

# Noble Energy

Weld County, CO (NAD 83)

Sec. 6-T6N-R62W (Wells Ranch 5 North PAD)

Wells Ranch AE05-67HN

Design: Vaughn ESS and Sperry MWD Survey

## Sperry Drilling Services

### Final Survey Report

16 September, 2013

Well Coordinates: 1,434,043.17 N, 3,317,977.21 E (40° 31' 09.19" N, 104° 21' 22.50" W)

Ground Level: 4,933.00 ft

Local Coordinate Origin: Centered on Well Wells Ranch AE05-67HN - Slot A4

Viewing Datum: KB=30' @ 4963.00ft (H&P 321)

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 Wells Ranch AE05-67HN - Vaughn ESS 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
281.00	0.70	178.71	280.99	-1.72	0.04	-0.02	0.25
<b>Surveys from 281.00ft to 600.00ft are Vaughn ESS Surveys</b>							
600.00	0.20	220.31	599.98	-4.09	-0.28	-0.43	0.18
<b>Tie-On to Vaughn ESS Survey</b>							
728.00	0.15	114.92	727.98	-4.33	-0.27	-0.43	0.22
<b>First Sperry MWD Survey</b>							
820.00	0.28	167.17	819.98	-4.60	-0.11	-0.28	0.24
912.00	0.22	155.12	911.98	-4.98	0.01	-0.17	0.09
1,004.00	0.34	158.85	1,003.98	-5.39	0.19	-0.01	0.13
1,096.00	0.25	148.86	1,095.98	-5.82	0.39	0.18	0.11
1,188.00	0.16	151.31	1,187.98	-6.10	0.55	0.33	0.10
1,280.00	0.15	28.56	1,279.98	-6.11	0.67	0.45	0.30
1,371.00	0.09	152.02	1,370.98	-6.07	0.76	0.54	0.23
1,463.00	0.40	43.99	1,462.98	-5.90	1.02	0.80	0.47
1,558.00	0.25	56.63	1,557.98	-5.55	1.42	1.22	0.17
1,653.00	0.16	15.28	1,652.97	-5.31	1.63	1.44	0.18
1,748.00	0.04	76.18	1,747.97	-5.17	1.70	1.51	0.15
1,842.00	0.24	353.68	1,841.97	-4.97	1.71	1.53	0.25
1,937.00	0.18	196.86	1,936.97	-4.91	1.64	1.46	0.43
2,032.00	0.55	144.99	2,031.97	-5.43	1.86	1.66	0.49
2,127.00	0.46	184.52	2,126.97	-6.18	2.09	1.87	0.37
2,222.00	0.39	194.57	2,221.97	-6.88	1.98	1.73	0.11
2,316.00	0.25	301.36	2,315.97	-7.08	1.73	1.47	0.55
2,411.00	0.39	261.03	2,410.96	-7.02	1.23	0.97	0.27
2,506.00	1.05	49.43	2,505.96	-6.51	1.57	1.33	1.47
2,601.00	1.92	48.62	2,600.93	-4.89	3.43	3.25	0.92
2,696.00	4.30	62.92	2,695.78	-2.21	7.79	7.71	2.62
2,791.00	7.32	73.19	2,790.28	1.16	16.76	16.79	3.35
2,886.00	9.31	71.09	2,884.28	5.40	29.82	30.00	2.12
2,980.00	11.85	66.56	2,976.68	11.70	45.88	46.27	2.84
3,075.00	13.13	67.69	3,069.43	19.68	64.81	65.48	1.37
3,170.00	13.38	67.04	3,161.90	28.06	84.91	85.88	0.31
3,265.00	10.55	64.05	3,254.82	36.16	102.86	104.11	3.05
3,360.00	7.64	62.85	3,348.62	42.85	116.30	117.78	3.07
3,455.00	6.48	67.73	3,442.90	47.76	126.88	128.53	1.37
3,549.00	3.16	61.26	3,536.55	51.02	134.06	135.83	3.57
3,644.00	2.01	59.45	3,631.46	53.12	137.79	139.64	1.21
3,739.00	1.18	21.80	3,726.42	54.88	139.59	141.50	1.36
3,834.00	1.71	315.08	3,821.40	56.79	138.95	140.93	1.74
3,929.00	1.45	286.52	3,916.36	58.14	136.80	138.83	0.86
4,024.00	1.55	289.82	4,011.33	58.91	134.44	136.50	0.14
4,119.00	0.90	292.72	4,106.31	59.64	132.54	134.63	0.69
4,214.00	0.36	318.55	4,201.30	60.15	131.66	133.76	0.63
4,309.00	0.57	303.75	4,296.30	60.64	131.07	133.19	0.25
4,403.00	1.02	343.37	4,390.29	61.70	130.44	132.60	0.73
4,498.00	0.19	4.56	4,485.28	62.66	130.21	132.40	0.89
4,593.00	0.28	27.34	4,580.28	63.03	130.33	132.54	0.13
4,688.00	0.54	33.33	4,675.28	63.61	130.68	132.91	0.28
4,783.00	0.93	179.38	4,770.28	63.21	130.93	133.15	1.48

**Design Report for Wells Ranch AE05-67HN - Vaughn ESS and Sperry MWD Survey**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
4,878.00	1.04	169.55	4,865.26	61.59	131.10	133.25	0.21
4,973.00	1.38	173.76	4,960.24	59.61	131.38	133.46	0.37
5,068.00	1.36	166.12	5,055.21	57.38	131.77	133.78	0.19
5,163.00	0.17	163.37	5,150.20	56.15	132.08	134.04	1.25
5,258.00	0.13	7.43	5,245.20	56.12	132.14	134.10	0.31
5,353.00	0.10	247.41	5,340.20	56.19	132.08	134.04	0.21
5,447.00	0.47	140.38	5,434.20	55.86	132.25	134.19	0.54
5,542.00	0.46	136.51	5,529.20	55.29	132.76	134.68	0.03
5,637.00	0.45	158.97	5,624.20	54.66	133.15	135.06	0.19
5,732.00	0.43	135.86	5,719.19	54.06	133.54	135.42	0.19
5,827.00	0.39	142.07	5,814.19	53.55	133.98	135.84	0.06
5,922.00	0.10	346.37	5,909.19	53.37	134.16	136.02	0.51
5,965.00	0.07	174.10	5,952.19	53.38	134.16	136.01	0.39
6,028.00	0.50	145.20	6,015.19	53.12	134.32	136.16	0.70
6,110.00	3.08	97.97	6,097.14	52.52	136.70	138.53	3.37
6,158.00	8.89	91.26	6,144.86	52.26	141.69	143.50	12.17
6,204.00	12.75	89.67	6,190.04	52.21	150.33	152.13	8.42
6,252.00	15.99	88.14	6,236.53	52.46	162.23	164.04	6.80
6,299.00	19.11	88.41	6,281.34	52.88	176.40	178.21	6.64
6,347.00	22.32	87.46	6,326.23	53.50	193.36	195.18	6.72
6,394.00	25.46	87.46	6,369.19	54.35	212.37	214.21	6.68
6,442.00	27.94	89.21	6,412.07	54.96	233.93	235.78	5.42
6,489.00	31.92	88.48	6,452.80	55.44	257.37	259.22	8.50
6,537.00	34.25	86.18	6,493.01	56.68	283.54	285.41	5.51
6,584.00	39.04	85.67	6,530.71	58.68	311.51	313.44	10.21
6,632.00	43.42	86.67	6,566.80	60.78	343.07	345.05	9.23
6,679.00	46.46	88.85	6,600.07	62.06	376.23	378.24	7.25
6,727.00	51.79	89.33	6,631.47	62.63	412.51	414.52	11.13
6,774.00	58.17	89.27	6,658.43	63.10	450.98	452.98	13.57
6,822.00	62.01	88.58	6,682.36	63.88	492.57	494.57	8.10
6,868.00	65.44	86.79	6,702.72	65.56	533.77	535.81	8.23
6,916.00	68.82	85.81	6,721.37	68.42	577.90	580.01	7.29
6,964.00	71.06	85.74	6,737.84	71.74	622.86	625.06	4.67
7,012.00	74.16	86.81	6,752.18	74.71	668.57	670.84	6.80
7,058.00	77.08	88.75	6,763.60	76.43	713.09	715.40	7.55
7,097.00	79.55	90.26	6,771.50	76.76	751.27	753.57	7.38
7,142.00	82.16	91.04	6,778.65	76.25	795.69	797.94	6.05
<b>Estimated 7" Casing Point: 1317' FNL, 730' FWL (Not a Survey Station)</b>							
7,176.00	84.14	91.62	6,782.71	75.47	829.44	831.64	6.05
7,221.00	83.25	91.47	6,787.65	74.27	874.15	876.28	2.01
7,316.00	84.40	89.49	6,797.87	73.48	968.59	970.62	2.40
7,410.00	89.63	89.33	6,802.76	74.44	1,062.42	1,064.43	5.57
7,505.00	92.00	87.52	6,801.41	77.05	1,157.37	1,159.41	3.14
7,600.00	93.06	87.68	6,797.22	81.03	1,252.19	1,254.31	1.13
7,695.00	90.92	88.75	6,793.92	83.98	1,347.08	1,349.25	2.52
7,789.00	88.71	86.72	6,794.22	87.70	1,441.00	1,443.23	3.19
7,884.00	90.80	87.70	6,794.63	92.32	1,535.88	1,538.22	2.43
7,979.00	90.22	86.66	6,793.78	97.00	1,630.76	1,633.21	1.25
8,073.00	90.95	87.61	6,792.82	101.69	1,724.63	1,727.19	1.27
8,168.00	91.73	89.37	6,790.60	104.20	1,819.57	1,822.16	2.03
8,263.00	91.42	88.85	6,787.99	105.67	1,914.52	1,917.10	0.64

**Design Report for Wells Ranch AE05-67HN - Vaughn ESS and Sperry MWD Survey**

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,358.00	91.27	90.58	6,785.76	106.14	2,009.49	2,012.02	1.83
8,453.00	90.00	90.80	6,784.71	105.00	2,104.47	2,106.90	1.36
8,548.00	90.22	90.38	6,784.52	104.02	2,199.47	2,201.80	0.50
8,643.00	90.31	89.84	6,784.09	103.84	2,294.47	2,296.73	0.58
8,737.00	89.17	89.11	6,784.51	104.70	2,388.46	2,390.69	1.44
8,832.00	90.31	89.11	6,784.94	106.18	2,483.45	2,485.67	1.20
8,927.00	91.20	89.42	6,783.69	107.39	2,578.43	2,580.63	0.99
9,022.00	89.29	87.58	6,783.28	109.88	2,673.39	2,675.62	2.79
9,117.00	88.21	86.64	6,785.36	114.67	2,768.24	2,770.58	1.51
9,211.00	88.95	87.70	6,787.69	119.31	2,862.10	2,864.54	1.37
9,306.00	89.41	87.47	6,789.05	123.31	2,957.00	2,959.53	0.54
9,401.00	89.63	87.98	6,789.84	127.08	3,051.92	3,054.53	0.58
9,496.00	89.14	86.27	6,790.86	131.85	3,146.79	3,149.51	1.87
9,590.00	93.70	89.79	6,788.53	135.08	3,240.67	3,243.44	6.13
9,685.00	92.03	88.51	6,783.78	136.49	3,335.54	3,338.29	2.21
9,780.00	90.37	89.86	6,781.79	137.84	3,430.50	3,433.24	2.25
9,875.00	89.20	88.67	6,782.15	139.06	3,525.49	3,528.21	1.76
9,970.00	89.63	89.58	6,783.12	140.51	3,620.47	3,623.19	1.06
10,064.00	93.23	91.00	6,780.78	140.03	3,714.42	3,717.06	4.12
10,159.00	90.90	91.08	6,777.35	138.31	3,809.34	3,811.85	2.45
10,254.00	90.18	88.46	6,776.46	138.69	3,904.32	3,906.79	2.86
10,349.00	89.60	87.40	6,776.64	142.12	3,999.26	4,001.78	1.27
10,443.00	88.36	86.56	6,778.31	147.07	4,093.11	4,095.75	1.59
10,538.00	89.60	87.24	6,780.00	152.21	4,187.96	4,190.72	1.49
10,633.00	90.22	88.93	6,780.15	155.38	4,282.90	4,285.72	1.89
10,727.00	88.43	87.77	6,781.26	158.09	4,376.85	4,379.70	2.27
10,822.00	89.45	88.16	6,783.02	161.46	4,471.77	4,474.68	1.15
10,917.00	90.34	89.89	6,783.19	163.08	4,566.75	4,569.66	2.05
11,012.00	89.45	90.33	6,783.37	162.90	4,661.75	4,664.59	1.05
11,100.00	88.46	89.81	6,784.97	162.79	4,749.73	4,752.51	1.27
<b>Final Sperry MWD Survey</b>							
11,166.00	88.46	89.81	6,786.74	163.01	4,815.71	4,818.45	0.00
<b>Survey Projection to TD - Estimated BHL: 1332' FNL, 536' FEL</b>							

**Design Annotations**

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
281.00	280.99	-1.72	0.04	Surveys from 281.00ft to 600.00ft are Vaughn ESS Surveys
600.00	599.98	-4.09	-0.28	Tie-On to Vaughn ESS Survey
728.00	727.98	-4.33	-0.27	First Sperry MWD Survey
7,142.00	6,778.65	76.25	795.69	Estimated 7" Casing Point: 1317' FNL, 730' FWL (Not a Survey Station)
11,100.00	6,784.97	162.79	4,749.73	Final Sperry MWD Survey
11,166.00	6,786.74	163.01	4,815.71	Survey Projection to TD
11,166.00	6,786.74	163.01	4,815.71	Estimated BHL: 1332' FNL, 536' FEL

**Design Report for Wells Ranch AE05-67HN - Vaughn ESS and Sperry MWD Survey**

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (ft)	Origin +E/-W (ft)	Start TVD (ft)
Target	Wells Ranch AE05-67HN_PlanA - Rev0_BH L Tgt	87.91	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
281.00	600.00	Vaughn ESS Surveys	Flexi-Shot
728.00	7,142.00	Sperry MWD Surveys	MWD
7,142.00	11,166.00	Sperry MWD Surveys	MWD

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
631.00	630.98	9 5/8" Csg	9-5/8	13-3/4
7,142.00	6,778.65	7" Csg	7	8-3/4

Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
- hit/miss target									
- Shape									
Wells Ranch	0.00	0.00	6,780.18	175.54	4,816.36	1,434,218.71	3,322,793.42	40.519530	-104.338920
- actual wellpath misses target center by 14.16ft at 11166.00ft MD (6786.74 TVD, 163.01 N, 4815.71 E)									
- Point									
Wells Ranch	0.00	0.00	-6.00	-2,575.84	8.19	1,431,467.41	3,317,985.40	40.512150	-104.356340
- actual wellpath misses target center by 2575.90ft at 9.73ft MD (9.73 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				597.12	-3,472.90	1,430,570.39	3,318,574.31		
Point 2				500.50	914.11	1,434,957.25	3,318,477.69		
Point 3				4,870.51	1,047.73	1,435,090.87	3,322,847.56		
Point 4				4,953.13	-3,303.28	1,430,740.00	3,322,930.18		
Point 5				597.12	-3,472.90	1,430,570.39	3,318,574.31		
Wells Ranch	0.00	0.00	-6.00	-2,575.84	8.19	1,431,467.41	3,317,985.40	40.512150	-104.356340
- actual wellpath misses target center by 2575.90ft at 9.73ft MD (9.73 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				137.08	-3,932.86	1,430,110.44	3,318,114.28		
Point 2				40.54	1,374.15	1,435,417.28	3,318,017.75		
Point 3				5,330.55	1,507.69	1,435,550.81	3,323,307.59		
Point 4				5,413.09	-3,763.32	1,430,279.98	3,323,390.13		
Point 5				137.08	-3,932.86	1,430,110.44	3,318,114.28		

**North Reference Sheet for Sec. 6-T6N-R62W (Wells Ranch 5 North PAD) - Wells Ranch AE05-67HN**

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

Vertical Depths are relative to KB=30' @ 4963.00ft (H&P 321). Northing and Easting are relative to Wells Ranch AE05-67HN - Slot A4

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 -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99996780

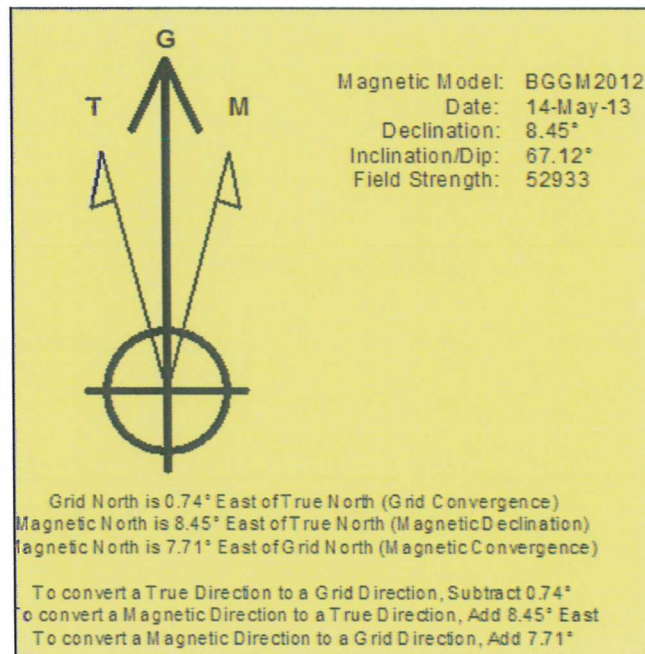
Grid Coordinates of Well: 1,434,043.17 ft N, 3,317,977.21 ft E

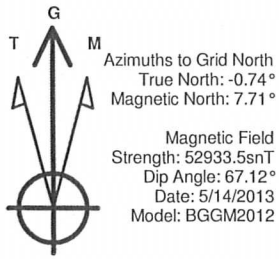
Geographical Coordinates of Well: 40° 31' 09.19" N, 104° 21' 22.50" W

Grid Convergence at Surface is: 0.74°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,166.00ft the Bottom Hole Displacement is 4,818.47ft in the Direction of 88.06° (Grid).

Magnetic Convergence at surface is: -7.71° (14 May 2013, , BGGM2012)

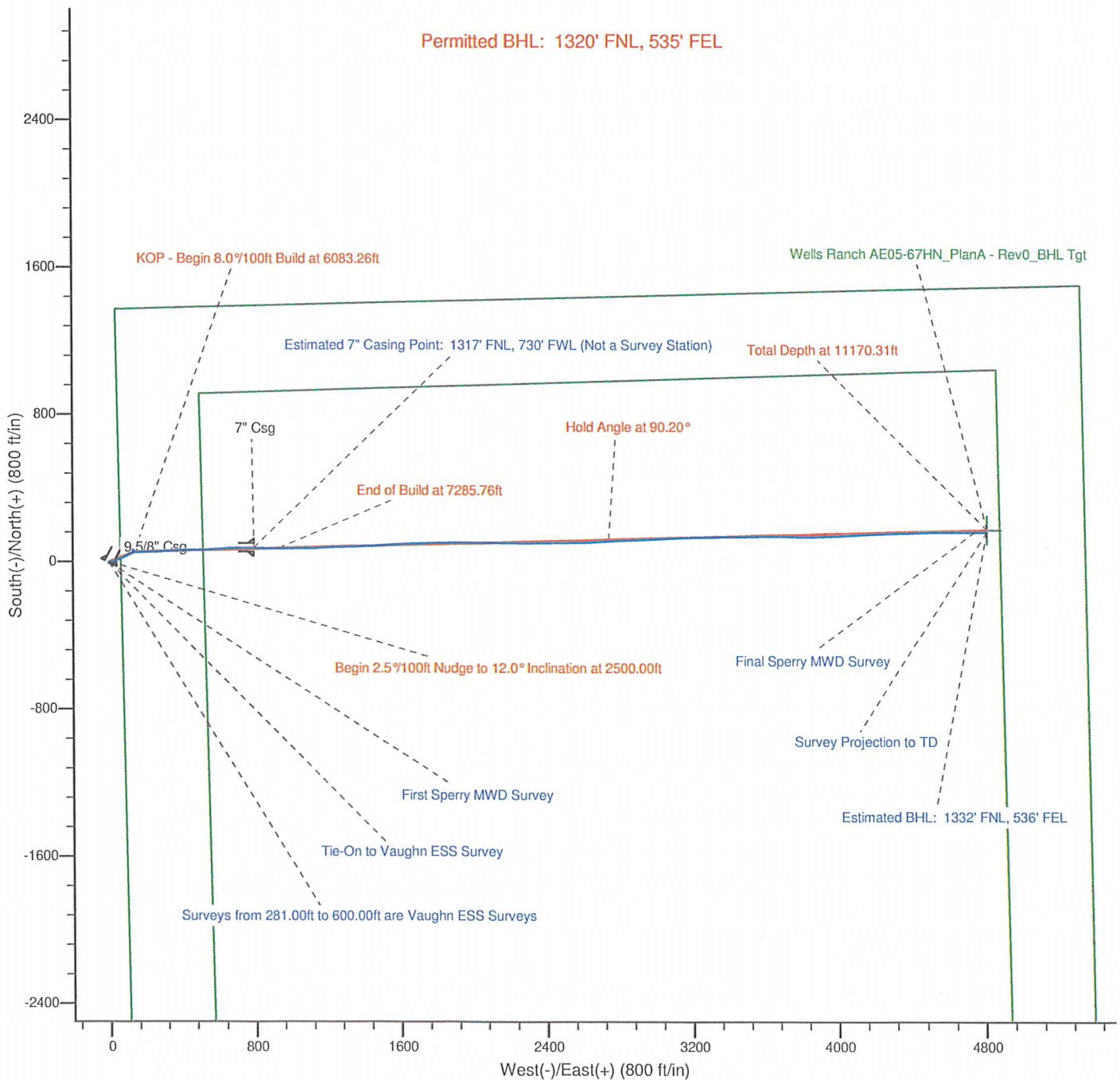




### LEGEND

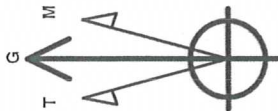
- Wells Ranch AE05-67HN, Plan A, Plan A - Rev 0 Proposal V0
- Vaughn ESS and Sperry MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Wells Ranch AE05-67HN 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.



Project: Weld County, CO (NAD 83)  
 Site: Sec. 6-T6N-R62W (Wells Ranch 5 North PAD)  
 Well: Wells Ranch AE05-67HN

# Noble Energy



Azimuths to Grid North  
 True North: -0.74°  
 Magnetic North: 7.71°  
 Magnetic Field  
 Strength: 52933.58nT  
 Dip Angle: 67.12°  
 Date: 5/14/2013  
 Model: BGGM2012

## LEGEND

- Wells Ranch AE05-67HN, Plan A, Plan A - Rev 0 Proposal V0
- Vaughn ESS and Sperry MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Wells Ranch AE05-67HN 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.

