

Noble Energy

Weld County, CO (NAD 83)

Sec. 33-T4N-R66W

Tanner K33-65HN

Design: MWD Survey

Sperry Drilling Services

Final Survey Report

13 December, 2011

Well Coordinates: 1,340,835.09 N, 3,197,866.39 E (40° 16' 00.55" N, 104° 47' 27.38" W)

Ground Level: 4,770.00 ft

Local Coordinate Origin:

Centered on Well Tanner K33-65HN

Viewing Datum:

KB @ 4794.00ft (H&P 343)

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 Tanner K33-65HN - 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
662.00	0.28	156.98	662.00	-1.49	0.63	0.47	0.04
First MWD Survey							
757.00	0.26	252.17	757.00	-1.77	0.52	0.33	0.42
851.00	0.41	238.08	851.00	-2.01	0.03	-0.19	0.18
946.00	0.18	72.60	945.99	-2.15	-0.12	-0.34	0.62
1,041.00	0.21	126.27	1,040.99	-2.20	0.17	-0.07	0.19
1,135.00	0.39	138.12	1,134.99	-2.55	0.52	0.24	0.20
1,228.00	0.60	117.82	1,227.99	-3.01	1.16	0.83	0.29
1,320.00	0.41	114.24	1,319.99	-3.37	1.89	1.52	0.21
1,412.00	0.46	75.46	1,411.98	-3.41	2.54	2.17	0.32
1,504.00	0.90	71.58	1,503.98	-3.09	3.59	3.24	0.48
1,596.00	0.68	56.67	1,595.97	-2.56	4.73	4.43	0.33
1,689.00	1.03	58.75	1,688.96	-1.82	5.90	5.68	0.38
1,781.00	0.90	50.59	1,780.94	-0.94	7.17	7.03	0.21
1,873.00	0.44	1.52	1,872.94	-0.12	7.74	7.68	0.76
1,965.00	2.19	356.40	1,964.91	1.98	7.64	7.80	1.90
2,057.00	4.46	341.46	2,056.75	7.13	6.39	7.11	2.62
2,150.00	5.66	333.55	2,149.39	14.66	3.20	4.74	1.49
2,248.00	6.41	341.25	2,246.85	24.17	-0.72	1.87	1.12
2,344.00	7.21	335.82	2,342.17	34.74	-4.91	-1.17	1.07
2,439.00	7.75	335.34	2,436.36	46.00	-10.02	-5.06	0.57
2,535.00	10.93	334.95	2,531.08	60.13	-16.58	-10.07	3.31
2,630.00	10.81	334.12	2,624.37	76.31	-24.28	-16.00	0.21
2,726.00	10.33	333.45	2,718.74	92.11	-32.05	-22.05	0.52
2,821.00	10.45	334.12	2,812.18	107.48	-39.62	-27.93	0.18
2,917.00	9.48	335.54	2,906.73	122.51	-46.70	-33.36	1.04
3,012.00	9.21	335.72	3,000.47	136.56	-53.06	-38.19	0.29
3,107.00	8.59	334.03	3,094.33	149.87	-59.29	-42.97	0.71
3,203.00	9.79	332.51	3,189.10	163.55	-66.20	-48.38	1.28
3,298.00	8.29	330.61	3,282.91	176.69	-73.29	-54.03	1.61
3,393.00	8.44	334.11	3,376.90	188.93	-79.70	-59.09	0.56
3,489.00	9.28	334.35	3,471.76	202.24	-86.12	-64.06	0.88
3,584.00	9.94	334.04	3,565.42	216.52	-93.03	-69.40	0.70
3,680.00	10.23	335.40	3,659.94	231.72	-100.20	-74.92	0.39
3,775.00	11.12	335.39	3,753.29	247.72	-107.53	-80.50	0.94
3,871.00	11.33	334.75	3,847.46	264.66	-115.41	-86.52	0.25
3,966.00	12.10	340.50	3,940.48	282.49	-122.71	-91.88	1.47
4,062.00	12.17	339.95	4,034.34	301.48	-129.54	-96.65	0.14
4,157.00	10.17	336.90	4,127.53	318.61	-136.27	-101.51	2.19
4,252.00	10.29	336.70	4,221.02	334.11	-142.91	-106.46	0.13
4,348.00	11.17	338.69	4,315.34	350.65	-149.68	-111.43	0.99
4,443.00	10.31	339.32	4,408.68	367.18	-156.03	-115.98	0.91
4,539.00	10.55	338.27	4,503.09	383.38	-162.32	-120.50	0.32
4,634.00	9.26	337.53	4,596.67	398.52	-168.46	-124.99	1.36
4,729.00	10.47	344.49	4,690.27	413.90	-173.69	-128.55	1.79
4,825.00	10.49	346.42	4,784.67	430.80	-178.07	-131.11	0.37
4,920.00	9.86	345.51	4,878.18	447.08	-182.14	-133.42	0.68
5,016.00	8.91	345.23	4,972.89	462.23	-186.09	-135.73	0.99
5,111.00	8.46	346.64	5,066.80	476.14	-189.58	-137.72	0.52

Design Report for Tanner K33-65HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,207.00	7.28	340.77	5,161.90	488.76	-193.22	-139.99	1.49
5,302.00	6.69	334.82	5,256.19	499.45	-197.55	-143.16	0.98
5,398.00	6.29	335.17	5,351.58	509.28	-202.14	-146.67	0.42
5,493.00	5.48	335.12	5,446.08	518.12	-206.23	-149.80	0.85
5,589.00	4.40	340.82	5,541.72	525.76	-209.37	-152.10	1.23
5,684.00	2.62	20.51	5,636.55	531.24	-209.81	-151.95	3.06
5,780.00	1.32	142.46	5,732.52	532.41	-208.37	-150.39	3.65
5,875.00	0.61	153.03	5,827.50	531.10	-207.47	-149.64	0.77
5,971.00	0.77	195.53	5,923.50	530.02	-207.41	-149.70	0.54
6,066.00	0.41	257.78	6,018.49	529.33	-207.92	-150.27	0.72
6,162.00	0.38	236.06	6,114.49	529.08	-208.51	-150.90	0.16
6,257.00	0.75	259.31	6,209.48	528.79	-209.39	-151.79	0.45
6,353.00	0.69	211.20	6,305.48	528.18	-210.30	-152.77	0.61
6,401.00	2.29	100.64	6,353.46	527.75	-209.51	-152.03	5.44
6,448.00	3.98	77.63	6,400.39	527.93	-206.99	-149.51	4.41
6,544.00	8.39	96.62	6,495.82	527.84	-196.78	-139.36	5.00
6,592.00	11.68	98.02	6,543.08	526.76	-188.49	-131.23	6.87
6,639.00	13.79	96.29	6,588.92	525.48	-178.21	-121.14	4.56
6,687.00	15.90	97.36	6,635.32	524.01	-166.00	-109.16	4.43
6,734.00	18.61	90.44	6,680.20	523.13	-152.11	-95.45	7.22
6,782.00	24.14	86.01	6,724.89	523.75	-134.64	-78.01	11.99
6,829.00	29.75	82.62	6,766.77	525.92	-113.47	-56.73	12.37
6,877.00	35.13	80.17	6,807.27	529.81	-88.04	-31.03	11.54
6,925.00	41.01	78.46	6,845.04	535.32	-58.97	-1.54	12.44
6,973.00	47.38	77.41	6,879.44	542.33	-26.27	31.72	13.36
7,020.00	53.30	79.65	6,909.42	549.49	9.18	67.73	13.12
7,068.00	58.51	83.02	6,936.33	555.44	48.45	107.42	12.31
7,116.00	62.15	84.15	6,960.08	560.09	89.89	149.12	7.85
7,164.00	65.28	85.55	6,981.34	563.95	132.75	192.14	7.03
7,211.00	66.67	86.27	7,000.47	567.01	175.57	235.04	3.27
7,259.00	68.00	86.00	7,018.97	569.99	219.76	279.30	2.82
7,307.00	71.88	87.02	7,035.43	572.73	264.75	324.33	8.33
7,355.00	75.47	88.81	7,048.92	574.40	310.78	370.27	8.29
7,402.00	79.04	90.63	7,059.29	574.62	356.61	415.86	8.48
7,439.00	82.02	91.61	7,065.37	573.91	393.09	452.06	8.47
7,590.00	87.53	89.05	7,079.12	573.06	543.39	601.41	4.02
7,682.00	90.56	90.24	7,080.66	573.63	635.37	692.92	3.54
7,773.00	91.08	91.82	7,079.35	571.99	726.34	783.20	1.83
7,869.00	90.25	93.86	7,078.24	567.23	822.21	878.02	2.29
7,964.00	90.99	91.30	7,077.21	562.96	917.10	971.91	2.80
8,060.00	90.71	87.95	7,075.79	563.59	1,013.07	1,067.40	3.50
8,155.00	89.39	91.38	7,075.70	564.14	1,108.05	1,161.90	3.87
8,251.00	89.23	90.60	7,076.86	562.48	1,204.03	1,257.16	0.83
8,346.00	90.00	90.52	7,077.50	561.55	1,299.02	1,351.51	0.81
8,441.00	90.95	91.16	7,076.71	560.16	1,394.01	1,445.80	1.21
8,537.00	88.98	92.99	7,076.77	556.69	1,489.94	1,540.81	2.80
8,632.00	89.54	92.38	7,078.00	552.24	1,584.83	1,634.68	0.87
8,728.00	89.54	91.68	7,078.77	548.84	1,680.76	1,729.71	0.73
8,823.00	92.83	89.96	7,076.80	547.48	1,775.71	1,823.98	3.91
8,919.00	94.07	89.61	7,071.03	547.84	1,871.54	1,919.29	1.34
9,014.00	93.79	94.72	7,064.51	544.26	1,966.21	2,013.05	5.37

Design Report for Tanner K33-65HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,109.00	91.97	97.60	7,059.74	534.07	2,060.53	2,105.74	3.58
9,204.00	90.00	102.74	7,058.10	517.31	2,153.99	2,196.88	5.79
9,300.00	90.12	99.48	7,058.00	498.81	2,248.18	2,288.56	3.40
9,332.00	90.06	97.27	7,057.95	494.15	2,279.84	2,319.54	6.91
9,363.00	89.63	95.75	7,058.04	490.64	2,310.63	2,349.78	5.10
9,395.00	90.59	92.91	7,057.97	488.22	2,342.54	2,381.25	9.37
9,491.00	89.91	87.58	7,057.55	487.81	2,438.50	2,476.62	5.60
9,586.00	88.70	85.58	7,058.71	493.48	2,533.32	2,571.50	2.46
9,682.00	90.31	84.96	7,059.54	501.39	2,628.99	2,667.47	1.80
9,777.00	89.66	84.93	7,059.56	509.76	2,723.62	2,762.45	0.68
9,873.00	89.26	86.95	7,060.47	516.56	2,819.37	2,858.38	2.14
9,968.00	90.09	87.34	7,061.01	521.29	2,914.24	2,953.22	0.97
10,064.00	89.08	87.71	7,061.70	525.44	3,010.15	3,049.02	1.12
10,159.00	90.56	87.38	7,062.00	529.51	3,105.06	3,143.82	1.60
10,254.00	89.41	87.98	7,062.02	533.35	3,199.98	3,238.61	1.37
10,350.00	90.19	88.90	7,062.36	535.96	3,295.94	3,334.31	1.26
10,445.00	90.74	89.41	7,061.59	537.37	3,390.93	3,428.90	0.79
10,541.00	89.88	90.26	7,061.07	537.64	3,486.93	3,524.38	1.26
10,636.00	89.88	89.02	7,061.27	538.24	3,581.92	3,618.90	1.31
10,731.00	91.14	89.68	7,060.42	539.32	3,676.91	3,713.46	1.50
10,827.00	89.04	90.47	7,060.27	539.19	3,772.90	3,808.89	2.34
10,922.00	89.14	88.14	7,061.78	540.34	3,867.88	3,903.45	2.45
11,018.00	91.76	86.02	7,061.03	545.23	3,963.74	3,999.28	3.51
11,114.00	90.71	85.96	7,058.96	551.94	4,059.48	4,095.19	1.10
11,209.00	89.51	84.99	7,058.77	559.44	4,154.18	4,190.15	1.62
11,305.00	91.73	83.66	7,057.74	568.93	4,249.69	4,286.13	2.70
11,400.00	89.91	84.23	7,056.38	578.95	4,344.15	4,381.12	2.01
11,496.00	90.93	82.56	7,055.67	589.99	4,439.51	4,477.11	2.04
11,591.00	90.00	83.11	7,054.90	601.84	4,533.76	4,572.09	1.14
11,687.00	90.31	82.88	7,054.64	613.55	4,629.04	4,668.08	0.40
11,782.00	90.86	83.55	7,053.67	624.77	4,723.37	4,763.06	0.91
11,878.00	91.08	84.53	7,052.05	634.74	4,818.84	4,859.05	1.05
11,973.00	91.57	84.18	7,049.85	644.08	4,913.35	4,954.02	0.63
12,069.00	91.42	85.48	7,047.35	652.73	5,008.93	5,049.97	1.36
12,164.00	89.32	88.09	7,046.73	658.05	5,103.76	5,144.83	3.53
12,260.00	88.83	88.60	7,048.28	660.82	5,199.71	5,240.53	0.74
12,355.00	89.38	87.65	7,049.77	663.93	5,294.64	5,335.25	1.16
12,450.00	89.88	86.93	7,050.38	668.42	5,389.53	5,430.08	0.92
12,546.00	89.41	87.93	7,050.97	672.73	5,485.43	5,525.90	1.15
12,641.00	91.33	85.35	7,050.36	678.30	5,580.26	5,620.77	3.39
12,736.00	90.68	86.27	7,048.69	685.24	5,674.99	5,715.70	1.19
12,768.00	90.77	86.38	7,048.29	687.29	5,706.92	5,747.67	0.44
Final MWD Survey							
12,826.00	90.77	86.38	7,047.51	690.95	5,764.80	5,805.61	0.00

Survey Projection to TD - Estimated BHL: 2475' FNL, 745' FWL

Design Report for Tanner K33-65HN - MWD Survey

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
662.00	662.00	-1.49	0.63	First MWD Survey
12,768.00	7,048.29	687.29	5,706.92	Final MWD Survey
12,826.00	7,047.51	690.95	5,764.80	Survey Projection to TD
12,826.00	7,047.51	690.95	5,764.80	Estimated BHL: 2475' FNL, 745' FWL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/-S (ft)	Origin +E/-W (ft)	Start TVD (ft)
Target	Tanner K33-65HN_PlanA - Rev0_BHL Tgt	83.88	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
662.00	12,826.00	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
Tanner	0.00	0.00	7,048.31	622.72	5,805.30	1,341,457.78	3,203,671.44	40° 16' 6.240 N	104° 46' 12.432 W
- actual wellpath misses target center by 79.35ft at 12826.00ft MD (7047.51 TVD, 690.95 N, 5764.80 E)									
- Point									
Tanner	0.00	0.00	0.00	0.00	0.00	1,340,835.09	3,197,866.39	40° 16' 0.552 N	104° 47' 27.384 W
- actual wellpath hits target center									
- Polygon									
Point 1			5,054.00	-2,090.00	1,338,745.18	3,202,920.17			
Point 2			4,986.00	3,148.00	1,343,982.95	3,202,852.18			
Point 3			7,651.00	3,206.00	1,344,040.95	3,205,517.06			
Point 4			7,711.00	-2,050.00	1,338,785.18	3,205,577.06			
Point 5			5,054.00	-2,090.00	1,338,745.18	3,202,920.17			
Tanner	0.00	0.00	0.00	0.00	0.00	1,340,835.09	3,197,866.39	40° 16' 0.552 N	104° 47' 27.384 W
- actual wellpath hits target center									
- Polygon									
Point 1			218.00	-1,699.00	1,339,136.16	3,198,084.38			
Point 2			164.00	2,656.00	1,343,490.97	3,198,030.38			
Point 3			4,986.00	2,688.00	1,343,522.97	3,202,852.18			
Point 4			7,651.00	2,746.00	1,343,580.97	3,205,517.06			
Point 5			7,711.00	-1,590.00	1,339,245.16	3,205,577.06			
Point 6			5,054.00	-1,630.00	1,339,205.16	3,202,920.17			
Point 7			218.00	-1,699.00	1,339,136.16	3,198,084.38			
Tanner	0.00	0.00	0.00	0.00	0.00	1,340,835.09	3,197,866.39	40° 16' 0.552 N	104° 47' 27.384 W
- actual wellpath hits target center									
- Polygon									
Point 1			-242.00	-2,159.00	1,338,676.18	3,197,624.40			
Point 2			-296.00	3,116.00	1,343,950.95	3,197,570.40			
Point 3			4,986.00	3,148.00	1,343,982.95	3,202,852.18			
Point 4			5,054.00	-2,090.00	1,338,745.18	3,202,920.17			
Point 5			-242.00	-2,159.00	1,338,676.18	3,197,624.40			

North Reference Sheet for Sec. 33-T4N-R66W - Tanner K33-65HN

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

Vertical Depths are relative to KB @ 4794.00ft (H&P 343). Northing and Easting are relative to Tanner K33-65HN

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: 0.99995689

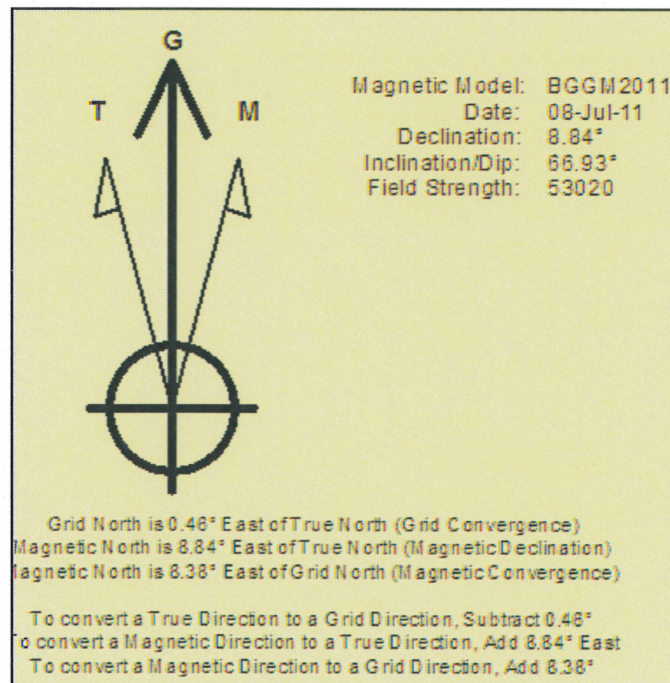
Grid Coordinates of Well: 1,340,835.09 ft N, 3,197,866.39 ft E

Geographical Coordinates of Well: 40° 16' 00.55" N, 104° 47' 27.38" W

Grid Convergence at Surface is: 0.46°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,826.00ft
the Bottom Hole Displacement is 5,806.06ft in the Direction of 83.17° (Grid).

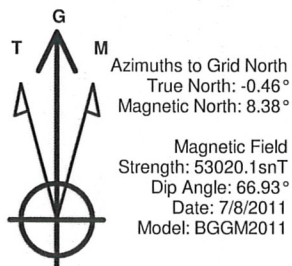
Magnetic Convergence at surface is: -8.38° (8 July 2011, , BGGM2011)



Noble Energy

HALLIBURTON

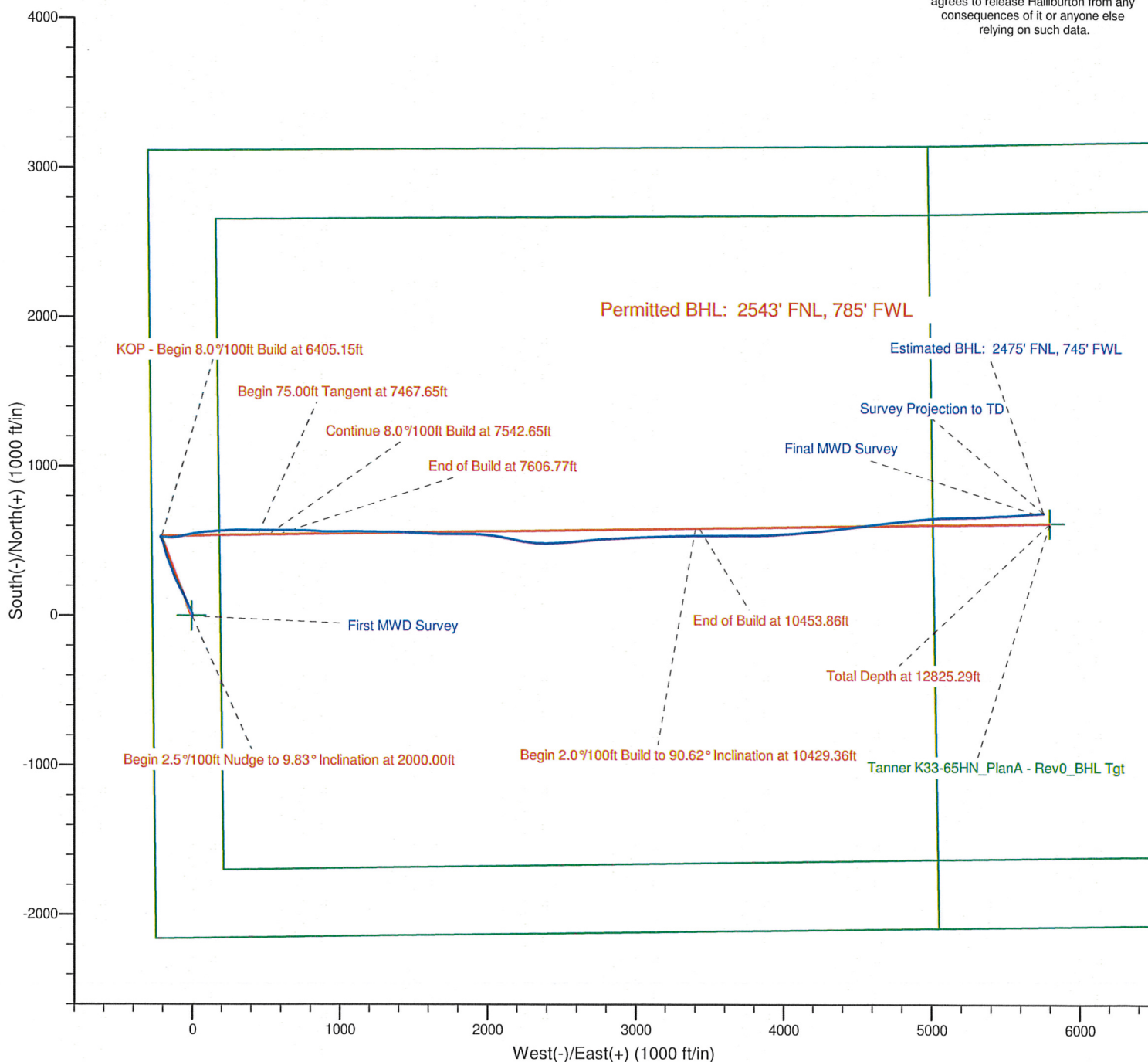
Sperry Drilling



LEGEND

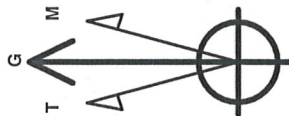
- Tanner K33-65HN, Plan A, Plan A - Rev 0 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Tanner K33-65HN 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. 33-T4N-R66W
Well: Tanner K33-65HN

Noble Energy



Azimuths to Grid North
True North: -0.46°
Magnetic North: 8.38°
Magnetic Field
Strength: 53020.1 nT
Dip Angle: 66.93°
Date: 7/8/2011
Model: BGGM2011

LEGEND

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