

Noble Energy

Weld County, CO (NAD 83)

Sec. 27-T9N-R60W

Keota PC LB26-62HN

Design: MWD Surveys

Sperry Drilling Services

Final Survey Report

14 April, 2013

Well Coordinates: 1,507,375.99 N, 3,396,391.99 E (40° 43' 02.51" N, 104° 04' 11.95" W)

Ground Level: 4,949.00 ft

Local Coordinate Origin:

Centered on Well Keota PC LB26-62HN

Viewing Datum:

KB=24' @ 4973.00ft (H&P 322)

TVDs to System:

N

North Reference:

Grid

Unit System:

API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 2003.16 Build: 431

HALLIBURTON

Design Report for Keota PC LB26-62HN - MWD Surveys

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
728.00	0.00	0.00	728.00	0.00	0.00	0.00	0.00
Surface Casing Assumed Vertical at 728.00 ft. MD							
826.00	0.28	130.35	826.00	-0.16	0.18	0.20	0.29
First Sperry MWD Survey @ 826.00 ft. MD							
1,105.00	0.26	289.59	1,105.00	-0.38	0.11	0.14	0.19
1,384.00	0.28	319.03	1,384.00	0.34	-0.94	-0.97	0.05
1,477.00	0.43	319.04	1,476.99	0.78	-1.32	-1.39	0.16
1,572.00	2.29	174.44	1,571.97	-0.84	-1.37	-1.27	2.79
1,667.00	5.16	169.42	1,666.76	-6.93	-0.40	0.31	3.04
1,762.00	4.33	189.77	1,761.44	-14.67	-0.22	1.26	1.96
1,856.00	5.72	169.06	1,855.09	-22.76	0.07	2.37	2.41
1,951.00	7.56	156.52	1,949.45	-33.15	3.45	6.79	2.46
2,047.00	10.51	152.66	2,044.25	-46.72	9.99	14.67	3.14
2,141.00	10.97	142.63	2,136.61	-61.44	19.36	25.48	2.04
2,237.00	12.35	138.66	2,230.63	-76.41	31.69	39.26	1.66
2,331.00	15.01	128.90	2,321.97	-91.61	47.80	56.83	3.74
2,426.00	13.62	127.07	2,414.01	-106.08	66.30	76.70	1.54
2,521.00	15.15	124.36	2,506.03	-119.83	85.48	97.16	1.76
2,616.00	16.62	116.80	2,597.41	-132.96	107.86	120.76	2.67
2,711.00	15.35	116.11	2,688.74	-144.62	131.27	145.24	1.35
2,806.00	17.29	119.44	2,779.91	-157.09	154.86	169.96	2.27
2,901.00	17.25	119.69	2,870.63	-171.01	179.39	195.78	0.09
2,996.00	17.83	128.45	2,961.22	-187.03	203.03	220.91	2.84
3,091.00	18.90	136.60	3,051.40	-207.26	224.99	244.81	2.93
3,186.00	17.39	146.84	3,141.70	-230.33	243.33	265.39	3.71
3,280.00	15.22	146.69	3,231.91	-252.40	257.80	282.01	2.31
3,375.00	14.95	156.41	3,323.65	-274.06	269.55	295.90	2.67
3,470.00	12.02	153.57	3,416.02	-294.15	278.86	307.19	3.16
3,565.00	14.44	160.79	3,508.50	-314.20	287.16	317.48	3.08
3,754.00	18.95	160.48	3,689.49	-365.40	305.18	340.59	2.39
3,849.00	19.09	158.54	3,779.30	-394.40	316.01	354.30	0.68
3,944.00	19.05	157.26	3,869.09	-423.16	327.69	368.83	0.44
4,039.00	18.36	166.31	3,959.09	-452.00	337.23	381.23	3.14
4,134.00	16.18	167.06	4,049.80	-479.44	343.73	390.48	2.31
4,229.00	14.75	164.92	4,141.36	-504.02	349.84	399.05	1.62
4,324.00	13.01	163.24	4,233.58	-525.94	356.07	407.47	1.88
4,419.00	11.10	160.59	4,326.48	-544.80	362.20	415.47	2.09
4,514.00	9.66	164.02	4,419.93	-561.09	367.43	422.32	1.65
4,609.00	9.37	165.54	4,513.62	-576.24	371.56	427.96	0.40
4,704.00	7.99	163.70	4,607.53	-590.07	375.34	433.12	1.48
4,799.00	6.25	176.66	4,701.80	-601.57	377.50	436.43	2.48
4,894.00	3.96	166.28	4,796.42	-609.92	378.58	438.35	2.59
4,989.00	0.89	193.00	4,891.32	-613.83	379.19	439.35	3.36
5,084.00	0.39	242.69	4,986.32	-614.69	378.73	438.99	0.74
5,179.00	0.53	269.49	5,081.32	-614.85	378.01	438.28	0.27
5,369.00	0.24	1.44	5,271.31	-614.46	377.14	437.38	0.31
5,559.00	0.95	94.58	5,461.30	-614.18	378.72	438.92	0.52
5,646.00	0.91	70.23	5,548.29	-614.01	380.09	440.27	0.45
5,741.00	6.99	90.24	5,643.02	-613.78	386.58	446.71	6.47

Design Report for Keota PC LB26-62HN - MWD Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,836.00	15.23	93.67	5,736.16	-614.60	404.85	464.96	8.70
5,931.00	21.28	85.39	5,826.36	-614.01	434.52	494.42	6.91
6,026.00	26.71	80.21	5,913.12	-608.99	472.77	531.97	6.13
6,121.00	31.03	82.06	5,996.30	-601.98	518.08	576.34	4.64
6,216.00	37.63	84.98	6,074.71	-596.05	571.29	628.67	7.16
6,311.00	45.69	82.56	6,145.63	-589.10	633.99	690.35	8.65
6,358.00	50.33	83.30	6,177.07	-584.81	668.65	724.39	9.94
6,406.00	56.32	85.24	6,205.73	-580.99	706.94	762.10	12.89
6,453.00	63.43	86.20	6,229.30	-577.97	747.45	802.10	15.23
6,502.00	68.35	87.61	6,249.31	-575.57	792.09	846.27	10.38
6,550.00	72.09	89.19	6,265.55	-574.32	837.23	891.05	8.38
6,597.00	76.90	89.10	6,278.11	-573.64	882.51	936.02	10.24
6,645.00	80.01	89.80	6,287.72	-573.19	929.53	982.76	6.63
6,690.00	81.30	90.23	6,295.03	-573.20	973.93	1,026.93	3.02
6,734.00	82.85	90.87	6,301.09	-573.62	1,017.50	1,070.33	3.81
Estimated 7" Casing Point: 677' FSL, 623' FWL (Not a Survey Station)							
6,758.00	83.70	91.22	6,303.90	-574.06	1,041.34	1,094.08	3.81
6,853.00	85.96	91.54	6,312.46	-576.34	1,135.92	1,188.40	2.40
6,948.00	88.58	90.75	6,316.98	-578.23	1,230.78	1,282.97	2.88
7,043.00	91.08	87.79	6,317.27	-577.02	1,325.75	1,377.34	4.08
7,137.00	91.20	89.72	6,315.40	-574.98	1,419.71	1,470.60	2.06
7,232.00	92.13	88.95	6,312.64	-573.88	1,514.66	1,564.96	1.27
7,327.00	93.76	88.22	6,307.76	-571.53	1,609.50	1,659.07	1.88
7,422.00	93.98	88.72	6,301.34	-569.00	1,704.25	1,753.08	0.57
7,517.00	93.36	89.98	6,295.26	-567.93	1,799.05	1,847.28	1.48
7,612.00	89.04	91.51	6,293.27	-569.16	1,893.99	1,941.87	4.82
7,707.00	89.88	91.53	6,294.17	-571.68	1,988.95	2,036.59	0.88
7,802.00	89.63	90.69	6,294.57	-573.52	2,083.94	2,131.27	0.92
7,897.00	89.42	90.62	6,295.36	-574.61	2,178.93	2,225.89	0.23
7,992.00	88.43	89.43	6,297.14	-574.65	2,273.91	2,320.38	1.63
8,087.00	89.63	89.02	6,298.75	-573.37	2,368.88	2,414.74	1.33
8,182.00	90.46	88.20	6,298.68	-571.06	2,463.85	2,508.99	1.23
8,277.00	89.63	88.13	6,298.60	-568.02	2,558.80	2,603.15	0.88
8,372.00	88.74	88.84	6,299.95	-565.51	2,653.76	2,697.36	1.20
8,467.00	90.93	90.39	6,300.23	-564.87	2,748.75	2,791.80	2.82
8,562.00	89.78	90.17	6,299.64	-565.33	2,843.74	2,886.35	1.23
8,657.00	89.51	90.13	6,300.23	-565.58	2,938.74	2,980.89	0.29
8,752.00	89.72	89.69	6,300.87	-565.43	3,033.74	3,075.38	0.51
8,847.00	87.38	86.21	6,303.27	-562.04	3,128.63	3,169.44	4.41
8,942.00	89.85	88.08	6,305.57	-557.31	3,223.47	3,263.32	3.26
9,037.00	90.34	88.82	6,305.41	-554.74	3,318.43	3,357.53	0.93
9,131.00	91.02	88.47	6,304.29	-552.52	3,412.40	3,450.79	0.81
9,227.00	90.28	89.24	6,303.21	-550.60	3,508.37	3,546.08	1.11
9,322.00	90.31	88.28	6,302.72	-548.54	3,603.35	3,640.36	1.01
9,417.00	88.98	88.07	6,303.30	-545.52	3,698.30	3,734.51	1.42
9,512.00	88.95	85.91	6,305.02	-540.53	3,793.14	3,828.37	2.27
9,607.00	89.17	86.37	6,306.58	-534.14	3,887.91	3,922.01	0.54
9,702.00	90.15	87.77	6,307.14	-529.28	3,982.78	4,015.90	1.80
9,797.00	91.23	88.75	6,306.00	-526.40	4,077.73	4,110.07	1.54
9,892.00	93.02	89.96	6,302.48	-525.33	4,172.65	4,204.39	2.27
9,987.00	91.29	90.82	6,298.90	-525.97	4,267.58	4,298.90	2.03

Design Report for Keota PC LB26-62HN - MWD Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
10,082.00	87.16	90.90	6,300.19	-527.40	4,362.54	4,393.52	4.35
10,177.00	89.32	92.22	6,303.11	-529.99	4,457.45	4,488.20	2.66
10,272.00	91.11	91.61	6,302.75	-533.16	4,552.40	4,582.98	1.99
10,367.00	90.03	89.02	6,301.81	-533.68	4,647.38	4,677.53	2.95
10,461.00	89.17	89.31	6,302.46	-532.31	4,741.37	4,770.89	0.97
10,556.00	90.43	88.09	6,302.79	-530.16	4,836.34	4,865.16	1.85
10,651.00	89.04	87.30	6,303.23	-526.34	4,931.26	4,959.20	1.68
10,672.00	88.58	86.80	6,303.67	-525.26	4,952.22	4,979.96	3.23
Final Sperry MWD Survey @ 10672.00 ft. MD							
10,740.00	88.58	86.80	6,305.35	-521.46	5,020.10	5,047.10	0.00
Estimated BHL: 648' FSL, 660' FEL :: Straight Line Projection to TD @ 10740.00 ft. MD							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
728.00	728.00	0.00	0.00	Surface Casing Assumed Vertical at 728.00 ft. MD
826.00	826.00	-0.16	0.18	First Sperry MWD Survey @ 826.00 ft. MD
6,734.00	6,301.09	-573.62	1,017.50	Estimated 7" Casing Point: 677' FSL, 623' FWL (Not a Survey Station)
10,672.00	6,303.67	-525.26	4,952.22	Final Sperry MWD Survey @ 10672.00 ft. MD
10,740.00	6,305.35	-521.46	5,020.10	Estimated BHL: 648' FSL, 660' FEL :: Straight Line Projection to TD @ 10740.00 ft. MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Keota PC LB26-62HN_PlanA - Rev0_BH L Tgt	95.81	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
728.00	6,734.00	Sperry MWD Surveys	MWD
6,734.00	10,740.00	Sperry MWD Surveys	MWD

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
6,734.00	6,301.09	7" Casing PT	7	8-3/4

Design Report for Keota PC LB26-62HN - MWD Surveys

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
Keota PC	0.00	0.00	0.00	0.00	0.00	1,507,375.99	3,396,391.99	40.717364	-104.069986
- actual wellpath hits target center									
- Polygon									
Point 1				373.00	-1,265.00	1,506,111.00	3,396,764.99		
Point 2				-4,966.00	-1,504.00	1,505,872.01	3,391,426.04		
Point 3				-5,063.00	3,854.00	1,511,229.95	3,391,329.04		
Point 4				552.00	4,043.00	1,511,418.95	3,396,943.99		
Point 5				373.00	-1,265.00	1,506,111.00	3,396,764.99		
Keota PC	0.00	0.00	0.00	0.00	0.00	1,507,375.99	3,396,391.99	40.717364	-104.069986
- actual wellpath hits target center									
- Polygon									
Point 1				973.00	-665.00	1,506,711.00	3,397,364.98		
Point 2				1,152.00	3,443.00	1,510,818.96	3,397,543.98		
Point 3				5,062.00	3,577.00	1,510,952.96	3,401,453.94		
Point 4				5,083.00	-557.00	1,506,819.00	3,401,474.94		
Point 5				973.00	-665.00	1,506,711.00	3,397,364.98		
Keota PC	0.00	0.00	0.00	0.00	0.00	1,507,375.99	3,396,391.99	40.717364	-104.069986
- actual wellpath hits target center									
- Polygon									
Point 1				373.00	-1,265.00	1,506,111.00	3,396,764.99		
Point 2				552.00	4,043.00	1,511,418.95	3,396,943.99		
Point 3				5,662.00	4,177.00	1,511,552.95	3,402,053.94		
Point 4				5,683.00	-1,157.00	1,506,219.00	3,402,074.94		
Point 5				373.00	-1,265.00	1,506,111.00	3,396,764.99		
Keota PC	0.00	0.00	0.00	0.00	0.00	1,507,375.99	3,396,391.99	40.717364	-104.069986
- actual wellpath hits target center									
- Polygon									
Point 1				-227.00	-665.00	1,506,711.00	3,396,165.00		
Point 2				-4,366.00	-904.00	1,506,472.00	3,392,026.04		
Point 3				-4,463.00	3,254.00	1,510,629.96	3,391,929.04		
Point 4				-48.00	3,443.00	1,510,818.96	3,396,343.99		
Point 5				-227.00	-665.00	1,506,711.00	3,396,165.00		
Keota PC	0.00	0.00	6,291.43	-510.64	5,020.40	1,506,865.36	3,401,412.34	40.715739	-104.051908
- actual wellpath misses target center by 17.64ft at 10740.00ft MD (6305.35 TVD, -521.46 N, 5020.10 E)									
- Point									

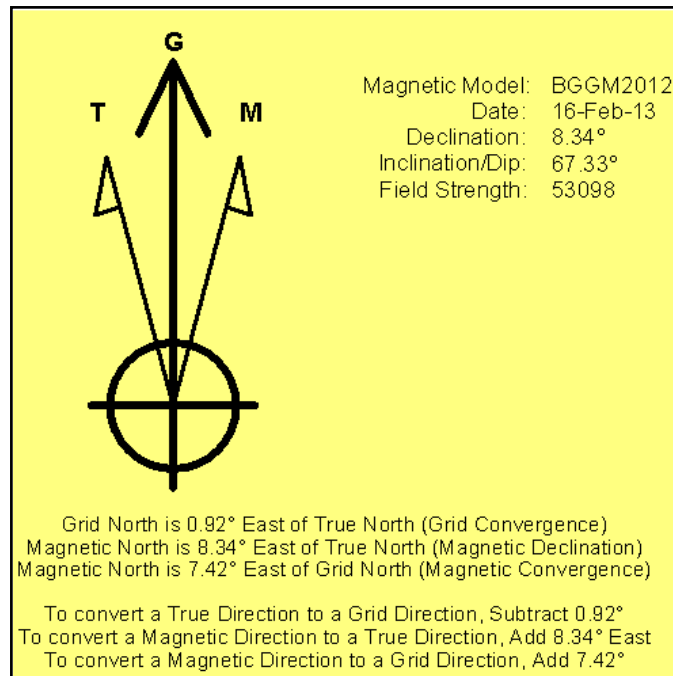
North Reference Sheet for Sec. 27-T9N-R60W - Keota PC LB26-62HN

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.
 Vertical Depths are relative to KB=24' @ 4973.00ft (H&P 322). Northing and Easting are relative to Keota PC LB26-62HN
 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: 0.99998996

Grid Coordinates of Well: 1,507,375.99 ft N, 3,396,391.99 ft E
 Geographical Coordinates of Well: 40° 43' 02.51" N, 104° 04' 11.95" W
 Grid Convergence at Surface is: 0.92°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,740.00ft
 the Bottom Hole Displacement is 5,047.11ft in the Direction of 95.93° (Grid).

Magnetic Convergence at surface is: -7.42° (16 February 2013, , BGGM2012)

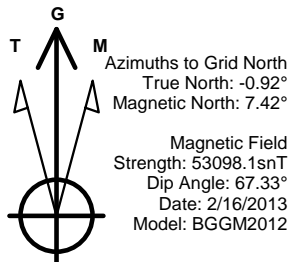


Project: Weld County, CO (NAD 83)
 Site: Sec. 27-T9N-R60W
 Well: Keota PC LB26-62HN

Noble Energy

HALLIBURTON

Sperry Drilling

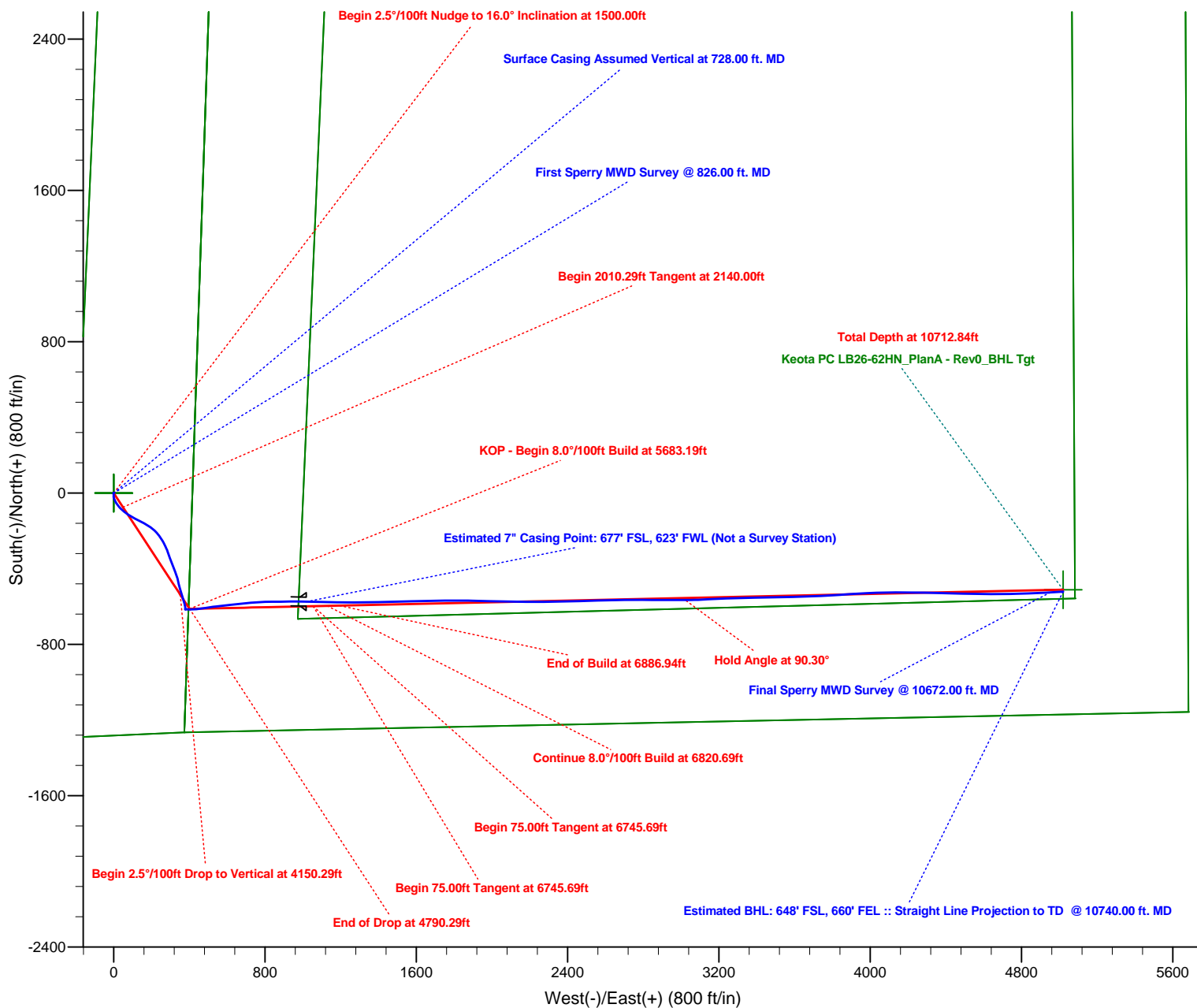


LEGEND

- Keota PC LB26-62HN, Plan A, Plan A - Rev 0 Proposal V0
- MWD Surveys

Permitted BHL: 660' FSL, 660' FEL

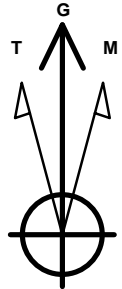
Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Keota PC LB26-62HN well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them 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. 27-T9N-R60W
Well: Keota PC LB26-62HN

Noble Energy

HALLIBURTON
Sperry Drilling



Azimuths to Grid North
True North: -0.92°
Magnetic North: 7.42°

Magnetic Field
Strength: 53098.1snT
Dip Angle: 67.33°
Date: 2/16/2013
Model: BGGM2012

LEGEND

- Keota PC LB26-62HN, Plan A, Plan A - Rev 0 Proposal V0
- MWD Surveys

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Keota PC LB26-62HN 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.

