

Noble Energy

Weld County, CO (NAD 83)

Sec. 16-T3N-R64W

Spike State D16-99HZ

Design: MWD Survey

Sperry Drilling Services Final Survey Report

21 April, 2011

Well Coordinates: 1,325,084.55 N, 3,266,093.25 E (40° 13' 18.59" N, 104° 32' 49.45" W)
Ground Level: 4,782.00 ft

Local Coordinate Origin:	Centered on Well Spike State D16-99HZ
Viewing Datum:	KB @ 4806.00ft (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	

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Design Report for Spike State D16-99HZ - 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
731.00	3.30	34.44	730.60	17.36	11.90	-11.21	0.45
First MWD Survey							
883.00	2.90	31.57	882.37	24.24	16.39	-15.43	0.28
1,066.00	3.21	34.13	1,065.11	32.43	21.69	-20.40	0.19
1,252.00	2.74	21.08	1,250.86	40.89	26.21	-24.59	0.44
1,441.00	2.44	27.66	1,439.67	48.66	29.70	-27.77	0.22
1,630.00	2.43	9.68	1,628.50	56.18	32.24	-30.02	0.40
1,725.00	4.12	1.60	1,723.35	61.57	32.68	-30.24	1.84
1,819.00	5.66	4.05	1,817.00	69.57	33.10	-30.35	1.65
1,914.00	6.35	11.56	1,911.48	79.39	34.48	-31.34	1.10
2,008.00	6.58	2.43	2,004.88	89.87	35.75	-32.20	1.12
2,102.00	6.65	2.57	2,098.26	100.69	36.22	-32.25	0.08
2,232.00	9.03	359.99	2,227.03	118.41	36.56	-31.89	1.85
2,390.00	6.52	357.37	2,383.57	139.77	36.15	-30.64	1.60
2,486.00	8.51	353.67	2,478.74	152.28	35.11	-29.12	2.13
2,582.00	8.72	2.02	2,573.66	166.61	34.59	-28.03	1.32
2,678.00	8.97	4.82	2,668.52	181.34	35.47	-28.34	0.52
2,773.00	9.92	6.55	2,762.23	196.85	37.03	-29.28	1.04
2,869.00	10.33	9.15	2,856.74	213.57	39.34	-30.94	0.64
2,965.00	10.26	13.04	2,951.19	230.39	42.64	-33.57	0.73
3,060.00	9.11	16.82	3,044.84	245.83	46.72	-37.05	1.38
3,156.00	9.22	15.17	3,139.61	260.53	50.93	-40.68	0.30
3,252.00	7.33	14.04	3,234.61	273.90	54.43	-43.65	1.98
3,347.00	6.46	16.80	3,328.92	284.89	57.45	-46.24	0.98
3,443.00	7.45	18.40	3,424.21	295.97	60.97	-49.32	1.05
3,538.00	8.35	16.56	3,518.31	308.42	64.88	-52.74	0.98
3,634.00	9.53	8.14	3,613.15	322.97	68.00	-55.28	1.83
3,729.00	9.43	5.35	3,706.85	338.51	69.83	-56.51	0.49
3,825.00	11.41	2.50	3,801.26	355.83	70.98	-56.98	2.13
3,921.00	10.64	3.97	3,895.49	374.16	72.01	-57.29	0.85
4,016.00	8.78	6.77	3,989.13	390.11	73.47	-58.12	2.02
4,112.00	7.24	6.94	4,084.19	403.39	75.07	-59.20	1.60
4,208.00	6.27	6.54	4,179.52	414.60	76.40	-60.08	1.01
4,304.00	4.74	6.14	4,275.07	423.75	77.42	-60.75	1.59
4,399.00	4.11	4.18	4,369.79	431.05	78.08	-61.13	0.68
4,495.00	3.42	3.52	4,465.58	437.34	78.51	-61.31	0.72
4,591.00	3.15	16.09	4,561.43	442.73	79.42	-62.00	0.80
4,686.00	2.38	24.50	4,656.32	447.04	80.96	-63.37	0.91
4,782.00	2.07	17.09	4,752.24	450.51	82.30	-64.57	0.44
4,877.00	2.27	359.65	4,847.18	454.03	82.79	-64.93	0.72
4,973.00	1.09	350.52	4,943.13	456.83	82.63	-64.65	1.26
5,260.00	0.91	102.72	5,230.11	459.02	84.40	-66.34	0.58
5,547.00	1.71	118.53	5,517.03	456.47	90.39	-72.42	0.30
5,643.00	1.46	119.48	5,613.00	455.19	92.71	-74.79	0.26
5,739.00	0.96	100.34	5,708.97	454.44	94.56	-76.68	0.66
5,834.00	1.09	106.15	5,803.96	454.05	96.21	-78.34	0.18
5,972.00	1.11	100.26	5,941.93	453.44	98.79	-80.94	0.08
6,126.00	4.23	275.99	6,095.82	453.77	94.61	-76.75	3.47
6,158.00	8.24	273.87	6,127.63	454.05	91.14	-73.28	12.55

Design Report for Spike State D16-99HZ - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
6,190.00	11.14	275.59	6,159.17	454.51	85.78	-67.90	9.11
6,222.00	14.02	276.48	6,190.39	455.24	78.85	-60.94	9.02
6,254.00	16.63	280.45	6,221.25	456.51	70.49	-52.54	8.79
6,286.00	19.16	279.94	6,251.70	458.25	60.82	-42.81	7.92
6,317.00	20.78	277.32	6,280.84	459.83	50.35	-32.29	5.97
6,350.00	23.42	277.59	6,311.41	461.44	38.04	-19.92	8.01
6,381.00	25.92	277.13	6,339.58	463.10	25.21	-7.04	8.09
6,413.00	28.10	273.75	6,368.09	464.46	10.75	7.47	8.33
6,460.00	32.36	271.05	6,408.69	465.41	-12.89	31.12	9.51
6,508.00	36.01	269.63	6,448.39	465.56	-39.85	58.07	7.78
6,556.00	40.31	269.74	6,486.12	465.39	-69.50	87.69	8.96
6,604.00	44.99	269.31	6,521.42	465.12	-102.01	120.16	9.77
6,651.00	49.60	269.19	6,553.29	464.67	-136.54	154.65	9.81
6,699.00	52.15	269.86	6,583.57	464.36	-173.77	191.84	5.42
6,747.00	53.37	268.33	6,612.62	463.75	-211.97	229.99	3.59
6,795.00	56.89	267.60	6,640.06	462.35	-251.32	269.25	7.44
6,842.00	60.32	267.53	6,664.54	460.65	-291.40	309.23	7.30
6,890.00	63.65	268.11	6,687.08	459.04	-333.74	351.48	7.02
6,938.00	67.45	268.13	6,706.95	457.60	-377.40	395.05	7.92
6,986.00	71.51	267.73	6,723.77	455.98	-422.32	439.87	8.49
7,033.00	76.21	268.47	6,736.83	454.49	-467.43	484.89	10.11
7,081.00	79.42	268.06	6,746.96	453.06	-514.32	531.68	6.74
7,119.00	81.91	268.28	6,753.12	451.87	-551.79	569.08	6.58
7,213.00	87.05	266.46	6,762.16	447.57	-645.22	662.27	5.80
7,309.00	90.34	266.73	6,764.35	441.87	-741.02	757.77	3.44
7,404.00	89.78	267.06	6,764.25	436.72	-835.88	852.35	0.68
7,499.00	91.72	265.43	6,763.01	430.50	-930.66	946.82	2.67
7,595.00	89.72	265.50	6,761.80	422.91	-1,026.34	1,042.13	2.08
7,691.00	89.41	265.15	6,762.53	415.09	-1,122.02	1,137.43	0.49
7,787.00	89.04	264.93	6,763.83	406.79	-1,217.65	1,232.66	0.45
7,881.00	90.68	264.13	6,764.06	397.83	-1,311.22	1,325.81	1.94
7,977.00	90.06	262.94	6,763.44	387.02	-1,406.61	1,420.70	1.40
8,072.00	89.20	263.90	6,764.05	376.14	-1,500.98	1,514.57	1.36
8,168.00	90.68	264.31	6,764.15	366.28	-1,596.47	1,609.60	1.60
8,263.00	88.89	264.30	6,764.51	356.85	-1,690.99	1,703.68	1.88
8,359.00	90.00	263.08	6,765.44	346.30	-1,786.40	1,798.60	1.72
8,454.00	91.26	261.67	6,764.39	333.70	-1,880.55	1,892.19	1.99
8,549.00	89.11	263.71	6,764.09	321.61	-1,974.77	1,985.86	3.12
8,645.00	90.15	265.88	6,764.71	312.90	-2,070.37	2,081.04	2.51
8,741.00	88.24	265.58	6,766.06	305.75	-2,166.08	2,176.41	2.01
8,836.00	89.75	265.35	6,767.72	298.24	-2,260.77	2,270.72	1.61
8,931.00	91.54	265.09	6,766.65	290.33	-2,355.43	2,365.00	1.90
9,026.00	90.65	265.03	6,764.84	282.15	-2,450.06	2,459.24	0.94
9,122.00	89.69	266.25	6,764.55	274.85	-2,545.78	2,554.59	1.62
9,217.00	89.29	267.43	6,765.40	269.62	-2,640.63	2,649.17	1.31
9,313.00	89.69	268.09	6,766.25	265.86	-2,736.55	2,744.87	0.80
9,409.00	88.74	269.33	6,767.57	263.70	-2,832.51	2,840.67	1.63
9,505.00	90.43	267.71	6,768.26	261.22	-2,928.47	2,936.46	2.44
9,601.00	88.64	267.75	6,769.04	257.42	-3,024.39	3,032.16	1.87
9,696.00	90.65	269.54	6,769.63	255.17	-3,119.35	3,126.96	2.83
9,792.00	88.49	269.14	6,770.35	254.07	-3,215.34	3,222.83	2.29

Design Report for Spike State D16-99HZ - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,888.00	89.85	268.27	6,771.74	251.90	-3,311.30	3,318.63	1.68
9,984.00	88.58	266.45	6,773.06	247.48	-3,407.18	3,414.26	2.31
10,080.00	88.34	265.87	6,775.64	241.05	-3,502.93	3,509.69	0.65
10,176.00	89.94	265.26	6,777.08	233.63	-3,598.63	3,605.02	1.78
10,271.00	87.93	265.14	6,778.84	225.68	-3,693.28	3,699.28	2.12
10,367.00	86.91	264.57	6,783.16	217.08	-3,788.79	3,794.39	1.22
10,463.00	88.27	264.17	6,787.20	207.67	-3,884.24	3,889.40	1.48
10,559.00	88.89	264.97	6,789.58	198.59	-3,979.78	3,984.50	1.05
10,654.00	89.94	264.37	6,790.55	189.77	-4,074.36	4,078.67	1.27
10,749.00	88.00	263.95	6,792.26	180.10	-4,168.85	4,172.70	2.09
10,845.00	88.77	264.07	6,794.96	170.09	-4,264.29	4,267.68	0.81
10,940.00	87.26	265.13	6,798.25	161.15	-4,358.80	4,361.77	1.94
11,036.00	87.50	267.26	6,802.64	154.79	-4,454.49	4,457.13	2.23
11,109.00	88.46	267.61	6,805.22	151.53	-4,527.37	4,529.83	1.40
Final MWD Survey							
11,167.00	88.46	267.61	6,806.77	149.11	-4,585.30	4,587.62	0.00
Survey Projection to TD - Estimated BHL: 1447' FSL, 599' FWL							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
731.00	730.60	17.36	11.90	First MWD Survey
11,109.00	6,805.22	151.53	-4,527.37	Final MWD Survey
11,167.00	6,806.77	149.11	-4,585.30	Survey Projection to TD
11,167.00	6,806.77	149.11	-4,585.30	Estimated BHL: 1447' FSL, 599' FWL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Spike State D16-99HZ_ _ Rev0_BHL Tgt	272.25	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
731.00	11,167.00	Sperry MWD Surveys	MWD

Design Report for Spike State D16-99HZ - 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
Spike State	0.00	0.00	0.00	0.00	0.00	1,325,084.55	3,266,093.25	40° 13' 18.588 N	104° 32' 49.452 W
- actual wellpath hits target center									
- Polygon									
Point 1			112.00	-1,358.00		1,323,726.61	3,266,205.25		
Point 2			-5,177.00	-1,403.00		1,323,681.61	3,260,916.47		
Point 3			-5,205.00	3,897.00		1,328,981.39	3,260,888.47		
Point 4			61.00	3,957.00		1,329,041.38	3,266,154.25		
Point 5			112.00	-1,358.00		1,323,726.61	3,266,205.25		
Spike State	0.00	0.00	6,771.00	181.79	-4,633.95	1,325,266.34	3,261,459.50	40° 13' 20.872 N	104° 33' 49.162 W
- actual wellpath misses target center by 68.67ft at 11167.00ft MD (6806.77 TVD, 149.11 N, -4585.30 E)									
- Point									
Spike State	0.00	0.00	4,732.00	489.00	100.00	1,325,573.53	3,266,193.25	40° 13' 23.409 N	104° 32' 48.095 W
- actual wellpath misses target center by 43.08ft at 4763.41ft MD (4733.67 TVD, 449.86 N, 82.09 E)									
- Point									
Spike State	0.00	0.00	0.00	0.00	0.00	1,325,084.55	3,266,093.25	40° 13' 18.588 N	104° 32' 49.452 W
- actual wellpath hits target center									
- Polygon									
Point 1			-348.00	-898.00		1,324,186.59	3,265,745.27		
Point 2			-4,717.00	-943.00		1,324,141.59	3,261,376.45		
Point 3			-4,745.00	3,437.00		1,328,521.41	3,261,348.45		
Point 4			-399.00	3,497.00		1,328,581.40	3,265,694.27		
Point 5			-348.00	-898.00		1,324,186.59	3,265,745.27		

North Reference Sheet for Sec. 16-T3N-R64W - Spike State D16-99HZ

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

Vertical Depths are relative to KB @ 4806.00ft (Rig KB). Northing and Easting are relative to Spike State D16-99HZ

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: 0.99995697

Grid Coordinates of Well: 1,325,084.55 ft N, 3,266,093.25 ft E

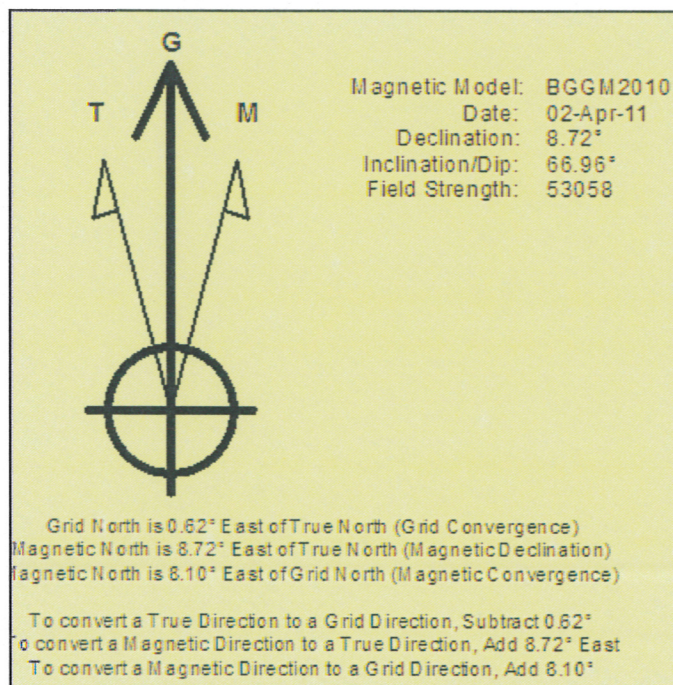
Geographical Coordinates of Well: 40° 13' 18.59" N, 104° 32' 49.45" W

Grid Convergence at Surface is: 0.62°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,167.00ft

the Bottom Hole Displacement is 4,587.72ft in the Direction of 271.86° (Grid).

Magnetic Convergence at surface is: -8.10° (2 April 2011, , BGGM2010)





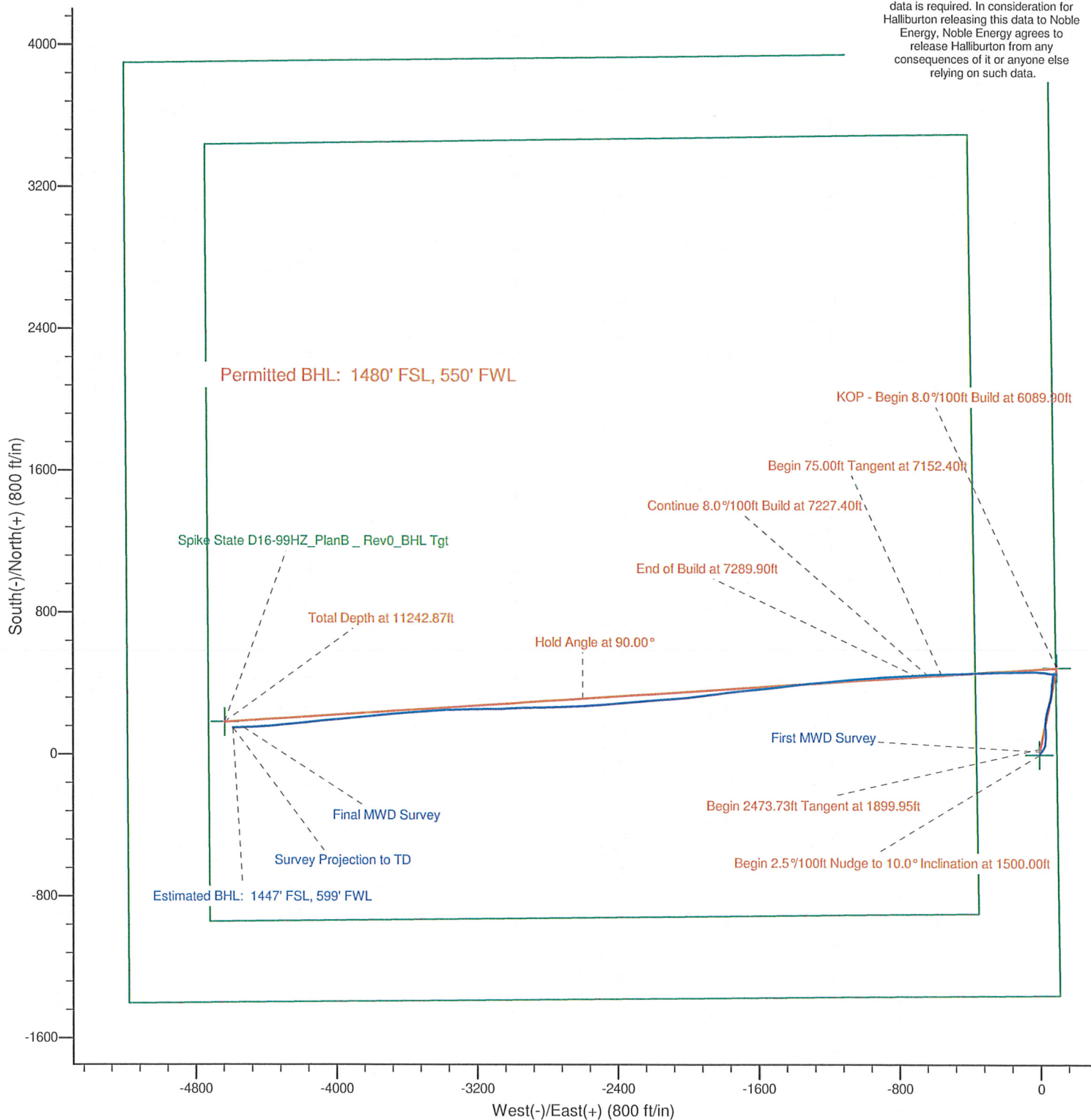
Azimuths to Grid North
 True North: -0.62°
 Magnetic North: 8.10°

Magnetic Field
 Strength: 53058.4snT
 Dip Angle: 66.96°
 Date: 4/2/2011
 Model: BGGM2010

LEGEND

- Spike State D16-99HZ,
- MWD Survey

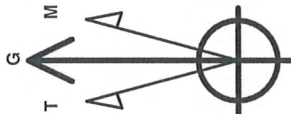
Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Spike State D16-99HZ well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide 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-T3N-R64W
 Well: Spike State D16-99HZ

HALLIBURTON
 Sperry Drilling



Azimuths to Grid North
 True North: -0.62°
 Magnetic North: 8.10°
 Magnetic Field
 Strength: 53058.4snT
 Dip Angle: 66.96°
 Date: 4/2/2011
 Model: BGGM2010

LEGEND

- Spike State D16-99HZ,
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Spike State D16-99HZ 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.

