Noble Energy

Weld County, CO (NAD 83)
Sec. 8-T4N-R64W (Northrup 8 PAD)
Ruff C08-27D - A3

Design: MWD Survey

Sperry Drilling Services

Final Survey Report

23 January, 2012

Well Coordinates: 1,365,631.77 N, 3,258,851.98 E (40° 20' 00.02" N, 104° 34' 17.33" W)
Ground Level: 4,765.00 ft

Local Coordinate Origin:	Centered on Well Ruff C08-27D - Slot A3
Viewing Datum:	KB @ 4778.00ft (Ensign 132)
TVDs to System:	N
North Reference:	Grid
Unit System:	API - US Survey Feet - Custom

Geodetic Scale Factor Applied
Version: 2003.16 Build: 43I

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Design Report for Ruff C08-27D - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
692.00	0.00	0.00	692.00	0.00	0.00	0.00	0.00
Surface Casing Assumed Vertical at 692.00ft							
723.00	0.25	21.34	723.00	0.06	0.02	0.05	0.81
First MWD Survey							
751.00	0.26	26.04	751.00	0.18	0.07	0.14	0.08
781.00	0.31	4.10	781.00	0.32	0.11	0.23	0.40
873.00	0.16	14.57	873.00	0.69	0.16	0.43	0.17
965.00	0.35	39.63	965.00	1.03	0.37	0.77	0.23
1,056.00	5.71	65.24	1,055.84	3.14	4.66	5.55	5.93
1,151.00	7.40	69.56	1,150.21	7.26	14.69	16.38	1.85
1,246.00	8.21	72.95	1,244.33	11.39	26.91	29.20	0.98
1,341.00	10.01	68.37	1,338.13	16.42	41.07	44.17	2.04
1,437.00	11.62	64.12	1,432.43	23.71	57.52	62.17	1.87
1,532.00	11.76	64.68	1,525.46	32.03	74.88	81.42	0.19
1,627.00	10.72	63.85	1,618.63	40.07	91.56	99.93	1.11
1,722.00	11.87	64.70	1,711.79	48.14	108.33	118.53	1.22
1,817.00	12.51	64.34	1,804.65	56.77	126.44	138.59	0.68
1,912.00	11.20	59.73	1,897.62	65.87	143.68	158.06	1.70
2,007.00	11.99	68.40	1,990.69	74.16	160.83	177.10	2.01
2,102.00	10.71	67.26	2,083.83	81.20	178.14	195.78	1.37
2,199.00	12.48	67.80	2,178.85	88.65	196.16	215.26	1.83
2,294.00	11.10	67.29	2,271.84	96.06	214.10	234.65	1.46
2,389.00	11.32	62.26	2,365.03	103.93	230.79	253.10	1.05
2,484.00	11.42	66.50	2,458.17	112.02	247.67	271.82	0.89
2,579.00	11.63	69.08	2,551.25	119.19	265.24	290.78	0.59
2,674.00	10.00	69.00	2,644.56	125.56	281.88	308.56	1.72
2,770.00	11.92	70.75	2,738.81	131.82	299.02	326.76	2.03
2,865.00	12.28	69.20	2,831.70	138.64	317.73	346.60	0.51
2,960.00	10.66	69.16	2,924.80	145.35	335.39	365.45	1.71
3,055.00	11.19	67.95	3,018.07	151.94	352.14	383.43	0.61
3,150.00	10.77	60.01	3,111.34	159.84	368.38	401.48	1.65
3,245.00	9.59	62.46	3,204.84	167.93	383.08	418.22	1.32
3,340.00	9.17	63.27	3,298.57	175.00	396.86	433.69	0.46
3,435.00	9.32	51.93	3,392.35	183.15	409.68	448.73	1.92
3,530.00	9.12	54.32	3,486.12	192.28	421.85	463.60	0.45
3,625.00	8.74	46.10	3,579.97	201.68	433.17	477.81	1.40
3,720.00	8.68	58.31	3,673.88	210.45	444.47	491.73	1.94
3,816.00	8.51	58.18	3,768.81	218.00	456.67	505.97	0.18
3,911.00	6.80	59.96	3,862.96	224.52	467.51	518.54	1.82
4,006.00	4.66	70.48	3,957.48	228.63	476.02	527.99	2.50
4,101.00	2.59	55.78	4,052.29	231.12	481.43	533.95	2.37
4,197.00	1.24	322.55	4,148.25	233.17	482.59	535.86	3.06
4,292.00	0.98	168.39	4,243.24	233.19	482.13	535.44	2.28
4,387.00	0.79	150.89	4,338.23	231.82	482.61	535.31	0.35
4,482.00	0.61	165.29	4,433.22	230.76	483.06	535.28	0.26
4,577.00	0.22	119.24	4,528.22	230.18	483.35	535.30	0.51
4,672.00	0.55	169.64	4,623.22	229.64	483.59	535.29	0.47
4,767.00	0.06	350.69	4,718.22	229.24	483.66	535.19	0.64
4,862.00	0.25	316.79	4,813.21	229.44	483.51	535.14	0.21

Design Report for Ruff C08-27D - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
4,957.00	0.18	300.36	4,908.21	229.67	483.24	534.99	0.10
5,051.00	0.26	332.15	5,002.21	229.93	483.01	534.89	0.15
5,146.00	0.58	342.97	5,097.21	230.58	482.77	534.94	0.35
5,241.00	1.09	328.75	5,192.20	231.82	482.16	534.90	0.58
5,336.00	1.28	336.86	5,287.18	233.57	481.28	534.83	0.27
5,432.00	0.09	301.44	5,383.17	234.59	480.79	534.81	1.26
5,527.00	0.97	325.57	5,478.17	235.29	480.27	534.63	0.94
5,622.00	0.93	328.29	5,573.15	236.61	479.41	534.40	0.06
5,717.00	1.31	184.75	5,668.15	236.19	478.92	533.77	2.24
5,811.00	1.17	170.12	5,762.12	234.17	478.99	533.00	0.37
5,906.00	0.81	155.36	5,857.11	232.60	479.44	532.75	0.46
6,001.00	0.63	119.91	5,952.10	231.73	480.17	533.06	0.50
6,096.00	0.59	85.29	6,047.10	231.51	481.11	533.82	0.38
6,192.00	0.77	57.90	6,143.09	231.90	482.15	534.93	0.38
6,287.00	1.00	59.00	6,238.08	232.66	483.40	536.38	0.24
6,382.00	1.38	45.96	6,333.06	233.88	484.94	538.28	0.49
6,477.00	1.87	41.97	6,428.02	235.83	486.79	540.79	0.53
6,572.00	0.72	226.40	6,523.01	236.57	487.40	541.64	2.72
6,667.00	0.76	194.55	6,618.00	235.55	486.81	540.68	0.43
6,762.00	1.14	160.58	6,712.99	234.05	486.96	540.20	0.70
6,857.00	0.93	123.82	6,807.97	232.73	487.92	540.52	0.72
6,952.00	0.60	7.59	6,902.97	232.79	488.63	541.19	1.38
7,047.00	0.55	3.91	6,997.96	233.74	488.72	541.67	0.07
7,139.00	0.77	343.66	7,089.96	234.78	488.58	541.97	0.35
Final MWD Survey							
7,196.00	0.77	343.66	7,146.95	235.51	488.36	542.08	0.00
Survey Projection to TD - Estimated BHL: 87' FNL, 1320' FEL							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
692.00	692.00	0.00	0.00	Surface Casing Assumed Vertical at 692.00ft
723.00	723.00	0.06	0.02	First MWD Survey
7,139.00	7,089.96	234.78	488.58	Final MWD Survey
7,196.00	7,146.95	235.51	488.36	Survey Projection to TD
7,196.00	7,146.95	235.51	488.36	Estimated BHL: 87' FNL, 1320' FEL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (ft)	Origin +E/-W (ft)	Start TVD (ft)
Target	Ruff C08-27D_PlanA - Rev1_BHL Tgt	65.39	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
692.00	7,196.00	Sperry MWD Surveys	MWD

Design Report for Ruff C08-27D - MWD Survey

Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Ruff C08-27D_PlanA	0.00	0.00	7,165.00	223.72	488.36	1,365,855.48	3,259,340.32	40° 20' 2.184 N	104° 34' 10.992 W
- actual wellpath misses target center by 21.56ft at 7196.00ft MD (7146.95 TVD, 235.51 N, 488.36 E)									
- Point									
Ruff C08-27D_PlanA	0.00	0.00	5,669.00	223.72	488.36	1,365,855.48	3,259,340.32	40° 20' 2.184 N	104° 34' 10.992 W
- actual wellpath misses target center by 15.63ft at 5718.13ft MD (5669.27 TVD, 236.16 N, 478.92 E)									
- Circle (radius 35.00)									
Northrup	0.00	0.00	1.00	-0.46	-44.60	1,365,631.31	3,258,807.38	40° 20' 0.024 N	104° 34' 17.904 W
- actual wellpath misses target center by 44.60ft at 1.00ft MD (1.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				1,809.40	317.54	1,365,949.29	3,260,661.30		
Point 2				1,825.40	-2,319.46	1,363,312.40	3,260,677.30		
Point 3				1,842.40	-4,961.46	1,360,670.52	3,260,694.30		
Point 4				-800.60	-4,996.46	1,360,635.52	3,258,051.41		
Point 5				-3,430.60	-5,041.46	1,360,590.52	3,255,421.52		
Point 6				-3,463.60	-2,396.46	1,363,235.41	3,255,388.52		
Point 7				-3,484.60	236.54	1,365,868.30	3,255,367.53		
Point 8				-844.60	278.54	1,365,910.29	3,258,007.41		
Point 9				1,809.40	317.54	1,365,949.29	3,260,661.30		
Northrup	0.00	0.00	1.00	-0.46	-44.60	1,365,631.31	3,258,807.38	40° 20' 0.024 N	104° 34' 17.904 W
- actual wellpath misses target center by 44.60ft at 1.00ft MD (1.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				1,349.40	-142.46	1,365,489.31	3,260,201.32		
Point 2				1,365.40	-2,319.46	1,363,312.40	3,260,217.32		
Point 3				1,382.40	-4,501.46	1,361,130.50	3,260,234.32		
Point 4				-800.60	-4,536.46	1,361,095.50	3,258,051.41		
Point 5				-2,970.60	-4,581.46	1,361,050.50	3,255,881.50		
Point 6				-3,003.60	-2,396.46	1,363,235.41	3,255,848.51		
Point 7				-3,024.60	-223.46	1,365,408.32	3,255,827.51		
Point 8				-844.60	-181.46	1,365,450.31	3,258,007.41		
Point 9				1,349.40	-142.46	1,365,489.31	3,260,201.32		

North Reference Sheet for Sec. 8-T4N-R64W (Northrup 8 PAD) - Ruff C08-27D

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

Vertical Depths are relative to KB @ 4778.00ft (Ensign 132). Northing and Easting are relative to Ruff C08-27D - 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: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99995788

Grid Coordinates of Well: 1,365,631.77 ft N, 3,258,851.98 ft E

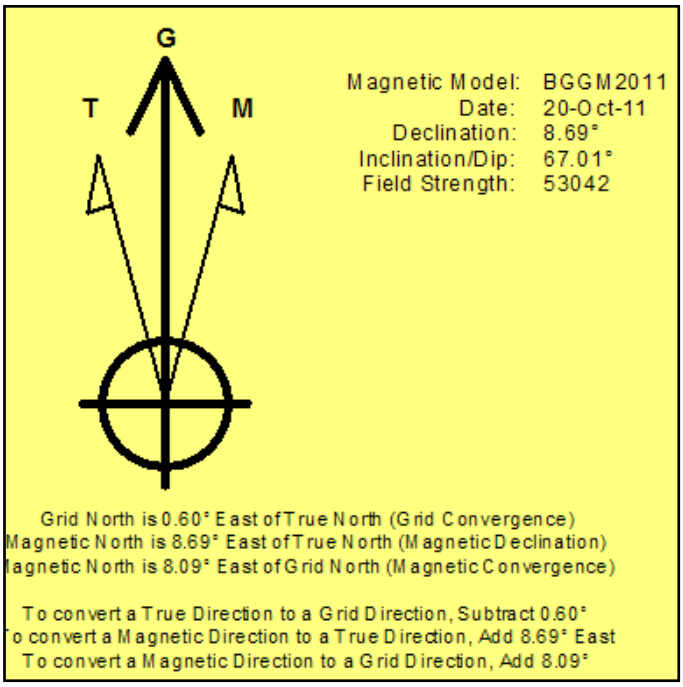
Geographical Coordinates of Well: 40° 20' 00.02" N, 104° 34' 17.33" W

Grid Convergence at Surface is: 0.60°

Based upon Minimum Curvature type calculations, at a Measured Depth of 7,196.00ft

the Bottom Hole Displacement is 542.18ft in the Direction of 64.25° (Grid).

Magnetic Convergence at surface is: -8.09° (20 October 2011, , BGGM2011)



Project: Weld County, CO (NAD 83)
Site: Sec. 8-T4N-R64W (Northrup 8 PAD)
Well: Ruff C08-27D

Noble Energy

HALLIBURTON
Sperry Drilling

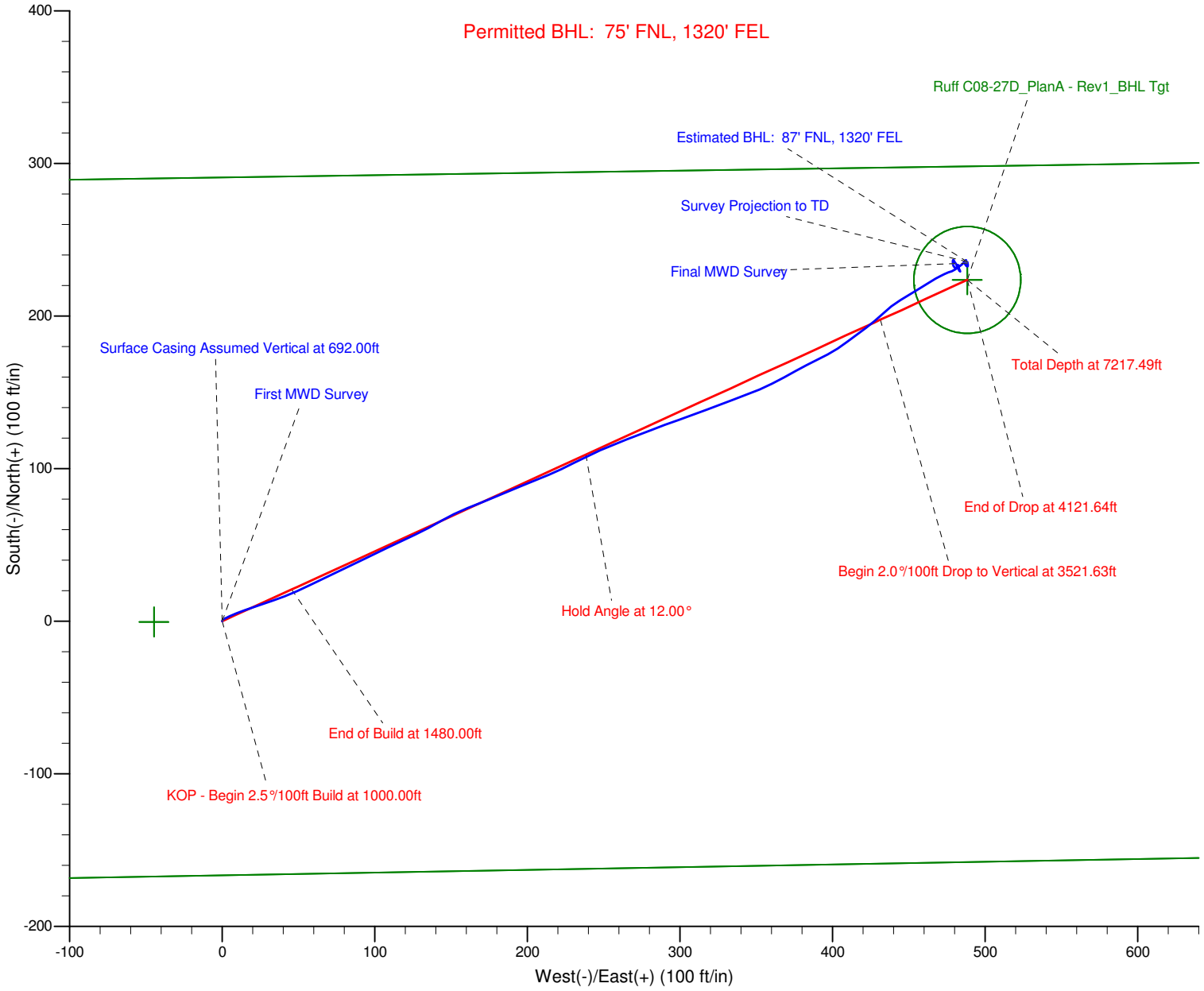
Azimuths to Grid North
True North: -0.60°
Magnetic North: 8.09°

Magnetic Field
Strength: 53042.3snT
Dip Angle: 67.01°
Date: 10/20/2011
Model: BGGM2011

LEGEND

Ruff C08-27D, Plan A, Plan A - Rev 1 Proposal V0
MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Ruff C08-27D 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.



Project: Weld County, CO (NAD 83)
Site: Sec. 8-T4N-R64W (Northrup 8 PAD)
Well: Ruff C08-27D

Noble Energy

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Azimuths to Grid North
True North: -0.60°
Magnetic North: 8.09°

Magnetic Field
Strength: 53042.3snT
Dip Angle: 67.01°
Date: 10/20/2011
Model: BGGM2011

LEGEND

Ruff C08-27D, Plan A, Plan A - Rev 1 Proposal V0
MWD Survey