



## **Noble Energy Inc.**

**Weld County, CO  
Sec 16, T4N, R65W  
Boulter G16-75HN**

**Wellbore #1**

**Survey: MWD FINAL**

## **DDC Survey Report**

**02 November, 2012**



<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Boulter G16-75HN
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	WELL @ 4831.0usft (H&P #323)
<b>Site:</b>	Sec 16, T4N, R65W	<b>MD Reference:</b>	WELL @ 4831.0usft (H&P #323)
<b>Well:</b>	Boulter G16-75HN	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db

Project	Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site		Sec 16, T4N, R65W			
Site Position:		Northing:	1,355,932.57 usft	Latitude:	40° 18' 26.748 N
From:	Lat/Long	Easting:	3,232,700.14 usft	Longitude:	104° 39' 56.196 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.54 °

Well	Boulter G16-75HN					
Well Position	+N-S	0.0 usft	Northing:	1,355,932.56 usft	Latitude:	40° 18' 26.748 N
	+E-W	0.0 usft	Easting:	3,232,700.14 usft	Longitude:	104° 39' 56.196 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft	Ground Level:	4,807.0 usft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	10/18/2012	8.62	66.95	52,952

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (usft)	+N-S (usft)	+E-W (usft)	Direction (°)	
	0.0	0.0	0.0	348.70	

Survey Program		Date	11/2/2012		
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description	
621.0	11,589.0	MWD (Wellbore #1)	MWD default	MWD - Standard	

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N-S (usft)	+E-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
TIE IN @ 621' MD / 621' TVD									
621.0	0.00	0.00	621.0	0.0	0.0	0.0	0.00	0.00	0.00
724.0	0.30	62.40	724.0	0.1	0.2	0.1	0.29	0.29	0.00
999.0	0.50	114.60	999.0	0.0	2.0	-0.4	0.14	0.07	18.98
1,182.0	0.50	131.10	1,182.0	-0.9	3.3	-1.5	0.08	0.00	9.02
1,274.0	1.70	213.70	1,274.0	-2.3	2.8	-2.8	1.86	1.30	89.78
1,366.0	3.90	228.50	1,365.9	-5.5	-0.3	-5.3	2.50	2.39	16.09
1,458.0	5.80	233.30	1,457.5	-10.4	-6.3	-8.9	2.11	2.07	5.22
1,553.0	7.10	229.90	1,551.9	-17.0	-14.7	-13.8	1.43	1.37	-3.58
1,648.0	7.80	229.60	1,646.1	-25.0	-24.1	-19.8	0.74	0.74	-0.32

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<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db

Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
1,743.0	9.60	228.50	1,740.0	-34.4	-34.9	-26.9	1.90	1.89	-1.16
1,838.0	11.60	229.00	1,833.4	-45.9	-48.1	-35.6	2.11	2.11	0.53
1,933.0	13.60	226.10	1,926.1	-59.9	-63.3	-46.4	2.21	2.11	-3.05
2,028.0	15.10	226.90	2,018.1	-76.1	-80.4	-58.9	1.59	1.58	0.84
2,123.0	16.20	227.30	2,109.6	-93.6	-99.2	-72.3	1.16	1.16	0.42
2,218.0	18.50	228.30	2,200.3	-112.6	-120.2	-86.9	2.44	2.42	1.05
2,313.0	15.40	228.90	2,291.1	-130.9	-140.9	-100.8	3.27	-3.26	0.63
2,408.0	15.80	232.00	2,382.6	-147.2	-160.6	-112.8	0.97	0.42	3.26
2,503.0	17.50	232.50	2,473.7	-163.8	-182.2	-125.0	1.80	1.79	0.53
2,598.0	17.00	229.90	2,564.4	-181.5	-204.1	-137.9	0.97	-0.53	-2.74
2,693.0	17.90	226.90	2,655.0	-200.4	-225.4	-152.3	1.34	0.95	-3.16
2,788.0	19.90	228.90	2,744.9	-221.0	-248.2	-168.1	2.21	2.11	2.11
2,883.0	20.20	228.00	2,834.1	-242.6	-272.6	-184.5	0.45	0.32	-0.95
2,978.0	20.80	226.90	2,923.1	-265.1	-297.1	-201.7	0.75	0.63	-1.16
3,073.0	16.90	226.10	3,013.0	-286.2	-319.4	-218.1	4.11	-4.11	-0.84
3,168.0	16.00	224.30	3,104.1	-305.1	-338.5	-232.9	1.09	-0.95	-1.89
3,263.0	15.70	224.10	3,195.5	-323.7	-356.6	-247.6	0.32	-0.32	-0.21
3,358.0	15.60	229.40	3,287.0	-341.3	-375.2	-261.2	1.51	-0.11	5.58
3,453.0	15.60	227.60	3,378.5	-358.2	-394.4	-274.0	0.51	0.00	-1.89
3,548.0	16.40	226.40	3,469.8	-376.1	-413.5	-287.8	0.91	0.84	-1.26
3,643.0	16.20	224.50	3,561.0	-394.8	-432.5	-302.4	0.60	-0.21	-2.00
3,738.0	15.20	229.70	3,652.5	-412.3	-451.3	-315.9	1.82	-1.05	5.47
3,833.0	14.40	230.40	3,744.3	-427.9	-469.9	-327.5	0.86	-0.84	0.74
3,928.0	17.30	225.50	3,835.7	-445.3	-489.1	-340.8	3.36	3.05	-5.16
4,024.0	19.30	221.50	3,926.8	-467.2	-509.8	-358.3	2.46	2.08	-4.17
4,119.0	18.20	220.10	4,016.8	-490.3	-529.7	-377.0	1.25	-1.16	-1.47
4,214.0	17.20	218.00	4,107.3	-512.7	-547.9	-395.4	1.25	-1.05	-2.21
4,309.0	17.10	216.70	4,198.1	-535.0	-564.9	-413.9	0.42	-0.11	-1.37
4,404.0	18.90	219.90	4,288.4	-558.0	-583.1	-432.9	2.16	1.89	3.37
4,499.0	18.00	223.10	4,378.5	-580.5	-603.0	-451.1	1.43	-0.95	3.37
4,594.0	18.00	226.80	4,468.9	-601.3	-623.8	-467.4	1.20	0.00	3.89
4,689.0	17.90	224.50	4,559.3	-621.7	-644.7	-483.4	0.75	-0.11	-2.42
4,783.0	17.30	227.60	4,648.9	-641.5	-665.2	-498.7	1.18	-0.64	3.30
4,879.0	14.80	229.20	4,741.1	-659.1	-685.0	-512.1	2.64	-2.60	1.67
4,974.0	11.90	230.40	4,833.5	-673.3	-701.7	-522.7	3.07	-3.05	1.26
5,069.0	8.40	228.70	4,927.0	-684.1	-714.5	-530.9	3.70	-3.68	-1.79
5,164.0	8.40	226.60	5,021.0	-693.5	-724.7	-538.0	0.32	0.00	-2.21
5,259.0	7.40	225.40	5,115.1	-702.5	-734.1	-545.1	1.07	-1.05	-1.26
5,354.0	5.00	223.10	5,209.6	-709.8	-741.3	-550.8	2.54	-2.53	-2.42
5,449.0	3.30	215.30	5,304.3	-715.1	-745.7	-555.1	1.88	-1.79	-8.21
5,544.0	2.00	203.70	5,399.2	-718.9	-748.0	-558.4	1.47	-1.37	-12.21
5,639.0	1.70	200.70	5,494.1	-721.7	-749.1	-560.9	0.33	-0.32	-3.16
5,734.0	1.10	184.70	5,589.1	-723.9	-749.7	-563.0	0.75	-0.63	-16.84
5,829.0	1.10	161.00	5,684.1	-725.7	-749.5	-564.8	0.48	0.00	-24.95

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5,924.0	1.60	135.70	5,779.1	-727.5	-748.3	-566.8	0.81	0.53	-26.63
6,019.0	0.80	139.60	5,874.1	-729.0	-746.9	-568.5	0.85	-0.84	4.11
6,114.0	0.50	145.00	5,969.0	-729.8	-746.2	-569.4	0.32	-0.32	5.68
6,209.0	0.50	159.30	6,064.0	-730.5	-745.9	-570.2	0.13	0.00	15.05
6,304.0	0.90	168.90	6,159.0	-731.6	-745.6	-571.4	0.44	0.42	10.11
6,341.0	1.00	154.70	6,196.0	-732.2	-745.4	-572.0	0.69	0.27	-38.38
6,393.0	1.00	159.60	6,248.0	-733.1	-745.0	-572.9	0.16	0.00	9.42
6,438.0	0.30	199.00	6,293.0	-733.5	-744.9	-573.4	1.76	-1.56	87.56
6,488.0	4.10	341.20	6,343.0	-732.0	-745.5	-571.7	8.68	7.60	284.40
6,583.0	5.90	343.10	6,437.6	-724.1	-748.1	-563.5	1.90	1.89	2.00
6,628.0	8.90	356.50	6,482.2	-718.4	-748.9	-557.7	7.65	6.67	29.78
6,678.0	12.80	0.30	6,531.3	-709.0	-749.1	-548.4	7.93	7.80	7.60
6,723.0	16.80	357.50	6,574.8	-697.5	-749.4	-537.1	9.03	8.89	-6.22
6,773.0	21.80	357.50	6,622.0	-681.0	-750.1	-520.8	10.00	10.00	0.00
6,818.0	24.90	359.60	6,663.3	-663.2	-750.6	-503.2	7.13	6.89	4.67
6,868.0	29.30	0.20	6,707.8	-640.4	-750.6	-480.9	8.82	8.80	1.20
6,913.0	33.20	359.80	6,746.3	-617.1	-750.6	-458.0	8.68	8.67	-0.89
6,963.0	37.10	0.00	6,787.2	-588.3	-750.6	-429.8	7.80	7.80	0.40
7,008.0	40.30	359.10	6,822.3	-560.1	-750.9	-402.2	7.22	7.11	-2.00
7,058.0	44.30	355.30	6,859.3	-526.6	-752.6	-368.9	9.49	8.00	-7.60
7,103.0	47.40	354.50	6,890.6	-494.4	-755.4	-336.8	7.01	6.89	-1.78
7,153.0	51.00	355.10	6,923.3	-456.7	-758.9	-299.2	7.26	7.20	1.20
7,198.0	54.50	357.70	6,950.5	-421.0	-761.1	-263.7	9.03	7.78	5.78
7,248.0	60.10	0.20	6,977.5	-378.9	-761.8	-222.3	11.96	11.20	5.00
<b>CROSSED HARD LINE @ 7258' MD / 6982' TVD</b>									
7,258.0	60.92	0.36	6,982.4	-370.2	-761.8	-213.8	8.34	8.22	1.60
7,293.0	63.80	0.90	6,998.7	-339.2	-761.4	-183.4	8.34	8.22	1.54
7,343.0	66.70	0.20	7,019.6	-293.8	-761.0	-139.0	5.94	5.80	-1.40
7,388.0	68.30	359.60	7,036.8	-252.2	-761.1	-98.2	3.76	3.56	-1.33
7,438.0	70.50	359.50	7,054.4	-205.5	-761.4	-52.3	4.40	4.40	-0.20
7,483.0	75.80	359.30	7,067.4	-162.4	-761.9	-10.0	11.79	11.78	-0.44
7,533.0	79.80	358.80	7,078.0	-113.5	-762.7	38.1	8.06	8.00	-1.00
7,581.0	81.80	358.20	7,085.7	-66.2	-764.0	84.8	4.35	4.17	-1.25
7,657.0	83.90	358.40	7,095.1	9.2	-766.2	159.1	2.78	2.76	0.26
7,752.0	86.80	358.80	7,102.8	103.8	-768.5	252.4	3.08	3.05	0.42
7,847.0	88.90	359.10	7,106.4	198.7	-770.2	345.8	2.23	2.21	0.32
7,942.0	91.60	359.60	7,106.0	293.7	-771.3	439.2	2.89	2.84	0.53
8,037.0	93.30	358.80	7,101.9	388.6	-772.6	532.5	1.98	1.79	-0.84
8,132.0	93.40	357.90	7,096.4	483.4	-775.4	626.0	0.95	0.11	-0.95
8,227.0	90.00	359.30	7,093.6	578.3	-777.7	719.5	3.87	-3.58	1.47
8,322.0	88.40	359.50	7,094.9	673.3	-778.7	812.9	1.70	-1.68	0.21
8,417.0	88.90	358.80	7,097.1	768.3	-780.1	906.3	0.91	0.53	-0.74
8,512.0	87.10	359.30	7,100.4	863.2	-781.7	999.6	1.97	-1.89	0.53

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8,607.0	88.00	359.60	7,104.5	958.1	-782.6	1,092.9	1.00	0.95	0.32
8,702.0	90.30	1.20	7,105.9	1,053.1	-781.9	1,185.9	2.95	2.42	1.68
8,797.0	91.00	0.90	7,104.8	1,148.1	-780.2	1,278.7	0.80	0.74	-0.32
8,892.0	89.50	1.60	7,104.4	1,243.0	-778.1	1,371.4	1.74	-1.58	0.74
8,987.0	90.00	1.40	7,104.8	1,338.0	-775.6	1,464.1	0.57	0.53	-0.21
9,082.0	90.70	1.40	7,104.2	1,433.0	-773.3	1,556.7	0.74	0.74	0.00
9,177.0	89.60	2.10	7,104.0	1,527.9	-770.4	1,649.3	1.37	-1.16	0.74
9,272.0	90.00	3.90	7,104.3	1,622.8	-765.4	1,741.3	1.94	0.42	1.89
9,367.0	89.80	0.30	7,104.5	1,717.7	-761.9	1,833.7	3.80	-0.21	-3.79
9,461.0	90.00	355.80	7,104.7	1,811.6	-765.1	1,926.5	4.79	0.21	-4.79
9,557.0	89.60	354.90	7,105.0	1,907.3	-772.9	2,021.8	1.03	-0.42	-0.94
9,651.0	89.80	0.00	7,105.5	2,001.2	-777.1	2,114.7	5.43	0.21	5.43
9,746.0	90.00	2.50	7,105.7	2,096.2	-775.0	2,207.4	2.64	0.21	2.63
9,841.0	89.60	3.90	7,106.0	2,191.0	-769.7	2,299.4	1.53	-0.42	1.47
9,936.0	90.00	4.90	7,106.3	2,285.7	-762.4	2,390.8	1.13	0.42	1.05
10,032.0	89.00	4.40	7,107.2	2,381.4	-754.7	2,483.1	1.16	-1.04	-0.52
10,127.0	89.00	1.60	7,108.8	2,476.3	-749.7	2,575.2	2.95	0.00	-2.95
10,222.0	88.20	359.80	7,111.1	2,571.2	-748.5	2,668.0	2.07	-0.84	-1.89
10,317.0	90.30	358.90	7,112.4	2,666.2	-749.6	2,761.4	2.40	2.21	-0.95
10,411.0	90.70	358.60	7,111.6	2,760.2	-751.7	2,854.0	0.53	0.43	-0.32
10,506.0	90.80	358.60	7,110.3	2,855.1	-754.0	2,947.5	0.11	0.11	0.00
10,601.0	89.30	356.80	7,110.2	2,950.1	-757.8	3,041.4	2.47	-1.58	-1.89
10,696.0	90.00	358.20	7,110.8	3,045.0	-761.9	3,135.2	1.65	0.74	1.47
10,791.0	89.30	356.60	7,111.4	3,139.9	-766.2	3,229.1	1.84	-0.74	-1.68
10,886.0	90.10	358.80	7,111.9	3,234.8	-770.1	3,323.0	2.46	0.84	2.32
10,981.0	90.30	359.80	7,111.6	3,329.8	-771.2	3,416.3	1.07	0.21	1.05
11,076.0	91.00	359.80	7,110.5	3,424.8	-771.5	3,509.5	0.74	0.74	0.00
11,171.0	90.10	358.40	7,109.6	3,519.7	-773.0	3,603.0	1.75	-0.95	-1.47
11,265.0	90.00	359.60	7,109.5	3,613.7	-774.7	3,695.5	1.28	-0.11	1.28
11,360.0	90.00	0.30	7,109.5	3,708.7	-774.8	3,788.6	0.74	0.00	0.74
11,455.0	90.20	1.00	7,109.3	3,803.7	-773.7	3,881.6	0.77	0.21	0.74
11,533.0	90.00	1.90	7,109.2	3,881.7	-771.7	3,957.7	1.18	-0.26	1.15
<b>TD @ 11589' MD / 7109' TVD</b>									
11,589.0	90.00	1.90	7,109.2	3,937.7	-769.9	4,012.2	0.00	0.00	0.00

#### Survey Annotations

Measured Depth (usft)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Comment
621.0	621.0	0.0	0.0	TIE IN @ 621' MD / 621' TVD
7,258.0	6,982.4	-370.2	-761.8	CROSSED HARD LINE @ 7258' MD / 6982' TVD
11,589.0	7,109.2	3,937.7	-769.9	TD @ 11589' MD / 7109' TVD

<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Boulter G16-75HN
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	WELL @ 4831.0usft (H&P #323)
<b>Site:</b>	Sec 16, T4N, R65W	<b>MD Reference:</b>	WELL @ 4831.0usft (H&P #323)
<b>Well:</b>	Boulter G16-75HN	<b>North Reference:</b>	Grid
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM 5000.1 Single User Db

Checked By: _____	Approved By: _____	Date: _____
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## Survey Certification Sheet

Noble Energy  
Company

RM-12783  
Job Number

11/2/2012  
Date

Sec16,T4N,R65W,65W  
Lease

Boulter G16-75HN  
Well Name

Weld,CO  
County & State

Surveyed from a depth of: 621 feet to 11589 feet MD

Type of Survey: MWD

Directional Supervisor/Surveyor: Boud Wolff

The data and calculations for this survey have been checked by me and conform to the standards and procedures set forth by **The Directional Drilling Company (DDC)**. This report represents a true and correct Directional survey of this well based on the original data obtained at the well site. Wellbore Coordinates are calculated using minimum curvature.

Digitally signed by Larry Wright  
DN: cn=Larry Wright, o=The Directional Drilling  
Company, ou=GM of Guidance Services,  
email=larryw@directionaldrillers.com, c=US  
Date: 2012.11.05 16:34:27 -0600

Larry Wright  
MWD General Manager



Vertical Section at 348.70° (200 usft/in)