

Noble Energy

Weld County, CO (NAD 83)

Sec. 19-T3N-R64W (Butterball 19 PAD)

Butterball D18-75HN

Design: MWD Survey

Sperry Drilling Services

Final Survey Report

12 March, 2012

Well Coordinates: 1,323,296.50 N, 3,253,662.29 E (40° 13' 02.21" N, 104° 35' 29.94" W)

Ground Level: 4,772.00 ft

Local Coordinate Origin:

Centered on Well Butterball D18-75HN

Viewing Datum:

KB @ 4796.00ft (Rig KB)

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 Butterball D18-75HN - 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
695.00	0.53	214.24	694.99	-2.66	-1.81	-2.44	0.08
First MWD Survey							
786.00	0.74	206.63	785.98	-3.53	-2.31	-3.26	0.25
877.00	0.35	222.26	876.98	-4.26	-2.76	-3.93	0.45
967.00	0.63	224.19	966.98	-4.82	-3.29	-4.43	0.31
1,061.00	0.65	201.00	1,060.97	-5.69	-3.84	-5.23	0.27
1,156.00	0.64	210.81	1,155.97	-6.65	-4.31	-6.14	0.12
1,250.00	0.68	228.20	1,249.96	-7.47	-4.99	-6.88	0.22
1,344.00	0.74	156.81	1,343.95	-8.40	-5.17	-7.78	0.88
1,439.00	0.80	180.09	1,438.95	-9.63	-4.93	-9.03	0.33
1,533.00	0.28	145.73	1,532.94	-10.47	-4.80	-9.88	0.63
1,627.00	0.42	180.46	1,626.94	-11.01	-4.67	-10.43	0.26
1,722.00	0.57	202.80	1,721.94	-11.79	-4.86	-11.19	0.25
1,816.00	0.36	174.44	1,815.93	-12.52	-5.01	-11.89	0.33
1,910.00	0.33	128.32	1,909.93	-12.98	-4.77	-12.38	0.29
2,006.00	2.37	10.92	2,005.90	-11.20	-4.18	-10.67	2.64
2,101.00	2.99	5.46	2,100.80	-6.80	-3.57	-6.37	0.71
2,197.00	4.17	328.30	2,196.62	-1.34	-5.16	-0.77	2.65
2,292.00	5.26	303.52	2,291.31	4.00	-10.61	5.14	2.40
2,387.00	5.53	290.09	2,385.89	7.98	-18.54	9.96	1.36
2,482.00	6.69	312.33	2,480.37	13.28	-26.93	16.15	2.75
2,577.00	7.60	319.54	2,574.63	21.79	-35.10	25.50	1.34
2,672.00	9.51	315.32	2,668.57	32.15	-44.69	36.85	2.12
2,767.00	11.55	312.27	2,761.96	44.13	-57.25	50.13	2.23
2,862.00	12.49	300.82	2,854.89	55.79	-73.11	63.46	2.69
2,957.00	12.99	295.47	2,947.56	65.64	-91.58	75.28	1.35
3,052.00	12.57	281.08	3,040.23	72.22	-111.37	83.99	3.37
3,147.00	13.27	281.71	3,132.82	76.42	-132.19	90.44	0.75
3,242.00	10.72	283.27	3,225.74	80.66	-151.47	96.77	2.71
3,337.00	9.29	288.08	3,319.30	85.07	-167.36	102.89	1.74
3,432.00	9.97	287.48	3,412.96	89.92	-182.49	109.37	0.72
3,527.00	10.09	284.74	3,506.50	94.51	-198.38	115.67	0.52
3,622.00	10.59	274.17	3,599.97	97.26	-215.14	120.24	2.06
3,717.00	10.15	268.37	3,693.42	97.66	-232.21	122.51	1.19
3,812.00	10.45	280.17	3,786.90	98.94	-249.06	125.63	2.24
3,907.00	11.38	287.45	3,880.18	103.27	-266.48	131.84	1.75
4,002.00	11.59	289.81	3,973.28	109.32	-284.40	139.81	0.54
4,097.00	9.40	289.60	4,066.69	115.16	-300.69	147.40	2.31
4,191.00	9.94	291.05	4,159.35	120.65	-315.50	154.48	0.63
4,287.00	10.05	294.60	4,253.90	127.11	-330.84	162.58	0.65
4,382.00	12.60	285.11	4,347.05	133.26	-348.39	170.62	3.32
4,477.00	12.96	288.58	4,439.69	139.36	-368.49	178.88	0.89
4,572.00	12.20	288.34	4,532.41	145.91	-388.12	187.54	0.80
4,667.00	10.47	284.02	4,625.56	151.16	-406.02	194.72	2.03
4,761.00	11.80	302.99	4,717.82	158.47	-422.38	203.78	4.12
4,856.00	10.34	297.66	4,811.05	167.71	-438.08	214.69	1.88
4,950.00	11.89	285.13	4,903.30	174.16	-454.90	222.94	3.04
5,046.00	11.69	283.36	4,997.27	178.99	-473.91	229.82	0.43
5,140.00	10.76	281.44	5,089.47	182.93	-491.77	235.69	1.07

Design Report for Butterball D18-75HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,235.00	7.85	284.33	5,183.21	186.29	-506.76	240.68	3.10
5,330.00	6.36	286.80	5,277.48	189.42	-518.08	245.03	1.60
5,425.00	5.38	283.82	5,371.98	192.00	-527.44	248.62	1.08
5,520.00	4.52	287.12	5,466.63	194.17	-535.34	251.64	0.95
5,615.00	1.68	262.93	5,561.48	195.10	-540.30	253.11	3.23
5,710.00	1.39	248.73	5,656.45	194.51	-542.76	252.79	0.50
5,805.00	1.20	235.28	5,751.42	193.53	-544.65	252.02	0.38
5,900.00	1.25	43.72	5,846.42	193.71	-544.75	252.21	2.57
5,994.00	1.17	47.84	5,940.40	195.09	-543.33	253.43	0.13
6,090.00	1.02	50.66	6,036.38	196.29	-541.95	254.47	0.17
6,184.00	1.06	17.00	6,130.36	197.66	-541.04	255.73	0.64
6,231.00	1.57	22.68	6,177.35	198.67	-540.67	256.69	1.12
6,279.00	5.91	11.00	6,225.24	201.70	-539.94	259.63	9.13
6,326.00	10.50	16.81	6,271.75	208.18	-538.24	265.88	9.91
6,374.00	13.27	16.99	6,318.71	217.64	-535.37	274.97	5.77
6,421.00	17.42	13.41	6,364.03	229.64	-532.16	286.55	9.05
6,469.00	20.68	9.25	6,409.39	245.00	-529.13	301.49	7.35
6,516.00	24.52	6.10	6,452.78	262.90	-526.76	319.01	8.56
6,564.00	28.26	3.08	6,495.77	284.16	-525.09	339.96	8.28
6,611.00	32.81	0.97	6,536.24	308.01	-524.27	363.59	9.94
6,659.00	37.87	358.29	6,575.39	335.76	-524.49	391.19	11.02
6,706.00	42.81	356.59	6,611.20	366.14	-525.87	421.54	10.77
6,754.00	47.89	357.44	6,644.93	400.23	-527.64	455.62	10.66
6,801.00	53.46	359.18	6,674.70	436.56	-528.69	491.84	12.19
6,848.00	57.79	0.03	6,701.23	475.34	-528.95	530.42	9.33
6,895.00	61.07	358.13	6,725.13	515.79	-529.61	570.70	7.80
6,943.00	64.10	357.23	6,747.23	558.36	-531.34	613.20	6.53
6,990.00	67.06	358.09	6,766.66	601.12	-533.08	655.89	6.51
7,038.00	69.94	358.28	6,784.25	645.75	-534.50	700.41	6.01
7,085.00	70.71	359.52	6,800.07	690.00	-535.35	744.48	2.98
7,134.00	71.86	358.77	6,815.80	736.40	-536.04	790.68	2.76
7,181.00	72.92	358.65	6,830.02	781.18	-537.05	835.31	2.27
7,229.00	73.77	358.24	6,843.77	827.15	-538.30	881.14	1.95
7,276.00	74.58	357.93	6,856.59	872.35	-539.81	926.22	1.84
7,324.00	76.79	359.11	6,868.46	918.84	-541.01	972.57	5.18
7,348.00	77.23	358.98	6,873.85	942.22	-541.40	995.85	1.91
7,436.00	81.39	359.37	6,890.17	1,028.66	-542.64	1,081.91	4.75
7,531.00	83.83	359.26	6,902.39	1,122.86	-543.77	1,175.67	2.57
7,626.00	85.59	359.89	6,911.15	1,217.45	-544.47	1,269.76	1.97
7,720.00	89.75	359.30	6,914.97	1,311.35	-545.13	1,363.17	4.47
7,815.00	90.03	358.09	6,915.15	1,406.32	-547.29	1,457.81	1.31
7,910.00	91.91	358.26	6,913.54	1,501.26	-550.32	1,552.50	1.99
8,006.00	89.17	358.60	6,912.64	1,597.21	-552.95	1,648.16	2.88
8,100.00	89.54	358.94	6,913.70	1,691.18	-554.97	1,741.79	0.53
8,196.00	89.26	359.40	6,914.70	1,787.16	-556.36	1,837.35	0.56
8,290.00	90.12	359.21	6,915.21	1,881.15	-557.50	1,930.90	0.94
8,385.00	91.11	358.91	6,914.19	1,976.13	-559.06	2,025.48	1.09
8,480.00	89.60	358.29	6,913.60	2,071.10	-561.38	2,120.13	1.72
8,575.00	90.68	358.58	6,913.37	2,166.06	-563.97	2,214.80	1.18
8,670.00	89.57	359.37	6,913.16	2,261.05	-565.67	2,309.40	1.43
8,764.00	91.27	359.78	6,912.47	2,355.04	-566.37	2,402.90	1.86

Design Report for Butterball D18-75HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,859.00	89.66	359.78	6,911.70	2,450.03	-566.73	2,497.36	1.69
8,954.00	91.20	0.29	6,910.99	2,545.02	-566.67	2,591.78	1.71
9,049.00	90.83	357.91	6,909.31	2,639.99	-568.17	2,686.34	2.53
9,143.00	88.48	357.86	6,909.87	2,733.92	-571.64	2,780.08	2.50
9,239.00	88.80	357.47	6,912.15	2,829.81	-575.55	2,875.83	0.53
9,334.00	89.88	357.61	6,913.25	2,924.72	-579.62	2,970.61	1.15
9,429.00	91.48	357.39	6,912.12	3,019.62	-583.77	3,065.39	1.70
9,524.00	89.85	358.36	6,911.02	3,114.54	-587.29	3,160.13	2.00
9,619.00	90.65	358.76	6,910.60	3,209.51	-589.68	3,254.79	0.94
9,714.00	88.73	359.29	6,911.12	3,304.49	-591.29	3,349.37	2.10
9,809.00	88.92	358.67	6,913.06	3,399.45	-592.98	3,443.95	0.68
9,904.00	88.43	358.28	6,915.26	3,494.39	-595.51	3,538.60	0.66
9,999.00	89.63	358.10	6,916.87	3,589.33	-598.51	3,633.29	1.28
10,094.00	90.90	358.67	6,916.43	3,684.29	-601.19	3,727.97	1.47
10,189.00	89.44	0.23	6,916.15	3,779.28	-602.10	3,822.49	2.25
10,284.00	90.59	0.26	6,916.12	3,874.28	-601.69	3,916.87	1.21
10,379.00	91.17	359.76	6,914.66	3,969.26	-601.68	4,011.29	0.81
10,474.00	90.12	0.62	6,913.59	4,064.26	-601.36	4,105.67	1.43
10,569.00	91.17	359.31	6,912.53	4,159.25	-601.42	4,200.10	1.77
10,664.00	89.97	359.63	6,911.58	4,254.24	-602.30	4,294.61	1.31
10,759.00	90.22	358.67	6,911.42	4,349.22	-603.71	4,389.18	1.04
10,854.00	90.25	358.11	6,911.03	4,444.18	-606.38	4,483.86	0.59
10,949.00	88.71	357.59	6,911.89	4,539.11	-609.94	4,578.61	1.71
11,045.00	89.04	357.88	6,913.78	4,635.02	-613.73	4,674.35	0.46
11,140.00	90.28	356.80	6,914.34	4,729.91	-618.14	4,769.16	1.73
11,235.00	91.91	356.36	6,912.53	4,824.72	-623.81	4,864.02	1.78
11,330.00	90.49	356.10	6,910.54	4,919.49	-630.05	4,958.90	1.52
11,424.00	89.29	356.85	6,910.72	5,013.31	-635.83	5,052.79	1.51
11,519.00	89.48	357.92	6,911.74	5,108.20	-640.17	5,147.59	1.14
11,614.00	88.65	0.15	6,913.29	5,203.17	-641.77	5,242.16	2.50
11,709.00	90.49	0.06	6,914.00	5,298.16	-641.59	5,336.56	1.94
11,804.00	88.70	0.24	6,914.67	5,393.16	-641.34	5,430.96	1.89
11,899.00	87.99	0.20	6,917.42	5,488.12	-640.98	5,525.30	0.75
11,994.00	88.80	359.53	6,920.08	5,583.08	-641.20	5,619.72	1.11
12,045.00	89.14	359.40	6,920.99	5,634.07	-641.68	5,670.45	0.71
Final MWD Survey							
12,107.00	89.14	359.40	6,921.93	5,696.06	-642.33	5,732.14	0.00
Survey Projection to TD - Estimated BHL: 147' FSL, 2615' FWL							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
695.00	694.99	-2.66	-1.81	First MWD Survey
12,045.00	6,920.99	5,634.07	-641.68	Final MWD Survey
12,107.00	6,921.93	5,696.06	-642.33	Survey Projection to TD
12,107.00	6,921.93	5,696.06	-642.33	Estimated BHL: 147' FSL, 2615' FWL

Design Report for Butterball D18-75HN - MWD Survey

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (ft)	Origin +E/-W (ft)	Start TVD (ft)
Target	Butterball D18-75HN_PlanA - Rev1_BHL Tgt	353.71	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
695.00	12,107.00	Sperry MWD Surveys	MWD

Design Report for Butterball D18-75HN - 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
Butterball	0.00	0.00	0.00	0.00	0.00	1,323,296.50	3,253,662.29	40° 13' 2.208 N	104° 35' 29.940 W
- actual wellpath hits target center									
- Polygon									
Point 1			1,973.00	5,605.00		1,328,901.26	3,255,635.21		
Point 2			-3,111.00	5,510.00		1,328,806.27	3,250,551.43		
Point 3			-3,145.00	10,792.00		1,334,088.04	3,250,517.43		
Point 4			1,988.00	10,903.00		1,334,199.03	3,255,650.21		
Point 5			1,973.00	5,605.00		1,328,901.26	3,255,635.21		
Butterball	0.00	0.00	0.00	0.00	0.00	1,323,296.50	3,253,662.29	40° 13' 2.208 N	104° 35' 29.940 W
- actual wellpath hits target center									
- Polygon									
Point 1			2,013.00	305.00		1,323,601.49	3,255,675.21		
Point 2			-3,080.00	213.00		1,323,509.49	3,250,582.42		
Point 3			-3,111.00	5,510.00		1,328,806.27	3,250,551.43		
Point 4			1,973.00	5,605.00		1,328,901.26	3,255,635.21		
Point 5			2,013.00	305.00		1,323,601.49	3,255,675.21		
Butterball	0.00	0.00	0.00	0.00	0.00	1,323,296.50	3,253,662.29	40° 13' 2.208 N	104° 35' 29.940 W
- actual wellpath hits target center									
- Polygon									
Point 1			2,013.00	305.00		1,323,601.49	3,255,675.21		
Point 2			2,040.00	-5,003.00		1,318,293.72	3,255,702.20		
Point 3			-3,046.00	-5,091.00		1,318,205.72	3,250,616.42		
Point 4			-3,080.00	213.00		1,323,509.49	3,250,582.42		
Point 5			2,013.00	305.00		1,323,601.49	3,255,675.21		
Butterball	0.00	0.00	0.00	0.00	0.00	1,323,296.50	3,253,662.29	40° 13' 2.208 N	104° 35' 29.940 W
- actual wellpath hits target center									
- Polygon									
Point 1			1,553.00	-155.00		1,323,141.51	3,255,215.23		
Point 2			1,580.00	-4,543.00		1,318,753.70	3,255,242.22		
Point 3			-2,586.00	-4,631.00		1,318,665.70	3,251,076.40		
Point 4			-2,620.00	-247.00		1,323,049.51	3,251,042.40		
Point 5			1,553.00	-155.00		1,323,141.51	3,255,215.23		
Butterball	0.00	0.00	0.00	0.00	0.00	1,323,296.50	3,253,662.29	40° 13' 2.208 N	104° 35' 29.940 W
- actual wellpath hits target center									
- Polygon									
Point 1			1,513.00	6,065.00		1,329,361.24	3,255,175.23		
Point 2			-2,651.00	5,970.00		1,329,266.25	3,251,011.41		
Point 3			-2,685.00	10,332.00		1,333,628.06	3,250,977.41		
Point 4			1,528.00	10,443.00		1,333,739.05	3,255,190.23		
Point 5			1,513.00	6,065.00		1,329,361.24	3,255,175.23		
Butterball	0.00	0.00	0.00	0.00	0.00	1,323,296.50	3,253,662.29	40° 13' 2.208 N	104° 35' 29.940 W
- actual wellpath hits target center									
- Polygon									
Point 1			1,553.00	765.00		1,324,061.47	3,255,215.23		
Point 2			-2,620.00	673.00		1,323,969.47	3,251,042.40		
Point 3			-2,651.00	5,050.00		1,328,346.28	3,251,011.41		
Point 4			1,513.00	5,145.00		1,328,441.28	3,255,175.23		
Point 5			1,553.00	765.00		1,324,061.47	3,255,215.23		
Butterball	0.00	0.00	6,875.88	5,698.82	-627.99	1,328,995.07	3,253,034.33	40° 13' 58.584 N	104° 35' 37.284 W
- actual wellpath misses target center by 48.30ft at 12107.00ft MD (6921.93 TVD, 5696.06 N, -642.33 E)									
- Point									

North Reference Sheet for Sec. 19-T3N-R64W (Butterball 19 PAD) - Butterball D18-75HN

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

Vertical Depths are relative to KB @ 4796.00ft (Rig KB). Northing and Easting are relative to Butterball D18-75HN

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: 0.99995702

Grid Coordinates of Well: 1,323,296.50 ft N, 3,253,662.29 ft E

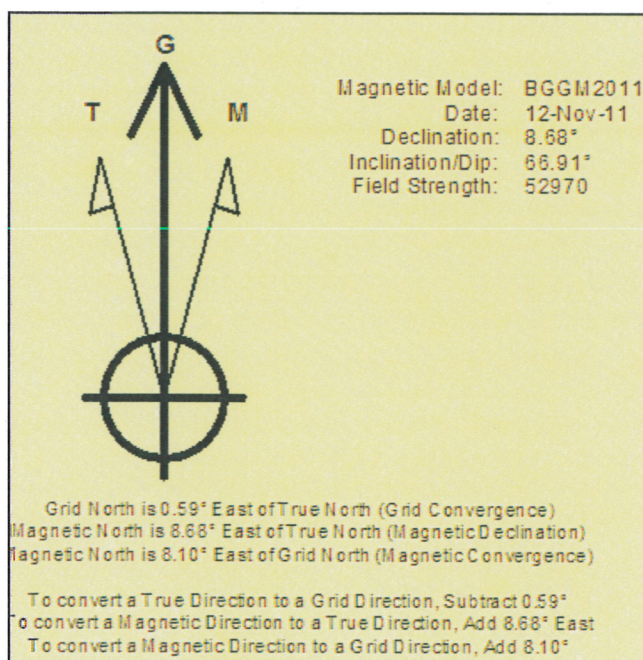
Geographical Coordinates of Well: 40° 13' 02.21" N, 104° 35' 29.94" W

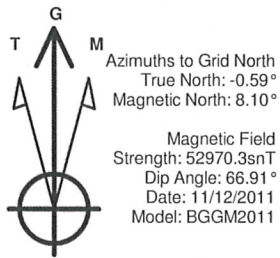
Grid Convergence at Surface is: 0.59°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,107.00ft

the Bottom Hole Displacement is 5,732.16ft in the Direction of 353.57° (Grid).

Magnetic Convergence at surface is: -8.10° (12 November 2011, , BGGM2011)



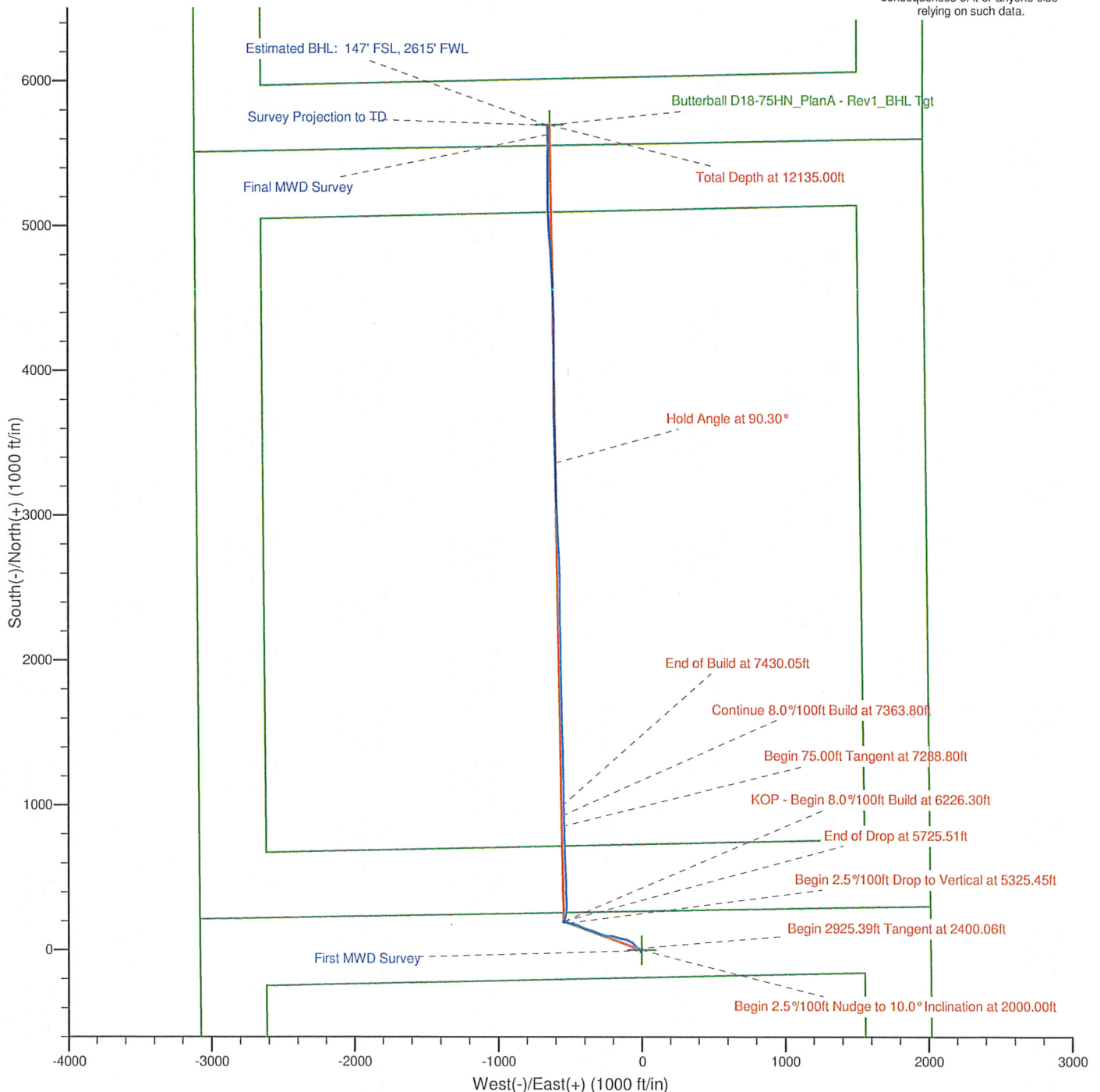


LEGEND

- Butterball D18-75HN, Plan A, Plan A - Rev 1 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Butterball D18-75HN 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: 150' FSL, 2600' FEL



Project: Weld County, CO (NAD 83)
Site: Sec. 19-T3N-R64W (Butterball 19 PAD)
Well: Butterball D18-75HN

Noble Energy

HALLIBURTON

Sperry Drilling



Azimuths to Grid North
True North: -0.59°
Magnetic North: 8.10°

Magnetic Field
Strength: 52970.3snT
Dip Angle: 66.91°
Date: 11/12/2011
Model: BGGM2011

LEGEND

- Butterball D18-75HN, Plan A, Plan A - Rev 1 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Butterball D18-75HN 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.

