

Noble Energy

Weld County, CO (NAD 83)

Sec. 4-T4N-R65W (Knaub-Frankie 4 PAD)

Knaub PC G04-67-1HN

Design: MWD Survey

Sperry Drilling Services

Final Survey Report

15 April, 2013

Well Coordinates: 1,368,037.72 N, 3,229,500.29 E (40°20' 26.66" N, 104°40' 36.05" W)

Ground Level: 4,678.00 ft

Local Coordinate Origin: Centered on Well Knaub PC G04-67-1HN - Slot A1

Viewing Datum: Corrected KB=30' @ 4708.00ft (H&P 321)

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 Knaub PC G04-67-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (7100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
698.00	0.00	0.00	698.00	0.00	0.00	0.00	0.00
Tie On To Surface Casing Assumed Vertical							
715.00	0.43	60.87	715.00	0.03	0.06	0.05	2.53
First MWD Survey							
992.00	0.40	82.83	991.99	0.66	1.92	1.38	0.06
1,268.00	0.41	27.91	1,267.99	1.65	3.34	2.87	0.14
1,549.00	0.48	359.46	1,548.98	3.72	3.80	4.94	0.08
1,739.00	0.29	38.61	1,738.97	4.89	4.09	6.13	0.17
1,834.00	2.41	4.47	1,833.94	7.07	4.40	8.25	2.29
1,929.00	3.80	358.67	1,928.80	12.21	4.48	12.97	1.50
2,023.00	4.39	352.88	2,022.56	18.89	3.96	18.87	0.77
2,118.00	5.79	4.08	2,117.19	27.28	3.85	26.48	1.80
2,213.00	7.15	3.56	2,211.58	37.96	4.56	36.53	1.43
2,308.00	9.77	355.84	2,305.54	51.90	4.34	49.17	3.00
2,403.00	11.71	355.43	2,398.87	69.55	2.99	64.74	2.04
2,498.00	14.02	359.87	2,491.48	90.67	2.20	83.70	2.64
2,593.00	13.65	0.51	2,583.73	113.39	2.27	104.48	0.42
2,688.00	14.25	0.75	2,675.93	136.29	2.52	125.50	0.63
2,783.00	14.33	1.09	2,767.99	159.74	2.90	147.06	0.12
2,878.00	13.02	354.99	2,860.30	182.15	2.19	167.25	2.05
2,972.00	11.91	354.66	2,952.08	202.36	0.36	184.96	1.18
3,067.00	13.36	354.54	3,044.78	223.05	-1.60	203.05	1.53
3,162.00	11.85	356.35	3,137.48	243.71	-3.26	221.24	1.64
3,257.00	12.28	358.53	3,230.39	263.54	-4.14	239.00	0.66
3,352.00	13.23	358.34	3,323.04	284.51	-4.71	257.91	1.00
3,447.00	13.27	354.20	3,415.51	306.22	-6.13	277.17	1.00
3,541.00	13.65	354.79	3,506.93	328.00	-8.23	296.20	0.43
3,636.00	14.89	357.96	3,599.00	351.36	-9.68	316.95	1.54
3,730.00	15.00	357.62	3,689.82	375.59	-10.62	338.69	0.15
3,825.00	15.53	353.97	3,781.47	400.52	-12.46	360.70	1.15
3,919.00	15.74	350.89	3,871.99	425.62	-15.80	382.27	0.91
4,014.00	14.01	357.40	3,963.81	449.84	-18.37	403.34	2.53
4,109.00	10.36	359.21	4,056.66	469.87	-19.01	421.38	3.86
4,204.00	11.45	359.23	4,149.94	487.84	-19.25	437.69	1.15
4,299.00	12.23	358.97	4,242.92	507.33	-19.56	455.36	0.82
4,394.00	13.79	358.58	4,335.48	528.71	-20.02	474.70	1.64
4,488.00	14.37	357.21	4,426.65	551.56	-20.86	495.23	0.71
4,583.00	15.18	359.95	4,518.51	575.78	-21.45	517.10	1.13
4,678.00	14.60	0.63	4,610.32	600.19	-21.33	539.44	0.64
4,773.00	15.02	357.46	4,702.17	624.46	-21.74	561.44	0.96
4,867.00	15.36	357.24	4,792.88	649.06	-22.88	583.45	0.37
4,962.00	15.36	356.92	4,884.49	674.19	-24.16	605.88	0.09
5,057.00	15.72	356.45	4,976.02	699.60	-25.64	628.48	0.40
5,152.00	13.29	0.72	5,067.98	723.37	-26.30	649.92	2.79
5,246.00	12.80	0.95	5,159.56	744.58	-25.99	669.42	0.52
5,341.00	13.24	359.13	5,252.12	765.98	-25.98	688.97	0.63
5,436.00	13.32	357.94	5,344.58	787.80	-26.54	708.66	0.30
5,531.00	13.99	355.92	5,436.89	810.19	-27.75	728.62	0.87
5,626.00	14.43	356.33	5,528.98	833.46	-29.32	749.23	0.48

Design Report for Knaub PC G04-67-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,721.00	13.93	355.62	5,621.09	856.67	-30.95	769.76	0.56
5,816.00	12.67	358.12	5,713.54	878.49	-32.17	789.19	1.46
5,910.00	13.32	2.89	5,805.13	899.61	-31.96	808.56	1.33
6,005.00	15.34	2.45	5,897.17	923.09	-30.87	830.45	2.13
6,100.00	15.58	357.11	5,988.74	948.39	-30.98	853.51	1.52
6,195.00	16.17	353.37	6,080.12	974.27	-33.15	876.27	1.24
6,289.00	14.41	351.89	6,170.79	998.85	-36.31	897.43	1.92
6,337.00	15.77	0.94	6,217.14	1,011.29	-37.05	908.49	5.66
6,384.00	19.65	12.24	6,261.92	1,025.41	-35.26	922.11	10.99
6,432.00	22.08	18.66	6,306.77	1,041.85	-30.67	939.00	6.94
6,479.00	24.16	23.34	6,350.00	1,059.05	-24.03	957.41	5.90
6,527.00	26.02	25.40	6,393.47	1,077.58	-15.62	977.76	4.28
6,574.00	29.93	26.30	6,434.97	1,097.42	-6.00	999.79	8.37
6,622.00	35.17	28.01	6,475.42	1,120.37	5.81	1,025.57	11.08
6,669.00	39.91	33.71	6,512.68	1,144.89	20.55	1,053.96	12.49
6,717.00	42.46	41.22	6,548.83	1,169.90	39.78	1,084.64	11.58
6,764.00	43.47	47.11	6,583.23	1,192.85	62.09	1,114.68	8.80
6,812.00	44.02	51.82	6,617.92	1,214.40	87.31	1,144.64	6.88
6,858.00	44.52	55.15	6,650.86	1,233.50	113.11	1,172.59	5.17
6,906.00	46.59	58.56	6,684.48	1,252.21	141.80	1,201.37	6.66
6,953.00	48.52	61.35	6,716.20	1,269.56	171.82	1,229.44	6.00
7,001.00	50.83	65.62	6,747.27	1,285.87	204.56	1,257.67	8.31
7,048.00	55.55	68.31	6,775.42	1,300.56	239.19	1,285.20	11.04
7,096.00	59.18	70.82	6,801.31	1,314.65	277.06	1,313.50	8.75
7,143.00	63.49	74.36	6,823.85	1,326.96	316.40	1,340.76	11.30
7,191.00	66.84	77.33	6,844.01	1,337.60	358.63	1,367.68	8.96
7,238.00	68.89	80.09	6,861.72	1,346.11	401.32	1,392.84	6.97
7,286.00	71.32	82.53	6,878.06	1,352.92	445.93	1,417.23	6.96
7,333.00	73.63	84.54	6,892.21	1,357.96	490.46	1,439.98	6.39
7,381.00	76.81	86.04	6,904.46	1,361.77	536.70	1,462.29	7.28
7,428.00	81.07	88.35	6,913.47	1,364.02	582.76	1,483.11	10.27
7,454.00	83.83	90.46	6,916.89	1,364.29	608.53	1,493.85	13.32
7,508.00	85.54	92.22	6,921.89	1,363.03	662.28	1,514.60	4.53
7" Casing Point Estimated from section line 1461' FNL 959' FWL (Not a survey point)							
7,531.00	86.27	92.96	6,923.53	1,361.99	685.20	1,522.99	4.53
7,598.00	87.53	93.22	6,927.16	1,358.39	752.00	1,546.91	1.92
7,693.00	90.31	92.93	6,928.95	1,353.29	846.84	1,580.89	2.94
7,788.00	91.23	91.66	6,927.67	1,349.49	941.75	1,616.08	1.65
7,883.00	90.89	92.18	6,925.91	1,346.31	1,036.68	1,651.84	0.65
7,978.00	89.41	93.52	6,925.66	1,341.58	1,131.56	1,686.17	2.10
8,073.00	90.89	91.53	6,925.42	1,337.40	1,226.46	1,721.01	2.61
8,167.00	89.13	91.70	6,925.40	1,334.75	1,320.42	1,756.87	1.88
8,262.00	91.04	92.16	6,925.26	1,331.55	1,415.36	1,792.62	2.07
8,357.00	89.85	90.83	6,924.52	1,329.07	1,510.32	1,829.04	1.88
8,452.00	90.49	89.66	6,924.24	1,328.67	1,605.32	1,867.37	1.40
8,547.00	91.45	93.52	6,922.63	1,326.03	1,700.25	1,903.63	4.19
8,642.00	89.26	91.67	6,922.04	1,321.73	1,795.14	1,938.36	3.02
8,737.00	88.77	89.54	6,923.67	1,320.73	1,890.11	1,976.13	2.30
8,832.00	89.01	89.15	6,925.51	1,321.81	1,985.09	2,015.81	0.48
8,926.00	89.38	91.03	6,926.83	1,321.67	2,079.07	2,053.96	2.04
9,021.00	90.62	91.19	6,926.83	1,319.83	2,174.05	2,090.97	1.32

Design Report for Knaub PC G04-67-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N-S (ft)	+E-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,116.00	89.23	92.13	6,926.96	1,317.07	2,269.01	2,127.14	1.77
9,211.00	92.81	92.09	6,925.27	1,313.58	2,363.92	2,162.61	3.77
9,306.00	91.36	94.11	6,921.81	1,308.44	2,458.71	2,196.53	2.62
9,401.00	89.94	94.40	6,920.73	1,301.39	2,553.44	2,228.68	1.53
9,496.00	89.44	94.07	6,921.25	1,294.38	2,648.17	2,260.87	0.63
9,590.00	90.86	91.52	6,921.00	1,289.80	2,742.05	2,294.93	3.10
9,685.00	91.02	92.00	6,919.44	1,286.88	2,836.99	2,330.94	0.53
9,780.00	90.09	91.02	6,918.52	1,284.38	2,931.95	2,367.33	1.42
9,875.00	90.25	91.80	6,918.24	1,282.04	3,026.92	2,403.89	0.84
9,970.00	89.57	92.16	6,918.39	1,278.76	3,121.87	2,439.56	0.81
10,065.00	89.78	90.69	6,918.93	1,276.39	3,216.83	2,476.09	1.56
10,159.00	90.03	91.96	6,919.09	1,274.22	3,310.81	2,512.39	1.38
10,254.00	89.66	92.98	6,919.34	1,270.13	3,405.72	2,547.31	1.14
10,349.00	89.94	92.18	6,919.67	1,265.85	3,500.62	2,582.06	0.89
10,444.00	90.83	90.96	6,919.04	1,263.25	3,595.58	2,618.37	1.59
10,539.00	89.10	92.19	6,919.09	1,260.64	3,690.54	2,654.67	2.23
10,634.00	89.81	91.95	6,920.00	1,257.20	3,785.47	2,690.20	0.79
10,729.00	90.15	92.23	6,920.03	1,253.74	3,880.41	2,725.71	0.46
10,824.00	90.22	90.27	6,919.72	1,251.67	3,975.38	2,762.51	2.06
10,919.00	89.51	91.29	6,919.95	1,250.37	4,070.37	2,800.02	1.31
11,013.00	91.17	92.37	6,919.39	1,247.37	4,164.31	2,835.55	2.11
11,108.00	91.14	94.64	6,917.47	1,241.57	4,259.11	2,868.86	2.39
11,203.00	91.54	94.46	6,915.25	1,234.03	4,353.78	2,900.55	0.46
11,258.00	92.16	95.81	6,913.48	1,229.11	4,408.53	2,918.36	2.70
Final Survey							
11,321.00	92.16	95.81	6,911.10	1,222.74	4,471.17	2,938.05	0.00
Estimated BHL 1646' FNL 529' FEL - Bit Projection at TD							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N-S (ft)	+E-W (ft)	
698.00	698.00	0.00	0.00	Tie On To Surface Casing Assumed Vertical
715.00	715.00	0.03	0.06	First MWD Survey
7,508.00	6,921.89	1,363.03	662.28	7" Casing Point Estimated from section line 1461' FNL 959' FWL (Not a survey point)
11,258.00	6,913.48	1,229.11	4,408.53	Final Survey
11,321.00	6,911.10	1,222.74	4,471.17	Estimated BHL 1646' FNL 529' FEL
11,321.00	6,911.10	1,222.74	4,471.17	Bit Projection at TD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N_S (ft)	+E-W (ft)	
User	No Target (Freehand)	24.04	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
698.00	11,321.00	Sperry MWD Surveys	MWD
7,508.00	11,321.00	Sperry MWD Surveys	MWD

Design Report for Knaub PC G04-67-1HN - MWD Survey

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,508.00	6,921.89	7"	7-1/2"	

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
Knaub PC	0.00	0.00	60.00	0.00	0.00	1,368,037.72	3,229,500.29	40.340740	-104.676680
- actual wellpath hits target center									
- Polygon									
Point 1				-243.00	-2,319.00	1,365,718.82	3,229,257.30		
Point 2				-319.00	2,813.00	1,370,850.61	3,229,181.30		
Point 3				4,991.00	2,870.00	1,370,907.60	3,234,491.08		
Point 4				5,045.00	-2,306.00	1,365,731.82	3,234,545.08		
Point 5				-243.00	-2,319.00	1,365,718.82	3,229,257.30		
Knaub PC	0.00	0.00	60.00	0.00	0.00	1,368,037.72	3,229,500.29	40.340740	-104.676680
- actual wellpath hits target center									
- Polygon									
Point 1				217.00	-1,859.00	1,366,178.80	3,229,717.28		
Point 2				141.00	2,353.00	1,370,390.62	3,229,641.28		
Point 3				4,531.00	2,410.00	1,370,447.62	3,234,031.10		
Point 4				4,585.00	-1,846.00	1,366,191.80	3,234,085.10		
Point 5				217.00	-1,859.00	1,366,178.80	3,229,717.28		
Knaub PC	0.00	0.00	6,911.84	1,230.00	4,471.66	1,369,267.67	3,233,971.76	40.344001	-104.660598
- actual wellpath misses target center by 7.31ft at 11320.73ft MD (6911.11 TVD, 1222.77 N, 4470.90 E)									
- Point									

North Reference Sheet for Sec. 4-T4N-R65W (Knaub-Frankie 4 PAD) - Knaub PC G04-67-1HN

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

Vertical Depths are relative to Corrected KB=30' @ 4708.00ft (H&P 321). Northing and Easting are relative to Knaub PC G04-67-1HN - Slot A1

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: 0.99995808

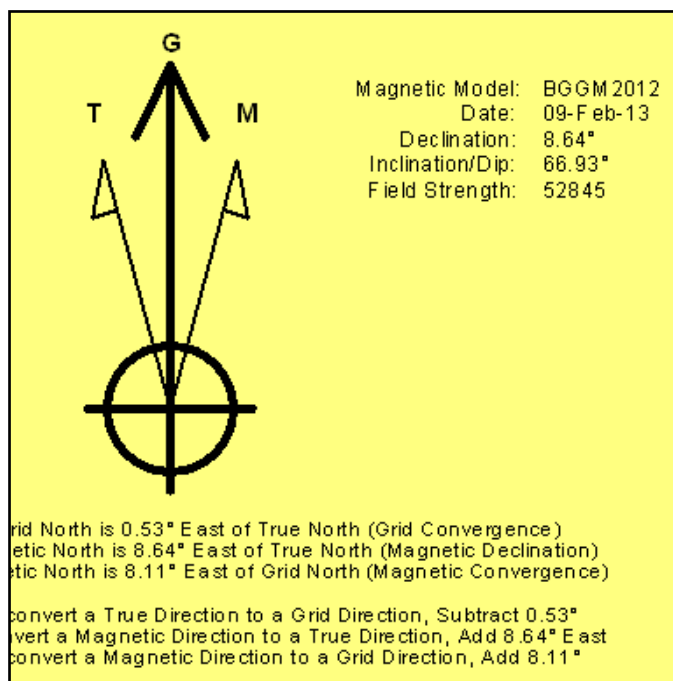
Grid Coordinates of Well: 1,368,037.72 ft N, 3,229,500.29 ft E

Geographical Coordinates of Well: 40°20' 26.66" N, 104°40' 36.05" W

Grid Convergence at Surface is: 0.53°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,321.00ft the Bottom Hole Displacement is 4,635.34ft in the Direction of 74.71°(Grid).

Magnetic Convergence at surface is: -8.11° (9 February 2013, , BGGM2012)



Project: Weld County, CO (NAD 83)
Site: Sec. 4-T4N-R65W (Knaub-Frankie 4 PAD)
Well: Knaub PC G04-67-1HN

Noble Energy

HALLIBURTON

Sperry Drilling



Azimuths to Grid North
True North: -0.53°
Magnetic North: 8.11°

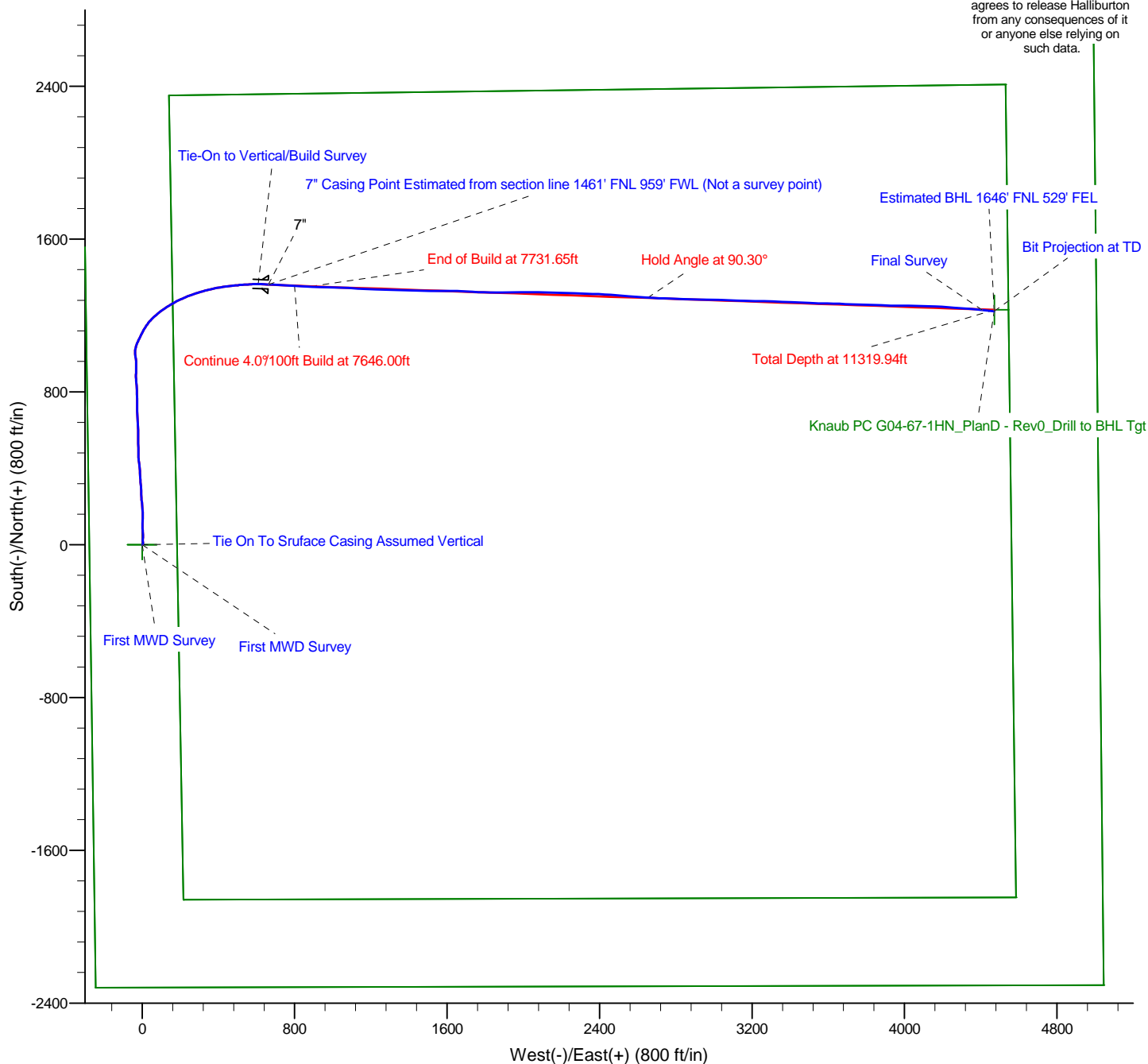
Magnetic Field
Strength: 52845.5snT
Dip Angle: 66.93°
Date: 2/9/2013
Model: BGGM2012

LEGEND

- Knaub PC G04-67-1HN, Plan D, Plan D - Rev 0 Proposal V0
- MWD Survey

Permitted BHL: 1650' FNL, 535' FEL

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Knaub PC G04-67-1HN 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.

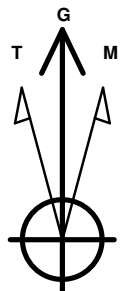


Project: Weld County, CO (NAD 83)
Site: Sec. 4-T4N-R65W (Knaub-Frankie 4 PAD)
Well: Knaub PC G04-67-1HN

Noble Energy

HALLIBURTON

Sperry Drilling



Azimuths to Grid North
True North: -0.53°
Magnetic North: 8.11°

Magnetic Field
Strength: 52845.5snT
Dip Angle: 66.93°
Date: 2/9/2013
Model: BGGM2012

LEGEND

— Knaub PC G04-67-1HN, Plan D, Plan D - Rev 0 Proposal V0
— MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Knaub PC G04-67-1HN 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.

