

# Noble Energy

Weld County, CO (NAD 83)

Sec. 15-T3N-R64W (Chandler - Guttersen PAD)

Guttersen D23-69HN

MWD Survey

## Sperry Drilling Services

# Final Survey Report

07 January, 2013

Well Coordinates: 1,324,295.83 N, 3,270,963.78 E (40° 13' 10.27" N, 104° 31' 46.78" W)

Ground Level: 4,817.00 ft

Local Coordinate Origin: Centered on Well Guttersen D23-69HN - Slot A2

Viewing Datum: KB @ 4830.00ft (Ensign 132)

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 Guttersen D23-69HN - 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
787.00	0.00	0.00	787.00	0.00	0.00	0.00	0.00
<b>Tie On To Surface Casing Assumed Vertical</b>							
826.00	0.53	14.71	826.00	0.17	0.05	0.03	1.36
<b>First MWD Survey</b>							
1,017.00	0.67	359.14	1,016.99	2.15	0.25	0.01	0.11
1,112.00	2.37	155.11	1,111.97	0.92	1.07	0.96	3.15
1,206.00	5.14	148.08	1,205.76	-4.42	4.12	4.58	2.98
1,297.00	7.26	142.34	1,296.22	-12.43	9.79	11.11	2.42
1,390.00	9.97	147.18	1,388.16	-23.85	17.74	20.28	3.01
1,482.00	12.13	147.38	1,478.45	-38.69	27.27	31.40	2.35
1,573.00	14.80	146.19	1,566.94	-56.40	38.89	44.92	2.95
1,665.00	15.26	145.30	1,655.80	-76.12	52.32	60.46	0.56
1,757.00	14.77	142.44	1,744.66	-95.37	66.37	76.55	0.97
1,849.00	14.04	149.71	1,833.77	-114.30	79.14	91.36	2.12
1,941.00	14.32	146.97	1,922.97	-133.48	90.97	105.24	0.79
2,033.00	14.61	148.40	2,012.05	-152.90	103.26	119.61	0.50
2,125.00	15.87	146.93	2,100.81	-173.32	116.20	134.74	1.43
2,217.00	13.68	144.92	2,189.77	-192.77	129.32	149.94	2.44
2,312.00	15.59	148.35	2,281.68	-212.83	142.47	165.24	2.21
2,407.00	14.66	141.57	2,373.40	-233.12	156.65	181.58	2.10
2,502.00	15.08	148.98	2,465.23	-253.13	170.49	197.56	2.05
2,597.00	16.78	146.02	2,556.57	-275.09	184.52	213.95	1.98
2,692.00	16.21	149.97	2,647.67	-297.95	198.82	230.70	1.32
2,787.00	17.28	150.24	2,738.64	-321.68	212.46	246.89	1.13
2,882.00	18.16	146.85	2,829.13	-346.32	227.56	264.64	1.43
2,977.00	15.76	147.61	2,919.99	-369.61	242.57	282.14	2.54
3,072.00	13.37	147.77	3,011.93	-389.80	255.34	297.08	2.52
3,167.00	14.29	147.20	3,104.18	-408.95	267.55	311.34	0.98
3,262.00	15.21	139.38	3,196.06	-428.26	282.02	327.86	2.31
3,357.00	14.93	137.55	3,287.79	-446.75	298.39	346.19	0.58
3,452.00	14.48	146.44	3,379.69	-465.68	313.22	363.03	2.42
3,546.00	15.05	153.78	3,470.59	-486.43	325.11	377.15	2.08
3,642.00	14.10	151.87	3,563.50	-507.92	336.13	390.49	1.11
3,737.00	11.39	157.92	3,656.16	-526.82	345.11	401.52	3.18
3,832.00	9.79	153.59	3,749.54	-542.75	352.23	410.36	1.88
3,927.00	7.90	151.23	3,843.41	-555.71	358.97	418.49	2.03
4,022.00	5.69	149.77	3,937.73	-565.50	364.48	425.06	2.33
4,117.00	2.75	175.50	4,032.47	-571.84	367.03	428.30	3.61
4,212.00	0.93	277.98	4,127.43	-574.01	366.45	427.96	3.25
4,402.00	0.96	293.76	4,317.41	-573.15	363.46	424.90	0.14
4,497.00	0.34	304.72	4,412.40	-572.67	362.50	423.89	0.66
4,782.00	0.80	330.07	4,697.39	-570.47	360.82	421.97	0.18
4,878.00	1.46	320.51	4,793.37	-568.94	359.70	420.70	0.71
4,972.00	0.52	205.41	4,887.36	-568.40	358.76	419.70	1.86
5,257.00	0.84	193.33	5,172.34	-571.60	357.72	419.02	0.12
5,542.00	1.82	285.32	5,457.28	-572.44	352.88	414.30	0.71
5,637.00	0.81	200.50	5,552.26	-572.67	351.18	412.64	2.03
5,922.00	0.44	260.68	5,837.25	-574.74	349.40	411.10	0.25
6,080.00	0.71	238.41	5,995.24	-575.35	347.97	409.74	0.22

## Design Report for Guttersen D23-69HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
6,112.00	0.62	242.40	6,027.24	-575.53	347.64	409.44	0.32
6,160.00	2.52	97.46	6,075.22	-575.79	348.46	410.28	6.35
6,207.00	7.74	88.21	6,122.02	-575.82	352.65	414.45	11.21
6,255.00	11.57	91.50	6,169.33	-575.85	360.70	422.45	8.06
6,302.00	14.90	90.12	6,215.08	-575.99	371.45	433.16	7.12
6,350.00	18.29	92.06	6,261.07	-576.27	385.16	446.81	7.16
6,397.00	21.96	92.96	6,305.19	-576.99	401.31	462.94	7.84
6,445.00	25.18	90.51	6,349.18	-577.54	420.49	482.06	7.01
6,492.00	28.61	90.30	6,391.09	-577.69	441.75	503.20	7.30
6,540.00	32.17	91.57	6,432.49	-578.10	466.02	527.37	7.54
6,586.00	35.13	92.89	6,470.78	-579.10	491.48	552.79	6.63
6,634.00	38.54	91.40	6,509.19	-580.17	520.24	581.48	7.34
6,682.00	42.76	90.07	6,545.60	-580.55	551.49	612.59	8.97
6,730.00	46.41	90.24	6,579.78	-580.64	585.18	646.08	7.61
6,777.00	49.86	89.47	6,611.15	-580.55	620.18	680.85	7.44
6,825.00	54.09	90.03	6,640.71	-580.39	657.98	718.40	8.86
6,872.00	57.24	90.19	6,667.21	-580.47	696.79	756.97	6.71
6,920.00	60.31	89.76	6,692.09	-580.44	737.83	797.76	6.44
6,967.00	63.94	90.04	6,714.07	-580.37	779.37	839.03	7.74
7,015.00	67.57	90.15	6,733.77	-580.45	823.13	882.53	7.57
7,062.00	70.66	89.65	6,750.53	-580.37	867.03	926.15	6.65
7,110.00	74.42	89.30	6,764.93	-579.95	912.81	971.60	7.86
7,157.00	77.78	89.57	6,776.21	-579.50	958.43	1,016.88	7.17
7,213.00	82.52	90.33	6,785.79	-579.45	1,013.58	1,071.69	8.57
7,288.00	85.44	89.04	6,793.66	-579.04	1,088.16	1,145.76	4.25
7,383.00	85.71	88.73	6,800.99	-577.20	1,182.86	1,239.67	0.43
7,478.00	87.79	88.50	6,806.37	-574.91	1,277.67	1,333.64	2.20
7,574.00	89.91	89.88	6,808.30	-573.55	1,373.64	1,428.86	2.63
7,668.00	91.06	91.18	6,807.50	-574.42	1,467.62	1,522.36	1.85
7,763.00	89.60	90.51	6,806.96	-575.82	1,562.61	1,616.92	1.69
7,858.00	90.52	93.72	6,806.86	-579.32	1,657.53	1,711.64	3.51
7,953.00	90.25	92.32	6,806.22	-584.33	1,752.39	1,806.47	1.50
8,048.00	90.43	91.05	6,805.65	-587.12	1,847.35	1,901.15	1.35
8,143.00	89.82	90.00	6,805.45	-587.99	1,942.34	1,995.65	1.28
8,238.00	90.22	90.47	6,805.41	-588.38	2,037.34	2,090.11	0.65
8,334.00	90.71	89.18	6,804.63	-588.09	2,133.34	2,185.47	1.44
8,429.00	88.64	87.56	6,805.17	-585.39	2,228.29	2,279.54	2.77
8,524.00	89.57	89.07	6,806.66	-582.59	2,323.23	2,373.58	1.87
8,619.00	90.03	90.23	6,806.99	-582.01	2,418.23	2,467.92	1.31
8,714.00	90.52	88.73	6,806.53	-581.15	2,513.22	2,562.23	1.66
8,809.00	91.36	91.67	6,804.97	-581.48	2,608.20	2,656.66	3.22
8,904.00	90.31	92.72	6,803.59	-585.12	2,703.11	2,751.39	1.56
8,999.00	90.06	92.44	6,803.28	-589.40	2,798.02	2,846.18	0.40
9,094.00	88.86	91.28	6,804.18	-592.48	2,892.96	2,940.88	1.76
9,189.00	89.23	89.05	6,805.76	-592.75	2,987.94	3,035.30	2.38
9,283.00	89.82	89.34	6,806.54	-591.43	3,081.93	3,128.56	0.70
9,378.00	89.26	89.46	6,807.30	-590.44	3,176.92	3,222.85	0.60
9,473.00	89.17	89.01	6,808.61	-589.17	3,271.90	3,317.10	0.48
9,568.00	90.46	88.91	6,808.91	-587.45	3,366.88	3,411.31	1.36
9,663.00	90.96	89.25	6,807.74	-585.92	3,461.86	3,505.53	0.64
9,758.00	89.35	89.28	6,807.48	-584.70	3,556.85	3,599.79	1.70

## Design Report for Guttersen D23-69HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,853.00	89.02	89.22	6,808.83	-583.46	3,651.83	3,694.05	0.35
9,948.00	89.81	89.80	6,809.80	-582.65	3,746.82	3,788.36	1.03
10,043.00	89.54	89.42	6,810.34	-582.00	3,841.82	3,882.70	0.49
10,138.00	90.00	89.87	6,810.72	-581.41	3,936.82	3,977.04	0.68
10,233.00	89.88	89.86	6,810.82	-581.19	4,031.81	4,071.43	0.13
10,328.00	89.94	90.92	6,810.97	-581.84	4,126.81	4,165.91	1.12
10,423.00	90.93	91.38	6,810.25	-583.74	4,221.79	4,260.51	1.15
10,518.00	90.43	91.68	6,809.12	-586.28	4,316.75	4,355.16	0.61
10,613.00	89.85	90.30	6,808.89	-587.92	4,411.73	4,449.74	1.58
10,708.00	89.82	90.43	6,809.16	-588.52	4,506.73	4,544.21	0.14
10,803.00	89.72	88.94	6,809.54	-588.00	4,601.72	4,638.56	1.57
10,899.00	89.78	89.14	6,809.96	-586.39	4,697.71	4,733.78	0.22
10,994.00	89.20	89.02	6,810.81	-584.87	4,792.69	4,828.00	0.62
11,089.00	89.20	90.27	6,812.13	-584.28	4,887.68	4,922.33	1.32
11,184.00	89.38	90.64	6,813.31	-585.03	4,982.67	5,016.82	0.43
11,279.00	90.68	89.96	6,813.26	-585.53	5,077.66	5,111.28	1.54
11,373.00	90.89	90.42	6,811.97	-585.84	5,171.65	5,204.73	0.54
11,394.00	91.54	90.54	6,811.53	-586.02	5,192.65	5,225.61	3.15
<b>Final MWD Survey</b>							
11,450.00	91.54	90.54	6,810.02	-586.55	5,248.63	5,281.30	0.00
<b>Estimated BHL 75°FNL 535°FEL - Bit Projection</b>							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
787.00	787.00	0.00	0.00	Tie On To Surface Casing Assumed Vertical
826.00	826.00	0.17	0.05	First MWD Survey
11,394.00	6,811.53	-586.02	5,192.65	Final MWD Survey
11,450.00	6,810.02	-586.55	5,248.63	Estimated BHL 75°FNL 535°FEL
11,450.00	6,810.02	-586.55	5,248.63	Bit Projection

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Guttersen D23-69HN_PlanA - Rev1_BHL	96.38	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
787.00	11,450.00	Sperry MWD Surveys	MWD

## Design Report for Guttersen D23-69HN - 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
Chandler	0.00	0.00	0.00	-0.25	-22.34	1,324,295.58	3,270,941.44	40° 13' 10.272 N	104° 31' 47.064 W
- actual wellpath misses target center by 22.34ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				505.66	-493.25	1,323,802.61	3,271,469.42		
Point 2				5,783.66	-515.25	1,323,780.61	3,276,747.19		
Point 3				5,847.66	-5,724.25	1,318,571.83	3,276,811.19		
Point 4				529.66	-5,783.25	1,318,512.83	3,271,493.42		
Point 5				505.66	-493.25	1,323,802.61	3,271,469.42		
Chandler	0.00	0.00	0.00	-0.25	-22.34	1,324,295.58	3,270,941.44	40° 13' 10.272 N	104° 31' 47.064 W
- actual wellpath misses target center by 22.34ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				965.66	-33.25	1,324,262.59	3,271,929.40		
Point 2				915.66	4,331.75	1,328,627.40	3,271,879.40		
Point 3				5,256.66	4,346.75	1,328,642.40	3,276,220.22		
Point 4				5,323.66	-55.25	1,324,240.59	3,276,287.21		
Point 5				965.66	-33.25	1,324,262.59	3,271,929.40		
Chandler	0.00	0.00	0.00	-0.25	-22.34	1,324,295.58	3,270,941.44	40° 13' 10.272 N	104° 31' 47.064 W
- actual wellpath misses target center by 22.34ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				45.66	-953.25	1,323,342.62	3,271,009.44		
Point 2				69.66	-5,323.25	1,318,972.81	3,271,033.44		
Point 3				-4,305.34	-5,388.25	1,318,907.82	3,266,658.63		
Point 4				-4,298.34	-1,029.25	1,323,266.63	3,266,665.63		
Point 5				45.66	-953.25	1,323,342.62	3,271,009.44		
Chandler	0.00	0.00	0.00	-0.25	-22.34	1,324,295.58	3,270,941.44	40° 13' 10.272 N	104° 31' 47.064 W
- actual wellpath misses target center by 22.34ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				45.66	-33.25	1,324,262.59	3,271,009.44		
Point 2				-4,298.34	-109.25	1,324,186.59	3,266,665.63		
Point 3				-4,350.34	4,285.75	1,328,581.40	3,266,613.63		
Point 4				-4.34	4,331.75	1,328,627.40	3,270,959.44		
Point 5				45.66	-33.25	1,324,262.59	3,271,009.44		
Guttersen	0.00	0.00	6,805.00	-586.86	5,248.66	1,323,709.00	3,276,212.21	40° 13' 3.900 N	104° 30' 39.204 W
- actual wellpath misses target center by 5.03ft at 11450.00ft MD (6810.02 TVD, -586.55 N, 5248.63 E)									
- Point									
Chandler	0.00	0.00	0.00	-0.25	-22.34	1,324,295.58	3,270,941.44	40° 13' 10.272 N	104° 31' 47.064 W
- actual wellpath misses target center by 22.34ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				505.66	-493.25	1,323,802.61	3,271,469.42		
Point 2				529.66	-5,783.25	1,318,512.83	3,271,493.42		
Point 3				-4,765.34	-5,848.25	1,318,447.84	3,266,198.65		
Point 4				-4,758.34	-569.25	1,323,726.61	3,266,205.65		
Point 5				505.66	-493.25	1,323,802.61	3,271,469.42		
Chandler	0.00	0.00	0.00	-0.25	-22.34	1,324,295.58	3,270,941.44	40° 13' 10.272 N	104° 31' 47.064 W
- actual wellpath misses target center by 22.34ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				505.66	-493.25	1,323,802.61	3,271,469.42		
Point 2				455.66	4,791.75	1,329,087.38	3,271,419.42		
Point 3				5,716.66	4,806.75	1,329,102.38	3,276,680.20		
Point 4				5,783.66	-515.25	1,323,780.61	3,276,747.19		
Point 5				505.66	-493.25	1,323,802.61	3,271,469.42		
Chandler	0.00	0.00	0.00	-0.25	-22.34	1,324,295.58	3,270,941.44	40° 13' 10.272 N	104° 31' 47.064 W
- actual wellpath misses target center by 22.34ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				965.66	-953.25	1,323,342.62	3,271,929.40		
Point 2				5,323.66	-975.25	1,323,320.63	3,276,287.21		
Point 3				5,387.66	-5,264.25	1,319,031.81	3,276,351.21		
Point 4				989.66	-5,323.25	1,318,972.81	3,271,953.40		
Point 5				965.66	-953.25	1,323,342.62	3,271,929.40		
Chandler	0.00	0.00	0.00	-0.25	-22.34	1,324,295.58	3,270,941.44	40° 13' 10.272 N	104° 31' 47.064 W

**Design Report for Guttersen D23-69HN - MWD Survey**

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- actual wellpath misses target center by 22.34ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)

- Polygon

Point 1	505.66	-493.25	1,323,802.61	3,271,469.42
Point 2	-4,758.34	-569.25	1,323,726.61	3,266,205.65
Point 3	-4,810.34	4,745.75	1,329,041.38	3,266,153.65
Point 4	455.66	4,791.75	1,329,087.38	3,271,419.42
Point 5	505.66	-493.25	1,323,802.61	3,271,469.42

**North Reference Sheet for Sec. 15-T3N-R64W (Chandler - Guttersen PAD) - Guttersen D23-69HN**

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

Vertical Depths are relative to KB @ 4830.00ft (Ensign 132). Northing and Easting are relative to Guttersen D23-69HN - Slot A2

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: 0.99995699

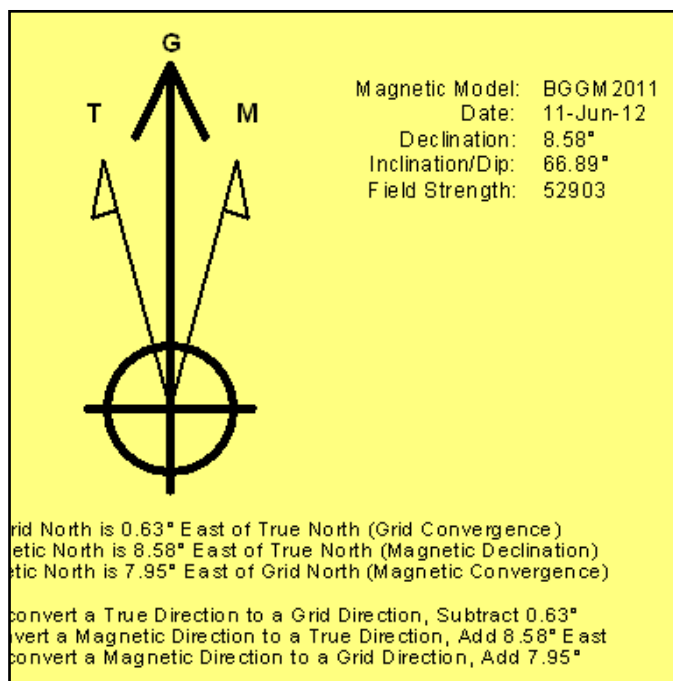
Grid Coordinates of Well: 1,324,295.83 ft N, 3,270,963.78 ft E

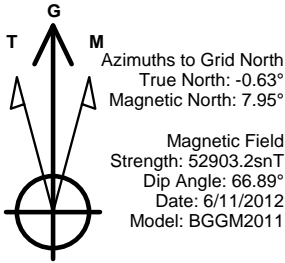
Geographical Coordinates of Well: 40° 13' 10.27" N, 104° 31' 46.78" W

Grid Convergence at Surface is: 0.63°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,450.00ft the Bottom Hole Displacement is 5,281.30ft in the Direction of 96.38° (Grid).

Magnetic Convergence at surface is: -7.95° (11 June 2012, , BGGM2011)



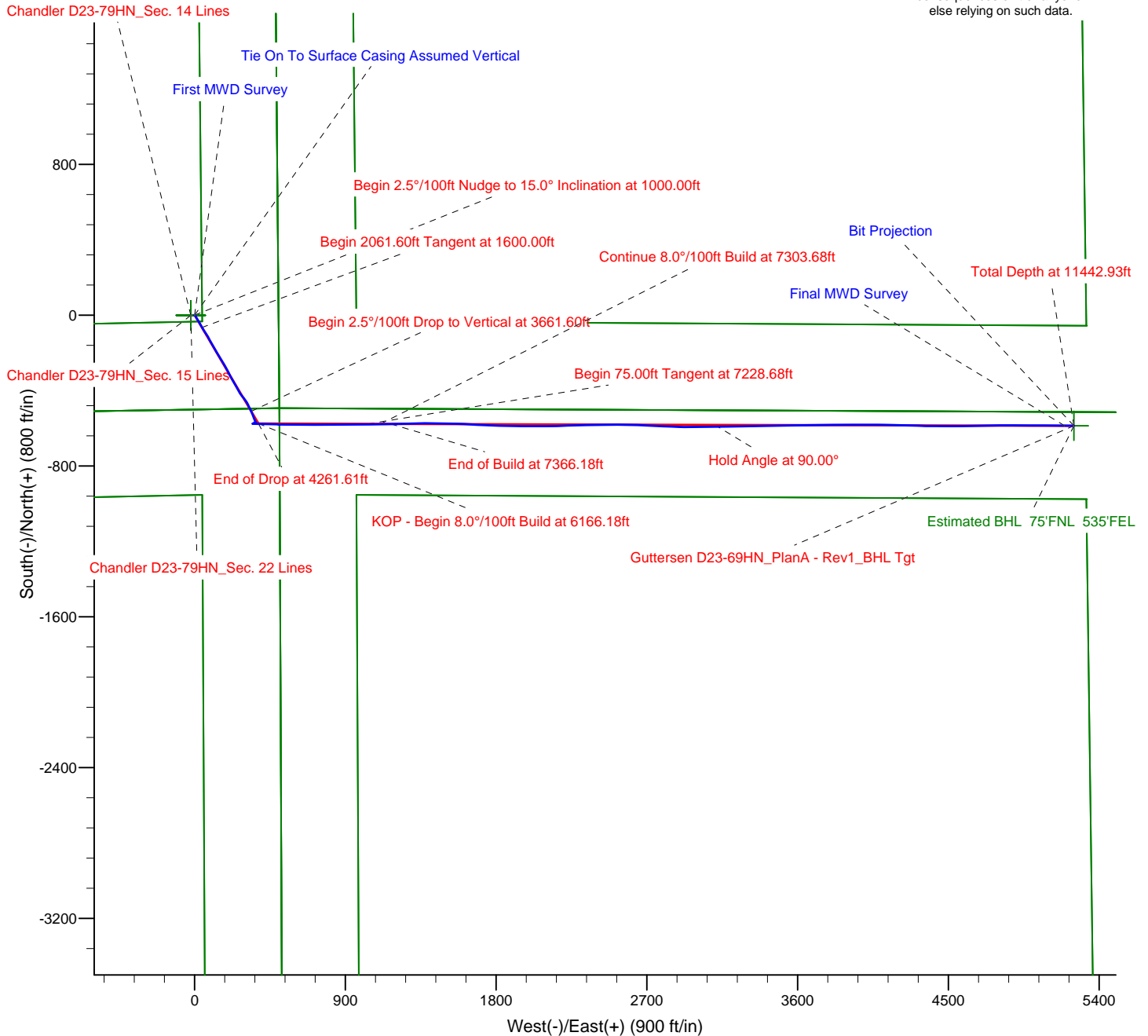


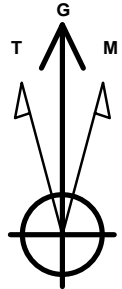
## LEGEND

- Guttersen D23-69HN, Plan A, Plan A - Rev 1 Proposal V0
- MWD Survey

Permitted BHL: 75' FNL, 535' FEL

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Guttersen D23-69HN 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.





Azimuths to Grid North  
 True North:  $-0.63^\circ$   
 Magnetic North:  $7.95^\circ$

Magnetic Field  
 Strength: 52903.2snT  
 Dip Angle:  $66.89^\circ$   
 Date: 6/11/2012  
 Model: BGGM2011

### LEGEND

- Guttersen D23-69HN, Plan A, Plan A - Rev 1 Proposal V0
- MWD Survey

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