.75	40° 25' 32.078 N	104° 31' 35.375 W	1,399,365.81	3,271,024.05
6,179.00	22.37	88.18	6,155.30	177.25	-25.06	40° 25' 32.078 N	104° 31' 35.159 W	1,399,366.03	3,271,040.74
6,224.00	24.81	84.56	6,196.53	178.42	-7.10	40° 25' 32.088 N	104° 31' 34.926 W	1,399,367.20	3,271,058.71
6,269.00	26.51	85.85	6,237.09	180.04	12.32	40° 25' 32.102 N	104° 31' 34.675 W	1,399,368.82	3,271,078.12

**Design Report for Wolfpack B02-64-1HN - MWD Survey**

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)
6,313.00	28.68	88.08	6,276.09	181.10	32.67	40° 25' 32.110 N	104° 31' 34.412 W	1,399,369.89	3,271,098.47
6,358.00	33.08	88.02	6,314.70	181.89	55.75	40° 25' 32.115 N	104° 31' 34.113 W	1,399,370.67	3,271,121.55
6,403.00	36.68	87.31	6,351.61	182.94	81.45	40° 25' 32.123 N	104° 31' 33.781 W	1,399,371.73	3,271,147.25
6,448.00	39.33	88.54	6,387.07	183.94	109.14	40° 25' 32.130 N	104° 31' 33.423 W	1,399,372.72	3,271,174.94
6,493.00	45.79	88.67	6,420.19	184.68	139.55	40° 25' 32.134 N	104° 31' 33.029 W	1,399,373.46	3,271,205.35
6,538.00	51.89	88.67	6,449.80	185.46	173.41	40° 25' 32.138 N	104° 31' 32.592 W	1,399,374.25	3,271,239.20
6,582.00	55.51	88.92	6,475.84	186.21	208.85	40° 25' 32.141 N	104° 31' 32.133 W	1,399,374.99	3,271,274.65
6,627.00	58.83	87.79	6,500.23	187.30	246.64	40° 25' 32.148 N	104° 31' 31.644 W	1,399,376.08	3,271,312.44
6,672.00	62.29	87.15	6,522.35	189.03	285.79	40° 25' 32.161 N	104° 31' 31.138 W	1,399,377.82	3,271,351.58
6,717.00	64.99	87.21	6,542.33	191.02	326.06	40° 25' 32.176 N	104° 31' 30.617 W	1,399,379.80	3,271,391.85
6,762.00	66.72	89.88	6,560.74	192.05	367.10	40° 25' 32.182 N	104° 31' 30.086 W	1,399,380.84	3,271,432.89
6,806.00	72.25	91.84	6,576.15	191.42	408.29	40° 25' 32.171 N	104° 31' 29.554 W	1,399,380.21	3,271,474.07
6,851.00	77.67	90.86	6,587.83	190.40	451.72	40° 25' 32.156 N	104° 31' 28.993 W	1,399,379.19	3,271,517.50
6,896.00	80.52	90.47	6,596.34	189.89	495.90	40° 25' 32.146 N	104° 31' 28.421 W	1,399,378.68	3,271,561.68
6,935.00	83.25	91.67	6,601.84	189.17	534.49	40° 25' 32.135 N	104° 31' 27.922 W	1,399,377.95	3,271,600.27
6,974.00	84.94	91.04	6,605.85	188.25	573.27	40° 25' 32.122 N	104° 31' 27.421 W	1,399,377.03	3,271,639.05
7,025.00	87.16	90.23	6,609.37	187.68	624.15	40° 25' 32.111 N	104° 31' 26.763 W	1,399,376.47	3,271,689.92
7,114.00	87.97	90.37	6,613.15	187.22	713.06	40° 25' 32.096 N	104° 31' 25.614 W	1,399,376.00	3,271,778.84
7,204.00	91.91	90.54	6,613.24	186.50	803.04	40° 25' 32.080 N	104° 31' 24.451 W	1,399,375.29	3,271,868.81
7,294.00	93.36	89.24	6,609.10	186.68	892.94	40° 25' 32.071 N	104° 31' 23.288 W	1,399,375.46	3,271,958.71
7,383.00	92.90	87.94	6,604.24	188.86	981.78	40° 25' 32.083 N	104° 31' 22.139 W	1,399,377.65	3,272,047.55
7,473.00	91.02	87.82	6,601.17	192.19	1,071.66	40° 25' 32.106 N	104° 31' 20.977 W	1,399,380.98	3,272,137.42
7,563.00	90.77	87.56	6,599.76	195.82	1,161.58	40° 25' 32.133 N	104° 31' 19.814 W	1,399,384.60	3,272,227.34
7,653.00	88.95	87.74	6,599.98	199.51	1,251.50	40° 25' 32.159 N	104° 31' 18.650 W	1,399,388.29	3,272,317.25
7,742.00	91.33	89.70	6,599.76	201.50	1,340.47	40° 25' 32.169 N	104° 31' 17.500 W	1,399,390.28	3,272,406.22
7,832.00	91.39	88.95	6,597.63	202.56	1,430.43	40° 25' 32.170 N	104° 31' 16.336 W	1,399,391.34	3,272,496.18
7,922.00	89.26	91.88	6,597.12	201.90	1,520.42	40° 25' 32.154 N	104° 31' 15.173 W	1,399,390.69	3,272,586.16
8,011.00	90.59	91.47	6,597.23	199.30	1,609.38	40° 25' 32.118 N	104° 31' 14.023 W	1,399,388.09	3,272,675.12
8,101.00	89.75	89.97	6,596.96	198.17	1,699.36	40° 25' 32.097 N	104° 31' 12.860 W	1,399,386.96	3,272,765.10
8,190.00	89.94	89.30	6,597.21	198.74	1,788.36	40° 25' 32.093 N	104° 31' 11.709 W	1,399,387.52	3,272,854.09
8,280.00	90.40	84.46	6,596.94	203.64	1,878.20	40° 25' 32.132 N	104° 31' 10.547 W	1,399,392.42	3,272,943.93
8,370.00	86.89	85.50	6,599.07	211.51	1,967.82	40° 25' 32.200 N	104° 31' 9.387 W	1,399,400.29	3,273,033.54
8,459.00	86.51	87.36	6,604.19	217.04	2,056.49	40° 25' 32.245 N	104° 31' 8.240 W	1,399,405.82	3,273,122.21
8,549.00	89.57	89.28	6,607.27	219.68	2,146.38	40° 25' 32.261 N	104° 31' 7.077 W	1,399,408.46	3,273,212.10
8,639.00	91.42	87.90	6,606.49	221.89	2,236.35	40° 25' 32.273 N	104° 31' 5.914 W	1,399,410.67	3,273,302.06
8,728.00	91.23	87.77	6,604.43	225.25	2,325.26	40° 25' 32.296 N	104° 31' 4.764 W	1,399,414.03	3,273,390.97
8,818.00	89.17	88.00	6,604.12	228.57	2,415.19	40° 25' 32.319 N	104° 31' 3.600 W	1,399,417.36	3,273,480.90
8,907.00	89.75	89.13	6,604.96	230.80	2,504.16	40° 25' 32.332 N	104° 31' 2.450 W	1,399,419.58	3,273,569.87
8,997.00	88.64	89.33	6,606.22	232.01	2,594.14	40° 25' 32.334 N	104° 31' 1.286 W	1,399,420.79	3,273,659.84
9,087.00	87.70	90.98	6,609.10	231.77	2,684.09	40° 25' 32.321 N	104° 31' 0.123 W	1,399,420.55	3,273,749.79
9,176.00	88.58	90.84	6,611.98	230.35	2,773.03	40° 25' 32.298 N	104° 30' 58.973 W	1,399,419.14	3,273,838.73
9,311.00	90.12	89.08	6,613.52	230.45	2,908.01	40° 25' 32.284 N	104° 30' 57.228 W	1,399,419.23	3,273,973.70

## Design Report for Wolfpack B02-64-1HN - MWD Survey

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)
9,401.00	88.80	88.16	6,614.36	232.62	2,997.98	40° 25' 32.295 N	104° 30' 56.065 W	1,399,421.40	3,274,063.67
9,490.00	88.98	87.91	6,616.09	235.67	3,086.91	40° 25' 32.316 N	104° 30' 54.914 W	1,399,424.45	3,274,152.60
9,580.00	89.04	88.47	6,617.64	238.51	3,176.85	40° 25' 32.334 N	104° 30' 53.751 W	1,399,427.29	3,274,242.53
9,670.00	89.17	88.88	6,619.05	240.59	3,266.82	40° 25' 32.345 N	104° 30' 52.587 W	1,399,429.37	3,274,332.49
9,759.00	89.38	89.09	6,620.18	242.17	3,355.80	40° 25' 32.350 N	104° 30' 51.437 W	1,399,430.95	3,274,421.47
9,849.00	89.54	89.03	6,621.02	243.64	3,445.78	40° 25' 32.355 N	104° 30' 50.273 W	1,399,432.43	3,274,511.45
9,939.00	89.91	88.81	6,621.46	245.34	3,535.76	40° 25' 32.362 N	104° 30' 49.109 W	1,399,434.12	3,274,601.43
10,028.00	89.57	90.31	6,621.86	246.02	3,624.76	40° 25' 32.359 N	104° 30' 47.959 W	1,399,434.81	3,274,690.42
10,118.00	89.35	89.98	6,622.71	245.80	3,714.75	40° 25' 32.347 N	104° 30' 46.795 W	1,399,434.58	3,274,780.41
10,208.00	90.68	89.87	6,622.68	245.91	3,804.75	40° 25' 32.338 N	104° 30' 45.631 W	1,399,434.70	3,274,870.41
10,297.00	91.08	89.59	6,621.32	246.33	3,893.74	40° 25' 32.332 N	104° 30' 44.481 W	1,399,435.12	3,274,959.39
10,387.00	90.89	88.43	6,619.77	247.89	3,983.71	40° 25' 32.338 N	104° 30' 43.317 W	1,399,436.67	3,275,049.36
10,477.00	91.36	87.16	6,618.00	251.35	4,073.62	40° 25' 32.362 N	104° 30' 42.154 W	1,399,440.13	3,275,139.27
10,566.00	91.36	88.27	6,615.89	254.90	4,162.53	40° 25' 32.388 N	104° 30' 41.004 W	1,399,443.68	3,275,228.17
10,656.00	91.02	88.95	6,614.02	257.08	4,252.48	40° 25' 32.399 N	104° 30' 39.841 W	1,399,445.86	3,275,318.12
10,746.00	89.35	88.90	6,613.73	258.77	4,342.46	40° 25' 32.406 N	104° 30' 38.677 W	1,399,447.55	3,275,408.10
10,789.00	89.69	88.45	6,614.09	259.76	4,385.45	40° 25' 32.411 N	104° 30' 38.121 W	1,399,448.54	3,275,451.08
10,853.00	89.69	88.45	6,614.44	261.49	4,449.42	40° 25' 32.421 N	104° 30' 37.294 W	1,399,450.28	3,275,515.05

### Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
621.00	621.00	0.00	0.00	Tie-On to Surface Hole @ 621.00ft (Assumed Vertical)
654.00	654.00	-0.16	-0.30	First MWD Survey @ 654.00ft
10,789.00	6,614.09	259.76	4,385.45	Final MWD Survey @ 10789.00ft
10,853.00	6,614.44	261.49	4,449.42	Straight Line Proj @ 10853' MD, 6614.44' TVD

### Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Wolfpack B02-64-1HN_Rev A0_BHL Tgt	86.65	Slot	0.00	0.00	0.00

**Design Report for Wolfpack B02-64-1HN - MWD Survey**

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
621.00	6,935.00	Sperry MWD Surveys - Vert/Build	MWD
7,025.00	10,789.00	Sperry MWD Surveys - Lateral	MWD

**Casing Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,974.00	6,605.85	Estimated: 7" Casing @ 6974' MD, 6605.85' TVD	7	8-3/4

**Design Targets**

Shape	Target Name	TVD (usft)	Northing (usft)	Easting (usft)	+N/-S usft	+E/-W usft	Created	Updated
Polygon	Wolfpack B02-64-1HN_Se	0.00	1,399,188.79	3,271,065.80	0.00	0.00	6/25/2013	6/25/2013
Polygon	Wolfpack B02-64-1HN_Se	0.00	1,399,188.79	3,271,065.80	0.00	0.00	6/25/2013	6/25/2013
Polygon	Wolfpack B02-64-1HN_Se	0.00	1,399,188.79	3,271,065.80	0.00	0.00	6/25/2013	6/25/2013
Polygon	Wolfpack B02-64-1HN_Se	0.00	1,399,188.79	3,271,065.80	0.00	0.00	6/25/2013	6/25/2013
Point	Wolfpack B02-64-1HN_Re	6,584.29	1,399,449.35	3,275,514.90	260.57	4,449.27	6/25/2013	6/25/2013

**Directional Difficulty Index**

Average Dogleg over Survey:	1.89 °/100usft	Maximum Dogleg over Survey:	14.36 °/100usft at 6,493.00 usft
Net Tortousity applicable to Plans:	0.83 °/100usft	Directional Difficulty Index:	6.206

**Audit Info**

**North Reference Sheet for Sec. 2-T5N-R64W (Wolfpack 2 South PAD) - Wolfpack B02-64-1HN -**

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' @ 4632.00usft (Precision 829). Northing and Easting are relative to Wolfpack B02-64-1HN - Slot A1

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: 1,399,188.79 usft N, 3,271,065.80 usft E

Geographical Coordinates of Well: 40° 25' 30.32" N, 104° 31' 34.86" W

Grid Convergence at Surface is: 0.63°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,853.00usft

the Bottom Hole Displacement is 4,457.10usft in the Direction of 86.64° (Grid).

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

