

# Noble Energy

Weld County, CO (NAD 83)

Sec. 17-T4N-R64W (Sandy Hills-Pluss PAD)

Sandy Hills PC C17-67HN - A2

Design: MWD Survey

## Sperry Drilling Services

### Final Survey Report

26 January, 2012

Well Coordinates: 1,358,712.80 N, 3,255,985.07 E (40° 18' 51.95" N, 104° 34' 55.27" W)

Ground Level: 4,748.00 ft

Local Coordinate Origin: Centered on Well Sandy Hills PC C17-67HN - Slot A2

Viewing Datum: KB @ 4761.00ft (Ensign 132)

TVDs to System: N

North Reference: Grid

Unit System: API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 2003.16 Build: 43I

**HALLIBURTON**

## Design Report for Sandy Hills PC C17-67HN - 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
780.00	0.00	0.00	780.00	0.00	0.00	0.00	0.00
Surface Casing Assumed Vertical at 780.00ft							
794.00	0.06	119.79	794.00	0.00	0.01	0.01	0.43
First MWD Survey							
1,069.00	0.19	271.86	1,069.00	-0.06	-0.32	-0.33	0.09
1,354.00	0.31	40.98	1,354.00	0.54	-0.29	-0.20	0.16
1,449.00	0.23	80.42	1,449.00	0.76	0.07	0.19	0.21
1,544.00	1.60	299.50	1,543.99	1.45	-0.90	-0.66	1.88
1,639.00	4.87	340.86	1,638.83	5.91	-3.38	-2.39	4.02
1,734.00	6.40	333.08	1,733.37	14.44	-7.10	-4.70	1.80
1,829.00	8.65	339.09	1,827.55	25.84	-12.05	-7.76	2.51
1,923.00	10.53	338.35	1,920.23	40.43	-17.74	-11.04	2.00
2,018.00	12.51	340.66	2,013.31	58.21	-24.35	-14.73	2.14
2,113.00	14.05	341.56	2,105.77	78.85	-31.40	-18.39	1.64
2,208.00	15.02	338.02	2,197.73	101.21	-39.66	-22.96	1.38
2,300.00	14.48	339.64	2,286.70	123.05	-48.12	-27.82	0.74
2,392.00	15.91	340.29	2,375.48	145.70	-56.38	-32.35	1.57
2,484.00	13.55	337.27	2,464.45	167.52	-64.80	-37.17	2.70
2,576.00	14.12	337.89	2,553.78	187.86	-73.18	-42.20	0.64
2,668.00	15.79	339.16	2,642.66	209.95	-81.86	-47.23	1.85
2,760.00	15.46	337.91	2,731.26	233.01	-90.93	-52.49	0.51
2,852.00	15.53	337.09	2,819.92	255.72	-100.33	-58.14	0.25
2,944.00	12.62	334.31	2,909.15	276.13	-109.49	-63.91	3.25
3,037.00	13.79	332.80	2,999.69	295.14	-118.96	-70.22	1.31
3,130.00	13.38	332.57	3,090.09	314.55	-128.98	-77.01	0.44
3,224.00	12.20	337.69	3,181.75	333.39	-137.76	-82.66	1.74
3,319.00	14.86	341.35	3,274.11	354.23	-145.47	-86.94	2.94
3,413.00	13.23	340.50	3,365.30	375.79	-152.91	-90.84	1.75
3,509.00	15.40	342.07	3,458.31	398.27	-160.51	-94.74	2.30
3,604.00	14.17	346.07	3,550.17	421.56	-167.19	-97.61	1.68
3,699.00	16.24	350.01	3,641.84	445.93	-172.29	-98.75	2.43
3,794.00	16.46	349.37	3,733.00	472.24	-177.08	-99.27	0.30
3,889.00	16.66	349.41	3,824.06	498.86	-182.07	-99.93	0.21
3,984.00	12.95	346.10	3,915.89	522.59	-187.13	-101.13	4.00
4,079.00	10.49	333.91	4,008.92	540.69	-193.49	-104.52	3.66
4,174.00	8.34	330.79	4,102.63	554.47	-200.66	-109.39	2.33
4,270.00	7.33	322.44	4,197.74	565.41	-207.79	-114.68	1.58
4,364.00	6.31	321.18	4,291.07	574.18	-214.68	-120.08	1.10
4,460.00	4.40	314.70	4,386.65	580.88	-220.61	-124.86	2.08
4,555.00	2.13	307.57	4,481.49	584.52	-224.60	-128.21	2.42
4,650.00	2.29	163.88	4,576.46	583.78	-225.47	-129.20	4.42
4,745.00	2.19	167.99	4,671.39	580.18	-224.57	-128.88	0.20
4,840.00	2.19	166.91	4,766.32	576.64	-223.78	-128.67	0.04
4,935.00	2.15	148.28	4,861.25	573.35	-222.43	-127.86	0.74
5,030.00	2.02	124.78	4,956.19	570.88	-220.12	-125.97	0.90
5,221.00	1.51	121.55	5,147.10	567.64	-215.21	-121.64	0.27
5,315.00	0.97	75.93	5,241.08	567.19	-213.38	-119.91	1.15
5,415.00	0.79	97.72	5,341.07	567.30	-211.88	-118.41	0.38
5,510.00	0.86	81.69	5,436.06	567.32	-210.52	-117.07	0.25

## Design Report for Sandy Hills PC C17-67HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,605.00	0.82	326.00	5,531.05	567.98	-210.20	-116.64	1.50
5,795.00	0.28	280.30	5,721.04	569.19	-211.41	-117.65	0.35
5,985.00	0.46	174.54	5,911.04	568.52	-211.80	-118.14	0.32
6,080.00	0.81	157.56	6,006.03	567.52	-211.50	-118.01	0.41
6,175.00	2.65	146.65	6,100.99	565.06	-210.04	-116.96	1.96
6,207.00	3.37	140.71	6,132.94	563.72	-209.04	-116.18	2.45
6,239.00	4.47	120.92	6,164.87	562.35	-207.37	-114.76	5.40
6,267.00	5.29	103.36	6,192.77	561.49	-205.18	-112.73	6.05
6,298.00	6.44	93.94	6,223.61	561.04	-202.06	-109.72	4.83
6,330.00	7.13	95.81	6,255.38	560.71	-198.29	-106.05	2.26
6,362.00	9.08	100.62	6,287.06	560.05	-193.83	-101.76	6.45
6,393.00	10.18	104.29	6,317.62	558.92	-188.77	-96.95	4.06
6,425.00	12.33	106.41	6,349.01	557.26	-182.75	-91.27	6.84
6,457.00	14.11	99.40	6,380.16	555.66	-175.63	-84.49	7.48
6,489.00	16.24	98.75	6,411.04	554.34	-167.36	-76.54	6.68
6,520.00	18.50	92.82	6,440.63	553.44	-158.16	-67.60	9.25
6,552.00	21.39	92.14	6,470.71	552.97	-147.25	-56.91	9.06
6,584.00	23.37	94.72	6,500.30	552.23	-135.09	-45.03	6.91
6,615.00	26.55	93.25	6,528.40	551.33	-122.05	-32.29	10.45
6,647.00	30.19	91.60	6,556.55	550.70	-106.86	-17.40	11.63
6,679.00	33.69	89.05	6,583.70	550.62	-89.94	-0.71	11.72
6,710.00	37.07	88.81	6,608.97	550.96	-71.99	17.06	10.91
6,742.00	40.53	89.17	6,633.91	551.31	-51.95	36.90	10.84
6,774.00	43.82	90.54	6,657.62	551.35	-30.47	58.11	10.67
6,805.00	47.93	89.22	6,679.20	551.41	-8.22	80.08	13.61
6,837.00	50.91	88.70	6,700.01	551.85	16.08	104.14	9.39
6,868.00	55.53	87.15	6,718.57	552.76	40.88	128.77	15.43
6,900.00	59.35	86.09	6,735.79	554.36	67.80	155.59	12.26
6,932.00	62.14	86.08	6,751.43	556.26	95.65	183.39	8.72
6,963.00	65.04	86.39	6,765.21	558.09	123.35	211.03	9.40
6,995.00	68.13	85.34	6,777.93	560.21	152.64	240.27	10.11
7,027.00	72.03	85.25	6,788.83	562.67	182.61	270.26	12.19
7,058.00	75.05	85.28	6,797.61	565.13	212.24	299.90	9.74
7,090.00	77.51	86.35	6,805.20	567.39	243.24	330.86	8.35
7,121.00	79.59	86.41	6,811.35	569.31	273.56	361.10	6.71
7,140.00	80.96	86.34	6,814.56	570.50	292.25	379.73	7.22
7,225.00	85.71	87.59	6,824.43	574.96	376.53	463.65	5.78
7,257.00	85.90	88.30	6,826.77	576.11	408.42	495.31	2.29
7,352.00	86.46	87.75	6,833.10	579.37	503.16	589.35	0.83
7,447.00	88.80	86.80	6,837.03	583.88	597.96	683.65	2.66
7,542.00	89.88	86.93	6,838.12	589.08	692.81	778.11	1.15
7,637.00	91.20	86.84	6,837.22	594.24	787.66	872.57	1.39
7,732.00	89.45	87.33	6,836.69	599.07	882.53	966.99	1.91
7,828.00	89.85	86.91	6,837.27	603.90	978.41	1,062.41	0.60
7,923.00	91.17	86.68	6,836.43	609.21	1,073.26	1,156.88	1.41
8,018.00	89.38	88.10	6,835.97	613.53	1,168.15	1,251.24	2.41
8,113.00	90.40	88.35	6,836.15	616.48	1,263.10	1,345.44	1.11
8,208.00	89.45	89.45	6,836.28	618.30	1,358.08	1,439.49	1.53
8,303.00	90.09	89.75	6,836.66	618.96	1,453.08	1,533.37	0.74
8,398.00	89.20	90.21	6,837.25	619.00	1,548.08	1,627.15	1.05
8,493.00	89.35	90.00	6,838.45	618.82	1,643.07	1,720.89	0.27



## Design Report for Sandy Hills PC C17-67HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,589.00	90.74	90.02	6,838.37	618.80	1,739.07	1,815.65	1.45
8,684.00	89.41	90.24	6,838.25	618.59	1,834.06	1,909.39	1.42
8,779.00	90.09	90.39	6,838.66	618.07	1,929.06	2,003.08	0.73
8,874.00	89.01	90.19	6,839.41	617.59	2,024.06	2,096.78	1.16
8,969.00	90.06	89.65	6,840.18	617.72	2,119.05	2,190.57	1.24
9,064.00	88.43	88.02	6,841.43	619.65	2,214.02	2,284.62	2.43
9,159.00	90.00	87.84	6,842.73	623.08	2,308.94	2,378.88	1.66
9,254.00	91.05	88.97	6,841.86	625.72	2,403.90	2,473.03	1.62
9,349.00	89.78	88.75	6,841.18	627.61	2,498.88	2,567.09	1.36
9,444.00	90.55	88.66	6,840.90	629.76	2,593.85	2,661.18	0.82
9,539.00	91.45	88.79	6,839.24	631.88	2,688.81	2,755.26	0.96
9,634.00	91.11	89.30	6,837.12	633.46	2,783.77	2,849.25	0.65
9,729.00	90.74	90.28	6,835.59	633.81	2,878.76	2,943.07	1.10
9,824.00	90.34	91.19	6,834.69	632.59	2,973.75	3,036.64	1.05
9,920.00	88.43	91.13	6,835.72	630.64	3,069.72	3,131.07	1.99
10,015.00	88.00	90.42	6,838.68	629.36	3,164.66	3,224.58	0.87
10,110.00	87.10	89.60	6,842.74	629.34	3,259.57	3,318.27	1.28
10,205.00	89.14	87.42	6,845.86	631.81	3,354.48	3,412.35	3.14
10,300.00	89.66	87.16	6,846.86	636.30	3,449.37	3,506.73	0.61
10,395.00	90.71	86.53	6,846.55	641.53	3,544.22	3,601.20	1.29
10,490.00	91.08	86.30	6,845.06	647.47	3,639.02	3,695.73	0.46
10,585.00	91.66	85.97	6,842.79	653.87	3,733.78	3,790.29	0.70
10,680.00	90.56	85.73	6,840.95	660.75	3,828.51	3,884.91	1.19
10,775.00	91.54	85.78	6,839.21	667.78	3,923.23	3,979.53	1.03
10,870.00	91.14	85.50	6,836.99	675.00	4,017.93	4,074.17	0.51
10,939.00	91.20	85.94	6,835.58	680.15	4,086.72	4,142.90	0.64

## Final MWD Survey

11,004.00	91.20	85.94	6,834.22	684.75	4,151.55	4,207.62	0.00
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Survey Projection to TD - Estimated BHL: 1268' FNL, 565' FEL

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
780.00	780.00	0.00	0.00	Surface Casing Assumed Vertical at 780.00ft
794.00	794.00	0.00	0.01	First MWD Survey
10,939.00	6,835.58	680.15	4,086.72	Final MWD Survey
11,004.00	6,834.22	684.75	4,151.55	Survey Projection to TD
11,004.00	6,834.22	684.75	4,151.55	Estimated BHL: 1268' FNL, 565' FEL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (ft)	Origin +E/-W (ft)	Start TVD (ft)
Target	Sandy Hills PC C17-67HN_PlanA - Rev1_BHL Tgt	80.80	Slot	0.00	0.00	0.00

## Design Report for Sandy Hills PC C17-67HN - MWD Survey

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
780.00	11,004.00	Sperry MWD Surveys	MWD

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
Pluss C17-32D_Sec.	0.00	0.00	0.00	-21.85	0.23	1,358,690.95	3,255,985.30	40° 18' 51.732 N	104° 34' 55.272 W
- actual wellpath misses target center by 21.85ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-114.77	1,425.15	1,360,137.89	3,255,870.30		
Point 2				4,249.23	1,498.15	1,360,210.88	3,260,234.12		
Point 3				4,280.23	-2,860.85	1,355,852.07	3,260,265.11		
Point 4				-84.77	-2,929.85	1,355,783.07	3,255,900.30		
Point 5				-114.77	1,425.15	1,360,137.89	3,255,870.30		
Pluss C17-32D_Sec.	0.00	0.00	0.00	-21.85	0.23	1,358,690.95	3,255,985.30	40° 18' 51.732 N	104° 34' 55.272 W
- actual wellpath misses target center by 21.85ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-574.77	1,885.15	1,360,597.87	3,255,410.32		
Point 2				4,709.23	1,958.15	1,360,670.86	3,260,694.10		
Point 3				4,740.23	-3,320.85	1,355,392.09	3,260,725.09		
Point 4				-544.77	-3,389.85	1,355,323.09	3,255,440.32		
Point 5				-574.77	1,885.15	1,360,597.87	3,255,410.32		
Sandy Hills PC	0.00	0.00	6,839.00	677.58	4,181.79	1,359,390.35	3,260,166.68	40° 18' 58.212 N	104° 34' 1.200 W
- actual wellpath misses target center by 31.44ft at 11004.00ft MD (6834.22 TVD, 684.75 N, 4151.55 E)									
- Point									

**North Reference Sheet for Sec. 17-T4N-R64W (Sandy Hills-Pluss PAD) - Sandy Hills  
PC C17-67HN**

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

Vertical Depths are relative to KB @ 4761.00ft (Ensign 132). Northing and Easting are relative to Sandy Hills PC C17-67HN - 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: 0.99995746

Grid Coordinates of Well: 1,358,712.80 ft N, 3,255,985.07 ft E

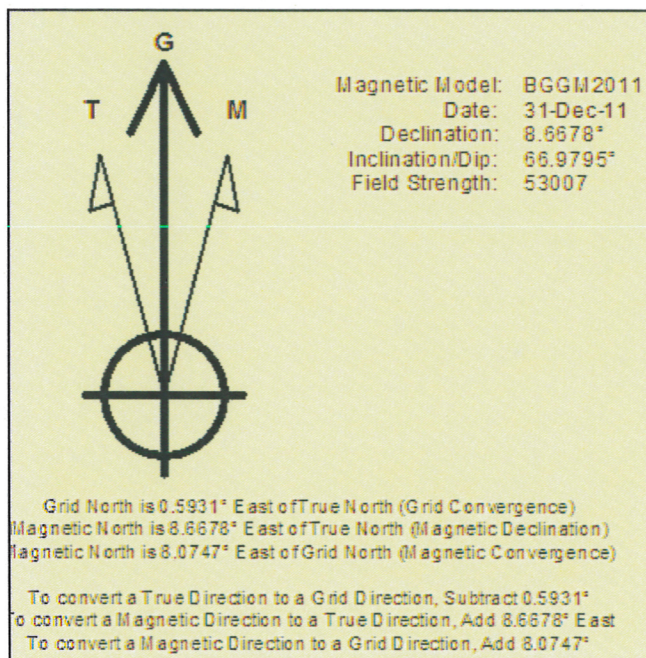
Geographical Coordinates of Well: 40° 18' 51.95" N, 104° 34' 55.27" W

Grid Convergence at Surface is: 0.5931°

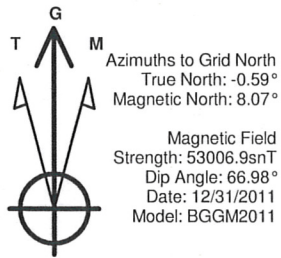
Based upon Minimum Curvature type calculations, at a Measured Depth of 11,004.00ft

the Bottom Hole Displacement is 4,207.64ft in the Direction of 80.63° (Grid).

Magnetic Convergence at surface is: -8.0700° (31 December 2011, , BGGM2011)



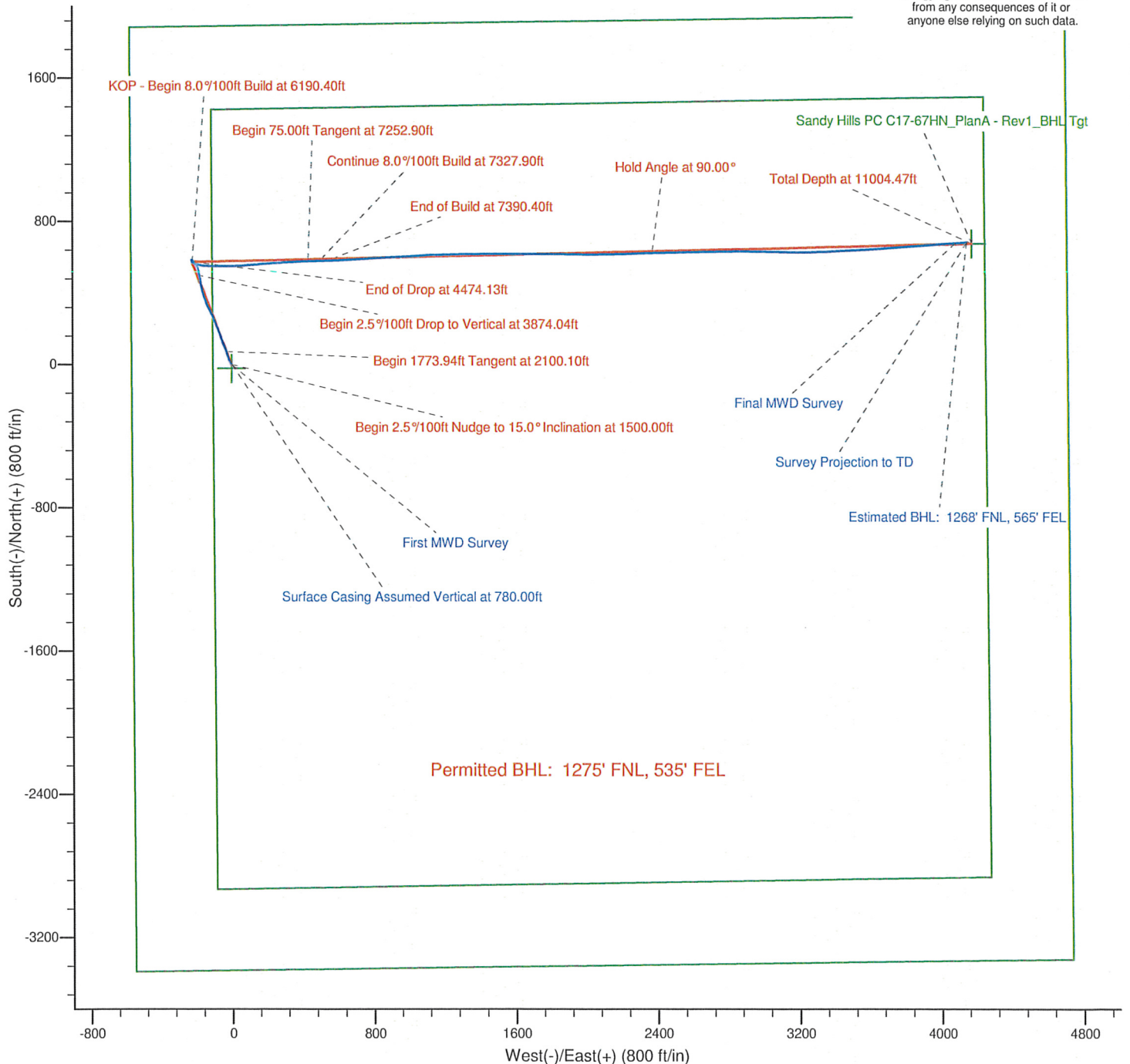




### LEGEND

- Sandy Hills PC C17-67HN, Plan A, Plan A - Rev 1 Proposal VC
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Sandy Hills PC C17-67HN 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. 17-T4N-R64W (Sandy Hills-Pluss PAD)  
 Well: Sandy Hills PC C17-67HN

# Noble Energy

**HALLIBURTON**

Sperry Drilling



Azimuths to Grid North  
 True North: -0.59°  
 Magnetic North: 8.07°

Magnetic Field  
 Strength: 53006.9nT  
 Dip Angle: 66.98°  
 Date: 12/31/2011  
 Model: BGGM2011

## LEGEND

- Sandy Hills PC C17-67HN, Plan A, Plan A - Rev 1 Proposal V0
- MWD Survey

Haliburton Energy Services, Inc. ("Haliburton") recently completed directional drilling and MWD operations at the Sandy Hills PC C17-67HN well located at Weld County, CO. At the conclusion of the job Haliburton performed a final survey on the well. Noble Energy has requested that Haliburton 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. Haliburton 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 Haliburton releasing this data to Noble Energy, Noble Energy agrees to release Haliburton from any consequences of it or anyone else relying on such data.

