

Noble Energy

Weld County, CO (NAD 83)
Sec. 16-T5N-R64W (Klein 16 PAD)
Klein B16-99HZ - A2

Design: MWD Survey

Sperry Drilling Services

Final Survey Report

20 April, 2011

Well Coordinates: 1,387,418.00 N, 3,265,058.46 E (40° 23' 34.66" N, 104° 32' 54.17" W)
Ground Level: 4,607.00 ft

Local Coordinate Origin:	Centered on Well Klein B16-99HZ - Slot A2
Viewing Datum:	KB @ 4631.00ft (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 Klein B16-99HZ - 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
776.00	0.47	27.29	775.99	2.83	1.46	1.41	0.06
First Sperry MWD Survey							
868.00	0.57	15.81	867.99	3.60	1.76	1.85	0.16
960.00	0.59	23.05	959.98	4.48	2.07	2.37	0.08
1,052.00	0.52	23.38	1,051.98	5.30	2.42	2.82	0.08
1,147.00	0.34	53.10	1,146.98	5.86	2.81	3.04	0.30
1,242.00	0.39	63.12	1,241.97	6.18	3.33	2.99	0.09
1,336.00	0.49	58.90	1,335.97	6.53	3.96	2.90	0.11
1,431.00	0.22	23.43	1,430.97	6.91	4.38	2.95	0.35
1,526.00	2.05	42.89	1,525.95	8.32	5.61	3.36	1.94
1,620.00	2.63	40.63	1,619.87	11.19	8.16	4.15	0.62
1,715.00	3.60	41.44	1,714.73	15.08	11.55	5.26	1.02
1,810.00	5.57	35.01	1,809.42	21.09	16.17	7.35	2.14
1,904.00	6.17	41.09	1,902.93	28.64	22.11	9.88	0.92
1,999.00	7.28	42.31	1,997.27	36.94	29.51	12.15	1.18
2,094.00	9.42	33.29	2,091.26	47.89	37.83	16.01	2.63
2,192.00	10.82	20.19	2,187.75	63.23	45.41	23.84	2.74
2,287.00	12.68	24.39	2,280.76	81.09	52.80	33.82	2.15
2,383.00	15.30	20.32	2,373.90	102.57	61.55	45.89	2.91
2,479.00	12.82	20.74	2,467.02	124.41	69.72	58.59	2.59
2,574.00	13.35	20.96	2,559.55	144.51	77.37	70.20	0.56
2,670.00	15.57	19.07	2,652.51	167.04	85.55	83.45	2.36
2,765.00	16.08	18.63	2,743.90	191.56	93.92	98.19	0.55
2,861.00	12.70	22.18	2,836.88	213.94	102.15	111.29	3.64
2,956.00	13.71	23.33	2,929.37	233.94	110.55	122.38	1.10
3,051.00	12.49	26.96	3,021.90	253.44	119.67	132.64	1.55
3,147.00	11.77	25.86	3,115.75	271.50	128.65	141.83	0.79
3,242.00	12.98	34.44	3,208.55	289.02	138.91	149.81	2.31
3,338.00	14.75	33.87	3,301.75	308.06	151.82	157.45	1.85
3,433.00	15.17	25.97	3,393.54	329.28	164.00	167.27	2.19
3,528.00	14.44	21.94	3,485.39	351.44	173.87	179.22	1.33
3,624.00	17.05	25.29	3,577.78	375.28	184.36	192.15	2.88
3,719.00	18.20	25.96	3,668.32	401.21	196.80	205.60	1.23
3,815.00	17.84	26.49	3,759.61	427.85	209.92	219.22	0.41
3,910.00	16.10	27.71	3,850.47	452.54	222.54	231.57	1.87
4,006.00	14.38	27.57	3,943.09	474.89	234.25	242.59	1.79
4,101.00	14.71	27.30	4,035.05	496.07	245.24	253.08	0.35
4,197.00	13.87	30.53	4,128.08	516.81	256.68	262.96	1.21
4,292.00	12.05	29.14	4,220.65	535.28	267.29	271.50	1.94
4,387.00	12.30	22.62	4,313.52	553.28	276.01	280.79	1.47
4,483.00	12.95	22.89	4,407.20	572.63	284.13	291.52	0.68
4,578.00	13.23	26.55	4,499.73	592.16	293.13	301.88	0.92
4,674.00	13.89	28.91	4,593.06	612.08	303.61	311.66	0.90
4,769.00	12.21	31.60	4,685.60	630.62	314.39	320.16	1.88
4,875.00	9.31	33.68	4,789.72	647.30	325.02	327.25	2.76
4,960.00	8.52	30.39	4,873.70	658.46	332.01	332.06	1.11
5,056.00	6.87	35.04	4,968.83	669.29	338.91	336.68	1.84
5,151.00	4.38	36.20	5,063.37	676.87	344.31	339.56	2.62
5,247.00	3.01	31.48	5,159.16	681.98	347.80	341.59	1.46

Design Report for Klein B16-99HZ - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,342.00	0.43	358.56	5,254.11	684.46	349.09	342.82	2.80
5,437.00	0.85	276.24	5,349.11	684.90	348.38	343.59	0.95
5,533.00	0.22	118.25	5,445.11	684.89	347.83	343.91	1.10
5,628.00	0.78	79.59	5,540.10	684.92	348.63	343.46	0.66
5,724.00	1.05	89.50	5,636.09	685.04	350.15	342.66	0.32
5,881.00	3.90	33.17	5,792.94	689.53	354.51	343.67	2.19
5,945.00	5.90	4.02	5,856.72	694.63	355.94	346.93	4.90
5,977.00	3.59	332.70	5,888.61	697.16	355.59	349.17	10.60
6,009.00	4.45	291.11	5,920.54	698.50	353.97	351.20	9.26
6,040.00	6.51	298.48	5,951.39	699.77	351.31	353.81	7.01
6,072.00	10.25	292.57	5,983.05	701.73	347.08	357.90	11.98
6,104.00	12.84	297.08	6,014.40	704.44	341.29	363.53	8.57
6,136.00	14.79	301.85	6,045.47	708.22	334.65	370.51	7.05
6,184.00	17.18	305.30	6,091.61	715.55	323.66	382.94	5.36
6,231.00	20.57	306.79	6,136.08	724.51	311.38	397.44	7.28
6,279.00	24.56	310.86	6,180.40	736.09	297.07	415.26	8.92
6,326.00	28.23	314.68	6,222.49	750.30	281.78	435.78	8.60
6,374.00	32.63	316.60	6,263.87	767.69	264.80	459.86	9.39
6,422.00	37.32	316.24	6,303.19	787.62	245.84	487.15	9.78
6,470.00	41.50	314.00	6,340.27	809.18	224.32	517.28	9.20
6,517.00	41.31	313.04	6,375.53	830.59	201.78	547.89	1.41
6,565.00	43.01	313.24	6,411.11	852.62	178.28	579.58	3.55
6,613.00	47.90	312.96	6,444.77	875.98	153.30	613.22	10.20
6,661.00	52.95	312.12	6,475.34	900.98	126.05	649.52	10.61
6,708.00	58.31	311.10	6,501.86	926.73	97.04	687.47	11.54
6,756.00	63.54	310.15	6,525.18	954.02	65.21	728.34	11.03
6,804.00	67.76	309.34	6,544.97	981.97	31.59	770.80	8.92
6,852.00	72.88	310.72	6,561.13	1,011.04	-3.00	814.74	11.00
6,899.00	75.82	313.54	6,573.80	1,041.40	-36.55	859.10	8.51
6,947.00	78.44	316.83	6,584.50	1,074.59	-69.52	905.39	8.63
6,981.00	81.55	316.69	6,590.40	1,098.98	-92.45	938.63	9.16
7,062.00	83.34	316.39	6,601.05	1,157.26	-147.68	1,018.33	2.24
7,158.00	86.94	316.45	6,609.19	1,226.54	-213.61	1,113.24	3.75
7,253.00	87.96	318.09	6,613.41	1,296.25	-278.01	1,207.57	2.03
7,349.00	90.86	313.18	6,614.40	1,364.85	-345.10	1,302.62	5.94
7,444.00	91.55	318.52	6,612.40	1,432.97	-411.24	1,396.71	5.67
7,539.00	90.34	319.18	6,610.84	1,504.50	-473.74	1,491.38	1.45
7,635.00	88.95	316.94	6,611.43	1,575.90	-537.90	1,586.94	2.75
7,730.00	89.23	316.34	6,612.94	1,644.96	-603.11	1,681.24	0.70
7,825.00	90.43	318.84	6,613.22	1,715.09	-667.18	1,775.72	2.92
7,921.00	90.50	315.25	6,612.44	1,785.34	-732.58	1,871.09	3.74
8,016.00	87.50	316.11	6,614.10	1,853.29	-798.93	1,965.18	3.29
8,112.00	88.83	318.56	6,617.17	1,923.84	-863.95	2,060.56	2.90
8,207.00	90.12	318.22	6,618.04	1,994.86	-927.04	2,155.17	1.40
8,303.00	89.45	316.07	6,618.40	2,065.23	-992.33	2,250.57	2.35
8,398.00	89.23	313.48	6,619.50	2,132.14	-1,059.75	2,344.45	2.74
8,494.00	90.80	316.28	6,619.47	2,199.87	-1,127.77	2,439.35	3.34
8,589.00	88.98	315.85	6,619.66	2,268.28	-1,193.68	2,533.54	1.97
8,684.00	88.64	315.52	6,621.63	2,336.23	-1,260.03	2,627.64	0.50
8,780.00	88.55	315.97	6,623.98	2,404.97	-1,327.01	2,722.72	0.48
8,875.00	87.53	315.33	6,627.23	2,472.86	-1,393.38	2,816.77	1.27

Design Report for Klein B16-99HZ - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,971.00	88.33	316.74	6,630.70	2,541.91	-1,459.97	2,911.89	1.69
9,066.00	88.76	316.58	6,633.11	2,610.98	-1,525.15	3,006.18	0.48
9,162.00	89.63	315.42	6,634.46	2,680.03	-1,591.83	3,101.34	1.51
9,257.00	89.32	314.18	6,635.33	2,746.97	-1,659.24	3,195.23	1.35
9,353.00	88.14	316.01	6,637.46	2,814.94	-1,726.99	3,290.17	2.27
9,448.00	88.06	315.41	6,640.61	2,882.91	-1,793.29	3,384.24	0.64
9,544.00	87.17	317.01	6,644.60	2,952.14	-1,859.66	3,479.37	1.91
9,639.00	88.27	317.98	6,648.38	3,022.12	-1,923.80	3,573.77	1.54
9,734.00	88.03	316.33	6,651.45	3,091.74	-1,988.36	3,668.13	1.75
9,830.00	90.86	318.01	6,652.38	3,162.13	-2,053.61	3,763.52	3.43
9,926.00	89.60	318.11	6,652.00	3,233.54	-2,117.77	3,859.08	1.32
10,021.00	89.29	317.61	6,652.92	3,303.98	-2,181.51	3,953.61	0.62
10,116.00	86.85	318.03	6,656.12	3,374.33	-2,245.26	4,048.08	2.61
10,212.00	85.85	315.36	6,662.23	3,444.04	-2,310.96	4,143.20	2.96
10,307.00	86.63	317.35	6,668.46	3,512.63	-2,376.38	4,237.25	2.25
10,402.00	87.37	314.81	6,673.43	3,580.96	-2,442.18	4,331.31	2.78
10,498.00	88.05	312.04	6,677.27	3,646.89	-2,511.84	4,425.74	2.97
10,593.00	86.27	309.82	6,681.97	3,709.05	-2,583.52	4,518.33	2.99
10,689.00	87.90	310.55	6,686.86	3,770.91	-2,656.76	4,611.62	1.86
10,784.00	89.60	311.23	6,688.93	3,833.08	-2,728.56	4,704.29	1.93
10,879.00	90.89	311.88	6,688.52	3,896.10	-2,799.65	4,797.22	1.52
10,975.00	91.17	311.65	6,686.80	3,960.03	-2,871.24	4,891.20	0.38
11,070.00	92.10	310.73	6,684.09	4,022.57	-2,942.70	4,983.96	1.38
11,166.00	91.57	312.71	6,681.01	4,086.42	-3,014.32	5,077.88	2.13
11,261.00	90.03	313.47	6,679.69	4,151.31	-3,083.68	5,171.30	1.81
11,325.00	90.65	313.84	6,679.31	4,195.49	-3,129.99	5,234.35	1.13
11,388.00	89.51	310.77	6,679.22	4,237.89	-3,176.57	5,296.14	5.20
11,452.00	89.51	312.62	6,679.77	4,280.45	-3,224.36	5,358.78	2.89
11,516.00	90.15	313.24	6,679.96	4,324.04	-3,271.22	5,421.68	1.39
Final Sperry MWD Survey							
11,595.00	90.15	313.24	6,679.75	4,378.16	-3,328.77	5,499.42	0.00
Survey Projection to TD - Estimated BHL: 488' FNL, 1153' FWL							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
776.00	775.99	2.83	1.46	First Sperry MWD Survey
11,516.00	6,679.96	4,324.04	-3,271.22	Final Sperry MWD Survey
11,595.00	6,679.75	4,378.16	-3,328.77	Survey Projection to TD
11,595.00	6,679.75	4,378.16	-3,328.77	Estimated BHL: 488' FNL, 1153' FWL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Klein B16-99HZ_Rev0_BHL Tgt	323.52	Slot	0.00	0.00	0.00

Design Report for Klein B16-99HZ - MWD Survey

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
776.00	11,595.00	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
Klein	0.00	0.00	6,629.97	4,460.68	-3,298.15	1,391,878.50	3,261,760.44	40° 24' 19.080 N	104° 33' 36.180 W
- actual wellpath misses target center by 101.12ft at 11595.00ft MD (6679.75 TVD, 4378.16 N, -3328.77 E)									
- Point									
Klein B15-13D_Sec.	0.00	0.00	-1.00	0.24	22.28	1,387,418.24	3,265,080.74	40° 23' 34.656 N	104° 32' 53.880 W
- actual wellpath misses target center by 22.31ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				814.28	-300.76	1,387,117.25	3,265,872.71		
Point 2				-4,455.72	-375.76	1,387,042.26	3,260,602.92		
Point 3				-4,536.72	4,903.24	1,392,321.05	3,260,521.93		
Point 4				726.28	4,970.24	1,392,388.04	3,265,784.71		
Point 5				814.28	-300.76	1,387,117.25	3,265,872.71		
Klein B15-13D_Sec.	0.00	0.00	-1.00	0.24	22.28	1,387,418.24	3,265,080.74	40° 23' 34.656 N	104° 32' 53.880 W
- actual wellpath misses target center by 22.31ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				354.28	159.24	1,387,577.24	3,265,412.73		
Point 2				-3,995.72	84.24	1,387,502.24	3,261,062.90		
Point 3				-4,076.72	4,443.24	1,391,861.06	3,260,981.91		
Point 4				266.28	4,510.24	1,391,928.06	3,265,324.73		
Point 5				354.28	159.24	1,387,577.24	3,265,412.73		
Klein	0.00	0.00	6,629.44	4,405.91	-3,246.40	1,391,823.73	3,261,812.19	40° 24' 18.533 N	104° 33' 35.519 W
- actual wellpath misses target center by 99.35ft at 11516.00ft MD (6679.96 TVD, 4324.04 N, -3271.22 E)									
- Point									

North Reference Sheet for Sec. 16-T5N-R64W (Klein 16 PAD) - Klein B16-99HZ

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

Vertical Depths are relative to KB @ 4631.00ft (Rig KB). Northing and Easting are relative to Klein B16-99HZ - 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: 0.99995992

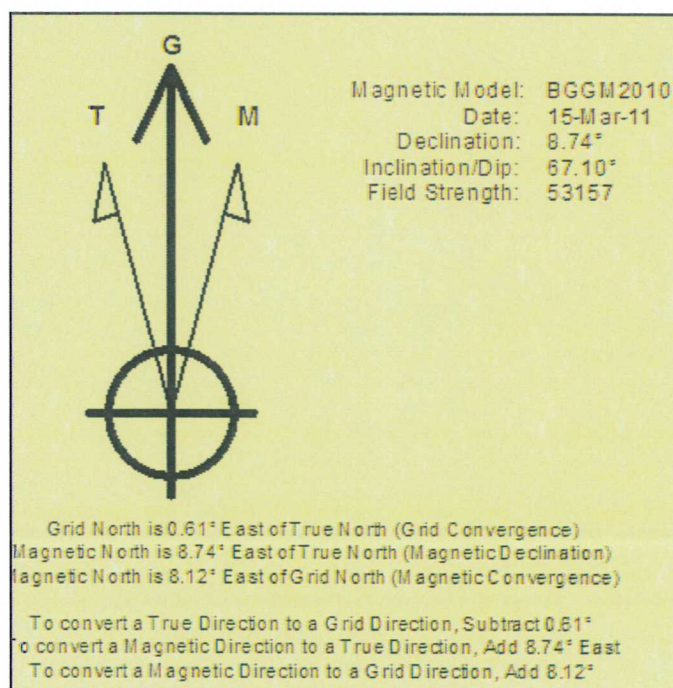
Grid Coordinates of Well: 1,387,418.00 ft N, 3,265,058.46 ft E

Geographical Coordinates of Well: 40° 23' 34.66" N, 104° 32' 54.17" W

Grid Convergence at Surface is: 0.61°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,595.00ft
the Bottom Hole Displacement is 5,499.91ft in the Direction of 322.75° (Grid).

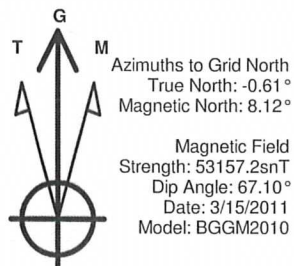
Magnetic Convergence at surface is: -8.12° (15 March 2011, , BGGM2010)



Noble Energy

HALLIBURTON

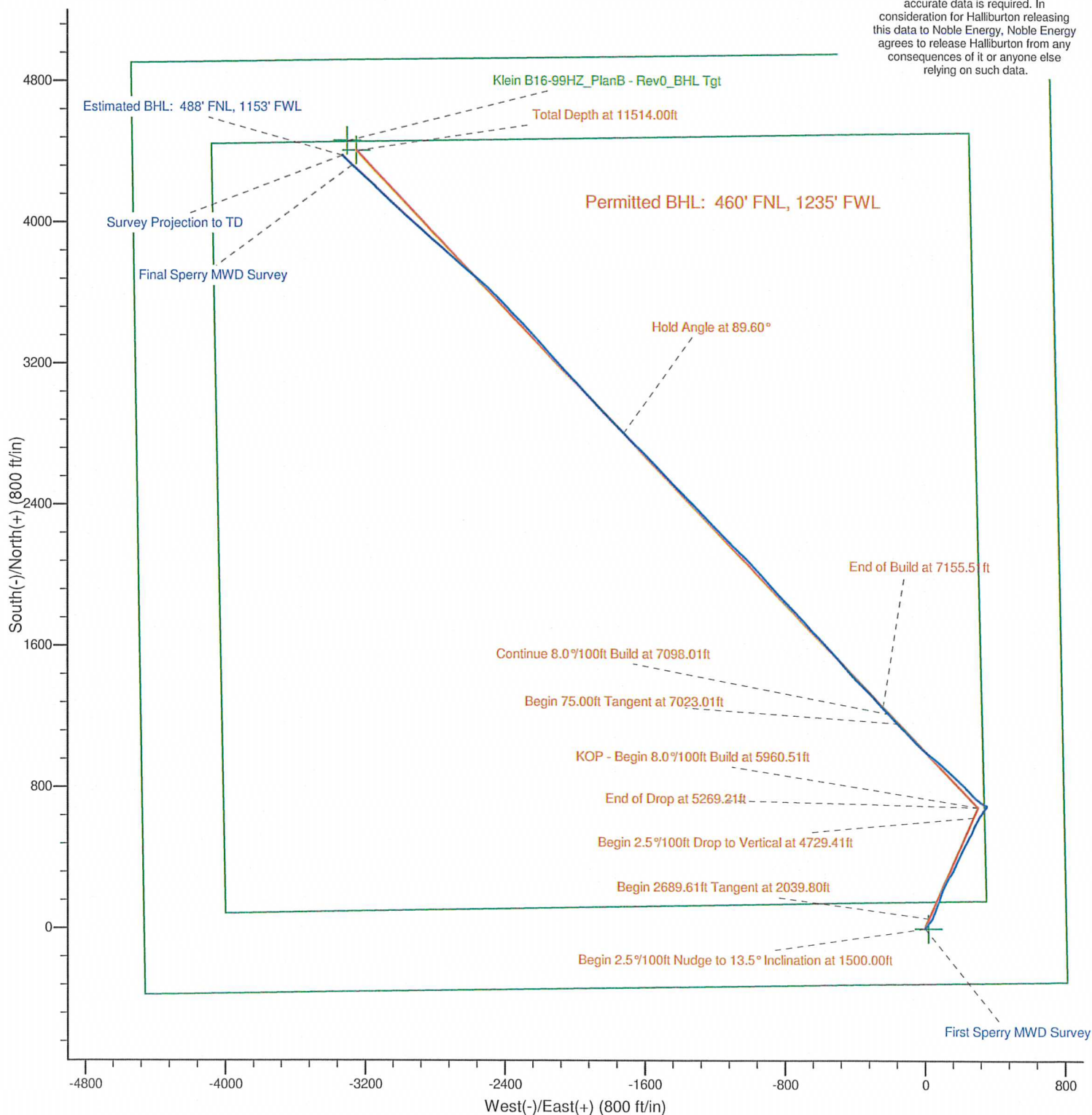
Sperry Drilling



LEGEND

— Klein B16-99HZ,
 — MWD Survey

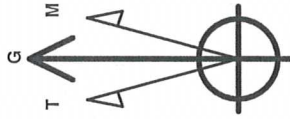
Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Klein B16-99HZ well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them the 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.



Noble Energy

Project: Weld County, CO (NAD 83)
 Site: Sec. 16-T5N-R64W (Klein 16 PAD)
 Well: Klein B16-99HZ

HALLIBURTON
 Sperry Drilling



Azimuths to Grid North
 True North: -0.61°
 Magnetic North: 8.12°
 Magnetic Field
 Strength: 53157.2snT
 Dip Angle: 67.10°
 Date: 3/15/2011
 Model: BGGM2010

LEGEND

— Klein B16-99HZ,
 — MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Klein B16-99HZ 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.

