

# Noble Energy

Weld County, CO (NAD 83)  
Sec. 19-T8N-R60W  
Hunt LF18-62HN

Design: MWD Survey

## Sperry Drilling Services

### Final Survey Report

24 July, 2013

Well Coordinates: 1,483,974.27 N, 3,381,224.49 E (40° 39' 13.67" N, 104° 07' 33.61" W)  
Ground Level: 4,940.00 ft

Local Coordinate Origin:	Centered on Well Hunt LF18-62HN
Viewing Datum:	KB=16' @ 4956.00ft (Precision 829)
TVDs to System:	N
North Reference:	Grid
Unit System:	API - US Survey Feet - Custom
Geodetic Scale Factor Applied	
Version: 2003.16 Build: 431	

**HALLIBURTON**

## Design Report for Hunt LF18-62HN - 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
623.00	0.00	0.00	623.00	0.00	0.00	0.00	0.00
Surface Casing Assumed Vertical at 623.00ft							
700.00	0.18	107.21	700.00	-0.04	0.12	-0.12	0.23
First MWD Survey							
969.00	0.25	188.50	969.00	-0.74	0.43	-0.59	0.11
1,232.00	0.46	197.63	1,231.99	-2.31	0.03	-0.55	0.08
1,515.00	0.38	177.27	1,514.99	-4.33	-0.27	-0.71	0.06
1,798.00	0.48	194.65	1,797.98	-6.42	-0.53	-0.93	0.06
2,080.00	0.34	112.89	2,079.97	-7.89	-0.05	-1.72	0.19
2,327.00	0.44	111.78	2,326.97	-8.52	1.50	-3.38	0.04
2,417.00	2.79	25.99	2,416.93	-6.68	2.78	-4.22	3.10
2,506.00	5.50	18.05	2,505.69	-0.68	5.05	-5.08	3.11
2,596.00	7.63	23.74	2,595.10	8.89	8.80	-6.57	2.47
2,686.00	10.75	23.11	2,683.93	22.08	14.50	-9.15	3.47
2,775.00	13.80	18.98	2,770.89	39.76	21.21	-11.70	3.56
2,865.00	14.39	10.21	2,858.19	60.92	26.68	-12.27	2.46
2,955.00	15.27	9.89	2,945.19	83.60	30.70	-11.07	0.98
3,044.00	13.11	5.28	3,031.47	105.20	33.64	-9.07	2.74
3,134.00	12.76	5.24	3,119.19	125.26	35.49	-6.34	0.39
3,224.00	12.96	2.65	3,206.93	145.24	36.86	-3.18	0.68
3,313.00	10.46	7.74	3,294.07	163.22	38.41	-0.64	3.04
3,403.00	8.99	2.75	3,382.78	178.34	39.85	1.37	1.88
3,493.00	10.19	14.49	3,471.53	193.07	42.18	2.42	2.54
3,582.00	11.63	15.75	3,558.92	209.33	46.59	1.79	1.64
3,672.00	12.83	16.20	3,646.87	227.66	51.84	0.81	1.34
3,762.00	13.68	16.94	3,734.47	247.44	57.73	-0.47	0.96
3,851.00	15.28	17.11	3,820.64	268.71	64.24	-2.02	1.80
3,941.00	14.23	14.46	3,907.68	290.76	70.49	-3.15	1.39
4,030.00	14.16	8.46	3,993.96	312.12	74.83	-2.55	1.65
4,120.00	10.99	9.06	4,081.79	331.49	77.80	-1.08	3.53
4,210.00	8.74	12.41	4,170.46	346.64	80.62	-0.42	2.58
4,299.00	8.67	5.79	4,258.43	359.91	82.75	0.50	1.13
4,389.00	10.71	1.16	4,347.15	375.03	83.60	3.08	2.42
4,479.00	9.72	0.86	4,435.72	390.98	83.89	6.40	1.10
4,569.00	11.37	15.07	4,524.21	407.15	86.31	7.68	3.41
4,658.00	12.37	10.40	4,611.31	425.00	90.31	7.81	1.56
4,748.00	14.56	2.97	4,698.84	445.78	92.64	10.22	3.10
4,838.00	13.34	2.41	4,786.18	467.46	93.66	14.11	1.36
4,928.00	14.20	7.78	4,873.60	488.77	95.59	17.03	1.71
5,018.00	14.86	4.89	4,960.72	511.20	98.07	19.68	1.09
5,107.00	14.37	1.92	5,046.84	533.61	99.41	23.42	1.01
5,197.00	16.27	6.91	5,133.64	557.29	101.30	26.91	2.57
5,287.00	14.84	7.46	5,220.34	581.24	104.32	29.38	1.60
5,377.00	12.69	8.14	5,307.75	602.45	107.21	31.34	2.40
5,467.00	13.47	359.46	5,395.43	622.72	108.51	34.64	2.35
5,557.00	15.18	0.49	5,482.62	644.99	108.52	39.65	1.92
5,646.00	12.93	1.55	5,568.95	666.60	108.88	44.17	2.54
5,691.00	12.13	1.47	5,612.88	676.36	109.14	46.11	1.78
5,736.00	15.24	1.68	5,656.60	687.00	109.44	48.23	6.91

## Design Report for Hunt LF18-62HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,781.00	17.34	3.41	5,699.79	699.61	110.01	50.51	4.79
5,826.00	20.89	3.65	5,742.30	714.31	110.92	52.94	7.89
5,871.00	24.91	3.90	5,783.75	731.78	112.08	55.75	8.94
5,915.00	28.38	2.38	5,823.07	751.48	113.14	59.15	8.04
5,960.00	32.46	0.90	5,861.87	774.25	113.77	63.67	9.22
6,005.00	36.27	357.60	5,899.01	799.64	113.41	69.75	9.42
6,050.00	38.50	351.70	5,934.77	826.81	110.83	78.38	9.37
6,095.00	39.23	343.16	5,969.84	854.31	104.68	90.57	12.01
6,139.00	42.37	335.99	6,003.16	881.19	94.61	106.44	12.81
6,184.00	45.03	331.03	6,035.70	908.98	80.72	126.24	9.64
6,229.00	45.72	324.39	6,067.33	936.02	63.62	148.99	10.61
6,274.00	46.29	316.93	6,098.61	961.01	43.12	174.60	11.99
6,319.00	46.51	309.09	6,129.67	983.21	19.32	202.78	12.62
6,363.00	48.47	302.65	6,159.41	1,002.17	-6.95	232.65	11.67
6,408.00	52.17	296.95	6,188.16	1,019.32	-37.00	265.80	12.75
6,453.00	57.08	292.20	6,214.21	1,034.53	-70.36	301.73	13.89
6,498.00	61.70	287.52	6,237.13	1,047.64	-106.77	340.16	13.62
6,543.00	65.50	280.92	6,257.15	1,057.50	-145.82	380.42	15.61
6,588.00	67.40	274.67	6,275.14	1,063.07	-186.66	421.47	13.41
6,633.00	69.36	268.27	6,291.74	1,064.13	-228.45	462.42	13.92
6,677.00	70.28	267.38	6,306.92	1,062.56	-269.72	502.28	2.82
6,722.00	69.73	269.74	6,322.30	1,061.50	-311.99	543.22	5.08
6,767.00	71.34	271.18	6,337.30	1,061.84	-354.42	584.63	4.68
6,812.00	67.15	272.69	6,353.24	1,063.25	-396.46	625.91	9.83
6,857.00	65.49	273.68	6,371.32	1,065.54	-437.61	666.51	4.20
6,902.00	67.23	275.88	6,389.36	1,068.98	-478.68	707.31	5.92
6,946.00	72.64	276.66	6,404.45	1,073.50	-519.75	748.33	12.41
6,960.00	75.49	276.38	6,408.30	1,075.02	-533.12	761.71	20.45
7,000.00	79.24	276.84	6,417.04	1,079.52	-571.89	800.49	9.45
<b>Estimated 7" Casing Point: 645' FSL, 849' FEL (Not a Survey Station)</b>							
7,025.00	81.59	277.12	6,421.20	1,082.51	-596.35	825.00	9.45
7,070.00	83.02	275.68	6,427.23	1,087.48	-640.67	869.29	4.49
7,115.00	85.31	275.03	6,431.81	1,091.66	-685.24	913.66	5.29
7,159.00	87.44	275.24	6,434.59	1,095.59	-728.97	957.15	4.86
7,204.00	87.41	274.62	6,436.61	1,099.45	-773.76	1,001.66	1.38
7,249.00	86.88	273.63	6,438.85	1,102.69	-818.58	1,046.06	2.49
7,294.00	85.34	271.00	6,441.90	1,104.50	-863.44	1,090.17	6.76
7,339.00	88.18	272.57	6,444.45	1,105.90	-908.34	1,134.23	7.21
7,384.00	89.60	271.95	6,445.32	1,107.67	-953.29	1,178.43	3.44
7,429.00	89.17	271.19	6,445.80	1,108.91	-998.27	1,222.53	1.94
7,473.00	88.21	266.97	6,446.81	1,108.20	-1,042.25	1,265.21	9.83
7,518.00	88.06	264.64	6,448.27	1,104.91	-1,087.10	1,308.17	5.19
7,563.00	88.06	265.32	6,449.80	1,100.98	-1,131.90	1,350.93	1.51
7,608.00	88.55	266.32	6,451.13	1,097.70	-1,176.76	1,393.89	2.47
7,653.00	89.04	267.25	6,452.07	1,095.17	-1,221.68	1,437.09	2.34
7,698.00	89.11	267.68	6,452.80	1,093.18	-1,266.63	1,480.43	0.97
7,742.00	89.35	267.74	6,453.39	1,091.43	-1,310.59	1,522.87	0.56
7,787.00	88.83	266.48	6,454.11	1,089.16	-1,355.53	1,566.14	3.03
7,832.00	89.38	266.59	6,454.81	1,086.44	-1,400.44	1,609.28	1.25
7,922.00	90.37	266.68	6,455.00	1,081.16	-1,490.28	1,695.62	1.10
8,011.00	91.02	268.17	6,453.93	1,077.16	-1,579.18	1,781.33	1.83

## Design Report for Hunt LF18-62HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,101.00	88.71	266.36	6,454.14	1,072.86	-1,669.07	1,867.94	3.26
8,190.00	88.43	265.26	6,456.36	1,066.36	-1,757.80	1,952.92	1.27
8,280.00	88.71	264.81	6,458.60	1,058.58	-1,847.44	2,038.49	0.59
8,370.00	89.97	264.84	6,459.64	1,050.46	-1,937.06	2,123.98	1.40
8,459.00	90.40	263.72	6,459.35	1,041.59	-2,025.62	2,208.26	1.35
8,549.00	89.23	263.14	6,459.64	1,031.29	-2,115.02	2,293.05	1.45
8,638.00	88.92	267.23	6,461.08	1,023.82	-2,203.68	2,377.74	4.61
8,728.00	89.29	271.86	6,462.49	1,023.11	-2,293.64	2,465.22	5.16
8,817.00	88.00	270.58	6,464.59	1,025.00	-2,382.59	2,552.31	2.04
8,907.00	89.48	272.04	6,466.57	1,027.06	-2,472.54	2,640.41	2.31
8,997.00	90.06	272.30	6,466.93	1,030.47	-2,562.47	2,728.80	0.71
9,086.00	90.15	272.13	6,466.77	1,033.91	-2,651.41	2,816.22	0.22
9,176.00	88.80	270.50	6,467.59	1,035.97	-2,741.38	2,904.34	2.35
9,265.00	89.14	269.02	6,469.19	1,035.60	-2,830.36	2,990.95	1.71
9,355.00	89.08	266.20	6,470.59	1,031.85	-2,920.26	3,077.69	3.13
9,445.00	89.94	268.53	6,471.36	1,027.71	-3,010.15	3,164.34	2.76
9,535.00	88.43	267.25	6,472.64	1,024.40	-3,100.08	3,251.20	2.20
9,624.00	88.95	267.90	6,474.68	1,020.63	-3,188.98	3,336.96	0.94
9,714.00	88.18	267.15	6,476.93	1,016.75	-3,278.86	3,423.66	1.19
9,803.00	91.69	267.71	6,477.03	1,012.76	-3,367.76	3,509.37	3.99
9,893.00	93.79	267.36	6,472.73	1,008.89	-3,457.57	3,595.99	2.37
9,983.00	93.95	265.30	6,466.66	1,003.15	-3,547.17	3,682.00	2.29
10,072.00	91.45	266.93	6,462.46	997.12	-3,635.86	3,767.05	3.35
10,162.00	91.26	267.81	6,460.33	993.00	-3,725.74	3,853.68	1.00
10,251.00	86.55	270.36	6,462.04	991.57	-3,814.68	3,940.01	6.02
10,341.00	85.74	270.64	6,468.09	992.36	-3,904.47	4,027.67	0.95
10,431.00	85.06	270.26	6,475.30	993.06	-3,994.18	4,115.23	0.86
10,520.00	85.34	269.42	6,482.75	992.81	-4,082.86	4,201.58	0.99
10,610.00	87.50	269.78	6,488.37	992.19	-4,172.68	4,288.94	2.43
10,700.00	89.11	271.40	6,491.03	993.11	-4,262.63	4,376.79	2.54
<b>Final MWD Survey</b>							
10,765.00	89.11	271.40	6,492.04	994.70	-4,327.60	4,440.44	0.00
<b>Survey Projection to TD - Estimated BHL: 653' FSL, 660' FWL</b>							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
623.00	623.00	0.00	0.00	Surface Casing Assumed Vertical at 623.00ft
700.00	700.00	-0.04	0.12	First MWD Survey
7,000.00	6,417.04	1,079.52	-571.89	Estimated 7" Casing Point: 645' FSL, 849' FEL (Not a Survey Station)
10,700.00	6,491.03	993.11	-4,262.63	Final MWD Survey
10,765.00	6,492.04	994.70	-4,327.60	Survey Projection to TD
10,765.00	6,492.04	994.70	-4,327.60	Estimated BHL: 653' FSL, 660' FWL

**Design Report for Hunt LF18-62HN - MWD Survey**

**Vertical Section Information**

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (ft)	Origin +E/-W (ft)	Start TVD (ft)
Target	Hunt LF18-62HN_PlanB - Rev0_BH	283.03	Slot	0.00	0.00	0.00

**Survey tool program**

From (ft)	To (ft)	Survey/Plan	Survey Tool
623.00	7,000.00	Sperry MWD Surveys	MWD
7,000.00	10,765.00	Sperry MWD Surveys	MWD

**Casing Details**

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,000.00	6,417.04	7" Csg	7	8-3/4

## Design Report for Hunt LF18-62HN - 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
Hunt	0.00	0.00	0.00	0.00	0.00	1,483,974.27	3,381,224.49	40° 39' 13.669 N	104° 7' 33.611 W
- actual wellpath hits target center									
- Polygon									
Point 1			276.00	456.00		1,484,430.26	3,381,500.48		
Point 2			-4,988.00	321.00		1,484,295.27	3,376,236.58		
Point 3			-4,989.00	5,626.00		1,489,600.17	3,376,235.58		
Point 4			295.00	5,735.00		1,489,709.17	3,381,519.48		
Point 5			276.00	456.00		1,484,430.26	3,381,500.48		
Hunt	0.00	0.00	0.00	0.00	0.00	1,483,974.27	3,381,224.49	40° 39' 13.669 N	104° 7' 33.611 W
- actual wellpath hits target center									
- Polygon									
Point 1			276.00	456.00		1,484,430.26	3,381,500.48		
Point 2			263.00	-4,840.00		1,479,134.36	3,381,487.48		
Point 3			-5,009.00	-4,935.00		1,479,039.36	3,376,215.58		
Point 4			-4,988.00	321.00		1,484,295.27	3,376,236.58		
Point 5			276.00	456.00		1,484,430.26	3,381,500.48		
Hunt	0.00	0.00	6,471.00	1,001.29	-4,328.05	1,484,975.54	3,376,896.52	40° 39' 24.221 N	104° 8' 29.558 W
- actual wellpath misses target center by 22.05ft at 10765.00ft MD (6492.04 TVD, 994.70 N, -4327.60 E)									
- Point									
Hunt	0.00	0.00	0.00	0.00	0.00	1,483,974.27	3,381,224.49	40° 39' 13.669 N	104° 7' 33.611 W
- actual wellpath hits target center									
- Polygon									
Point 1			-324.00	1,056.00		1,485,030.25	3,380,900.49		
Point 2			-4,388.00	921.00		1,484,895.26	3,376,836.57		
Point 3			-4,389.00	5,026.00		1,489,000.18	3,376,835.57		
Point 4			-305.00	5,135.00		1,489,109.18	3,380,919.49		
Point 5			-324.00	1,056.00		1,485,030.25	3,380,900.49		
Hunt	0.00	0.00	6,447.24	1,094.30	-500.00	1,485,068.55	3,380,724.50	40° 39' 24.557 N	104° 7' 39.877 W
- actual wellpath misses target center by 51.43ft at 6944.38ft MD (6403.97 TVD, 1073.32 N, -518.21 E)									
- Point									
Hunt	0.00	0.00	0.00	0.00	0.00	1,483,974.27	3,381,224.49	40° 39' 13.669 N	104° 7' 33.611 W
- actual wellpath hits target center									
- Polygon									
Point 1			-324.00	-144.00		1,483,830.28	3,380,900.49		
Point 2			-337.00	-4,240.00		1,479,734.35	3,380,887.49		
Point 3			-4,409.00	-4,335.00		1,479,639.35	3,376,815.57		
Point 4			-4,388.00	-279.00		1,483,695.28	3,376,836.57		
Point 5			-324.00	-144.00		1,483,830.28	3,380,900.49		

## North Reference Sheet for Sec. 19-T8N-R60W - Hunt LF18-62HN

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

Vertical Depths are relative to KB=16' @ 4956.00ft (Precision 829). Northing and Easting are relative to Hunt LF18-62HN

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: 0.99998155

Grid Coordinates of Well: 1,483,974.27 ft N, 3,381,224.49 ft E

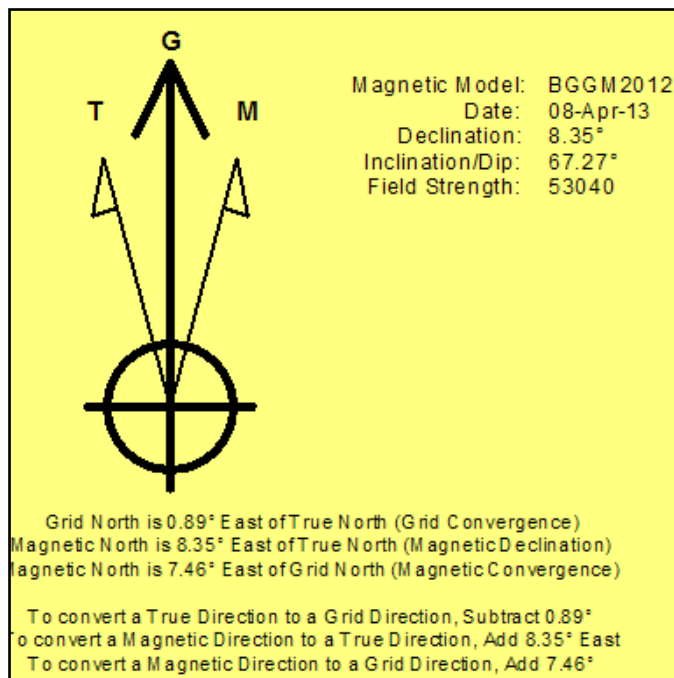
Geographical Coordinates of Well: 40° 39' 13.67" N, 104° 07' 33.61" W

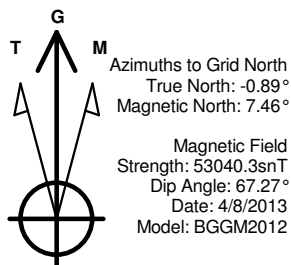
Grid Convergence at Surface is: 0.89°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,765.00ft

the Bottom Hole Displacement is 4,440.45ft in the Direction of 282.94° (Grid).

Magnetic Convergence at surface is: -7.46° ( 8 April 2013, , BGGM2012)



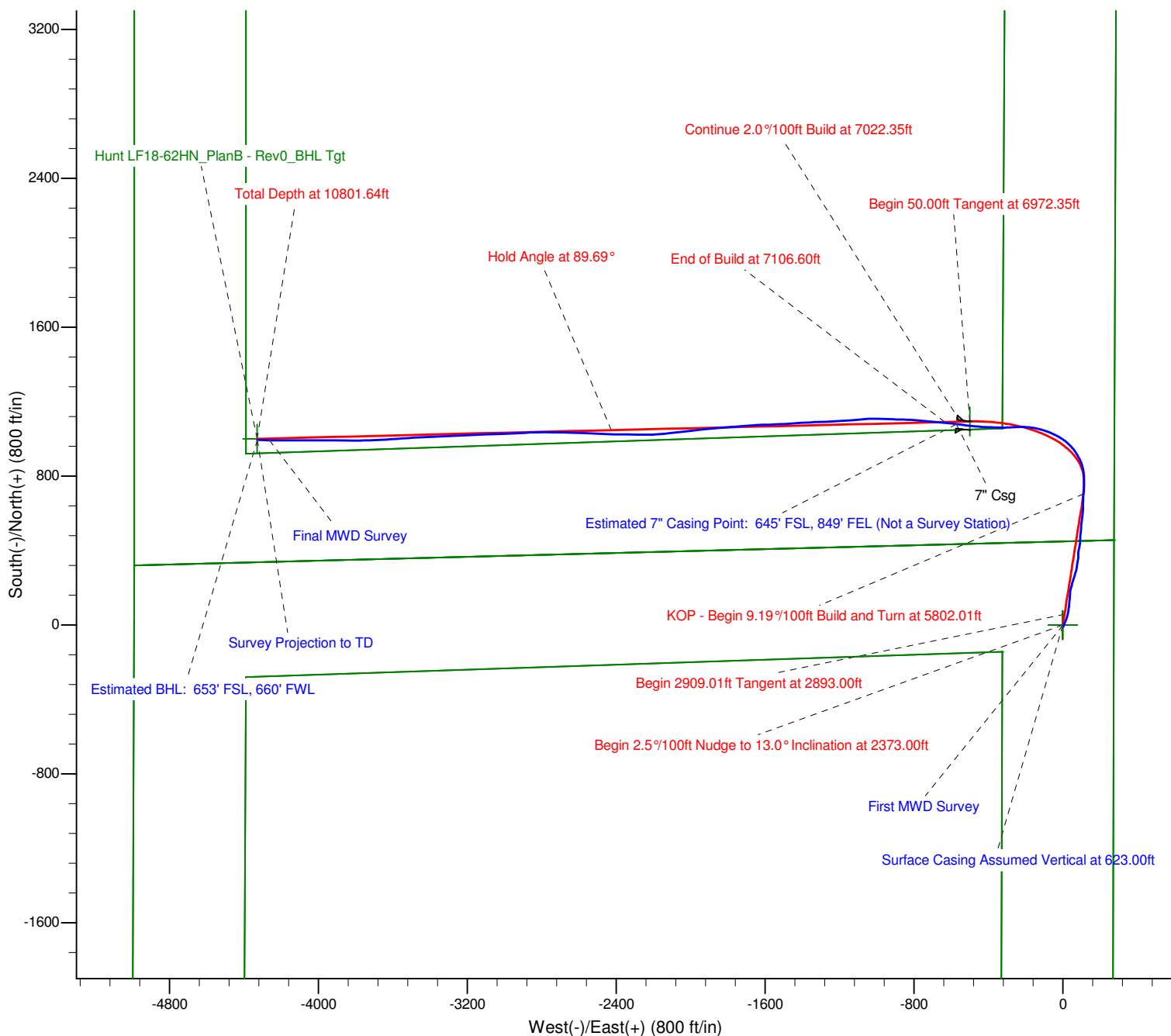


### LEGEND

- Hunt LF18-62HN, Plan B, Plan B - Rev 0 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Hunt LF18-62HN 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.

Permitted BHL: 660' FSL, 660' FWL



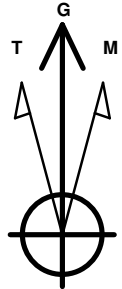


Project: Weld County, CO (NAD 83)  
Site: Sec. 19-T8N-R60W  
Well: Hunt LF18-62HN

# Noble Energy

**HALLIBURTON**

Sperry Drilling



Azimuths to Grid North  
True North:  $-0.89^\circ$   
Magnetic North:  $7.46^\circ$

Magnetic Field  
Strength: 53040.3snT  
Dip Angle:  $67.27^\circ$   
Date: 4/8/2013  
Model: BGGM2012

## LEGEND

- Hunt LF18-62HN, Plan B, Plan B - Rev 0 Proposal V0
- MWD Survey

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