



## **Noble Energy Inc.**

Weld County, CO

Sec 2, T9N, R58W

Upchurch State LD02-77-1BHN

API# 05-123-39817

Wellbore #1

Design: Wellbore #1 **FINAL**

## **DDC Survey Report**

13 January, 2015



<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Upchurch State LD02-77-1BHN
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	well @ 4772.0usft (H&P #326)
<b>Site:</b>	Sec 2, T9N, R58W	<b>MD Reference:</b>	well @ 4772.0usft (H&P #326)
<b>Well:</b>	Upchurch State LD02-77-1BHN	<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 Compass

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

<b>Site</b>	Sec 2, T9N, R58W				
<b>Site Position:</b>		<b>Northing:</b>	1,529,499.23 usft	<b>Latitude:</b>	40° 46' 29.928 N
<b>From:</b>	Lat/Long	<b>Easting:</b>	3,461,069.43 usft	<b>Longitude:</b>	103° 50' 6.756 W
<b>Position Uncertainty:</b>	0.0 usft	<b>Slot Radius:</b>	13-3/16 "	<b>Grid Convergence:</b>	1.08 °

<b>Well</b>	Upchurch State LD02-77-1BHN				
<b>Well Position</b>	<b>+N/-S</b>	0.0 usft	<b>Northing:</b>	1,529,498.50 usft	<b>Latitude:</b> 40° 46' 29.928 N
	<b>+E/-W</b>	0.0 usft	<b>Easting:</b>	3,461,030.66 usft	<b>Longitude:</b> 103° 50' 7.260 W
<b>Position Uncertainty</b>	0.0 usft		<b>Wellhead Elevation:</b>	0.0 usft	<b>Ground Level:</b> 4,742.0 usft

<b>Wellbore</b>	Wellbore #1				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	12/27/2014	7.90	67.37	53,047

<b>Design</b>	Wellbore #1				
<b>Audit Notes:</b>					
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b>	0.0
<b>Vertical Section:</b>	<b>Depth From (TVD) (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Direction (°)</b>	
	0.0	0.0	0.0	0.72	

<b>Survey Program</b>	<b>Date</b>	1/13/2015			
<b>From (usft)</b>	<b>To (usft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>	
364.0	1,163.0	Surface (Wellbore #1)	Flexi-Shot	VES Flexi-Shot Tool	
1,209.0	5,982.0	MWD Survey - Vert/Build (Wellbore #1)	MWD default	MWD - Standard	
6,071.0	9,688.0	MWD Survey - Lateral (Wellbore #1)	MWD default	MWD - Standard	

<b>Survey</b>										
<b>Measured Depth (usft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (usft)</b>	<b>+N/-S (usft)</b>	<b>+E/-W (usft)</b>	<b>Vertical Section (usft)</b>	<b>Dogleg Rate (°/100usft)</b>	<b>Build Rate (°/100usft)</b>	<b>Turn Rate (°/100usft)</b>	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
364.0	0.60	227.13	364.0	-1.3	-1.4	-1.3	0.16	0.16	0.00	
828.0	0.30	61.03	828.0	-2.4	-2.1	-2.4	0.19	-0.06	-35.80	
<b>TIE IN @ 1163' MD / 1163' TVD / END OF SUR HOLE /BEGIN INT HOLE</b>										
1,163.0	0.20	175.03	1,163.0	-2.5	-1.3	-2.5	0.13	-0.03	34.03	
1,209.0	0.35	124.43	1,209.0	-2.7	-1.2	-2.7	0.59	0.33	-110.00	
1,302.0	3.17	19.66	1,301.9	-0.4	-0.1	-0.4	3.52	3.03	-112.66	
1,394.0	5.80	5.25	1,393.7	6.6	1.2	6.6	3.09	2.86	-15.66	
1,487.0	5.54	8.06	1,486.2	15.7	2.3	15.8	0.41	-0.28	3.02	

<b>Company:</b>	Noble Energy Inc.	<b>Local Co-ordinate Reference:</b>	Well Upchurch State LD02-77-1BHN
<b>Project:</b>	Weld County, CO	<b>TVD Reference:</b>	well @ 4772.0usft (H&P #326)
<b>Site:</b>	Sec 2, T9N, R58W	<b>MD Reference:</b>	well @ 4772.0usft (H&P #326)
<b>Well:</b>	Upchurch State LD02-77-1BHN	<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 Compass

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)	
1,581.0	4.66	4.37	1,579.8	24.0	3.2	24.1	1.00	-0.94	-3.93	
1,673.0	4.57	359.45	1,671.5	31.4	3.4	31.5	0.44	-0.10	-5.35	
1,767.0	4.40	355.93	1,765.2	38.8	3.2	38.8	0.34	-0.18	-3.74	
1,861.0	1.67	353.65	1,859.1	43.7	2.7	43.8	2.91	-2.90	-2.43	
1,953.0	3.52	48.84	1,951.0	46.9	4.7	47.0	3.16	2.01	59.99	
2,045.0	4.13	77.14	2,042.8	49.5	10.1	49.6	2.13	0.66	30.76	
2,137.0	4.13	73.28	2,134.6	51.2	16.5	51.4	0.30	0.00	-4.20	
2,229.0	5.98	90.15	2,226.2	52.1	24.4	52.4	2.56	2.01	18.34	
2,322.0	5.28	89.10	2,318.8	52.2	33.6	52.6	0.76	-0.75	-1.13	
2,414.0	7.12	99.29	2,410.2	51.3	43.4	51.9	2.32	2.00	11.08	
2,507.0	6.68	100.35	2,502.6	49.4	54.4	50.1	0.49	-0.47	1.14	
2,600.0	8.18	110.19	2,594.8	46.2	66.0	47.0	2.11	1.61	10.58	
2,691.0	7.83	108.43	2,684.9	42.0	77.9	43.0	0.47	-0.38	-1.93	
2,785.0	7.39	108.43	2,778.1	38.1	89.7	39.2	0.47	-0.47	0.00	
2,880.0	10.29	116.52	2,871.9	32.3	103.1	33.6	3.31	3.05	8.52	
2,974.0	9.41	113.35	2,964.5	25.5	117.7	27.0	1.10	-0.94	-3.37	
3,068.0	8.71	113.18	3,057.4	19.7	131.3	21.3	0.75	-0.74	-0.18	
3,163.0	8.44	110.01	3,151.3	14.5	144.5	16.3	0.57	-0.28	-3.34	
3,258.0	8.53	109.84	3,245.3	9.7	157.6	11.7	0.10	0.09	-0.18	
3,353.0	8.62	95.78	3,339.2	6.6	171.4	8.7	2.20	0.09	-14.80	
3,447.0	6.33	92.61	3,432.4	5.6	183.5	8.0	2.47	-2.44	-3.37	
3,541.0	3.43	94.90	3,526.1	5.2	191.5	7.6	3.09	-3.09	2.44	
3,636.0	0.70	39.53	3,621.0	5.4	194.7	7.8	3.25	-2.87	-58.28	
3,730.0	0.62	66.24	3,715.0	6.0	195.5	8.5	0.33	-0.09	28.41	
3,825.0	1.32	92.44	3,810.0	6.2	197.1	8.7	0.85	0.74	27.58	
3,919.0	1.85	71.52	3,903.9	6.6	199.6	9.1	0.83	0.56	-22.26	
4,014.0	1.41	281.05	3,998.9	7.3	199.9	9.8	3.32	-0.46	-158.39	
4,108.0	2.02	290.37	4,092.9	8.1	197.3	10.6	0.71	0.65	9.91	
4,297.0	2.11	306.54	4,281.8	11.4	191.3	13.8	0.31	0.05	8.56	
4,392.0	1.76	294.94	4,376.7	13.0	188.6	15.4	0.55	-0.37	-12.21	
4,486.0	1.67	295.64	4,470.7	14.2	186.1	16.6	0.10	-0.10	0.74	
4,581.0	1.67	287.90	4,565.6	15.2	183.5	17.5	0.24	0.00	-8.15	
4,676.0	1.58	294.76	4,660.6	16.2	181.0	18.5	0.23	-0.09	7.22	
4,770.0	1.41	291.60	4,754.6	17.2	178.7	19.4	0.20	-0.18	-3.36	
4,864.0	1.23	281.58	4,848.5	17.8	176.7	20.0	0.31	-0.19	-10.66	
4,960.0	0.97	267.51	4,944.5	18.0	174.9	20.2	0.39	-0.27	-14.66	
5,054.0	7.83	347.32	5,038.2	24.2	172.7	26.4	8.21	7.30	84.90	
5,148.0	15.92	345.56	5,130.1	43.0	168.0	45.1	8.61	8.61	-1.87	
5,243.0	22.34	346.62	5,219.8	73.2	160.6	75.2	6.77	6.76	1.12	
5,338.0	27.35	353.65	5,306.0	112.5	154.0	114.4	6.11	5.27	7.40	
5,432.0	40.45	1.73	5,383.9	164.7	152.5	166.6	14.71	13.94	8.60	
5,526.0	47.31	2.79	5,451.6	229.7	155.1	231.7	7.34	7.30	1.13	
5,620.0	51.09	6.65	5,513.1	300.6	161.0	302.6	5.08	4.02	4.11	

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<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM Compass

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)
5,715.0	53.73	1.73	5,571.0	375.6	166.5	377.7	4.95	2.78	-5.18
5,810.0	62.26	0.15	5,621.3	456.1	167.7	458.2	9.09	8.98	-1.66
5,904.0	67.09	359.80	5,661.5	541.0	167.7	543.1	5.15	5.14	-0.37
5,982.0	80.64	356.28	5,683.2	615.7	165.1	617.8	17.90	17.37	-4.51
7" CASING POINT@ 6030' MD / 5689' TVD / END OF INT HOLE / BEGIN LATERAL									
6,030.0	85.47	355.80	5,689.0	663.3	161.8	665.2	10.12	10.07	-0.99
6,071.0	89.60	355.40	5,690.7	704.1	158.6	706.0	10.12	10.07	-0.98
6,163.0	89.96	355.58	5,691.1	795.8	151.4	797.6	0.44	0.39	0.20
6,256.0	89.43	356.46	5,691.6	888.6	145.0	890.3	1.10	-0.57	0.95
6,349.0	89.52	356.99	5,692.4	981.4	139.6	983.1	0.58	0.10	0.57
6,440.0	89.25	357.87	5,693.4	1,072.3	135.6	1,073.9	1.01	-0.30	0.97
6,535.0	88.72	358.57	5,695.1	1,167.3	132.6	1,168.8	0.92	-0.56	0.74
6,629.0	88.99	358.39	5,697.0	1,261.2	130.1	1,262.7	0.35	0.29	-0.19
6,723.0	89.16	358.92	5,698.5	1,355.2	127.9	1,356.7	0.59	0.18	0.56
6,818.0	89.25	358.92	5,699.8	1,450.1	126.1	1,451.6	0.09	0.09	0.00
6,912.0	89.16	358.74	5,701.1	1,544.1	124.2	1,545.6	0.21	-0.10	-0.19
7,007.0	89.08	358.57	5,702.6	1,639.1	122.0	1,640.5	0.20	-0.08	-0.18
7,101.0	89.16	358.57	5,704.0	1,733.0	119.6	1,734.4	0.09	0.09	0.00
7,196.0	89.25	359.10	5,705.3	1,828.0	117.7	1,829.3	0.57	0.09	0.56
7,290.0	88.99	359.10	5,706.8	1,922.0	116.2	1,923.3	0.28	-0.28	0.00
7,385.0	90.13	359.45	5,707.5	2,017.0	115.0	2,018.3	1.26	1.20	0.37
7,479.0	90.57	359.80	5,706.9	2,111.0	114.4	2,112.2	0.60	0.47	0.37
7,574.0	90.66	359.97	5,705.9	2,206.0	114.2	2,207.2	0.20	0.09	0.18
7,668.0	90.84	359.97	5,704.7	2,300.0	114.2	2,301.2	0.19	0.19	0.00
7,763.0	91.01	359.80	5,703.1	2,394.9	114.0	2,396.2	0.25	0.18	-0.18
7,857.0	90.84	0.15	5,701.6	2,488.9	113.9	2,490.2	0.41	-0.18	0.37
7,952.0	90.66	359.97	5,700.4	2,583.9	114.0	2,585.2	0.27	-0.19	-0.19
8,047.0	90.57	0.33	5,699.4	2,678.9	114.3	2,680.1	0.39	-0.09	0.38
8,141.0	90.40	0.68	5,698.6	2,772.9	115.1	2,774.1	0.41	-0.18	0.37
8,236.0	89.69	359.97	5,698.5	2,867.9	115.6	2,869.1	1.06	-0.75	-0.75
8,330.0	89.69	0.15	5,699.0	2,961.9	115.7	2,963.1	0.19	0.00	0.19
8,425.0	89.52	359.62	5,699.6	3,056.9	115.6	3,058.1	0.59	-0.18	-0.56
8,520.0	89.69	359.80	5,700.3	3,151.9	115.1	3,153.1	0.26	0.18	0.19
8,614.0	89.52	359.27	5,700.9	3,245.9	114.3	3,247.1	0.59	-0.18	-0.56
8,708.0	88.46	358.39	5,702.6	3,339.9	112.4	3,341.0	1.47	-1.13	-0.94
8,802.0	88.72	358.74	5,704.9	3,433.8	110.0	3,434.9	0.46	0.28	0.37
8,897.0	89.16	358.22	5,706.7	3,528.7	107.5	3,529.8	0.72	0.46	-0.55
8,992.0	89.08	358.39	5,708.1	3,623.7	104.7	3,624.7	0.20	-0.08	0.18
9,086.0	89.08	357.51	5,709.6	3,717.6	101.3	3,718.6	0.94	0.00	-0.94
9,181.0	89.34	357.16	5,711.0	3,812.5	96.9	3,813.4	0.46	0.27	-0.37
9,276.0	88.99	357.34	5,712.3	3,907.4	92.4	3,908.2	0.41	-0.37	0.19
9,370.0	88.02	356.46	5,714.8	4,001.2	87.3	4,002.0	1.39	-1.03	-0.94
9,464.0	89.69	356.99	5,716.7	4,095.0	81.9	4,095.7	1.86	1.78	0.56
CROSSED 460' HARD LINE @ 9559' MD / 5717' TVD									

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<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	EDM Compass

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)
9,559.0	90.40	356.28	5,716.6	4,189.9	76.3	4,190.5	1.06	0.75	-0.75
9,641.0	90.57	356.81	5,715.9	4,271.7	71.4	4,272.3	0.68	0.21	0.65
TD @ 9688' MD / 5715' TVD									
9,688.0	90.57	356.81	5,715.4	4,318.7	68.8	4,319.2	0.00	0.00	0.00

Design Annotations				
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
1,163.0	1,163.0	-2.5	-1.3	TIE IN @ 1163' MD / 1163' TVD / END OF SUR HOLE /BEGIN INT HOLE
6,030.0	5,689.0	663.3	161.8	7" CASING POINT@ 6030' MD / 5689' TVD / END OF INT HOLE / BEGIN LATI
9,559.0	5,716.6	4,189.9	76.3	CROSSED 460' HARD LINE @ 9559' MD / 5717' TVD
9,688.0	5,715.4	4,318.7	68.8	TD @ 9688' MD / 5715' TVD

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_



Company Name: Noble Energy Inc.  
Upchurch State LD02-77-1BHN  
Weld County, CO  
Rig: H&P #326  
Created By: Jerry Arsenault  
Date: 1/13/2014

Upchurch State LD02-77-1BHN  
Weld County, CO  
Q141324 & RM-141343  
Design #3



PROJECT DETAILS: Weld County, CO

Geodetic System: US State Plane 1983  
Datum: North American Datum 1983  
Ellipsoid: GRS 1980  
Zone: Colorado Northern Zone  
System Datum: Mean Sea Level



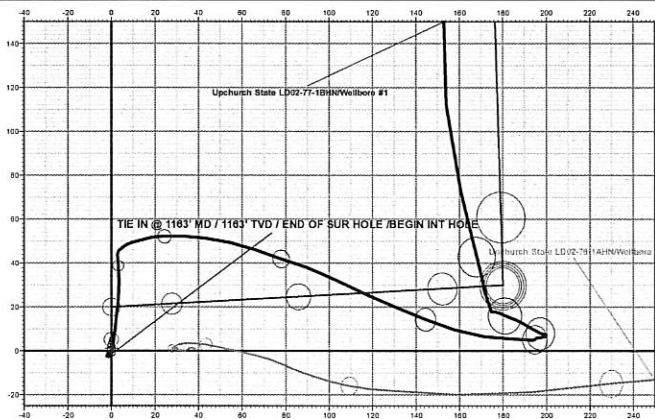
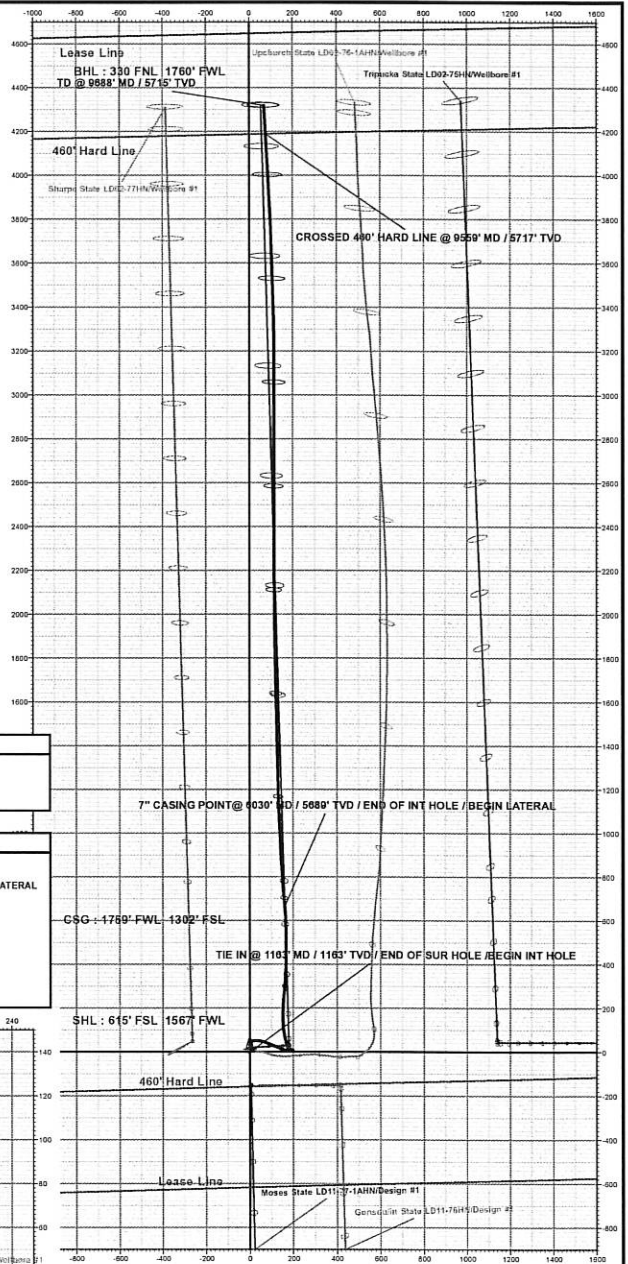
Azimuths to Grid North  
Correction: 6.83°  
Magnetic Field  
Strength: 53047.2snT  
Dip Angle: 67.37°  
Date: 12/27/2014  
Model: IGRF2010

DESIGN TARGET DETAILS

Name	TVD	+N-S	+E-W	Northing	Easting	Latitude	Longitude
PBHL Upchurch State LD02-77-1BHN - plan hits target center	5705.5	4319.2	54.6	1533817.66	3461055.28	40° 47' 12.588 N	103° 50' 5.488 W

ANNOTATIONS

MD	Inc	Azi	TVD	+N-S	+E-W	Vsect	Departure	Annotation
1163.0	0.26	175.03	1163.0	-2.5	-1.3	-2.5	7.0	TIE IN @ 1163' MD / 1163' TVD / END OF SUR HOLE / BEGIN INT HOLE
6030.0	85.47	355.80	5689.0	663.3	161.8	665.2	943.4	7" CASING POINT @ 6030' MD / 5689' TVD / END OF INT HOLE / BEGIN LATERAL
9559.0	90.40	358.28	5716.6	4180.9	78.3	4190.5	4471.8	CROSSED 460' HARD LINE @ 9559' MD / 5717' TVD
9888.0	90.57	356.81	5715.4	4318.7	68.8	4319.2	4600.8	TD @ 9888' MD / 5715' TVD



WELL DETAILS: Upchurch State LD02-77-1BHN

+N-S	+E-W	Ground Level:	Northing	Easting	Latitude	Longitude
0.0	0.0	4742.0	1529498.50	3461030.66	40° 46' 29.928 N	103° 50' 7.260 W

Vertical Section at 0.72" (200 usf/in)