

# Noble Energy

Weld County, CO (NAD 83)

Sec. 27-T4N-R66W

Nelson K27-63HN

Design: MWD Surveys

## Sperry Drilling Services

### Final Survey Report

27 October, 2011

Well Coordinates: 1,345,613.68 N, 3,203,135.01 E (40° 16' 47.35" N, 104° 46' 18.91" W)

Ground Level: 4,752.00 ft

Local Coordinate Origin:

Centered on Well Nelson K27-63HN

Viewing Datum:

KB @ 4776.00ft (H&P 322)

TVDs to System:

N

North Reference:

Grid

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 2003.16 Build: 431

**HALLIBURTON**

## Survey Report for Nelson K27-63HN - Sperry MWD Surveys

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
791.00	1.11	146.54	790.95	-6.39	4.22	6.99	0.14
<b>First MWD Survey</b>							
1,162.00	0.97	201.89	1,161.90	-12.30	5.03	12.96	0.26
1,540.00	0.69	229.19	1,539.86	-16.76	2.12	16.88	0.13
1,823.00	0.11	144.55	1,822.85	-18.10	0.99	18.02	0.24
2,109.00	1.47	170.13	2,108.82	-21.93	1.78	21.93	0.48
2,394.00	1.78	146.45	2,393.71	-29.22	4.85	29.62	0.26
2,489.00	2.61	146.40	2,488.64	-32.26	6.86	32.94	0.87
2,584.00	4.02	167.75	2,583.48	-37.31	8.76	38.24	1.95
2,679.00	4.03	169.46	2,678.24	-43.85	10.08	44.90	0.13
2,774.00	5.30	181.63	2,772.93	-51.52	10.57	52.55	1.69
2,869.00	5.22	170.10	2,867.53	-60.16	11.19	61.18	1.11
2,964.00	7.51	167.24	2,961.94	-70.47	13.30	71.70	2.43
3,059.00	8.82	173.39	3,055.98	-83.76	15.51	85.17	1.66
3,154.00	7.82	170.74	3,149.98	-97.38	17.39	98.91	1.13
3,248.00	6.39	171.27	3,243.25	-108.86	19.21	110.53	1.52
3,343.00	8.16	170.99	3,337.48	-120.74	21.07	122.56	1.86
3,438.00	7.96	169.55	3,431.55	-133.87	23.32	135.88	0.30
3,533.00	9.88	179.71	3,525.40	-148.49	24.55	150.51	2.61
3,628.00	9.85	167.75	3,619.00	-164.59	26.32	166.68	2.15
3,722.00	11.99	173.98	3,711.30	-182.16	29.05	184.46	2.60
3,817.00	12.81	174.41	3,804.08	-202.45	31.11	204.82	0.87
3,912.00	12.75	174.22	3,896.73	-223.36	33.19	225.79	0.08
4,006.00	10.77	173.06	3,988.75	-242.40	35.30	244.92	2.12
4,101.00	8.39	172.88	4,082.42	-258.09	37.23	260.72	2.51
4,196.00	7.83	172.70	4,176.47	-271.39	38.91	274.11	0.59
4,291.00	8.28	167.25	4,270.53	-284.48	41.24	287.41	0.93
4,386.00	7.16	168.88	4,364.67	-296.96	43.89	300.15	1.20
4,481.00	5.05	179.41	4,459.13	-306.95	45.08	310.20	2.51
4,576.00	2.93	170.49	4,553.89	-313.53	45.52	316.76	2.32
4,671.00	1.89	227.78	4,648.82	-316.98	44.76	320.04	2.61
4,766.00	2.68	223.46	4,743.75	-319.64	42.08	322.24	0.85
4,861.00	1.92	249.70	4,838.67	-321.81	39.06	323.89	1.35
4,956.00	1.53	331.04	4,933.64	-321.25	36.95	323.00	2.39
5,052.00	1.19	32.16	5,029.62	-319.28	36.86	321.04	1.47
5,146.00	0.84	43.11	5,123.60	-317.95	37.85	319.89	0.42
5,241.00	0.59	331.48	5,218.60	-317.02	38.09	319.00	0.91
5,336.00	0.20	57.34	5,313.59	-316.50	38.00	318.48	0.64
5,432.00	0.07	188.09	5,409.59	-316.47	38.13	318.47	0.26
5,527.00	0.53	236.79	5,504.59	-316.76	37.76	318.70	0.51
5,716.00	0.41	264.40	5,693.59	-317.31	36.35	319.01	0.13
5,906.00	0.28	296.92	5,883.58	-317.16	35.26	318.69	0.12
6,097.00	0.56	281.78	6,074.58	-316.76	33.93	-16.32	0.16
6,234.00	0.65	304.64	6,211.57	-316.18	32.64	-17.61	0.19
6,286.00	1.09	289.74	6,263.56	-315.85	31.93	-18.31	0.94
6,318.00	0.59	275.43	6,295.56	-315.73	31.48	-18.76	1.68
6,349.00	0.98	98.87	6,326.56	-315.76	31.58	-18.65	5.06
6,381.00	4.42	91.75	6,358.52	-315.84	33.08	-17.15	10.78
6,413.00	6.56	82.30	6,390.37	-315.63	36.13	-14.10	7.24

## Survey Report for Nelson K27-63HN - Sperry MWD Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
6,444.00	8.34	81.82	6,421.11	-315.07	40.11	-10.11	5.75
6,476.00	10.55	85.59	6,452.67	-314.52	45.33	-4.88	7.17
6,507.00	13.16	89.09	6,483.01	-314.24	51.69	1.48	8.73
6,539.00	15.44	89.28	6,514.02	-314.13	59.59	9.39	7.13
6,571.00	17.52	88.51	6,544.70	-313.95	68.66	18.46	6.54
6,603.00	19.27	89.23	6,575.06	-313.76	78.76	28.56	5.51
6,634.00	20.58	88.36	6,604.21	-313.53	89.32	39.12	4.33
6,666.00	22.39	88.80	6,633.98	-313.24	101.04	50.84	5.68
6,698.00	24.60	87.16	6,663.33	-312.78	113.78	63.60	7.20
6,730.00	25.71	88.07	6,692.29	-312.22	127.37	77.20	3.67
6,762.00	27.94	88.88	6,720.85	-311.84	141.81	91.64	7.06
6,793.00	30.49	88.01	6,747.90	-311.43	156.93	106.76	8.34
6,825.00	32.83	87.46	6,775.14	-310.76	173.71	123.56	7.37
6,857.00	35.59	87.13	6,801.60	-309.91	191.68	141.54	8.64
6,888.00	38.50	88.65	6,826.34	-309.23	210.34	160.21	9.84
6,920.00	40.85	90.77	6,850.97	-309.13	230.77	180.63	8.47
6,952.00	43.32	92.05	6,874.72	-309.67	252.21	202.06	8.17
6,984.00	44.89	93.55	6,897.69	-310.76	274.45	224.27	5.89
7,015.00	47.20	93.21	6,919.21	-312.07	296.73	246.51	7.49
7,047.00	50.64	92.23	6,940.23	-313.21	320.82	270.57	10.99
7,078.00	55.21	92.04	6,958.92	-314.13	345.53	295.25	14.75
7,110.00	59.90	91.12	6,976.08	-314.87	372.51	322.22	14.86
7,141.00	64.25	89.81	6,990.60	-315.09	399.89	349.59	14.52
7,173.00	68.55	88.24	7,003.41	-314.58	429.21	378.90	14.17
7,204.00	73.23	86.18	7,013.55	-313.15	458.45	408.17	16.35
7,236.00	76.07	85.48	7,022.02	-310.91	489.23	438.99	9.12
7,267.00	78.42	85.07	7,028.87	-308.41	519.36	469.17	7.69
7,286.00	80.78	85.87	7,032.30	-306.94	537.98	487.82	13.09
7,373.00	85.16	88.10	7,042.94	-302.41	624.18	574.10	5.64
7,405.00	86.45	88.45	7,045.28	-301.45	656.08	606.01	4.18
7,436.00	86.82	88.91	7,047.10	-300.73	687.02	636.96	1.90
7,467.00	88.06	89.06	7,048.49	-300.18	717.98	667.93	4.03
7,531.00	90.96	89.32	7,049.03	-299.28	781.97	731.92	4.55
7,626.00	90.74	87.84	7,047.63	-296.93	876.93	826.90	1.57
7,721.00	91.63	86.96	7,045.66	-292.62	971.81	921.86	1.32
7,816.00	92.90	87.17	7,041.91	-287.76	1,066.61	1,016.74	1.35
7,911.00	92.38	87.05	7,037.53	-282.97	1,161.38	1,111.60	0.56
8,006.00	91.91	87.59	7,033.97	-278.53	1,256.21	1,206.50	0.75
8,101.00	90.40	86.16	7,032.06	-273.36	1,351.05	1,301.43	2.19
8,196.00	88.98	85.10	7,032.57	-266.12	1,445.77	1,396.28	1.87
8,291.00	89.91	85.20	7,033.49	-258.09	1,540.42	1,491.09	0.98
8,385.00	90.15	87.40	7,033.44	-252.02	1,634.22	1,585.00	2.35
8,480.00	89.91	89.37	7,033.40	-249.34	1,729.18	1,679.99	2.09
8,575.00	91.76	89.23	7,032.01	-248.18	1,824.15	1,774.98	1.95
8,670.00	90.03	88.85	7,030.53	-246.59	1,919.13	1,869.96	1.86
8,765.00	88.21	91.69	7,031.99	-247.04	2,014.10	1,964.90	3.55
8,859.00	86.79	93.45	7,036.09	-251.25	2,107.91	2,058.59	2.40
8,953.00	88.24	93.05	7,040.16	-256.57	2,201.67	2,152.21	1.60
9,048.00	88.64	90.43	7,042.75	-259.46	2,296.58	2,247.04	2.79
9,143.00	89.20	87.94	7,044.54	-258.10	2,391.55	2,342.01	2.69
9,238.00	87.97	86.77	7,046.89	-253.72	2,486.41	2,436.95	1.79



**Survey Report for Nelson K27-63HN - Sperry MWD Surveys**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,333.00	87.44	86.35	7,050.69	-248.03	2,581.16	2,531.81	0.71
9,428.00	88.40	88.98	7,054.14	-244.16	2,676.01	2,626.72	2.95
9,523.00	90.34	89.35	7,055.18	-242.77	2,770.99	2,721.70	2.08
9,618.00	90.74	91.14	7,054.29	-243.18	2,865.98	2,816.66	1.93
9,713.00	89.41	89.61	7,054.16	-243.80	2,960.98	2,911.62	2.13
9,808.00	90.37	88.75	7,054.35	-242.44	3,055.97	3,006.61	1.36
9,902.00	88.00	88.89	7,055.68	-240.51	3,149.93	3,100.60	2.53
9,998.00	89.32	88.39	7,057.93	-238.23	3,245.87	3,196.57	1.47
10,093.00	89.72	88.32	7,058.72	-235.50	3,340.83	3,291.56	0.43
10,188.00	90.37	88.01	7,058.65	-232.46	3,435.78	3,386.56	0.76
10,283.00	90.62	89.59	7,057.83	-230.47	3,530.75	3,481.55	1.68
10,378.00	92.29	89.69	7,055.42	-229.87	3,625.72	3,576.51	1.76
10,473.00	91.20	88.93	7,052.52	-228.73	3,720.66	3,671.45	1.40
10,568.00	90.52	88.81	7,051.10	-226.86	3,815.64	3,766.44	0.73
10,664.00	89.47	88.00	7,051.11	-224.19	3,911.60	3,862.44	1.38
10,759.00	91.27	85.67	7,050.49	-218.94	4,006.44	3,957.37	3.10
10,853.00	91.30	85.13	7,048.38	-211.40	4,100.11	4,051.19	0.58
10,948.00	89.69	86.07	7,047.56	-204.12	4,194.82	4,146.04	1.96
11,043.00	90.43	85.97	7,047.46	-197.52	4,289.59	4,240.93	0.79
11,138.00	89.26	86.71	7,047.72	-191.46	4,384.40	4,335.85	1.46
11,234.00	91.08	86.47	7,047.44	-185.75	4,480.22	4,431.78	1.91
11,328.00	89.81	88.46	7,046.71	-181.59	4,574.12	4,525.74	2.51
11,423.00	89.88	88.93	7,046.96	-179.43	4,669.10	4,620.74	0.50
11,518.00	90.83	88.85	7,046.37	-177.59	4,764.08	4,715.74	1.00
11,612.00	90.74	87.81	7,045.09	-174.85	4,858.03	4,809.73	1.11
11,708.00	91.02	90.80	7,043.61	-173.69	4,954.00	4,905.70	3.13
11,803.00	92.38	90.49	7,040.79	-174.75	5,048.95	5,000.60	1.47
11,898.00	90.93	91.38	7,038.05	-176.30	5,143.89	5,095.49	1.79
11,992.00	87.78	91.94	7,039.11	-179.03	5,237.83	5,189.35	3.40
12,088.00	89.29	90.94	7,041.56	-181.44	5,333.77	5,285.21	1.89
12,183.00	85.98	91.13	7,045.48	-183.15	5,428.66	5,380.04	3.49
12,278.00	86.17	91.15	7,051.98	-185.04	5,523.42	5,474.73	0.20
12,372.00	87.94	89.69	7,056.81	-185.72	5,617.28	5,568.56	2.44
12,467.00	89.54	89.34	7,058.90	-184.92	5,712.25	5,663.52	1.72
12,503.00	89.35	89.92	7,059.25	-184.69	5,748.25	5,699.52	1.70
<b>Final MWD Survey</b>							
12,562.00	89.35	89.92	7,059.92	-184.61	5,807.25	5,758.50	0.00

Survey Projection to TD - Estimated BHL: 1313' FSL 773' FWL

**Survey Annotations**

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
791.00	790.95	-6.39	4.22	First MWD Survey
12,503.00	7,059.25	-184.69	5,748.25	Final MWD Survey
12,562.00	7,059.92	-184.61	5,807.25	Survey Projection to TD
12,562.00	7,059.92	-184.61	5,807.25	Estimated BHL: 1313' FSL 773' FWL

## Survey Report for Nelson K27-63HN - Sperry MWD Surveys

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/-S (ft)	Origin +E/-W (ft)	Start TVD (ft)
User	No Target (Freehand)	170.69	Slot	0.00	0.00	0.00
Target	Nelson K27-63HN_PlanA - Rev0_BHL	88.74	User	-305.00	50.00	6,000.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
791.00	12,562.00	Sperry MWD Surveys	MWD

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
Nelson - survey hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,345,613.68	3,203,135.01	40° 16' 47.352 N	104° 46' 18.912 W
Nelson - survey misses target center by 47.82ft at 12562.00ft MD (7059.92 TVD, -184.61 N, 5807.25 E) - Point	0.00	0.00	7,047.00	-177.13	5,852.67	1,345,436.56	3,208,987.43	40° 16' 45.120 N	104° 45' 3.420 W
Nelson - survey hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,345,613.68	3,203,135.01	40° 16' 47.352 N	104° 46' 18.912 W
Nelson - survey hits target center - Polygon	0.00	0.00	0.00	0.00	0.00	1,345,613.68	3,203,135.01	40° 16' 47.352 N	104° 46' 18.912 W

**North Reference Sheet for Sec. 27-T4N-R66W - Nelson K27-63HN**

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

Vertical Depths are relative to KB @ 4776.00ft (H&P 322). Northing and Easting are relative to Nelson K27-63HN

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: 0.99995697

Grid Coordinates of Well: 1,345,613.68 ft N, 3,203,135.01 ft E

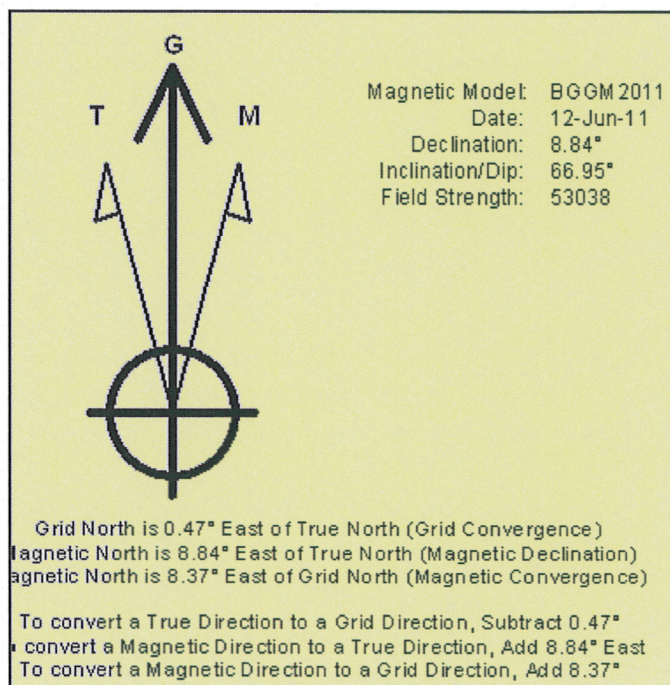
Geographical Coordinates of Well: 40° 16' 47.35" N, 104° 46' 18.91" W

Grid Convergence at Surface is: 0.47°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,562.00ft

the Bottom Hole Displacement is 5,810.18ft in the Direction of 91.82° (Grid).

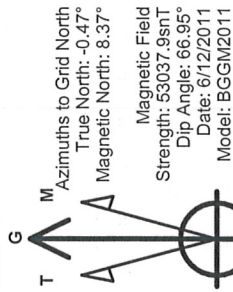
Magnetic Convergence at surface is: -8.37° (12 June 2011, , BGGM2011)





Project: Weld County, CO (NAD 83)  
Site: Sec. 27-T4N-R66W  
Well: Nelson K27-63HN

# Noble Energy

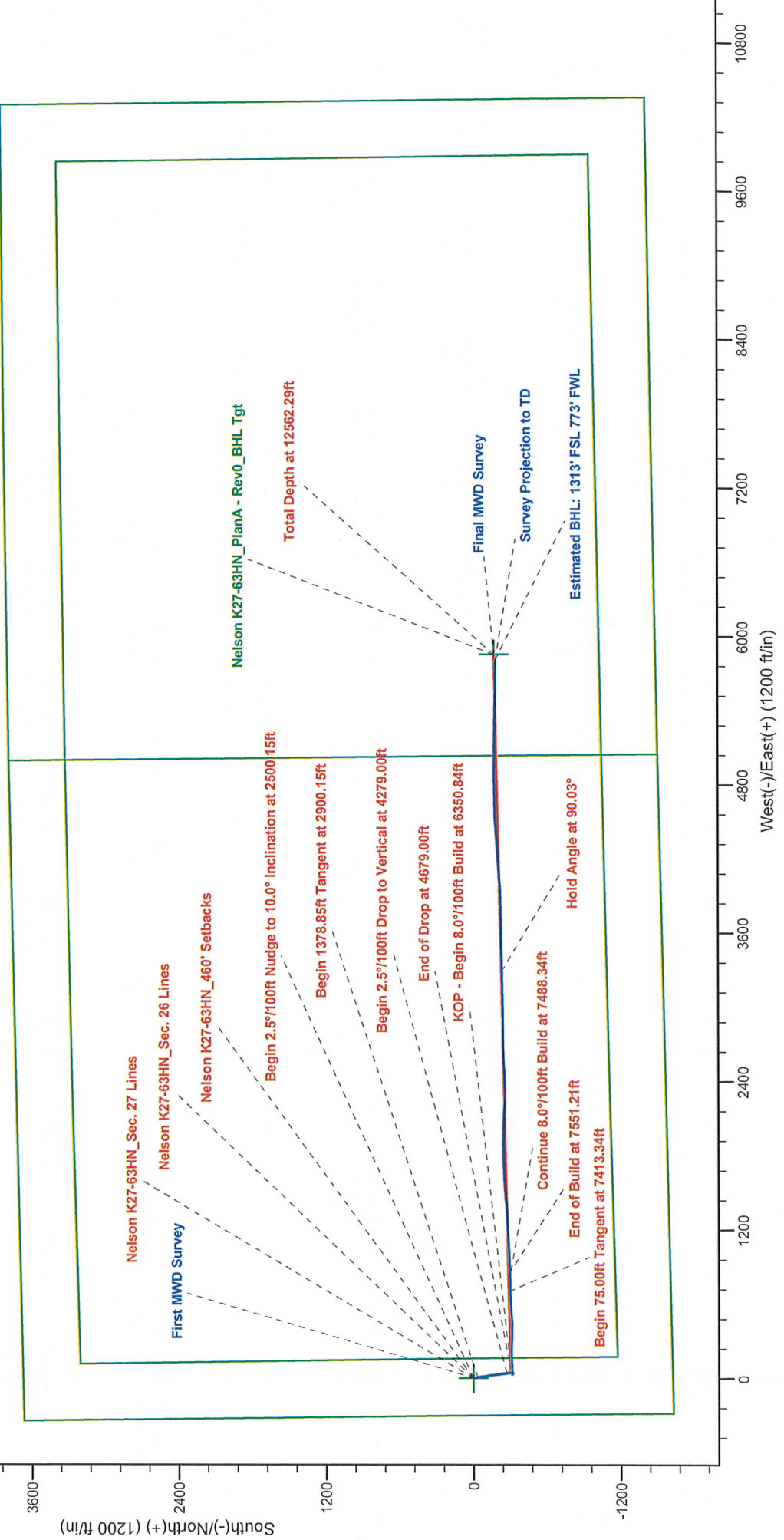


## LEGEND

- Nelson K27-63HN, Plan A, Plan A - Rev 0 Proposal V0
- MWD Survey

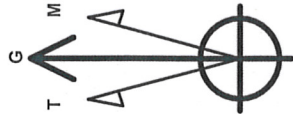
Permitted BHL: 1320' FSL, 820' FWL

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Nelson K27-63HN 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 Energy 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. 27-T4N-R66W  
Well: Nelson K27-63HN

# Noble Energy



Azimuths to Grid North  
True North: -0.47°  
Magnetic North: 8.37°  
  
Magnetic Field  
Strength: 53037.9snT  
Dip Angle: 66.95°  
Date: 6/12/2011  
Model: BGGM2011

## LEGEND

- Nelson K27-63HN, Plan A, Plan A - Rev 0 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Nelson K27-63HN 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.

