

Noble Energy

Garfield County, CO (NAD 83)

Sec. 35-T7S-R95W (Battlement Mesa 35L PAD)

BM 35-13C - A8

Plan A

Design: Gyro and Sperry MWD Survey

Sperry Drilling Services

Final Survey Report

16 March, 2011

Well Coordinates: 1,577,305.30 N, 2,301,455.90 E (39° 23' 32.53" N, 107° 58' 19.25" W)

Ground Level: 9,211.00 ft

Local Coordinate Origin:

Centered on Well BM 35-13C - Slot A8

Viewing Datum:

RKB 24' @ 9235.00ft

TVDs to System:

N

North Reference:

Grid

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 2003.16 Build: 43I

HALLIBURTON

Design Report for BM 35-13C - Gyro and Sperry 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
195.00	0.66	316.62	195.00	0.82	-0.77	-0.89	0.34
Surveys from 195.00ft to 652.00ft are Vaughn Gyro Surveys							
255.00	1.16	166.26	254.99	0.48	-0.86	-0.56	2.94
317.00	2.28	163.01	316.96	-1.31	-0.36	1.27	1.81
378.00	2.69	160.73	377.91	-3.82	0.47	3.85	0.69
469.00	3.47	158.22	468.77	-8.40	2.20	8.57	0.87
561.00	3.97	157.35	560.58	-13.92	4.46	14.28	0.55
652.00	4.60	157.30	651.32	-20.19	7.08	20.77	0.69
Tie-On to Vaughn Gyro Survey							
728.00	5.28	161.47	727.04	-26.32	9.37	27.09	1.01
First Sperry MWD Survey							
790.00	5.67	159.71	788.76	-31.90	11.34	32.83	0.68
881.00	6.11	160.90	879.28	-40.69	14.48	41.87	0.50
973.00	5.59	162.57	970.80	-49.59	17.42	51.01	0.59
1,067.00	4.50	162.43	1,064.43	-57.48	19.91	59.10	1.16
1,161.00	4.51	161.83	1,158.14	-64.50	22.17	66.31	0.05
1,256.00	5.27	161.06	1,252.80	-72.18	24.75	74.19	0.80
1,350.00	5.85	155.85	1,346.35	-80.63	28.12	82.92	0.82
1,444.00	5.58	157.91	1,439.89	-89.24	31.79	91.84	0.36
1,538.00	5.12	160.81	1,533.48	-97.44	34.89	100.29	0.57
1,633.00	4.54	164.85	1,628.14	-105.07	37.27	108.11	0.71
1,727.00	4.44	165.52	1,721.85	-112.18	39.15	115.37	0.12
1,822.00	4.97	166.26	1,816.53	-119.74	41.05	123.07	0.56
1,916.00	5.20	167.63	1,910.16	-127.86	42.93	131.33	0.28
2,010.00	4.97	165.80	2,003.79	-135.97	44.84	139.58	0.30
2,105.00	4.14	163.96	2,098.49	-143.25	46.79	147.02	0.89
2,199.00	4.41	168.91	2,192.23	-150.06	48.43	153.95	0.49
2,293.00	4.40	160.68	2,285.95	-157.01	50.32	161.05	0.67
2,388.00	5.11	158.89	2,380.63	-164.39	53.04	168.66	0.76
2,482.00	4.66	159.05	2,474.28	-171.86	55.92	176.37	0.48
2,577.00	4.96	161.17	2,568.95	-179.36	58.62	184.08	0.37
2,671.00	5.26	163.62	2,662.58	-187.34	61.15	192.26	0.39
2,765.00	4.36	163.15	2,756.24	-194.89	63.40	199.99	0.96
2,860.00	4.35	169.01	2,850.97	-201.88	65.13	207.12	0.47
2,954.00	4.25	172.33	2,944.71	-208.83	66.28	214.15	0.29
3,048.00	4.06	173.65	3,038.46	-215.59	67.11	220.95	0.23
3,143.00	4.20	165.85	3,133.21	-222.31	68.33	227.75	0.61
3,237.00	3.47	162.99	3,227.00	-228.37	70.01	233.94	0.80
3,268.00	3.59	153.73	3,257.94	-230.13	70.71	235.77	1.88
3,383.00	3.20	175.29	3,372.75	-236.56	72.57	242.34	1.15
3,477.00	2.02	175.24	3,466.65	-240.83	72.92	246.62	1.26
3,571.00	0.24	91.42	3,560.63	-242.48	73.26	248.30	2.14
3,666.00	0.46	68.60	3,655.62	-242.35	73.81	248.22	0.27
3,760.00	0.26	44.05	3,749.62	-242.06	74.31	247.98	0.26
3,854.00	0.18	104.02	3,843.62	-241.94	74.60	247.89	0.25
3,949.00	0.14	111.76	3,938.62	-242.02	74.85	247.99	0.05
4,043.00	0.18	155.95	4,032.62	-242.20	75.02	248.19	0.13
4,137.00	0.24	100.45	4,126.62	-242.37	75.27	248.38	0.22
4,232.00	0.49	72.10	4,221.62	-242.28	75.86	248.35	0.32

Design Report for BM 35-13C - Gyro and Sperry MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
4,326.00	0.53	111.75	4,315.62	-242.32	76.64	248.46	0.37
4,421.00	0.58	121.39	4,410.61	-242.73	77.46	248.95	0.11
4,515.00	0.55	119.35	4,504.61	-243.20	78.26	249.49	0.04
4,609.00	0.54	127.09	4,598.60	-243.69	79.01	250.04	0.08
4,703.00	0.56	142.44	4,692.60	-244.32	79.64	250.73	0.16
4,798.00	0.30	177.02	4,787.60	-244.94	79.94	251.37	0.38
4,892.00	0.17	104.83	4,881.59	-245.22	80.08	251.67	0.32
4,986.00	0.18	306.05	4,975.59	-245.17	80.10	251.62	0.37
5,081.00	0.40	317.07	5,070.59	-244.83	79.75	251.26	0.24
5,175.00	0.32	309.57	5,164.59	-244.43	79.33	250.81	0.10
5,269.00	0.58	291.07	5,258.59	-244.09	78.68	250.41	0.31
5,364.00	0.71	291.39	5,353.58	-243.70	77.68	249.93	0.14
5,458.00	0.44	298.83	5,447.58	-243.32	76.83	249.47	0.30
5,552.00	0.48	282.89	5,541.57	-243.05	76.13	249.14	0.14
5,647.00	0.41	66.38	5,636.57	-242.83	76.05	248.91	0.89
5,741.00	0.59	82.62	5,730.57	-242.63	76.84	248.79	0.24
5,835.00	0.48	102.91	5,824.57	-242.66	77.70	248.89	0.23
5,930.00	0.31	20.99	5,919.56	-242.51	78.18	248.79	0.56
6,024.00	0.64	29.18	6,013.56	-241.81	78.53	248.13	0.36
6,118.00	0.57	42.58	6,107.56	-241.01	79.10	247.38	0.17
6,212.00	0.58	63.42	6,201.55	-240.45	79.84	246.90	0.22
6,307.00	0.65	93.22	6,296.55	-240.27	80.81	246.81	0.34
6,401.00	0.71	78.01	6,390.54	-240.17	81.91	246.82	0.20
6,495.00	0.81	74.64	6,484.53	-239.88	83.12	246.64	0.12
6,590.00	0.74	77.06	6,579.52	-239.56	84.37	246.44	0.08
6,684.00	0.80	76.52	6,673.51	-239.27	85.60	246.27	0.06
6,778.00	1.26	78.61	6,767.50	-238.92	87.25	246.07	0.49
6,873.00	1.74	73.90	6,862.47	-238.31	89.66	245.69	0.52
6,967.00	1.43	117.70	6,956.43	-238.46	92.07	246.07	1.29
7,061.00	1.49	127.54	7,050.40	-239.75	94.08	247.54	0.27
7,156.00	1.18	189.98	7,145.38	-241.47	94.89	249.33	1.48
7,250.00	1.50	198.94	7,239.36	-243.58	94.32	251.38	0.41
7,344.00	1.86	207.05	7,333.31	-246.10	93.23	253.79	0.46
7,438.00	1.98	203.10	7,427.26	-248.96	91.90	256.50	0.19
7,533.00	1.83	208.04	7,522.21	-251.81	90.54	259.21	0.23
7,627.00	1.72	220.45	7,616.16	-254.20	88.92	261.45	0.42
7,722.00	1.89	220.56	7,711.12	-256.48	86.97	263.53	0.18
7,816.00	1.43	200.10	7,805.08	-258.76	85.56	265.66	0.79
7,911.00	0.53	116.94	7,900.07	-260.07	85.55	266.97	1.54
8,005.00	0.88	111.60	7,994.06	-260.53	86.61	267.53	0.38
8,099.00	0.81	116.77	8,088.05	-261.10	87.87	268.21	0.11
8,193.00	0.53	114.42	8,182.04	-261.58	88.86	268.78	0.30
8,288.00	1.11	132.15	8,277.03	-262.38	89.94	269.68	0.66
8,382.00	0.72	137.65	8,371.02	-263.42	91.01	270.82	0.42
8,476.00	0.38	85.52	8,465.02	-263.84	91.72	271.30	0.61
8,571.00	0.46	148.42	8,560.01	-264.14	92.24	271.65	0.47
8,665.00	0.76	187.38	8,654.01	-265.08	92.35	272.59	0.53
8,759.00	1.17	204.81	8,748.00	-266.57	91.87	274.03	0.53
8,854.00	1.36	218.71	8,842.97	-268.33	90.76	275.68	0.38
8,948.00	1.52	204.61	8,936.94	-270.33	89.54	277.56	0.41
9,042.00	1.81	205.59	9,030.90	-272.80	88.38	279.91	0.31

Design Report for BM 35-13C - Gyro and Sperry MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,137.00	2.15	209.03	9,125.85	-275.71	86.87	282.67	0.38
9,231.00	2.16	229.98	9,219.78	-278.39	84.66	285.13	0.83
9,325.00	2.74	236.39	9,313.70	-280.78	81.43	287.20	0.68
9,420.00	3.43	235.16	9,408.56	-283.66	77.21	289.67	0.73
9,514.00	4.22	234.75	9,502.35	-287.26	72.07	292.77	0.84
9,608.00	3.44	251.46	9,596.14	-290.15	66.58	295.13	1.44
9,703.00	3.37	269.25	9,690.98	-291.10	61.08	295.55	1.11
9,797.00	2.89	263.54	9,784.83	-291.40	55.96	295.37	0.61
9,892.00	3.17	261.88	9,879.70	-292.04	50.98	295.54	0.31
10,011.00	2.96	259.99	9,998.53	-293.04	44.70	295.94	0.20
Final Sperry MWD Survey							
10,069.00	2.96	259.99	10,056.45	-293.56	41.75	296.18	0.00
Survey Projection to TD - Estimated BHL: 1812' FSL, 628' FWL							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
195.00	195.00	0.82	-0.77	Surveys from 195.00ft to 652.00ft are Vaughn Gyro Surveys
652.00	651.32	-20.19	7.08	Tie-On to Vaughn Gyro Survey
728.00	727.04	-26.32	9.37	First Sperry MWD Survey
10,011.00	9,998.53	-293.04	44.70	Final Sperry MWD Survey
10,069.00	10,056.45	-293.56	41.75	Survey Projection to TD
10,069.00	10,056.45	-293.56	41.75	Estimated BHL: 1812' FSL, 628' FWL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	BM 35-13C Plan A0 BHL	174.60	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
195.00	652.00	Gyro Surveys	NS-GYRO-MS
728.00	10,069.00	Sperry MWD Surveys	MWD

Design Report for BM 35-13C - Gyro and Sperry 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
BM 35-13C Plan A0	0.00	360.00	7,029.00	-278.11	26.30	1,577,027.20	2,301,482.20	39° 23' 29.786 N	107° 58' 18.815 W
- actual wellpath misses target center by 77.65ft at 7038.68ft MD (7028.09 TVD, -239.41 N, 93.61 E)									
- Rectangle (sides W200.00 H200.00 D3,051.00)									
BM 35-13C Plan A0	0.00	360.00	7,029.00	-228.11	76.30	1,577,077.20	2,301,532.20	39° 23' 30.293 N	107° 58' 18.196 W
- actual wellpath misses target center by 20.69ft at 7039.07ft MD (7028.47 TVD, -239.41 N, 93.62 E)									
- Rectangle (sides W25.00 H25.00 D0.00)									
BM 35-13C Plan A0	0.00	360.00	10,080.00	-278.11	26.30	1,577,027.20	2,301,482.20	39° 23' 29.786 N	107° 58' 18.815 W
- actual wellpath misses target center by 32.12ft at 10069.00ft MD (10056.45 TVD, -293.56 N, 41.75 E)									
- Point									

North Reference Sheet for Sec. 35-T7S-R95W (Battlement Mesa 35L PAD) - BM 35-13C - Plan A

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

Vertical Depths are relative to RKB 24' @ 9235.00ft. Northing and Easting are relative to BM 35-13C - Slot A8

Coordinate System is US State Plane 1983, Colorado Central 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: 39° 45' 0.000 N°

False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99994880

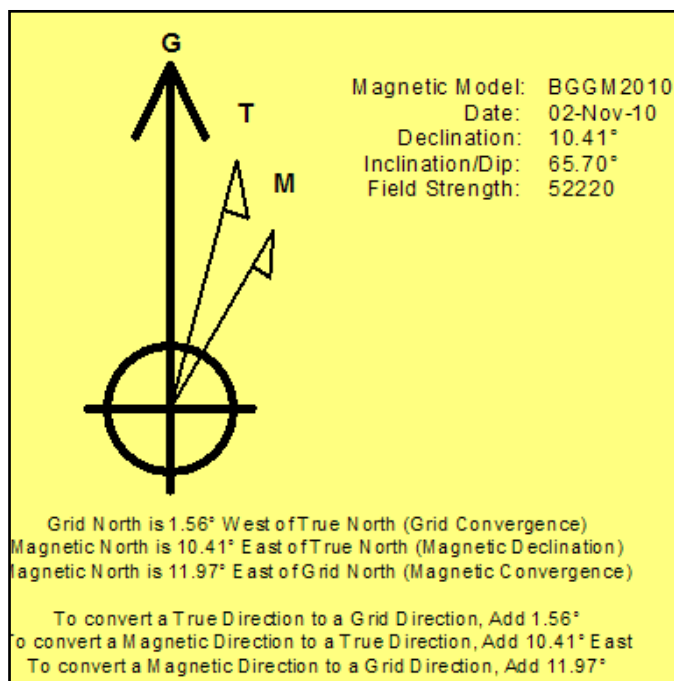
Grid Coordinates of Well: 1,577,305.30 ft N, 2,301,455.90 ft E

Geographical Coordinates of Well: 39° 23' 32.53" N, 107° 58' 19.25" W

Grid Convergence at Surface is: -1.56°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,069.00ft the Bottom Hole Displacement is 296.51ft in the Direction of 171.91° (Grid).

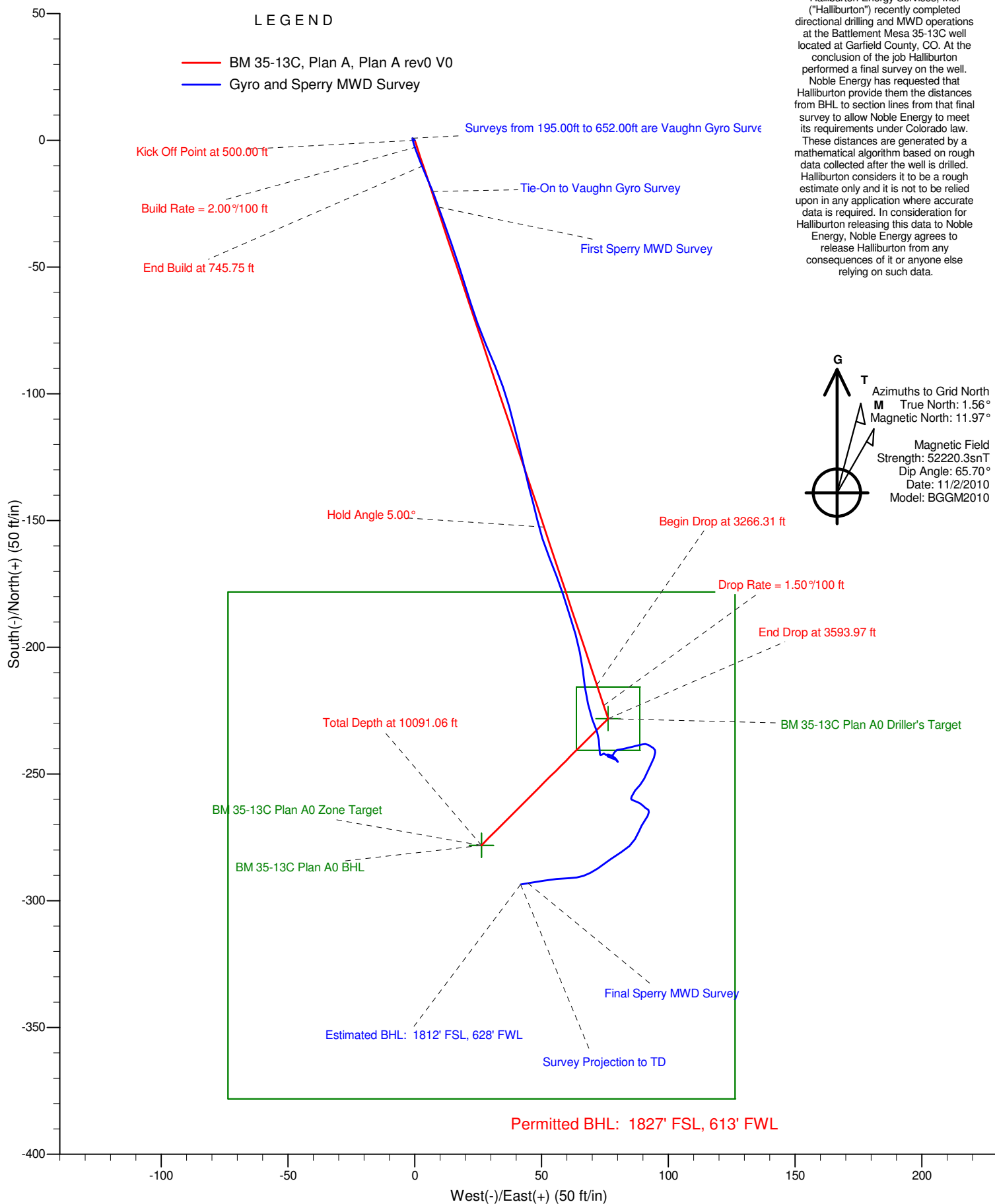
Magnetic Convergence at surface is: -11.97° (2 November 2010, , BGGM2010)

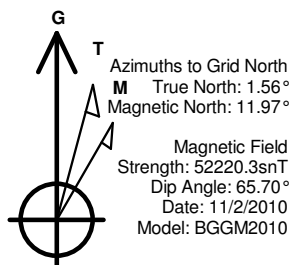


Noble Energy

HALLIBURTON

Sperry Drilling





LEGEND

- BM 35-13C, Plan A, Plan A rev0 V0
- Gyro and Sperry MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Battlement Mesa 35-13C well located at Garfield 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.

