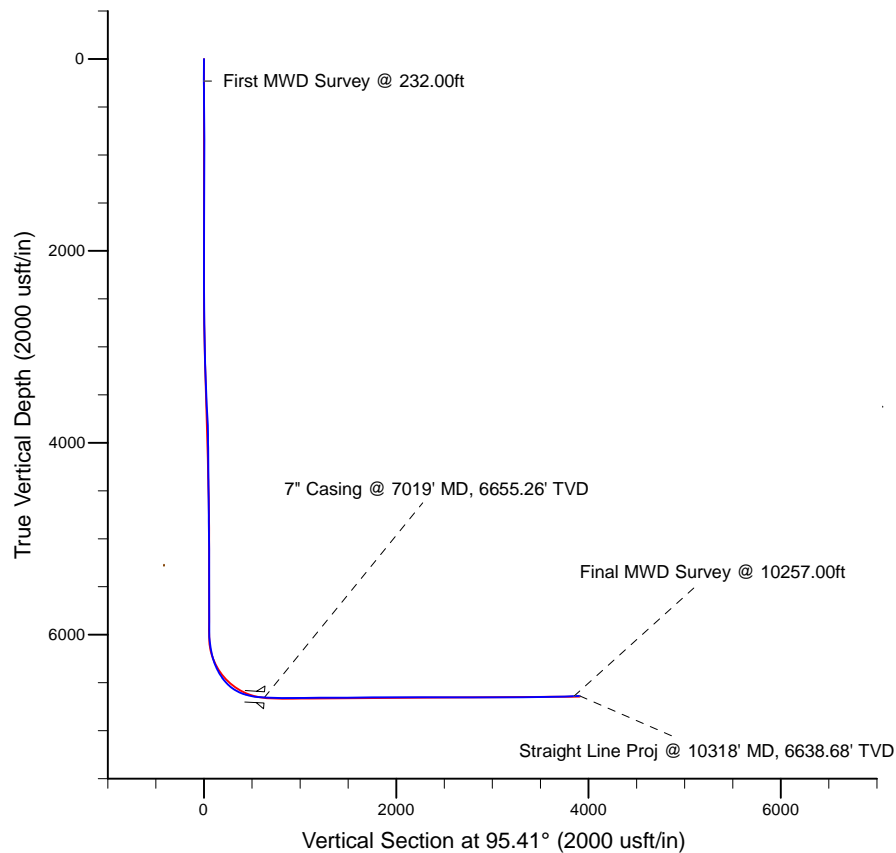
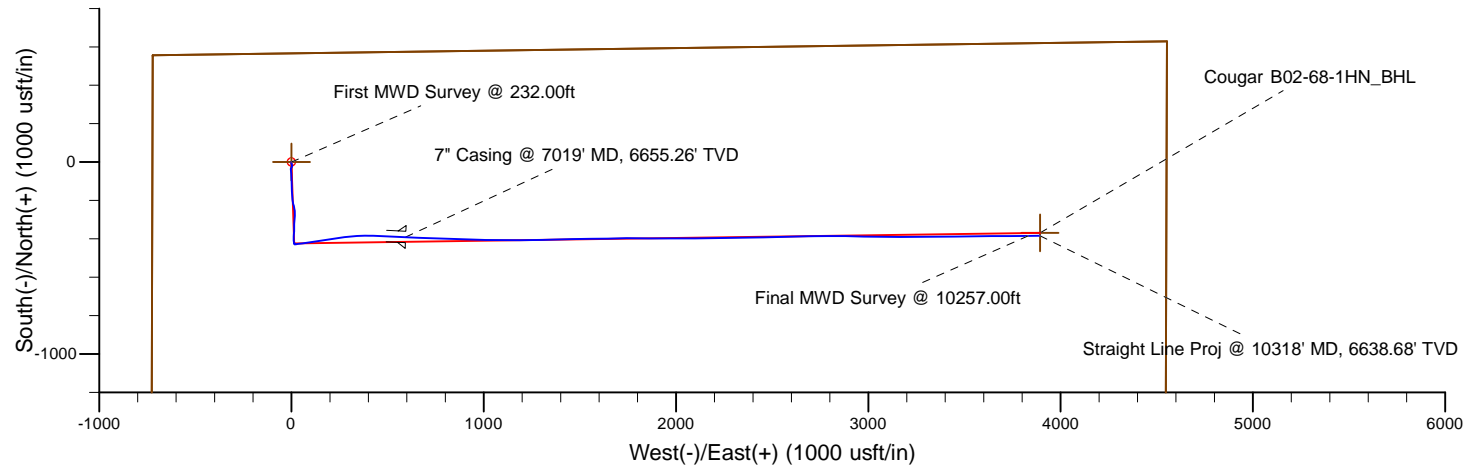


Project: Weld County, CO (NAD 83)
Site: Sec. 2-T5N-R64W (Cougar Pad)
Well: Cougar B02-68-1HN
Wellbore: Plan A
Design: Final Surveys

Noble Energy

HALLIBURTON
Sperry Drilling



LEGEND

- Cougar B02-68-1HN, Plan A, Rev A0 - PROPOSAL V0
- Final Surveys

Platted SHL: 566' FNL, 725' FWL
Platted Lat/Long: 40.43407 N, 104.52420 W
Location: Sec. 2-T5N-R64W

7" Casing: ~965.44' FNL, ~1318.31' FWL
Lat/Long: 40.432980 N, 104.522081 W
State Planes - CO Northern: 1,402,076.04' N, 3,272,222.55' E
Location: Sec. 2-T5N-R64W

BHL: ~1003.79' FNL, ~657.81' FEL
Lat/Long: 40.432900 N, 104.510235 W
State Planes - CO Northern: 1,402,083.34' N, 3,275,520.40' E
Location: Sec. 2-T5N-R64W

WELL DETAILS: Cougar B02-68-1HN

Ground Level: 4640.00
RKB=24 @ 4664.00usft (H&P 315)

Created By: Fred Hartmann
Created On: 01/21/2014

Noble Energy

Weld County, CO (NAD 83)

Sec. 2-T5N-R64W (Cougar Pad)

Cougar B02-68-1HN

Design: Final Surveys

Sperry Drilling Services

Final Survey Report

23 January, 2014

Surface UWI : 900918631

Well Coordinates: 1,402,466.57 N, 3,271,628.34 E (40° 26' 02.65" N, 104° 31' 27.12" W)

Ground Level: 4,640.00 usft

Local Coordinate Origin:

Centered on Well Cougar B02-68-1HN

Viewing Datum:

RKB=24 @ 4664.00usft (H&P 315)

TVDs to System:

N

North Reference:

Grid

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

HALLIBURTON

Design Report for Cougar B02-68-1HN - 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
232.00	0.48	186.29	232.00	-0.97	-0.11	-0.01	0.21
First MWD Survey @ 232.00ft							
324.00	0.44	160.70	323.99	-1.68	-0.03	0.13	0.23
417.00	0.64	156.17	416.99	-2.49	0.30	0.53	0.22
509.00	0.87	181.28	508.98	-3.66	0.49	0.83	0.43
601.00	0.93	179.37	600.97	-5.11	0.48	0.96	0.07
694.00	1.20	177.13	693.95	-6.83	0.54	1.18	0.29
786.00	1.43	162.89	785.93	-8.89	0.92	1.76	0.43
879.00	1.45	175.95	878.90	-11.18	1.35	2.40	0.35
972.00	0.69	173.88	971.88	-12.91	1.49	2.70	0.82
1,064.00	0.55	155.28	1,063.88	-13.86	1.73	3.03	0.26
1,157.00	0.77	142.65	1,156.87	-14.76	2.30	3.68	0.28
1,251.00	1.06	172.36	1,250.86	-16.13	2.80	4.31	0.58
1,344.00	1.00	172.42	1,343.85	-17.78	3.02	4.68	0.06
1,436.00	1.43	183.32	1,435.83	-19.72	3.06	4.91	0.53
1,529.00	0.94	194.69	1,528.81	-21.62	2.80	4.82	0.58
1,623.00	1.03	201.80	1,622.79	-23.15	2.29	4.46	0.16
1,718.00	1.20	194.44	1,717.77	-24.91	1.72	4.06	0.23
1,813.00	0.91	203.78	1,812.76	-26.56	1.17	3.67	0.35
1,908.00	1.13	212.73	1,907.74	-28.04	0.36	3.00	0.29
1,941.00	1.38	199.23	1,940.74	-28.69	0.06	2.76	1.17
2,037.00	1.05	213.98	2,036.71	-30.51	-0.82	2.06	0.47
2,132.00	0.99	205.38	2,131.70	-31.97	-1.66	1.36	0.17
2,227.00	0.80	200.27	2,226.69	-33.34	-2.24	0.91	0.22
2,322.00	0.32	225.22	2,321.68	-34.15	-2.66	0.57	0.56
2,417.00	0.68	222.37	2,416.68	-34.75	-3.22	0.07	0.38
2,512.00	2.90	185.56	2,511.63	-37.56	-3.84	-0.28	2.52
2,607.00	4.24	160.46	2,606.45	-43.26	-2.89	1.20	2.14
2,702.00	6.38	177.07	2,701.04	-51.84	-1.45	3.44	2.75
2,796.00	7.57	173.85	2,794.34	-63.21	-0.52	5.44	1.33
2,891.00	8.70	178.29	2,888.39	-76.62	0.37	7.58	1.36
2,986.00	9.74	177.14	2,982.16	-91.83	0.98	9.63	1.11
3,081.00	10.45	178.86	3,075.69	-108.47	1.55	11.77	0.81
3,176.00	11.64	179.95	3,168.92	-126.66	1.73	13.66	1.27
3,271.00	11.41	176.88	3,262.01	-145.63	2.25	15.97	0.69
3,366.00	12.46	177.54	3,354.96	-165.25	3.20	18.76	1.11
3,461.00	10.94	174.51	3,447.98	-184.47	4.51	21.87	1.73
3,555.00	10.46	174.64	3,540.35	-201.84	6.16	25.15	0.51
3,650.00	10.74	162.41	3,633.74	-218.87	9.64	30.22	2.38
3,745.00	11.54	168.09	3,726.95	-236.60	14.27	36.51	1.43
3,840.00	13.03	175.60	3,819.78	-256.58	17.06	41.16	2.30
3,935.00	12.21	183.51	3,912.49	-277.29	17.26	43.32	2.01
4,029.00	11.13	183.24	4,004.54	-296.27	16.14	43.99	1.15
4,124.00	9.82	182.04	4,097.96	-313.52	15.34	44.81	1.40
4,219.00	10.36	180.87	4,191.49	-330.16	14.92	45.96	0.61
4,314.00	8.88	179.17	4,285.15	-346.03	14.89	47.44	1.59
4,409.00	9.71	185.48	4,378.90	-361.34	14.24	48.22	1.38
4,504.00	8.33	186.06	4,472.73	-376.16	12.74	48.14	1.46
4,599.00	7.13	187.15	4,566.86	-388.85	11.28	47.88	1.27

Design Report for Cougar B02-68-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,694.00	6.38	174.51	4,661.21	-399.96	11.05	48.70	1.75
4,789.00	5.59	175.85	4,755.69	-409.82	11.89	50.46	0.84
4,884.00	3.80	162.87	4,850.37	-417.45	13.16	52.44	2.18
4,979.00	1.79	171.81	4,945.25	-421.93	14.30	53.99	2.16
5,073.00	1.89	162.27	5,039.20	-424.86	14.98	54.95	0.34
5,168.00	0.46	279.36	5,134.19	-426.29	15.08	55.18	2.25
5,453.00	0.62	60.20	5,419.18	-425.33	15.29	55.30	0.36
5,738.00	0.62	157.97	5,704.17	-426.00	17.20	57.27	0.33
5,926.00	0.58	216.93	5,892.16	-427.70	17.01	57.24	0.31
6,011.00	0.79	196.88	5,977.16	-428.60	16.58	56.90	0.37
6,149.00	8.05	80.17	6,114.72	-427.86	25.85	66.05	6.11
6,196.00	11.01	78.22	6,161.06	-426.39	33.48	73.52	6.33
6,291.00	17.60	84.14	6,253.07	-423.06	56.68	96.29	7.10
6,386.00	24.70	82.02	6,341.62	-418.84	90.67	129.73	7.52
6,434.00	28.75	80.57	6,384.48	-415.55	111.99	150.66	8.55
6,480.00	32.97	80.52	6,423.96	-411.68	135.26	173.46	9.17
6,528.00	37.96	82.08	6,463.04	-407.49	162.79	200.46	10.56
6,575.00	43.13	81.58	6,498.75	-403.14	193.02	230.15	11.02
6,623.00	49.20	80.79	6,531.98	-397.82	227.21	263.69	12.70
6,670.00	55.31	81.28	6,560.73	-392.04	263.91	299.68	13.03
6,765.00	66.92	87.25	6,606.58	-383.99	346.50	381.15	13.39
6,813.00	73.11	90.37	6,622.98	-383.08	391.57	425.93	14.27
6,860.00	76.51	91.52	6,635.29	-383.83	436.92	471.14	7.61
6,908.00	80.42	92.34	6,644.89	-385.42	483.91	518.08	8.32
6,971.00	86.00	92.81	6,652.33	-388.23	546.38	580.53	8.89
7,019.00	87.01	92.74	6,655.26	-390.55	594.23	628.39	2.10
7" Casing @ 7019' MD, 6655.26' TVD							
7,125.00	89.23	92.58	6,658.74	-395.46	700.06	734.21	2.10
7,220.00	89.14	92.47	6,660.09	-399.65	794.95	829.08	0.15
7,315.00	89.54	91.60	6,661.19	-403.02	889.89	923.91	1.01
7,410.00	90.96	91.07	6,660.77	-405.23	984.86	1,018.66	1.60
7,505.00	90.59	90.35	6,659.49	-406.41	1,079.84	1,113.33	0.85
7,600.00	91.26	90.19	6,657.95	-406.86	1,174.83	1,207.94	0.73
7,695.00	90.28	88.51	6,656.68	-405.78	1,269.81	1,302.40	2.05
7,790.00	90.25	88.77	6,656.24	-403.52	1,364.78	1,396.73	0.28
7,884.00	89.91	88.45	6,656.11	-401.24	1,458.75	1,490.07	0.50
7,979.00	89.51	89.35	6,656.59	-399.42	1,553.73	1,584.46	1.04
8,074.00	91.51	89.10	6,655.74	-398.14	1,648.71	1,678.90	2.12
8,169.00	90.65	89.22	6,653.95	-396.74	1,743.69	1,773.32	0.91
8,264.00	89.38	90.26	6,653.93	-396.31	1,838.68	1,867.85	1.73
8,359.00	90.89	90.84	6,653.70	-397.22	1,933.67	1,962.50	1.70
8,453.00	89.26	89.59	6,653.58	-397.58	2,027.67	2,056.11	2.19
8,548.00	90.40	90.12	6,653.86	-397.34	2,122.67	2,150.66	1.32
8,643.00	89.66	88.98	6,653.81	-396.59	2,217.66	2,245.17	1.43
8,738.00	90.86	88.90	6,653.38	-394.83	2,312.64	2,339.56	1.27
8,833.00	90.43	88.76	6,652.31	-392.89	2,407.62	2,433.93	0.48
8,928.00	88.46	88.59	6,653.23	-390.70	2,502.58	2,528.26	2.08
9,022.00	89.78	88.80	6,654.67	-388.56	2,596.54	2,621.61	1.42
9,117.00	90.89	89.07	6,654.12	-386.79	2,691.52	2,716.00	1.20
9,212.00	89.78	89.76	6,653.56	-385.82	2,786.52	2,810.47	1.38
9,307.00	89.45	90.24	6,654.20	-385.82	2,881.51	2,905.05	0.61

Design Report for Cougar B02-68-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,402.00	91.29	92.03	6,653.59	-387.70	2,976.48	2,999.77	2.70
9,497.00	90.37	90.50	6,652.21	-389.80	3,071.45	3,094.51	1.88
9,591.00	89.57	89.65	6,652.26	-389.92	3,165.45	3,188.10	1.24
9,686.00	90.31	90.44	6,652.36	-390.00	3,260.44	3,282.69	1.14
9,781.00	90.77	89.00	6,651.46	-389.53	3,355.44	3,377.21	1.59
9,876.00	90.71	88.98	6,650.24	-387.86	3,450.41	3,471.61	0.07
9,971.00	90.62	89.20	6,649.14	-386.35	3,545.40	3,566.03	0.25
10,066.00	92.19	90.11	6,646.81	-385.78	3,640.36	3,660.52	1.91
10,161.00	91.08	89.60	6,644.10	-385.54	3,735.32	3,755.03	1.29
10,257.00	92.37	88.97	6,641.21	-384.34	3,831.27	3,850.44	1.50
Final MWD Survey @ 10257.00ft							
10,318.00	92.37	88.97	6,638.68	-383.24	3,892.20	3,911.00	0.00
Straight Line Proj @ 10318' MD, 6638.68' TVD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Comment
232.00	232.00	-0.97	-0.11	First MWD Survey @ 232.00ft
10,257.00	6,641.21	-384.34	3,831.27	Final MWD Survey @ 10257.00ft
10,318.00	6,638.68	-383.24	3,892.20	Straight Line Proj @ 10318' MD, 6638.68' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Cougar B02-68-1HN_BHL	95.41	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
232.00	1,941.00	MWD Surveys - Surface	MWD
2,037.00	6,971.00	MWD Surveys - Intermediate	MWD
7,125.00	10,257.00	MWD Surveys - Production	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
7,019.00	6,655.26	7" Casing @ 7019' MD, 6655.26' TVD	7	8-3/4

Design Report for Cougar B02-68-1HN - 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
Cougar B02-68-1HN_ξ - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	1,402,466.57	3,271,628.34	40.434070	-104.524200
Cougar B02-68-1HN_⊥ - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,402,466.57	3,271,628.34	40.434070	-104.524200
Point 1				0.00	96.78	-261.57	1,402,563.35	3,271,366.78	
Point 2				0.00	-4,280.78	-275.82	1,398,185.96	3,271,352.53	
Point 3				0.00	-4,193.20	4,077.03	1,398,273.53	3,275,705.22	
Point 4				0.00	169.81	4,093.10	1,402,636.38	3,275,721.29	
Point 5				0.00	96.78	-261.57	1,402,563.35	3,271,366.78	
Cougar B02-68-1HN_ξ - actual wellpath hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,402,466.57	3,271,628.34	40.434070	-104.524200
Point 1				0.00	556.80	-721.59	1,403,023.35	3,270,906.78	
Point 2				0.00	-4,740.79	-735.84	1,397,725.96	3,270,892.53	
Point 3				0.00	-4,653.22	4,537.05	1,397,813.53	3,276,165.22	
Point 4				0.00	629.83	4,553.12	1,403,096.38	3,276,181.29	
Point 5				0.00	556.80	-721.59	1,403,023.35	3,270,906.78	
Cougar B02-68-1HN_E - actual wellpath misses target center by 16.28usft at 10318.00usft MD (6638.68 TVD, -383.24 N, 3892.20 E) - Point	0.00	0.00	6,645.57	-368.54	3,893.34	1,402,098.05	3,275,521.53	40.432940	-104.510230

Directional Difficulty Index

Average Dogleg over Survey:	1.79 °/100usft	Maximum Dogleg over Survey:	14.27 °/100usft at 6,813.00 usft
Net Tortousity applicable to Plans:	0.68 °/100usft	Directional Difficulty Index:	6.091

Audit Info

North Reference Sheet for Sec. 2-T5N-R64W (Cougar Pad) - Cougar B02-68-1HN -

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 @ 4664.00usft (H&P 315). Northing and Easting are relative to Cougar B02-68-1HN

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 -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996195

Grid Coordinates of Well: 1,402,466.57 usft N, 3,271,628.34 usft E

Geographical Coordinates of Well: 40° 26' 02.65" N, 104° 31' 27.12" W

Grid Convergence at Surface is: 0.63°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,318.00usft
the Bottom Hole Displacement is 3,911.03usft in the Direction of 95.62° (Grid).

Magnetic Convergence at surface is: -7.79° (15 January 2014, , BGGM2013)

