

# Noble Energy

Weld County, CO (NAD 83)

Sec. 26-T9N-59W (Gleason PAD)

Neal LC35-738

Original Wellbore

Design: Actual Surveys

05-123-40683

## Sperry Drilling Services

### Final Survey Report

05 May, 2015

Well Coordinates: 1,507,336.12 N, 3,431,954.34 E (40° 42' 56.20" N, 103° 56' 30.19" W)

Ground Level: 4,848.00 usft

Local Coordinate Origin:

Centered on Well Neal LC35-738

Viewing Datum:

KB @ 4878.00usft (HP 321)

TVDs to System:

N

North Reference:

Grid

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 73

**HALLIBURTON**

Project: Weld County, CO (NAD 83)  
Site: Sec. 26-T9N-59W (Gleason PAD)  
Well: Neal LC35-738  
Wellbore: Original Wellbore  
Design: Actual Surveys

# Noble Energy

**HALLIBURTON**  
Sperry Drilling

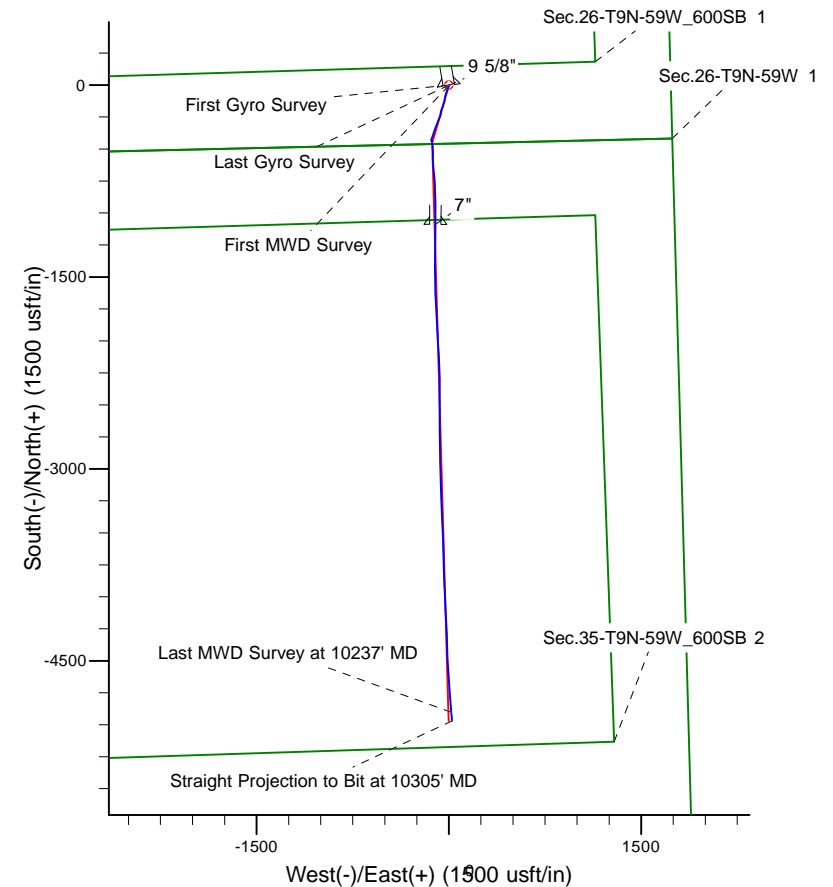
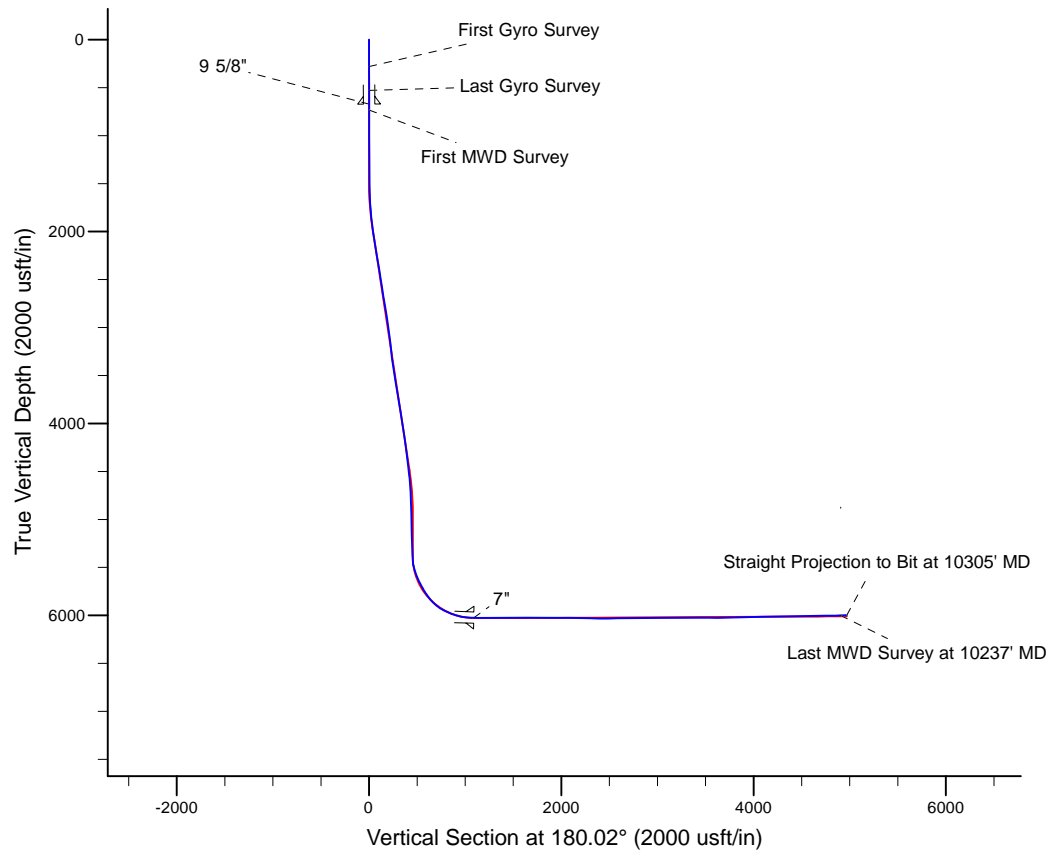
Platted SHL: 460' FSL, 1731' FEL  
Platted Lat/Long: 40.715610 N, 103.941720 W  
Location: Sec. 26-T9N-R59W

~7" Casing: 572 FNL, 1867 FEL  
Lat/Long: 40.712624 N, 103.942169 W  
State Planes - CO Northern: 1506246.25 N, 3431849.12 E  
Location: Sec. 26-T9N-R59W

Platted BHL: 810' FSL, 1870' FEL  
Lat/Long: 40.701970 N, 103.942040 W  
State Planes - CO Northern: 1502365.93 N, 3431952.95 E  
Location: Sec. 35-T9N-R59W

## LEGEND

- Neal LC35-738, Original Wellbore, Rev B0 V0
- Actual Surveys



WELL DETAILS: Neal LC35-738

Ground Level: 4848.00  
KB @ 4878.00usft (HP 321)

Created By: Amanda Marchand  
Created On: 5/5/2015

**Design Report for Neal LC35-738 - Actual 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
281.00	0.40	163.22	281.00	-0.94	0.28	0.94	0.14
<b>First Gyro Survey</b>							
528.00	0.40	240.12	527.99	-2.19	-0.22	2.19	0.20
<b>Last Gyro Survey</b>							
734.00	0.18	109.76	733.99	-2.66	-0.53	2.66	0.26
<b>First MWD Survey</b>							
918.00	0.18	93.67	917.99	-2.78	0.03	2.78	0.03
1,010.00	0.22	115.83	1,009.99	-2.86	0.33	2.86	0.09
1,102.00	0.37	126.48	1,101.99	-3.12	0.73	3.12	0.17
1,211.00	0.35	150.05	1,210.99	-3.62	1.18	3.62	0.14
1,302.00	0.42	147.28	1,301.98	-4.14	1.50	4.14	0.08
1,394.00	0.50	142.45	1,393.98	-4.74	1.92	4.74	0.10
1,486.00	0.43	146.82	1,485.98	-5.35	2.36	5.35	0.09
1,579.00	1.45	218.67	1,578.97	-6.56	1.81	6.56	1.48
1,670.00	3.31	206.24	1,669.89	-9.81	-0.07	9.81	2.11
1,763.00	4.91	206.85	1,762.64	-15.77	-3.05	15.77	1.72
1,854.00	6.35	204.77	1,853.20	-23.82	-6.92	23.82	1.60
1,946.00	7.89	198.85	1,944.49	-34.41	-11.09	34.42	1.85
2,038.00	8.79	201.73	2,035.52	-46.92	-15.74	46.92	1.08
2,129.00	9.60	197.98	2,125.35	-60.60	-20.65	60.60	1.11
2,222.00	9.89	194.37	2,217.01	-75.71	-25.03	75.72	0.73
2,314.00	9.36	189.23	2,307.71	-90.75	-28.19	90.75	1.10
2,405.00	9.37	187.71	2,397.50	-105.39	-30.37	105.40	0.27
2,498.00	9.44	191.88	2,489.25	-120.36	-32.96	120.37	0.74
2,590.00	9.05	198.25	2,580.06	-134.61	-36.78	134.62	1.19
2,683.00	9.39	201.20	2,671.86	-148.63	-41.81	148.64	0.63
2,778.00	9.65	199.71	2,765.55	-163.35	-47.30	163.37	0.38
2,872.00	9.70	198.44	2,858.21	-178.28	-52.46	178.30	0.23
2,967.00	9.18	197.28	2,951.93	-193.11	-57.24	193.13	0.58
3,062.00	8.41	194.11	3,045.81	-207.09	-61.19	207.10	0.96
3,157.00	6.09	183.42	3,140.05	-218.86	-63.18	218.87	2.81
3,251.00	5.93	185.99	3,233.53	-228.66	-63.99	228.68	0.33
3,346.00	8.45	203.58	3,327.79	-239.94	-67.29	239.96	3.49
3,441.00	9.18	202.52	3,421.66	-253.34	-72.99	253.36	0.79
3,535.00	9.65	201.78	3,514.40	-267.58	-78.78	267.60	0.52
3,630.00	9.91	201.44	3,608.02	-282.59	-84.72	282.61	0.28
3,724.00	10.19	201.25	3,700.57	-297.86	-90.69	297.89	0.30
3,819.00	10.11	201.76	3,794.09	-313.44	-96.83	313.47	0.13
3,913.00	10.03	200.52	3,886.64	-328.77	-102.76	328.80	0.25
4,008.00	9.26	199.14	3,980.30	-343.74	-108.16	343.77	0.85
4,103.00	9.01	198.90	4,074.09	-358.00	-113.08	358.03	0.27
4,198.00	8.35	198.53	4,168.00	-371.58	-117.68	371.61	0.70
4,292.00	8.13	198.42	4,261.03	-384.35	-121.95	384.39	0.23
4,387.00	7.59	197.66	4,355.14	-396.70	-125.98	396.74	0.58
4,482.00	7.11	200.66	4,449.36	-408.18	-129.96	408.22	0.65
4,577.00	6.49	202.96	4,543.69	-418.63	-134.12	418.67	0.71
4,671.00	4.34	190.79	4,637.27	-427.02	-136.86	427.05	2.58
4,766.00	2.11	158.18	4,732.12	-432.17	-136.89	432.21	2.95
4,861.00	1.84	155.62	4,827.06	-435.18	-135.61	435.22	0.30

## Design Report for Neal LC35-738 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,956.00	1.95	160.15	4,922.01	-438.09	-134.43	438.13	0.20
5,051.00	2.02	166.67	5,016.95	-441.24	-133.49	441.28	0.25
5,145.00	1.81	158.36	5,110.90	-444.23	-132.56	444.27	0.37
5,240.00	1.81	155.88	5,205.85	-447.00	-131.40	447.04	0.08
5,335.00	1.57	157.73	5,300.81	-449.57	-130.29	449.61	0.26
5,430.00	1.74	152.67	5,395.77	-452.06	-129.14	452.09	0.24
5,477.00	6.75	179.42	5,442.63	-455.46	-128.78	455.49	11.18
5,524.00	13.08	175.70	5,488.91	-463.53	-128.35	463.57	13.53
5,571.00	17.53	175.23	5,534.23	-475.89	-127.36	475.93	9.47
5,619.00	20.57	175.19	5,579.59	-491.50	-126.06	491.54	6.33
5,666.00	23.71	175.31	5,623.12	-509.15	-124.59	509.19	6.68
5,713.00	27.43	180.11	5,665.52	-529.41	-123.84	529.44	9.05
5,760.00	29.90	184.00	5,706.76	-551.92	-124.68	551.96	6.58
5,808.00	31.29	180.53	5,748.08	-576.33	-125.63	576.36	4.68
5,855.00	35.38	174.78	5,787.35	-602.10	-124.50	602.13	10.99
5,903.00	38.21	173.96	5,825.78	-630.70	-121.67	630.74	5.98
5,950.00	44.16	173.27	5,861.14	-661.45	-118.22	661.48	12.70
5,998.00	50.36	174.82	5,893.70	-696.49	-114.59	696.52	13.13
6,045.00	55.45	177.28	5,922.04	-733.88	-112.04	733.91	11.61
6,093.00	62.20	178.26	5,946.87	-774.89	-110.45	774.92	14.17
6,140.00	66.34	177.67	5,967.27	-817.19	-108.95	817.22	8.88
6,187.00	69.85	177.74	5,984.80	-860.76	-107.20	860.79	7.47
6,234.00	73.34	178.29	5,999.64	-905.32	-105.66	905.35	7.51
6,282.00	77.48	179.39	6,011.73	-951.75	-104.72	951.78	8.91
6,329.00	83.43	180.26	6,019.52	-998.08	-104.58	998.11	12.79
6,371.00	87.17	180.44	6,022.96	-1,039.93	-104.84	1,039.96	8.91
6,507.00	89.88	180.45	6,026.46	-1,175.87	-105.89	1,175.90	1.99
6,598.00	89.91	180.62	6,026.63	-1,266.87	-106.74	1,266.89	0.19
6,690.00	91.17	181.06	6,025.76	-1,358.85	-108.09	1,358.88	1.45
6,783.00	89.85	179.50	6,024.93	-1,451.84	-108.55	1,451.87	2.20
6,875.00	90.34	178.49	6,024.78	-1,543.82	-106.93	1,543.85	1.22
6,967.00	89.94	177.81	6,024.56	-1,635.77	-103.96	1,635.80	0.86
7,062.00	89.45	177.11	6,025.06	-1,730.68	-99.75	1,730.71	0.90
7,157.00	90.46	177.41	6,025.14	-1,825.57	-95.21	1,825.60	1.11
7,346.00	89.51	176.15	6,025.19	-2,014.26	-84.60	2,014.29	0.83
7,441.00	88.46	176.60	6,026.87	-2,109.06	-78.59	2,109.08	1.20
7,630.00	89.01	178.73	6,031.04	-2,297.84	-70.89	2,297.86	1.16
7,725.00	89.41	180.68	6,032.35	-2,392.83	-70.40	2,392.85	2.10
7,820.00	90.34	180.34	6,032.56	-2,487.82	-71.25	2,487.84	1.04
7,914.00	91.11	180.77	6,031.37	-2,581.81	-72.16	2,581.83	0.94
8,009.00	90.62	179.38	6,029.93	-2,676.80	-72.28	2,676.82	1.55
8,104.00	90.55	179.47	6,028.96	-2,771.79	-71.33	2,771.81	0.12
8,198.00	90.34	178.20	6,028.23	-2,865.76	-69.42	2,865.78	1.37
8,293.00	90.55	178.69	6,027.50	-2,960.72	-66.84	2,960.74	0.56
8,388.00	90.68	178.48	6,026.48	-3,055.69	-64.50	3,055.71	0.26
8,482.00	90.18	178.19	6,025.77	-3,149.65	-61.77	3,149.66	0.61
8,577.00	90.59	177.81	6,025.13	-3,244.59	-58.45	3,244.60	0.59
8,672.00	90.37	177.80	6,024.34	-3,339.51	-54.81	3,339.53	0.23
8,767.00	89.85	177.55	6,024.16	-3,434.44	-50.96	3,434.45	0.61
8,862.00	89.20	177.30	6,024.94	-3,529.34	-46.69	3,529.35	0.73
8,956.00	88.61	178.62	6,026.74	-3,623.26	-43.34	3,623.27	1.54

**Design Report for Neal LC35-738 - Actual Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,051.00	91.97	179.03	6,026.26	-3,718.22	-41.40	3,718.23	3.56
9,146.00	92.31	177.64	6,022.71	-3,813.11	-38.64	3,813.12	1.51
9,241.00	92.87	177.38	6,018.42	-3,907.93	-34.52	3,907.93	0.65
9,336.00	90.55	177.63	6,015.58	-4,002.79	-30.38	4,002.79	2.46
9,430.00	91.11	177.44	6,014.22	-4,096.69	-26.34	4,096.70	0.63
9,525.00	91.29	176.58	6,012.23	-4,191.54	-21.39	4,191.54	0.92
9,620.00	89.85	177.90	6,011.29	-4,286.42	-16.81	4,286.42	2.06
9,715.00	90.89	178.42	6,010.67	-4,381.37	-13.76	4,381.37	1.22
9,810.00	91.05	177.45	6,009.07	-4,476.29	-10.34	4,476.29	1.03
9,905.00	90.92	176.25	6,007.43	-4,571.13	-5.12	4,571.13	1.27
9,999.00	91.69	176.44	6,005.29	-4,664.91	0.87	4,664.91	0.84
10,094.00	90.68	175.81	6,003.33	-4,759.67	7.29	4,759.67	1.25
10,189.00	91.29	175.32	6,001.69	-4,854.38	14.64	4,854.37	0.82
10,237.00	91.20	174.95	6,000.65	-4,902.19	18.71	4,902.19	0.79
<b>Last MWD Survey at 10237' MD</b>							
10,305.00	91.20	174.95	5,999.23	-4,969.91	24.69	4,969.91	0.00
<b>Straight Projection to Bit at 10305' MD</b>							

**Design Annotations**

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
281.00	281.00	-0.94	0.28	First Gyro Survey
528.00	527.99	-2.19	-0.22	Last Gyro Survey
734.00	733.99	-2.66	-0.53	First MWD Survey
10,237.00	6,000.65	-4,902.19	18.71	Last MWD Survey at 10237' MD
10,305.00	5,999.23	-4,969.91	24.69	Straight Projection to Bit at 10305' MD

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	Neal LC35-738_BHL	180.02	Slot	0.00	0.00	0.00

**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
281.00	528.00	Gyro Surveys	Flexi-Shot
734.00	6,371.00	Intermediate Surveys	MWD
6,507.00	10,305.00	Production Surveys	MWD

**Casing Details**

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
673.00	672.99	9 5/8"	9-5/8	13-3/4
6,421.00	6,024.99	7"	7	8-3/4

**Design Report for Neal LC35-738 - Actual 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
Neal LC35-738_BHL - actual wellpath misses target center by 29.89usft at 10302.72usft MD (5999.27 TVD, -4967.64 N, 24.49 E) - Point	0.00	0.00	6,014.01	-4,970.24	-1.39	1,502,365.93	3,431,952.95	40.701970	-103.942040

**Directional Difficulty Index**

Average Dogleg over Survey:	1.66 °/100usft	Maximum Dogleg over Survey:	14.17 °/100usft at 6,093.00 usft
Net Tortousity applicable to Plans:	0.60 °/100usft	Directional Difficulty Index:	6.166

**Audit Info**

North Reference Sheet for Sec. 26-T9N-59W (Gleason PAD) - Neal LC35-738 - Original Wellbore

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

Vertical Depths are relative to KB @ 4878.00usft (HP 321). Northing and Easting are relative to Neal LC35-738

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: 0.99998971

Grid Coordinates of Well: 1,507,336.12 usft N, 3,431,954.34 usft E

Geographical Coordinates of Well: 40° 42' 56.20" N, 103° 56' 30.19" W

Grid Convergence at Surface is: 1.01°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,305.00usft the Bottom Hole Displacement is 4,969.97usft in the Direction of 179.72° (Grid).

Magnetic Convergence at surface is: -7.03° (17 March 2015, , BGGM2014)

