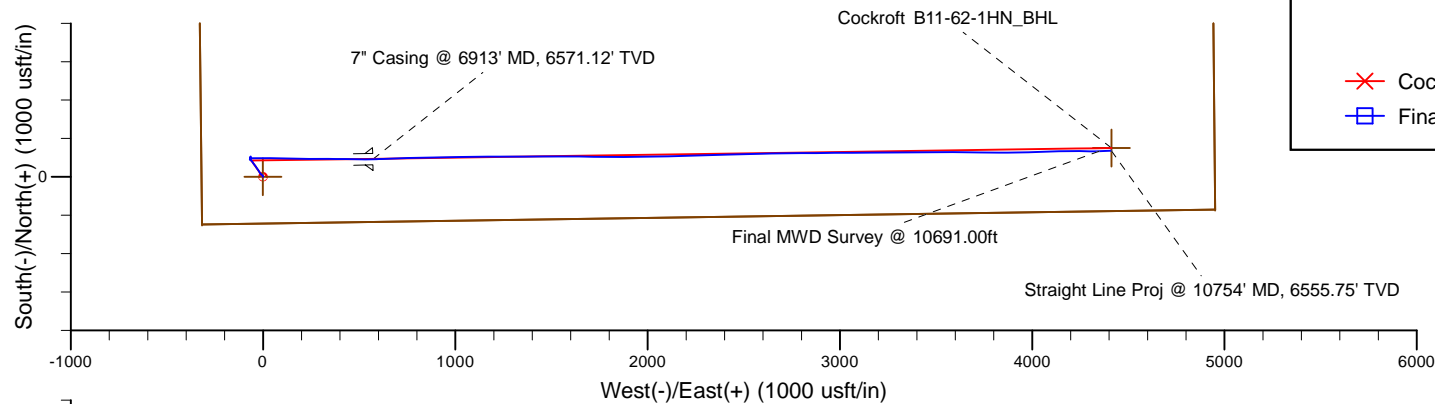


Project: Weld County, CO (NAD 83)
 Site: Sec. 11-T5N-R64W (Cockroft B11-62-1HN)
 Well: Cockroft B11-62-1HN
 Wellbore: Plan A
 Design: Final Surveys

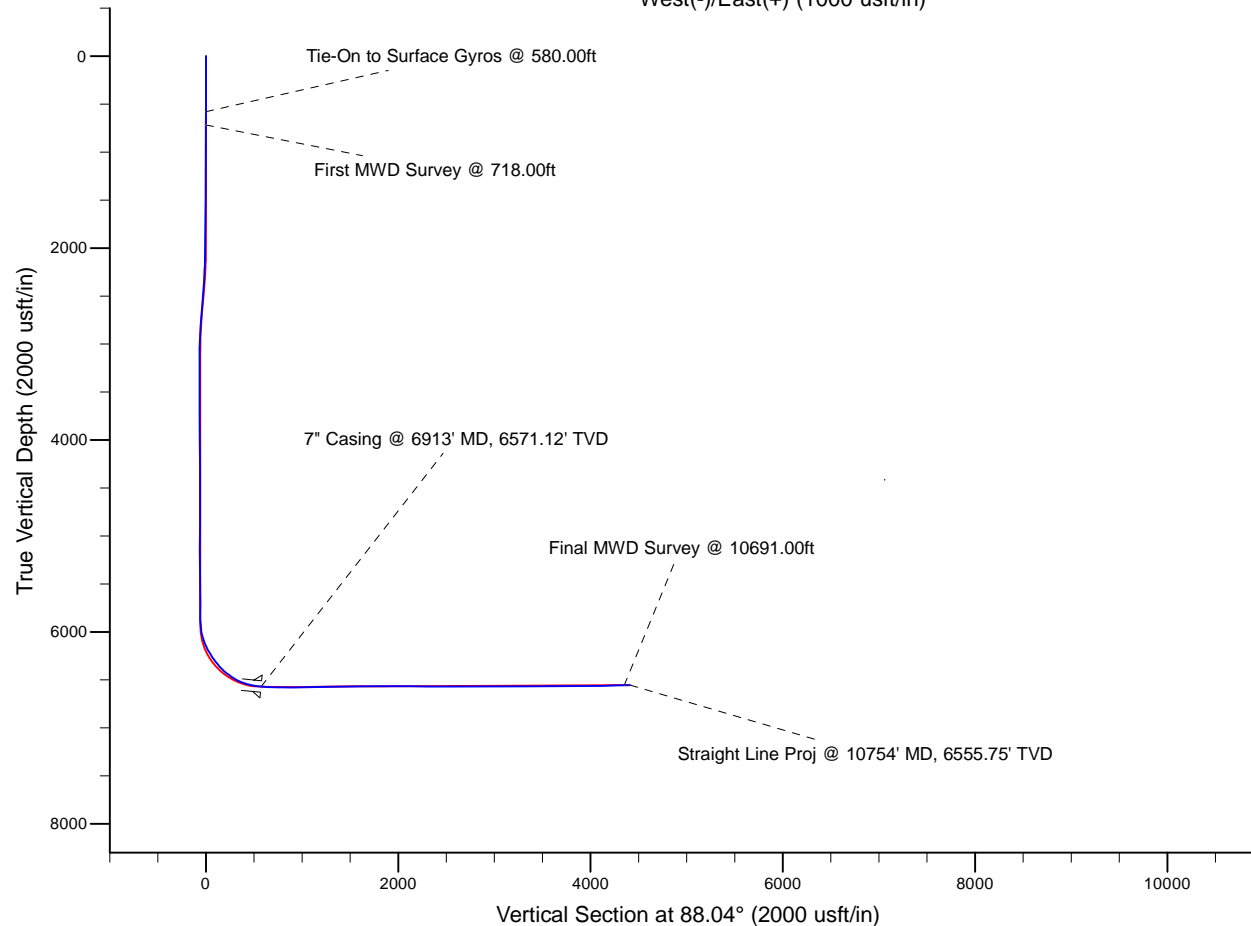
Noble Energy

HALLIBURTON
 Sperry Drilling



LEGEND

- ✕ Cockroft B11-62-1HN, Plan A, Rrev A0 - PROPOSAL V0
- Final Surveys



Platted SHL: 245' FSL, 322' FWL
 Platted Lat/Long: 40.40713° N, 104.52590° W
 Location: Sec. 11-T5N-R64W

7" Casing: ~326.73' FSL, ~892.7' FWL
 Lat/Long: 40° 24' 26.516 N, 104° 31' 25.835 W
 State Planes - CO Northern: 1,392,739.88' N, 3,271,834.76' E
 Location: Sec. 11-T5N-R64W

BHL: ~315.77 FSL, ~536.67' FEL
 Lat/Long: 40° 24' 26.539 N, 104° 30' 36.197 W
 State Planes - CO Northern: 1,392,784.73' N, 3,275,674.29' E
 Location: Sec. 11-T5N-R64W

WELL DETAILS: Cockroft B11-62-1HN

Ground Level: 4599.00
 RKB=24 @ 4623.00usft (H&P 315)

Created By: Fred Hartmann
 Created On: 12/06/2013

Noble Energy

Weld County, CO (NAD 83)

Sec. 11-T5N-R64W (Cockroft B11-62-1HN)

Cockroft B11-62-1HN

Design: Final Surveys

Sperry Drilling Services

Final Survey Report

06 December, 2013

Well Coordinates: 1,392,647.76 N, 3,271,262.95 E (40° 24' 25.67" N, 104° 31' 33.24" W)

Ground Level: 4,599.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Cockroft B11-62-1HN

RKB=24 @ 4623.00usft (H&P 315)

N

Grid

API - US Survey Feet - Custom

HALLIBURTON

Design Report for Cockroft B11-62-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
303.00	0.00	0.00	303.00	0.00	0.00	0.00	0.00
580.00	0.20	0.00	580.00	0.48	0.00	0.02	0.07
Tie-On to Surface Gyros @ 580.00ft							
718.00	0.42	348.80	718.00	1.22	-0.10	-0.06	0.16
First MWD Survey @ 718.00ft							
810.00	0.15	312.75	810.00	1.63	-0.25	-0.20	0.34
902.00	0.36	11.31	902.00	2.00	-0.28	-0.22	0.34
995.00	0.58	325.37	994.99	2.67	-0.49	-0.40	0.45
1,087.00	0.37	313.28	1,086.99	3.26	-0.97	-0.86	0.25
1,180.00	0.49	333.63	1,179.99	3.82	-1.37	-1.24	0.21
1,273.00	0.90	339.16	1,272.98	4.86	-1.81	-1.64	0.45
1,366.00	0.77	339.89	1,365.97	6.13	-2.28	-2.07	0.14
1,459.00	1.00	339.14	1,458.96	7.47	-2.79	-2.53	0.25
1,553.00	0.73	317.19	1,552.95	8.68	-3.48	-3.19	0.45
1,648.00	0.98	315.99	1,647.94	9.71	-4.46	-4.13	0.26
1,743.00	1.02	322.65	1,742.92	10.96	-5.54	-5.16	0.13
1,838.00	1.42	282.43	1,837.90	11.89	-7.20	-6.79	0.97
1,933.00	0.83	303.09	1,932.88	12.52	-8.93	-8.49	0.74
2,027.00	0.61	301.24	2,026.88	13.15	-9.92	-9.47	0.24
2,122.00	1.92	335.24	2,121.85	14.86	-11.02	-10.51	1.53
2,217.00	3.99	319.57	2,216.72	18.82	-13.83	-13.18	2.32
2,312.00	5.18	326.32	2,311.42	24.90	-18.36	-17.49	1.37
2,407.00	7.05	326.91	2,405.87	33.36	-23.92	-22.76	1.97
2,502.00	8.72	326.68	2,499.97	44.26	-31.06	-29.53	1.76
2,597.00	8.99	325.25	2,593.84	56.38	-39.24	-37.29	0.37
2,692.00	9.29	322.37	2,687.63	68.55	-48.16	-45.78	0.58
2,787.00	6.99	323.58	2,781.67	79.27	-56.27	-53.53	2.43
2,881.00	3.88	324.74	2,875.24	86.48	-61.50	-58.51	3.31
2,976.00	1.97	315.54	2,970.11	90.27	-64.50	-61.38	2.06
3,071.00	1.05	234.88	3,065.08	90.93	-66.36	-63.21	2.19
3,166.00	0.56	216.66	3,160.07	90.06	-67.35	-64.23	0.58
3,451.00	0.40	305.34	3,445.07	89.52	-68.99	-65.89	0.24
3,736.00	0.91	33.98	3,730.05	91.97	-68.54	-65.35	0.35
4,020.00	1.09	21.86	4,014.01	96.35	-66.27	-62.94	0.10
4,305.00	1.61	357.89	4,298.93	102.86	-65.41	-61.86	0.27
4,590.00	0.54	87.47	4,583.89	106.92	-64.21	-60.52	0.59
4,874.00	1.09	205.75	4,867.87	104.55	-64.05	-60.44	0.50
5,159.00	0.85	211.69	5,152.83	100.31	-66.34	-62.87	0.09
5,444.00	0.89	108.98	5,437.81	97.79	-65.36	-61.98	0.48
5,729.00	0.34	60.74	5,722.80	97.48	-62.53	-59.16	0.25
5,822.00	0.69	99.57	5,815.79	97.52	-61.73	-58.36	0.51
5,889.00	0.64	74.75	5,882.79	97.56	-60.97	-57.60	0.43
6,009.00	10.40	80.85	6,002.09	99.46	-49.61	-46.18	8.14
6,057.00	16.22	95.89	6,048.79	99.46	-38.65	-35.23	14.01
6,104.00	19.03	94.13	6,093.58	98.23	-24.47	-21.10	6.08
6,152.00	25.09	88.45	6,138.05	97.95	-6.48	-3.13	13.37
6,199.00	28.27	92.00	6,180.04	97.83	14.62	17.95	7.57
6,247.00	30.55	91.72	6,221.85	97.06	38.17	41.47	4.76
6,293.00	33.42	90.11	6,260.87	96.69	62.53	65.80	6.51

Design Report for Cockroft B11-62-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
6,341.00	35.93	89.29	6,300.34	96.84	89.84	93.09	5.32
6,389.00	39.38	90.33	6,338.34	96.92	119.15	122.40	7.31
6,437.00	43.07	92.58	6,374.43	96.10	150.77	153.96	8.28
6,484.00	47.95	91.90	6,407.36	94.80	184.26	187.39	10.43
6,532.00	53.23	88.88	6,437.83	94.58	221.32	224.43	12.02
6,578.00	54.82	90.10	6,464.85	94.91	258.55	261.64	4.07
6,626.00	58.18	90.64	6,491.34	94.65	298.57	301.63	7.06
6,673.00	65.24	90.81	6,513.60	94.12	339.92	342.94	15.02
6,721.00	71.52	90.24	6,531.28	93.72	384.52	387.50	13.13
6,768.00	74.04	91.01	6,545.19	93.23	429.41	432.34	5.59
6,816.00	77.93	91.05	6,556.81	92.39	475.96	478.84	8.10
6,866.00	81.79	90.35	6,565.61	91.79	525.17	528.00	7.84
6,913.00	84.75	88.84	6,571.12	92.12	571.84	574.65	7.07
7" Casing @ 6913' MD, 6571.12' TVD							
6,957.00	87.53	87.43	6,574.08	93.55	615.71	618.55	7.07
7,037.00	87.66	87.72	6,577.44	96.94	695.57	698.47	0.40
7,132.00	89.29	88.67	6,579.97	99.93	790.48	793.43	1.99
7,226.00	89.85	88.86	6,580.67	101.95	884.46	887.42	0.63
7,321.00	89.94	88.81	6,580.85	103.89	979.44	982.41	0.11
7,416.00	91.39	89.89	6,579.74	104.96	1,074.42	1,077.38	1.90
7,511.00	91.70	89.94	6,577.18	105.10	1,169.38	1,172.29	0.33
7,606.00	91.94	90.18	6,574.16	105.00	1,264.34	1,267.19	0.36
7,701.00	91.33	89.41	6,571.45	105.34	1,359.30	1,362.10	1.03
7,796.00	91.42	89.64	6,569.17	106.13	1,454.27	1,457.04	0.26
7,891.00	90.52	89.89	6,567.57	106.52	1,549.25	1,551.99	0.98
7,986.00	91.02	90.46	6,566.29	106.23	1,644.24	1,646.91	0.80
8,080.00	89.57	90.39	6,565.81	105.53	1,738.23	1,740.83	1.54
8,176.00	89.78	90.41	6,566.35	104.86	1,834.23	1,836.74	0.22
8,270.00	89.85	90.43	6,566.65	104.17	1,928.23	1,930.66	0.08
8,365.00	88.70	87.63	6,567.86	105.78	2,023.19	2,025.63	3.19
8,460.00	89.14	88.80	6,569.65	108.74	2,118.13	2,120.61	1.32
8,555.00	89.85	88.49	6,570.48	110.99	2,213.10	2,215.60	0.82
8,650.00	89.94	88.36	6,570.66	113.60	2,308.06	2,310.60	0.17
8,745.00	90.19	88.46	6,570.55	116.23	2,403.03	2,405.59	0.28
8,840.00	90.00	88.72	6,570.39	118.57	2,498.00	2,500.59	0.34
8,935.00	90.00	89.02	6,570.39	120.45	2,592.98	2,595.58	0.32
9,029.00	90.12	89.06	6,570.29	122.02	2,686.97	2,689.57	0.13
9,124.00	90.15	89.23	6,570.07	123.44	2,781.95	2,784.55	0.18
9,219.00	90.25	89.47	6,569.74	124.52	2,876.95	2,879.52	0.27
9,314.00	90.31	89.52	6,569.27	125.35	2,971.94	2,974.49	0.08
9,409.00	90.15	89.79	6,568.89	125.92	3,066.94	3,069.45	0.33
9,504.00	90.00	90.06	6,568.77	126.05	3,161.94	3,164.40	0.33
9,599.00	90.15	88.84	6,568.64	126.96	3,256.93	3,259.37	1.29
9,694.00	90.06	89.23	6,568.47	128.56	3,351.92	3,354.36	0.42
9,788.00	90.12	89.52	6,568.32	129.59	3,445.91	3,448.33	0.32
9,883.00	90.43	90.29	6,567.87	129.74	3,540.91	3,543.28	0.87
9,978.00	91.33	91.35	6,566.41	128.38	3,635.89	3,638.15	1.46
10,073.00	90.56	90.11	6,564.84	127.17	3,730.87	3,733.03	1.54
10,168.00	90.74	90.57	6,563.76	126.61	3,825.86	3,827.95	0.52
10,263.00	90.25	88.77	6,562.94	127.16	3,920.85	3,922.90	1.96
10,358.00	90.43	88.28	6,562.38	129.60	4,015.81	4,017.90	0.55

Design Report for Cockroft B11-62-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,453.00	89.38	86.83	6,562.54	133.66	4,110.72	4,112.89	1.88
10,548.00	92.32	91.86	6,561.13	134.74	4,205.67	4,207.81	6.13
10,643.00	91.60	89.73	6,557.88	133.43	4,300.60	4,302.64	2.37
10,691.00	90.96	87.74	6,556.80	134.49	4,348.57	4,350.63	4.35
Final MWD Survey @ 10691.00ft							
10,754.00	90.96	87.74	6,555.75	136.97	4,411.51	4,413.62	0.00
Straight Line Proj @ 10754' MD, 6555.75' TVD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
580.00	580.00	0.48	0.00	Tie-On to Surface Gyros @ 580.00ft
718.00	718.00	1.22	-0.10	First MWD Survey @ 718.00ft
10,691.00	6,556.80	134.49	4,348.57	Final MWD Survey @ 10691.00ft
10,754.00	6,555.75	136.97	4,411.51	Straight Line Proj @ 10754' MD, 6555.75' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Cockroft B11-62-1HN_BHL	88.04	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
303.00	580.00	Surface Gyros	Flexi-Shot
718.00	6,866.00	MWD Surveys - Vert/Build	MWD
6,957.00	10,691.00	MWD Surveys - Lateral	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,913.00	6,571.12	7" Casing @ 6913' MD, 6571.12' TVD	7	8-3/4

Design Report for Cockroft B11-62-1HN - Final Surveys

Wellbore Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Cockroft B11-62-1HN_ - actual wellpath hits target center - Polygon	0.00	359.37	0.00	0.00	0.00	1,392,647.77	3,271,262.95	40° 24' 25.668 N	104° 31' 33.240 W
Point 1				0.00	4,617.11	140.31	1,397,265.96	3,271,352.53	
Point 2				0.00	210.85	144.77	1,392,860.19	3,271,405.39	
Point 3				0.00	239.66	4,493.91	1,392,936.77	3,275,753.78	
Point 4				0.00	4,656.86	4,493.87	1,397,353.53	3,275,705.22	
Point 5				0.00	4,617.11	140.31	1,397,265.96	3,271,352.53	
Cockroft B11-62-1HN_ - actual wellpath hits target center - Polygon	0.00	359.37	0.00	0.00	0.00	1,392,647.77	3,271,262.95	40° 24' 25.668 N	104° 31' 33.240 W
Point 1				0.00	5,082.16	-314.63	1,397,725.96	3,270,892.53	
Point 2				0.00	-244.08	-320.27	1,392,400.19	3,270,945.39	
Point 3				0.00	-225.38	4,948.85	1,392,476.77	3,276,213.78	
Point 4				0.00	5,111.80	4,958.92	1,397,813.53	3,276,165.22	
Point 5				0.00	5,082.16	-314.63	1,397,725.96	3,270,892.53	
Cockroft B11-62-1HN_ - actual wellpath misses target center by 14.00usft at 10754.00usft MD (6555.75 TVD, 136.97 N, 4411.51 E) - Point	0.00	359.36	6,554.88	150.89	4,412.69	1,392,798.65	3,275,675.46	40° 24' 26.676 N	104° 30' 36.180 W

Directional Difficulty Index

Average Dogleg over Survey:	1.51 °/100usft	Maximum Dogleg over Survey:	15.02 °/100usft at 6,673.00 usft
Net Tortousity applicable to Plans:	0.48 °/100usft	Directional Difficulty Index:	6.089

Audit Info

North Reference Sheet for Sec. 11-T5N-R64W (Cockroft B11-62-1HN) - Cockroft B11-62-1HN

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

Vertical Depths are relative to RKB=24 @ 4623.00usft (H&P 315). Northing and Easting are relative to Cockroft B 11-62-1HN

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: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996056

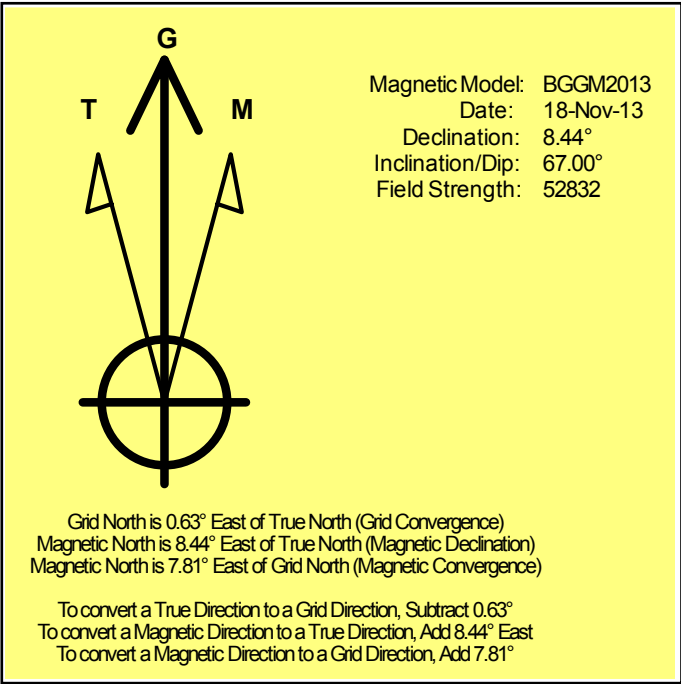
Grid Coordinates of Well: 1,392,647.76 usft N, 3,271,262.95 usft E

Geographical Coordinates of Well: 40° 24' 25.67" N, 104° 31' 33.24" W

Grid Convergence at Surface is: 0.63°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,754.00usft the Bottom Hole Displacement is 4,413.64usft in the Direction of 88.22° (Grid).

Magnetic Convergence at surface is: -7.81° (18 November 2013, , BGGM2013)



Noble Energy

Weld County, CO (NAD 83)

Sec. 11-T5N-R64W (Cockroft B11-62-1HN)

Cockroft B11-62-1HN

Design: Final Surveys

Sperry Drilling Services

Geodetic Report

06 December, 2013

Well Coordinates: 1,392,647.76 N, 3,271,262.95 E (40° 24' 25.67" N, 104° 31' 33.24" W)

Ground Level: 4,599.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Cockroft B11-62-1HN

RKB=24 @ 4623.00usft (H&P 315)

N

Grid

API - US Survey Feet - Custom

HALLIBURTON

Design Report for Cockroft B11-62-1HN - Final Surveys

Measured			Vertical			Local Coordinates		Geographic Coordinates		UTM Coordinates	
Depth (usft)	Inclination (°)	Azimuth (°)	Depth (usft)	+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
0.00	0.00	0.00	0.00	0.00	0.00	40° 24' 25.668 N	104° 31' 33.240 W	40° 24' 25.668 N	104° 31' 33.240 W	1,392,647.76	3,271,262.95
303.00	0.00	0.00	303.00	0.00	0.00	40° 24' 25.668 N	104° 31' 33.240 W	40° 24' 25.668 N	104° 31' 33.240 W	1,392,647.76	3,271,262.95
580.00	0.20	0.00	580.00	0.48	0.00	40° 24' 25.673 N	104° 31' 33.240 W	40° 24' 25.673 N	104° 31' 33.240 W	1,392,648.25	3,271,262.95
718.00	0.42	348.80	718.00	1.22	-0.10	40° 24' 25.680 N	104° 31' 33.241 W	40° 24' 25.680 N	104° 31' 33.241 W	1,392,648.98	3,271,262.85
810.00	0.15	312.75	810.00	1.63	-0.25	40° 24' 25.684 N	104° 31' 33.243 W	40° 24' 25.684 N	104° 31' 33.243 W	1,392,649.40	3,271,262.70
902.00	0.36	11.31	902.00	2.00	-0.28	40° 24' 25.688 N	104° 31' 33.243 W	40° 24' 25.688 N	104° 31' 33.243 W	1,392,649.76	3,271,262.67
995.00	0.58	325.37	994.99	2.67	-0.49	40° 24' 25.694 N	104° 31' 33.246 W	40° 24' 25.694 N	104° 31' 33.246 W	1,392,650.44	3,271,262.46
1,087.00	0.37	313.28	1,086.99	3.26	-0.97	40° 24' 25.700 N	104° 31' 33.252 W	40° 24' 25.700 N	104° 31' 33.252 W	1,392,651.02	3,271,261.97
1,180.00	0.49	333.63	1,179.99	3.82	-1.37	40° 24' 25.706 N	104° 31' 33.257 W	40° 24' 25.706 N	104° 31' 33.257 W	1,392,651.58	3,271,261.58
1,273.00	0.90	339.16	1,272.98	4.86	-1.81	40° 24' 25.716 N	104° 31' 33.263 W	40° 24' 25.716 N	104° 31' 33.263 W	1,392,652.62	3,271,261.14
1,366.00	0.77	339.89	1,365.97	6.13	-2.28	40° 24' 25.729 N	104° 31' 33.269 W	40° 24' 25.729 N	104° 31' 33.269 W	1,392,653.89	3,271,260.67
1,459.00	1.00	339.14	1,458.96	7.47	-2.79	40° 24' 25.742 N	104° 31' 33.275 W	40° 24' 25.742 N	104° 31' 33.275 W	1,392,655.24	3,271,260.16
1,553.00	0.73	317.19	1,552.95	8.68	-3.48	40° 24' 25.754 N	104° 31' 33.284 W	40° 24' 25.754 N	104° 31' 33.284 W	1,392,656.44	3,271,259.47
1,648.00	0.98	315.99	1,647.94	9.71	-4.46	40° 24' 25.764 N	104° 31' 33.296 W	40° 24' 25.764 N	104° 31' 33.296 W	1,392,657.47	3,271,258.49
1,743.00	1.02	322.65	1,742.92	10.96	-5.54	40° 24' 25.777 N	104° 31' 33.310 W	40° 24' 25.777 N	104° 31' 33.310 W	1,392,658.73	3,271,257.41
1,838.00	1.42	282.43	1,837.90	11.89	-7.20	40° 24' 25.786 N	104° 31' 33.331 W	40° 24' 25.786 N	104° 31' 33.331 W	1,392,659.65	3,271,255.75
1,933.00	0.83	303.09	1,932.88	12.52	-8.93	40° 24' 25.793 N	104° 31' 33.354 W	40° 24' 25.793 N	104° 31' 33.354 W	1,392,660.28	3,271,254.02
2,027.00	0.61	301.24	2,026.88	13.15	-9.92	40° 24' 25.799 N	104° 31' 33.366 W	40° 24' 25.799 N	104° 31' 33.366 W	1,392,660.91	3,271,253.03
2,122.00	1.92	335.24	2,121.85	14.86	-11.02	40° 24' 25.816 N	104° 31' 33.380 W	40° 24' 25.816 N	104° 31' 33.380 W	1,392,662.62	3,271,251.93
2,217.00	3.99	319.57	2,216.72	18.82	-13.83	40° 24' 25.855 N	104° 31' 33.416 W	40° 24' 25.855 N	104° 31' 33.416 W	1,392,666.58	3,271,249.12
2,312.00	5.18	326.32	2,311.42	24.90	-18.36	40° 24' 25.916 N	104° 31' 33.474 W	40° 24' 25.916 N	104° 31' 33.474 W	1,392,672.67	3,271,244.59
2,407.00	7.05	326.91	2,405.87	33.36	-23.92	40° 24' 26.000 N	104° 31' 33.544 W	40° 24' 26.000 N	104° 31' 33.544 W	1,392,681.12	3,271,239.03
2,502.00	8.72	326.68	2,499.97	44.26	-31.06	40° 24' 26.109 N	104° 31' 33.635 W	40° 24' 26.109 N	104° 31' 33.635 W	1,392,692.02	3,271,231.89
2,597.00	8.99	325.25	2,593.84	56.38	-39.24	40° 24' 26.229 N	104° 31' 33.739 W	40° 24' 26.229 N	104° 31' 33.739 W	1,392,704.14	3,271,223.71
2,692.00	9.29	322.37	2,687.63	68.55	-48.16	40° 24' 26.350 N	104° 31' 33.853 W	40° 24' 26.350 N	104° 31' 33.853 W	1,392,716.31	3,271,214.80
2,787.00	6.99	323.58	2,781.67	79.27	-56.27	40° 24' 26.457 N	104° 31' 33.956 W	40° 24' 26.457 N	104° 31' 33.956 W	1,392,727.04	3,271,206.68
2,881.00	3.88	324.74	2,875.24	86.48	-61.50	40° 24' 26.529 N	104° 31' 34.023 W	40° 24' 26.529 N	104° 31' 34.023 W	1,392,734.24	3,271,201.45
2,976.00	1.97	315.54	2,970.11	90.27	-64.50	40° 24' 26.567 N	104° 31' 34.061 W	40° 24' 26.567 N	104° 31' 34.061 W	1,392,738.03	3,271,198.45
3,071.00	1.05	234.88	3,065.08	90.93	-66.36	40° 24' 26.574 N	104° 31' 34.085 W	40° 24' 26.574 N	104° 31' 34.085 W	1,392,738.69	3,271,196.59
3,166.00	0.56	216.66	3,160.07	90.06	-67.35	40° 24' 26.565 N	104° 31' 34.098 W	40° 24' 26.565 N	104° 31' 34.098 W	1,392,737.82	3,271,195.60
3,451.00	0.40	305.34	3,445.07	89.52	-68.99	40° 24' 26.560 N	104° 31' 34.119 W	40° 24' 26.560 N	104° 31' 34.119 W	1,392,737.28	3,271,193.96
3,736.00	0.91	33.98	3,730.05	91.97	-68.54	40° 24' 26.584 N	104° 31' 34.113 W	40° 24' 26.584 N	104° 31' 34.113 W	1,392,739.73	3,271,194.41
4,020.00	1.09	21.86	4,014.01	96.35	-66.27	40° 24' 26.627 N	104° 31' 34.083 W	40° 24' 26.627 N	104° 31' 34.083 W	1,392,744.11	3,271,196.68
4,305.00	1.61	357.89	4,298.93	102.86	-65.41	40° 24' 26.691 N	104° 31' 34.071 W	40° 24' 26.691 N	104° 31' 34.071 W	1,392,750.62	3,271,197.54
4,590.00	0.54	87.47	4,583.89	106.92	-64.21	40° 24' 26.731 N	104° 31' 34.055 W	40° 24' 26.731 N	104° 31' 34.055 W	1,392,754.68	3,271,198.74
4,874.00	1.09	205.75	4,867.87	104.55	-64.05	40° 24' 26.708 N	104° 31' 34.053 W	40° 24' 26.708 N	104° 31' 34.053 W	1,392,752.31	3,271,198.90
5,159.00	0.85	211.69	5,152.83	100.31	-66.34	40° 24' 26.666 N	104° 31' 34.083 W	40° 24' 26.666 N	104° 31' 34.083 W	1,392,748.07	3,271,196.61
5,444.00	0.89	108.98	5,437.81	97.79	-65.36	40° 24' 26.641 N	104° 31' 34.071 W	40° 24' 26.641 N	104° 31' 34.071 W	1,392,745.55	3,271,197.60
5,729.00	0.34	60.74	5,722.80	97.48	-62.53	40° 24' 26.638 N	104° 31' 34.034 W	40° 24' 26.638 N	104° 31' 34.034 W	1,392,745.24	3,271,200.43
5,822.00	0.69	99.57	5,815.79	97.52	-61.73	40° 24' 26.638 N	104° 31' 34.024 W	40° 24' 26.638 N	104° 31' 34.024 W	1,392,745.28	3,271,201.22
5,889.00	0.64	74.75	5,882.79	97.56	-60.97	40° 24' 26.638 N	104° 31' 34.014 W	40° 24' 26.638 N	104° 31' 34.014 W	1,392,745.32	3,271,201.98
6,009.00	10.40	80.85	6,002.09	99.46	-49.61	40° 24' 26.656 N	104° 31' 33.867 W	40° 24' 26.656 N	104° 31' 33.867 W	1,392,747.22	3,271,213.34

Design Report for Cockroft B11-62-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
6,057.00	16.22	95.89	6,048.79	99.46	-38.65	40° 24' 26.655 N	104° 31' 33.725 W	1,392,747.22	3,271,224.30
6,104.00	19.03	94.13	6,093.58	98.23	-24.47	40° 24' 26.641 N	104° 31' 33.542 W	1,392,745.99	3,271,238.48
6,152.00	25.09	88.45	6,138.05	97.95	-6.48	40° 24' 26.636 N	104° 31' 33.310 W	1,392,745.71	3,271,256.47
6,199.00	28.27	92.00	6,180.04	97.83	14.62	40° 24' 26.633 N	104° 31' 33.037 W	1,392,745.59	3,271,277.56
6,247.00	30.55	91.72	6,221.85	97.06	38.17	40° 24' 26.623 N	104° 31' 32.733 W	1,392,744.82	3,271,301.12
6,293.00	33.42	90.11	6,260.87	96.69	62.53	40° 24' 26.617 N	104° 31' 32.418 W	1,392,744.45	3,271,325.48
6,341.00	35.93	89.29	6,300.34	96.84	89.84	40° 24' 26.615 N	104° 31' 32.065 W	1,392,744.60	3,271,352.78
6,389.00	39.38	90.33	6,338.34	96.92	119.15	40° 24' 26.613 N	104° 31' 31.686 W	1,392,744.68	3,271,382.10
6,437.00	43.07	92.58	6,374.43	96.10	150.77	40° 24' 26.601 N	104° 31' 31.278 W	1,392,743.86	3,271,413.71
6,484.00	47.95	91.90	6,407.36	94.80	184.26	40° 24' 26.585 N	104° 31' 30.845 W	1,392,742.56	3,271,447.20
6,532.00	53.23	88.88	6,437.83	94.58	221.32	40° 24' 26.578 N	104° 31' 30.366 W	1,392,742.34	3,271,484.26
6,578.00	54.82	90.10	6,464.85	94.91	258.55	40° 24' 26.578 N	104° 31' 29.885 W	1,392,742.67	3,271,521.49
6,626.00	58.18	90.64	6,491.34	94.65	298.57	40° 24' 26.571 N	104° 31' 29.367 W	1,392,742.41	3,271,561.50
6,673.00	65.24	90.81	6,513.60	94.12	339.92	40° 24' 26.561 N	104° 31' 28.833 W	1,392,741.88	3,271,602.86
6,721.00	71.52	90.24	6,531.28	93.72	384.52	40° 24' 26.552 N	104° 31' 28.256 W	1,392,741.48	3,271,647.46
6,768.00	74.04	91.01	6,545.19	93.23	429.41	40° 24' 26.542 N	104° 31' 27.676 W	1,392,740.99	3,271,692.34
6,816.00	77.93	91.05	6,556.81	92.39	475.96	40° 24' 26.529 N	104° 31' 27.075 W	1,392,740.15	3,271,738.89
6,866.00	81.79	90.35	6,565.61	91.79	525.17	40° 24' 26.518 N	104° 31' 26.439 W	1,392,739.55	3,271,788.10
6,913.00	84.75	88.84	6,571.12	92.12	571.84	40° 24' 26.516 N	104° 31' 25.835 W	1,392,739.88	3,271,834.76
6,957.00	87.53	87.43	6,574.08	93.55	615.71	40° 24' 26.525 N	104° 31' 25.268 W	1,392,741.31	3,271,878.63
7,037.00	87.66	87.72	6,577.44	96.94	695.57	40° 24' 26.550 N	104° 31' 24.235 W	1,392,744.70	3,271,958.49
7,132.00	89.29	88.67	6,579.97	99.93	790.48	40° 24' 26.569 N	104° 31' 23.008 W	1,392,747.69	3,272,053.40
7,226.00	89.85	88.86	6,580.67	101.95	884.46	40° 24' 26.579 N	104° 31' 21.793 W	1,392,749.71	3,272,147.37
7,321.00	89.94	88.81	6,580.85	103.89	979.44	40° 24' 26.588 N	104° 31' 20.565 W	1,392,751.64	3,272,242.35
7,416.00	91.39	89.89	6,579.74	104.96	1,074.42	40° 24' 26.588 N	104° 31' 19.337 W	1,392,752.72	3,272,337.33
7,511.00	91.70	89.94	6,577.18	105.10	1,169.38	40° 24' 26.579 N	104° 31' 18.110 W	1,392,752.86	3,272,432.29
7,606.00	91.94	90.18	6,574.16	105.00	1,264.34	40° 24' 26.568 N	104° 31' 16.882 W	1,392,752.76	3,272,527.24
7,701.00	91.33	89.41	6,571.45	105.34	1,359.30	40° 24' 26.561 N	104° 31' 15.655 W	1,392,753.10	3,272,622.19
7,796.00	91.42	89.64	6,569.17	106.13	1,454.27	40° 24' 26.558 N	104° 31' 14.427 W	1,392,753.89	3,272,717.16
7,891.00	90.52	89.89	6,567.57	106.52	1,549.25	40° 24' 26.552 N	104° 31' 13.199 W	1,392,754.28	3,272,812.14
7,986.00	91.02	90.46	6,566.29	106.23	1,644.24	40° 24' 26.539 N	104° 31' 11.971 W	1,392,753.99	3,272,907.13
8,080.00	89.57	90.39	6,565.81	105.53	1,738.23	40° 24' 26.521 N	104° 31' 10.757 W	1,392,753.29	3,273,001.12
8,176.00	89.78	90.41	6,566.35	104.86	1,834.23	40° 24' 26.504 N	104° 31' 9.516 W	1,392,752.62	3,273,097.11
8,270.00	89.85	90.43	6,566.65	104.17	1,928.23	40° 24' 26.487 N	104° 31' 8.301 W	1,392,751.93	3,273,191.10
8,365.00	88.70	87.63	6,567.86	105.78	2,023.19	40° 24' 26.493 N	104° 31' 7.073 W	1,392,753.54	3,273,286.06
8,460.00	89.14	88.80	6,569.65	108.74	2,118.13	40° 24' 26.512 N	104° 31' 5.846 W	1,392,756.50	3,273,381.00
8,555.00	89.85	88.49	6,570.48	110.99	2,213.10	40° 24' 26.523 N	104° 31' 4.618 W	1,392,758.75	3,273,475.96
8,650.00	89.94	88.36	6,570.66	113.60	2,308.06	40° 24' 26.539 N	104° 31' 3.390 W	1,392,761.36	3,273,570.92
8,745.00	90.19	88.46	6,570.55	116.23	2,403.03	40° 24' 26.554 N	104° 31' 2.162 W	1,392,763.99	3,273,665.88
8,840.00	90.00	88.72	6,570.39	118.57	2,498.00	40° 24' 26.567 N	104° 31' 0.934 W	1,392,766.33	3,273,760.85
8,935.00	90.00	89.02	6,570.39	120.45	2,592.98	40° 24' 26.575 N	104° 30' 59.706 W	1,392,768.20	3,273,855.83
9,029.00	90.12	89.06	6,570.29	122.02	2,686.97	40° 24' 26.580 N	104° 30' 58.491 W	1,392,769.78	3,273,949.81

Design Report for Cockroft B11-62-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
9,124.00	90.15	89.23	6,570.07	123.44	2,781.95	40° 24' 26.584 N	104° 30' 57.263 W	1,392,771.20	3,274,044.79
9,219.00	90.25	89.47	6,569.74	124.52	2,876.95	40° 24' 26.584 N	104° 30' 56.035 W	1,392,772.27	3,274,139.78
9,314.00	90.31	89.52	6,569.27	125.35	2,971.94	40° 24' 26.582 N	104° 30' 54.807 W	1,392,773.11	3,274,234.78
9,409.00	90.15	89.79	6,568.89	125.92	3,066.94	40° 24' 26.577 N	104° 30' 53.579 W	1,392,773.68	3,274,329.77
9,504.00	90.00	90.06	6,568.77	126.05	3,161.94	40° 24' 26.568 N	104° 30' 52.351 W	1,392,773.81	3,274,424.76
9,599.00	90.15	88.84	6,568.64	126.96	3,256.93	40° 24' 26.567 N	104° 30' 51.123 W	1,392,774.72	3,274,519.75
9,694.00	90.06	89.23	6,568.47	128.56	3,351.92	40° 24' 26.572 N	104° 30' 49.895 W	1,392,776.32	3,274,614.74
9,788.00	90.12	89.52	6,568.32	129.59	3,445.91	40° 24' 26.572 N	104° 30' 48.680 W	1,392,777.34	3,274,708.73
9,883.00	90.43	90.29	6,567.87	129.74	3,540.91	40° 24' 26.563 N	104° 30' 47.452 W	1,392,777.50	3,274,803.72
9,978.00	91.33	91.35	6,566.41	128.38	3,635.89	40° 24' 26.539 N	104° 30' 46.224 W	1,392,776.14	3,274,898.70
10,073.00	90.56	90.11	6,564.84	127.17	3,730.87	40° 24' 26.517 N	104° 30' 44.997 W	1,392,774.93	3,274,993.67
10,168.00	90.74	90.57	6,563.76	126.61	3,825.86	40° 24' 26.501 N	104° 30' 43.769 W	1,392,774.37	3,275,088.66
10,263.00	90.25	88.77	6,562.94	127.16	3,920.85	40° 24' 26.496 N	104° 30' 42.541 W	1,392,774.92	3,275,183.64
10,358.00	90.43	88.28	6,562.38	129.60	4,015.81	40° 24' 26.509 N	104° 30' 41.313 W	1,392,777.36	3,275,278.61
10,453.00	89.38	86.83	6,562.54	133.66	4,110.72	40° 24' 26.539 N	104° 30' 40.086 W	1,392,781.41	3,275,373.51
10,548.00	92.32	91.86	6,561.13	134.74	4,205.67	40° 24' 26.539 N	104° 30' 38.858 W	1,392,782.50	3,275,468.45
10,643.00	91.60	89.73	6,557.88	133.43	4,300.60	40° 24' 26.516 N	104° 30' 37.631 W	1,392,781.18	3,275,563.38
10,691.00	90.96	87.74	6,556.80	134.49	4,348.57	40° 24' 26.521 N	104° 30' 37.011 W	1,392,782.24	3,275,611.35
10,754.00	90.96	87.74	6,555.75	136.97	4,411.51	40° 24' 26.539 N	104° 30' 36.197 W	1,392,784.73	3,275,674.29

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
580.00	580.00	0.48	0.00	Tie-On to Surface Gyros @ 580.00ft
718.00	718.00	1.22	-0.10	First MWD Survey @ 718.00ft
10,691.00	6,556.80	134.49	4,348.57	Final MWD Survey @ 10691.00ft
10,754.00	6,555.75	136.97	4,411.51	Straight Line Proj @ 10754' MD, 6555.75' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	Cockroft B11-62-1HN_BHL	88.04	Slot	0.00	0.00	0.00

Design Report for Cockroft B11-62-1HN - Final Surveys

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
303.00	580.00	Surface Gyros	Flexi-Shot
718.00	6,866.00	MWD Surveys - Vert/Build	MWD
6,957.00	10,691.00	MWD Surveys - Lateral	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
6,913.00	6,571.12	7" Casing @ 6913' MD, 6571.12' TVD	7	8-3/4

Design Targets

Shape	Target Name	TVD (')	Northing (')	Easting (')	+N/-S	+E/-W	Created	Updated
-------	-------------	------------	-----------------	----------------	-------	-------	---------	---------

Directional Difficulty Index

Average Dogleg over Survey:	1.51 °/100usft	Maximum Dogleg over Survey:	15.02 °/100usft at 6,673.00 usft
Net Tortousity applicable to Plans:	0.48 °/100usft	Directional Difficulty Index:	6.089

Audit Info

North Reference Sheet for Sec. 11-T5N-R64W (Cockroft B11-62-1HN) - Cockroft B11-62-1HN

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

Vertical Depths are relative to RKB=24 @ 4623.00usft (H&P 315). Northing and Easting are relative to Cockroft B 11-62-1HN

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: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996056

Grid Coordinates of Well: 1,392,647.76 usft N, 3,271,262.95 usft E

Geographical Coordinates of Well: 40° 24' 25.67" N, 104° 31' 33.24" W

Grid Convergence at Surface is: 0.63°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,754.00usft

the Bottom Hole Displacement is 4,413.64usft in the Direction of 88.22° (Grid).

Magnetic Convergence at surface is: -7.81° (18 November 2013, , BGGM2013)

