Noble Energy

Weld County, CO (NAD 83)
Sec. 23-T8N-R61W
Kummer PC LE23-99HZ

Design: MWD Survey

Sperry Drilling Services

Final Survey Report

02 December, 2011

Well Coordinates: 1,483,445.31 N, 3,366,239.96 E (40° 39' 10.69" N, 104° 10' 48.11" W)
Ground Level: 4,992.00 ft

Local Coordinate Origin:	Centered on Well Kummer PC LE23-99HZ
Viewing Datum:	KB @ 5016.00ft (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 Kummer PC LE23-99HZ - 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
803.00	0.07	250.50	803.00	-0.16	-0.46	-0.46	0.01
First MWD Survey							
895.00	0.28	138.88	895.00	-0.35	-0.37	-0.37	0.34
1,174.00	0.44	240.13	1,174.00	-1.40	-0.85	-0.86	0.20
1,458.00	0.12	247.57	1,457.99	-2.06	-2.07	-2.08	0.11
1,553.00	1.83	254.07	1,552.97	-2.51	-3.62	-3.63	1.80
1,647.00	4.81	256.02	1,646.81	-3.87	-8.89	-8.91	3.17
1,742.00	5.73	252.08	1,741.40	-6.30	-17.27	-17.30	1.04
1,837.00	8.50	256.15	1,835.66	-9.44	-28.60	-28.64	2.96
1,931.00	9.88	257.92	1,928.46	-12.79	-43.23	-43.29	1.50
2,026.00	11.54	264.57	2,021.80	-15.39	-60.66	-60.74	2.18
2,121.00	12.10	263.54	2,114.79	-17.41	-80.01	-80.10	0.63
2,220.00	11.03	261.99	2,211.78	-19.90	-99.70	-99.80	1.13
2,315.00	11.58	262.99	2,304.93	-22.33	-118.17	-118.28	0.61
2,411.00	11.08	264.84	2,399.06	-24.33	-136.92	-137.04	0.64
2,506.00	10.79	264.06	2,492.34	-26.08	-154.85	-154.98	0.34
2,602.00	11.60	265.95	2,586.51	-27.69	-173.42	-173.55	0.93
2,697.00	11.25	264.90	2,679.63	-29.19	-192.18	-192.32	0.43
2,792.00	10.45	263.04	2,772.93	-31.05	-209.96	-210.11	0.92
2,888.00	10.87	265.40	2,867.27	-32.83	-227.62	-227.78	0.63
2,984.00	10.26	264.67	2,961.64	-34.35	-245.16	-245.33	0.65
3,079.00	10.47	264.82	3,055.09	-35.92	-262.18	-262.36	0.22
3,174.00	10.61	265.84	3,148.49	-37.33	-279.50	-279.68	0.25
3,270.00	10.46	267.12	3,242.87	-38.41	-297.02	-297.20	0.29
3,365.00	9.26	264.08	3,336.47	-39.63	-313.23	-313.43	1.38
3,461.00	7.50	259.83	3,431.44	-41.54	-327.08	-327.29	1.94
3,556.00	6.91	264.71	3,525.69	-43.16	-338.88	-339.09	0.89
3,652.00	8.37	271.93	3,620.84	-43.46	-351.61	-351.82	1.82
3,747.00	10.01	271.72	3,714.62	-42.98	-366.78	-366.98	1.73
3,843.00	10.80	271.37	3,809.04	-42.51	-384.11	-384.31	0.83
3,938.00	11.16	271.79	3,902.30	-42.01	-402.19	-402.40	0.39
4,034.00	11.14	273.12	3,996.48	-41.21	-420.74	-420.94	0.27
4,129.00	9.55	270.39	4,089.94	-40.66	-437.79	-437.98	1.75
4,225.00	7.86	267.28	4,184.83	-40.92	-452.31	-452.51	1.83
4,320.00	6.75	265.72	4,279.06	-41.64	-464.36	-464.56	1.19
4,416.00	6.65	263.67	4,374.40	-42.68	-475.51	-475.72	0.27
4,511.00	7.27	260.14	4,468.70	-44.31	-486.90	-487.12	0.79
4,606.00	7.25	265.80	4,562.94	-45.78	-498.80	-499.03	0.75
4,702.00	7.16	268.12	4,658.18	-46.42	-510.83	-511.05	0.32
4,798.00	5.64	265.40	4,753.58	-47.00	-521.51	-521.73	1.61
4,893.00	4.34	263.23	4,848.22	-47.79	-529.73	-529.96	1.38
4,988.00	3.30	255.68	4,943.01	-48.89	-535.95	-536.19	1.21
5,084.00	2.62	247.54	5,038.88	-50.42	-540.65	-540.90	0.83
5,179.00	2.79	264.95	5,133.78	-51.45	-544.96	-545.21	0.88
5,275.00	1.55	295.33	5,229.71	-51.10	-548.47	-548.71	1.72
5,371.00	1.42	301.66	5,325.68	-49.92	-550.65	-550.89	0.22
5,466.00	0.43	330.98	5,420.66	-48.99	-551.83	-552.06	1.12
5,561.00	0.37	333.93	5,515.66	-48.40	-552.13	-552.37	0.07
5,656.00	0.33	281.64	5,610.66	-48.07	-552.54	-552.77	0.33

Design Report for Kummer PC LE23-99HZ - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,751.00	0.25	81.53	5,705.66	-47.99	-552.60	-552.83	0.60
5,847.00	2.15	98.05	5,801.63	-48.21	-550.61	-550.84	1.99
5,895.00	7.82	92.13	5,849.43	-48.46	-546.45	-546.69	11.85
5,942.00	13.26	91.03	5,895.62	-48.67	-537.86	-538.10	11.58
5,990.00	19.22	91.19	5,941.69	-48.93	-524.45	-524.68	12.42
6,038.00	24.23	91.75	5,986.26	-49.40	-506.69	-506.93	10.45
6,086.00	27.37	92.16	6,029.47	-50.12	-485.81	-486.06	6.55
6,133.00	29.93	91.31	6,070.71	-50.79	-463.29	-463.54	5.52
6,181.00	33.98	88.76	6,111.43	-50.78	-437.90	-438.15	8.89
6,228.00	38.16	88.41	6,149.42	-50.09	-410.24	-410.48	8.90
6,276.00	41.47	89.02	6,186.28	-49.40	-379.52	-379.76	6.94
6,324.00	43.23	88.82	6,221.75	-48.79	-347.19	-347.43	3.68
6,372.00	43.14	89.21	6,256.75	-48.23	-314.35	-314.58	0.59
6,419.00	48.05	89.46	6,289.63	-47.84	-280.78	-281.01	10.45
6,467.00	53.26	89.96	6,320.05	-47.66	-243.67	-243.91	10.88
6,515.00	54.67	90.70	6,348.29	-47.89	-204.86	-205.10	3.19
6,563.00	55.68	90.89	6,375.70	-48.43	-165.46	-165.70	2.13
6,610.00	57.74	90.73	6,401.49	-48.99	-126.18	-126.42	4.39
6,658.00	59.75	90.49	6,426.40	-49.42	-85.15	-85.40	4.21
6,706.00	63.63	90.03	6,449.16	-49.61	-42.90	-43.15	8.13
6,754.00	68.43	89.24	6,468.65	-49.33	0.95	0.70	10.11
6,801.00	74.21	88.89	6,483.70	-48.60	45.45	45.20	12.32
6,849.00	77.61	89.04	6,495.38	-47.76	91.99	91.75	7.09
6,897.00	78.78	89.16	6,505.20	-47.02	138.96	138.73	2.45
6,939.00	82.32	89.25	6,512.10	-46.45	180.38	180.15	8.43
7,050.00	85.98	89.02	6,523.41	-44.78	290.77	290.55	3.30
7,145.00	87.28	88.90	6,528.99	-43.06	385.59	385.37	1.37
7,240.00	89.07	89.18	6,532.02	-41.47	480.53	480.32	1.91
7,336.00	90.80	88.78	6,532.13	-39.76	576.51	576.30	1.85
7,431.00	90.37	89.94	6,531.16	-38.70	671.50	671.29	1.30
7,527.00	89.63	90.11	6,531.16	-38.74	767.49	767.29	0.79
7,622.00	90.43	89.82	6,531.11	-38.68	862.49	862.29	0.90
7,718.00	91.67	90.14	6,529.35	-38.65	958.48	958.27	1.33
7,813.00	92.84	87.17	6,525.61	-36.42	1,053.36	1,053.17	3.36
7,909.00	92.41	87.68	6,521.21	-32.11	1,149.17	1,148.99	0.69
8,004.00	90.74	87.91	6,518.60	-28.46	1,244.06	1,243.90	1.77
8,100.00	87.84	87.83	6,519.79	-24.89	1,339.97	1,339.83	3.02
8,195.00	90.56	87.39	6,521.12	-20.93	1,434.87	1,434.75	2.90
8,291.00	90.43	87.20	6,520.29	-16.40	1,530.76	1,530.66	0.24
8,386.00	90.37	88.18	6,519.62	-12.57	1,625.68	1,625.60	1.03
8,482.00	90.86	91.60	6,518.59	-12.39	1,721.66	1,721.58	3.60
8,577.00	90.99	89.61	6,517.06	-13.39	1,816.64	1,816.55	2.10
8,673.00	90.56	89.51	6,515.76	-12.65	1,912.63	1,912.54	0.46
8,768.00	90.62	88.27	6,514.78	-10.81	2,007.60	2,007.52	1.31
8,864.00	91.36	88.19	6,513.13	-7.85	2,103.54	2,103.47	0.78
8,959.00	89.81	87.47	6,512.16	-4.25	2,198.46	2,198.41	1.80
9,055.00	91.23	87.62	6,511.28	-0.14	2,294.37	2,294.34	1.49
9,150.00	90.56	88.98	6,509.80	2.68	2,389.31	2,389.30	1.60
9,245.00	89.63	90.19	6,509.64	3.37	2,484.31	2,484.29	1.61
9,341.00	90.00	90.19	6,509.95	3.05	2,580.31	2,580.29	0.39
9,436.00	91.86	89.70	6,508.41	3.14	2,675.29	2,675.27	2.02

Design Report for Kummer PC LE23-99HZ - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,532.00	90.31	88.66	6,506.59	4.51	2,771.26	2,771.25	1.94
9,627.00	88.52	87.78	6,507.56	7.46	2,866.20	2,866.20	2.10
9,723.00	89.63	88.97	6,509.11	10.19	2,962.15	2,962.16	1.70
9,818.00	91.11	89.95	6,508.50	11.08	3,057.14	3,057.15	1.87
9,914.00	90.19	89.86	6,507.41	11.24	3,153.13	3,153.15	0.96
10,009.00	91.73	89.89	6,505.82	11.45	3,248.11	3,248.13	1.62
10,105.00	91.61	89.66	6,503.02	11.82	3,344.07	3,344.09	0.27
10,200.00	89.94	87.96	6,501.74	13.80	3,439.04	3,439.06	2.51
10,296.00	89.63	88.07	6,502.10	17.12	3,534.98	3,535.02	0.34
10,391.00	89.81	88.43	6,502.56	20.02	3,629.93	3,629.99	0.42
10,487.00	90.74	89.60	6,502.10	21.67	3,725.91	3,725.98	1.56
10,582.00	90.93	89.51	6,500.71	22.41	3,820.90	3,820.97	0.22
10,677.00	92.10	89.00	6,498.20	23.65	3,915.86	3,915.93	1.34
10,709.00	92.60	88.97	6,496.89	24.21	3,947.83	3,947.90	1.57
Final MWD Survey							
10,761.00	92.60	88.97	6,494.53	25.15	3,999.76	3,999.84	0.00

Survey Projection to TD - Estimated BHL: 695' FNL, 688' FEL

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
803.00	803.00	-0.16	-0.46	First MWD Survey
10,709.00	6,496.89	24.21	3,947.83	Final MWD Survey
10,761.00	6,494.53	25.15	3,999.76	Survey Projection to TD
10,761.00	6,494.53	25.15	3,999.76	Estimated BHL: 695' FNL, 688' FEL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (ft)	Origin +E/-W (ft)	Start TVD (ft)
Target	Kummer PC LE23-99HZ_PlanB - Rev3_BHL Tgt	89.71	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
803.00	10,761.00	Sperry MWD Surveys	MWD

Design Report for Kummer PC LE23-99HZ - 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
Kummer PC LE	0.00	0.00	0.00	0.00	0.00	1,483,445.31	3,366,239.96	40.652970	-104.180030
- actual wellpath hits target center									
- Polygon									
Point 1				-3.00	-11.00	1,483,434.31	3,366,236.96		
Point 2				4,087.00	148.00	1,483,593.31	3,370,326.88		
Point 3				4,086.00	-3,899.00	1,479,546.38	3,370,325.88		
Point 4				7.00	-4,098.00	1,479,347.39	3,366,246.96		
Point 5				-3.00	-11.00	1,483,434.31	3,366,236.96		
Kummer PC	0.00	0.00	0.00	0.00	0.00	1,483,445.31	3,366,239.96	40.652970	-104.180030
- actual wellpath hits target center									
- Polygon									
Point 1				-603.00	589.00	1,484,034.30	3,365,636.97		
Point 2				4,687.00	748.00	1,484,193.30	3,370,926.87		
Point 3				4,686.00	-4,499.00	1,478,946.39	3,370,925.87		
Point 4				-593.00	-4,698.00	1,478,747.40	3,365,646.97		
Point 5				-603.00	589.00	1,484,034.30	3,365,636.97		
Kummer PC	0.00	0.00	6,522.20	19.98	4,012.46	1,483,465.29	3,370,252.34	40.652860	-104.165570
- actual wellpath misses target center by 30.88ft at 10761.00ft MD (6494.53 TVD, 25.15 N, 3999.76 E)									
- Point									

North Reference Sheet for Sec. 23-T8N-R61W - Kummer PC LE23-99HZ

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

Vertical Depths are relative to KB @ 5016.00ft (Rig KB). Northing and Easting are relative to Kummer PC LE23-99HZ

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

False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99998144

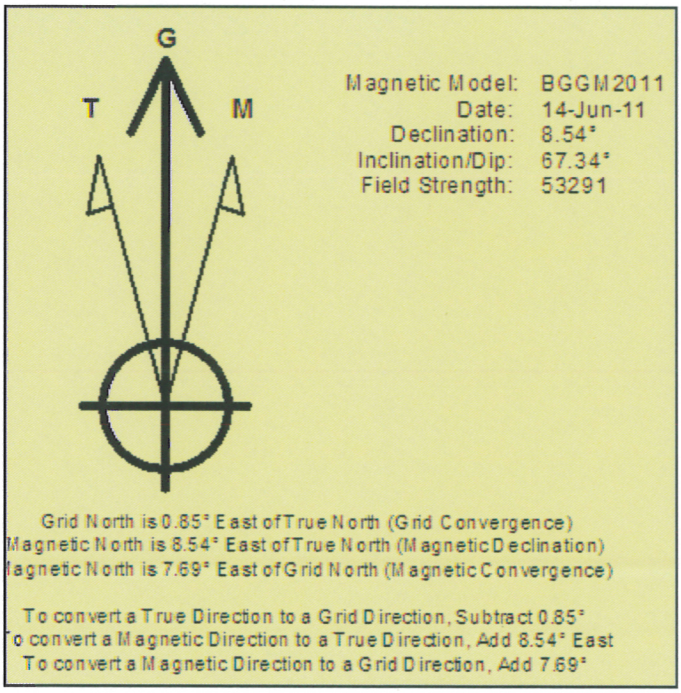
Grid Coordinates of Well: 1,483,445.31 ft N, 3,366,239.96 ft E

Geographical Coordinates of Well: 40° 39' 10.69" N, 104° 10' 48.11" W

Grid Convergence at Surface is: 0.85°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,761.00ft
the Bottom Hole Displacement is 3,999.84ft in the Direction of 89.64° (Grid).

Magnetic Convergence at surface is: -7.69° (14 June 2011, , BGGM2011)



Project: Weld County, CO (NAD 83)
Site: Sec. 23-T8N-R61W
Well: Kummer PC LE23-99HZ

Noble Energy

HALLIBURTON
Sperry Drilling

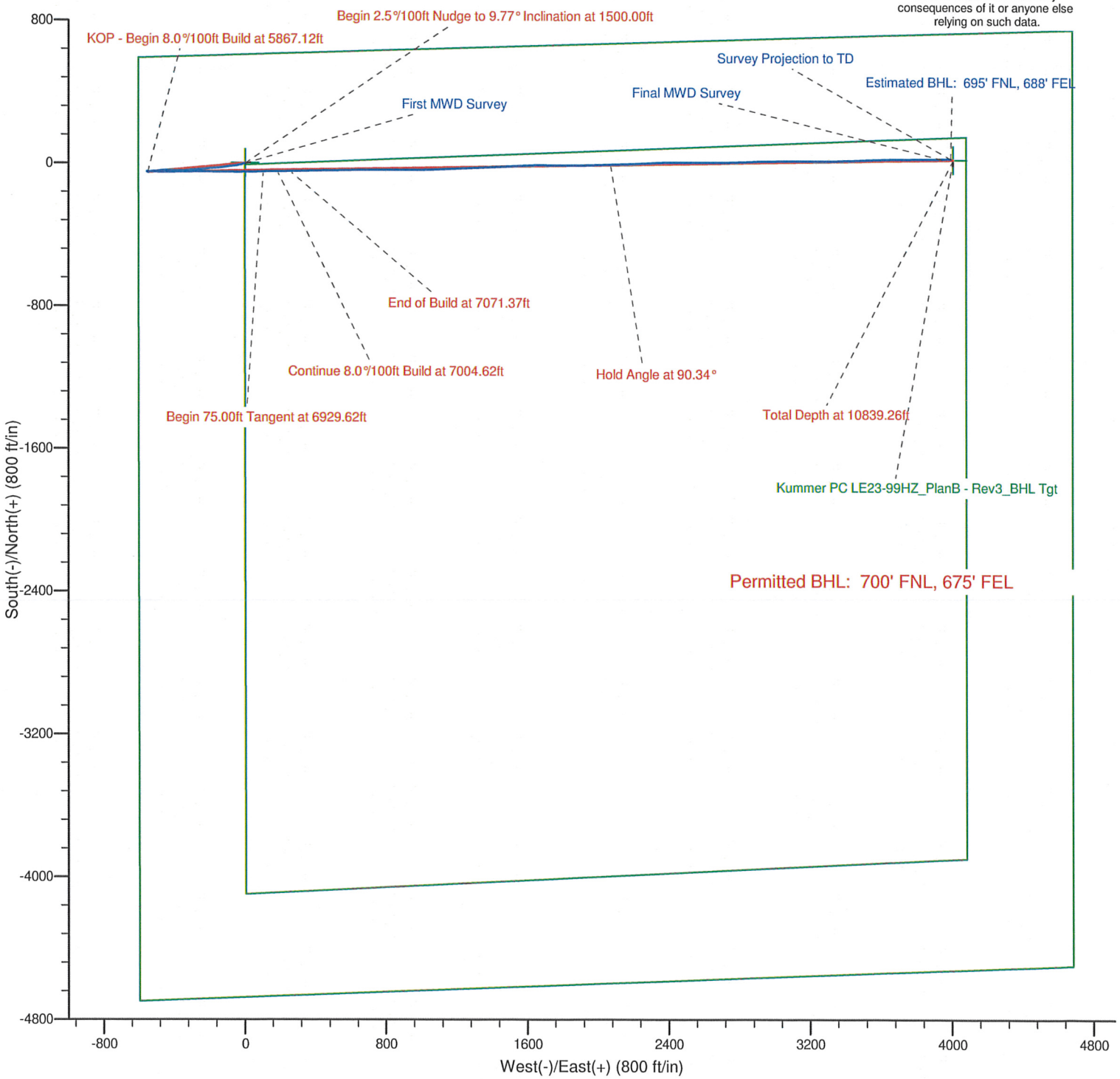
Azimuths to Grid North
True North: -0.85°
Magnetic North: 7.68°

Magnetic Field
Strength: 53291.3snT
Dip Angle: 67.34°
Date: 6/14/2011
Model: BGGM2011

LEGEND

Kummer PC LE23-99HZ, Plan B, Plan B - Rev 3 Proposal V0
MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Kummer PC LE23-99HZ 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.



Project: Weld County, CO (NAD 83)
Site: Sec. 23-T8N-R61W
Well: Kummer PC LE23-99HZ

Noble Energy

HALLIBURTON
Sperry Drilling

Azimuths to Grid North
True North: -0.85°
Magnetic North: 7.68°

Magnetic Field
Strength: 53291.3snT
Dip Angle: 67.34°
Date: 6/14/2011
Model: BGGM2011

LEGEND

Kummer PC LE23-99HZ, Plan B, Plan B - Rev 3 Proposal V0
MWD Survey

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