Noble Energy

Weld County, CO (NAD 83)
Sec. 17-T6N-R63W (Aggie State AA17)
Colt A13-628
05-123-40905
Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

13 April, 2015

Surface UWI : 05-123-40905

Well Coordinates: 1,420,155.53 N, 3,286,845.39 E (40° 28' 55.74" N, 104° 28' 07.68" W)
Ground Level: 4,665.00 usft

Local Coordinate Origin:	Centered on Well Colt A13-628
Viewing Datum:	KB = 24' @ 4689.00usft (H&P 273)
TVDs to System:	N
North Reference:	Grid
Unit System:	Dec-Deg - API - US Survey Feet - Custom

Geodetic Scale Factor Applied
Version: 5000.1 Build: 73

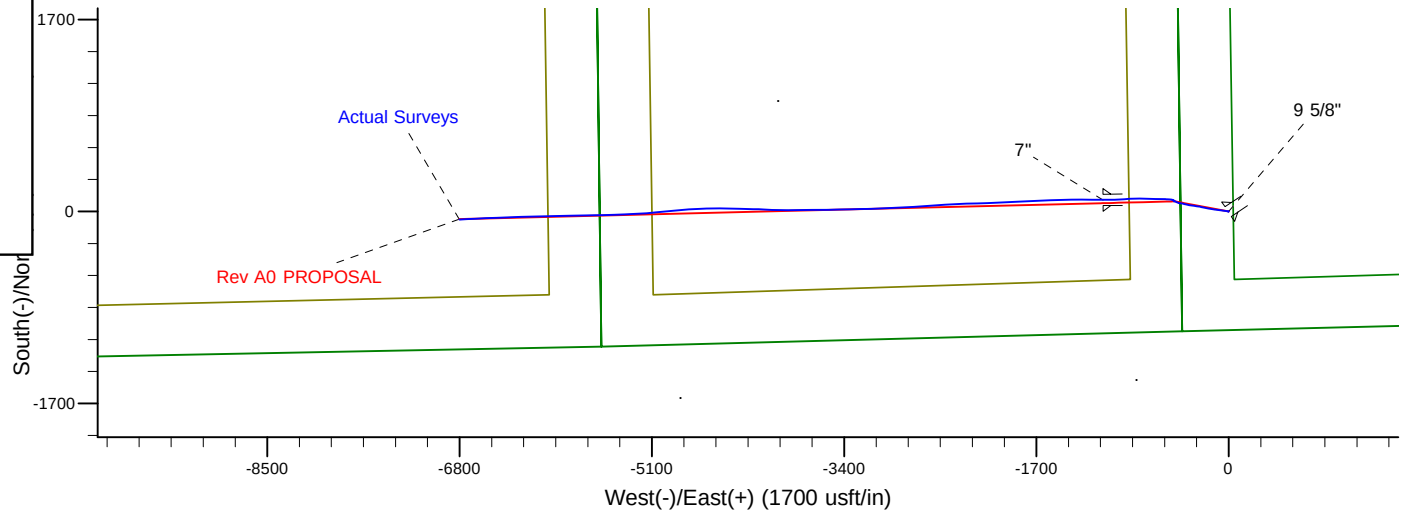
HALLIBURTON

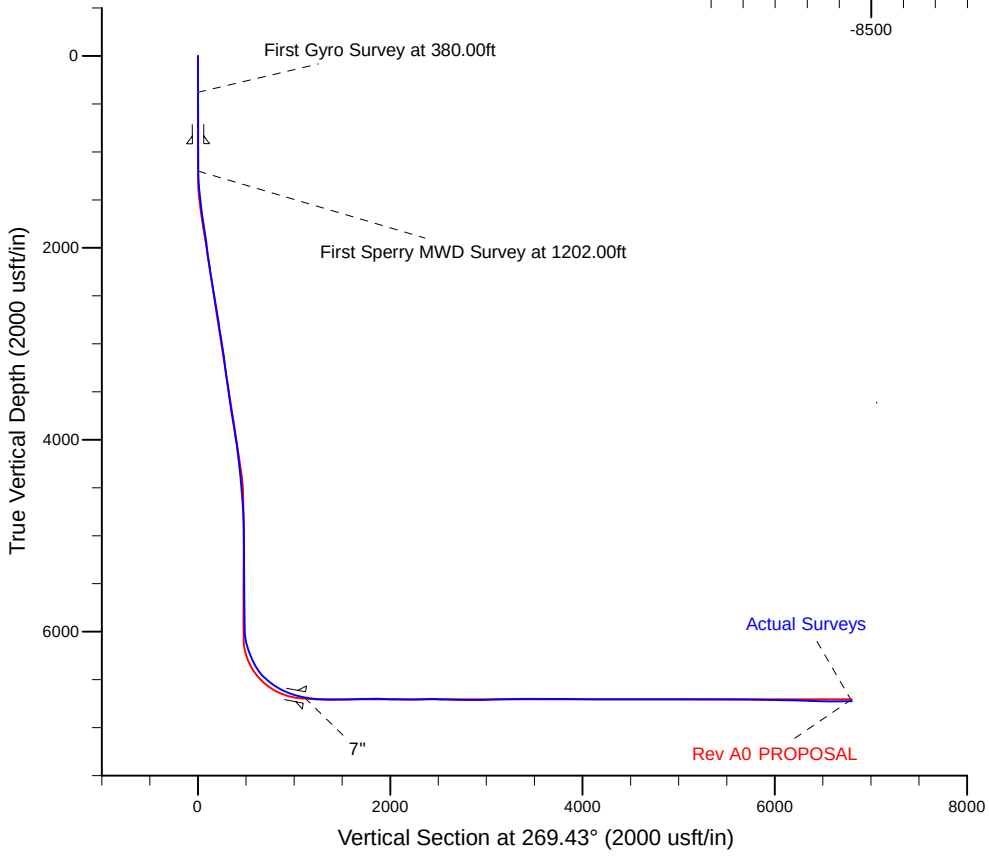
Project: Weld County, CO (NAD 83)
Site: Sec. 17-T6N-R63W (Aggie State AA17)
Well: Colt A13-628
Wellbore: Plan A
Design: Actual Surveys

noble energy

HALLIBURTON
Sperry Drilling

Platted SHL:	1052' FSL, 424' FWL
Platted Lat/Long:	40.482150 N, 104.4688 W
Location:	Sec. 17-T6N-R63W
~7" Casing:	1183' FSL, 669' FEL
Lat/Long:	40.482467 N,104.472783 W
State Planes - CO Northern:	1,420,258.14 N, 3,285,736.24 E
	Sec. 18-T6N-R63W
Platted BHL:	1155' FSL, 1240' FEL
Platted Lat/Long:	40.482177 N,104.493015 W
State Planes - CO Northern:	1,420,087.91 N, 3,280,109.72 E
Location:	Sec. 13-T6N-R63W





LEGEND

Colt A13-628, Plan A, Rev A0 PROPOSAL V0
Actual Surveys

WELL DETAILS: Colt A13-628

Ground Level: 4665.00
KB = 24' @ 4689.00usft (H&P 273)

Created By: Tatiana Gomez
Created On: 4/13/2015

Design Report for Colt A13-628 - Actual 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
380.00	0.40	288.93	380.00	0.43	-1.25	1.25	0.11
First Gyro Survey at 380.00ft							
650.00	0.20	202.53	649.99	0.30	-2.33	2.32	0.16
918.00	0.59	236.55	917.99	-0.89	-3.66	3.66	0.16
9 5/8"							
925.00	0.60	236.83	924.99	-0.93	-3.72	3.72	0.16
Tie on to Gyro Surveys at 925.00ft							
1,202.00	0.44	29.43	1,201.98	-0.80	-4.41	4.42	0.37
First Sperry MWD Survey at 1202.00ft							
1,295.00	3.47	294.49	1,294.93	0.68	-6.79	6.79	3.80
1,387.00	5.28	282.73	1,386.66	2.77	-13.46	13.43	2.19
1,572.00	6.83	273.87	1,570.62	5.39	-32.74	32.68	0.98
1,665.00	8.46	278.68	1,662.79	6.79	-45.02	44.95	1.88
1,849.00	9.10	279.25	1,844.64	11.17	-72.76	72.65	0.35
1,941.00	8.48	278.87	1,935.55	13.39	-86.64	86.51	0.68
2,219.00	6.90	272.95	2,211.05	17.41	-123.57	123.40	0.64
2,311.00	9.57	274.88	2,302.09	18.34	-136.72	136.53	2.92
2,403.00	10.36	286.16	2,392.71	21.30	-152.28	152.07	2.28
2,496.00	9.94	283.06	2,484.26	25.44	-168.13	167.87	0.74
2,588.00	9.50	279.44	2,574.94	28.48	-183.36	183.07	0.82
2,680.00	8.94	277.51	2,665.75	30.66	-197.94	197.62	0.70
2,772.00	8.51	277.35	2,756.69	32.46	-211.77	211.44	0.47
2,863.00	9.87	284.09	2,846.52	35.22	-226.02	225.66	1.90
2,956.00	9.23	282.81	2,938.23	38.82	-241.02	240.63	0.73
3,051.00	8.85	282.21	3,032.05	42.05	-255.59	255.17	0.41
3,240.00	7.00	277.62	3,219.24	46.65	-281.22	280.75	1.03
3,335.00	8.12	280.21	3,313.41	48.61	-293.56	293.07	1.23
3,430.00	7.00	274.14	3,407.58	50.22	-305.94	305.43	1.45
3,525.00	8.74	276.98	3,501.69	51.51	-318.88	318.35	1.88
3,620.00	8.88	276.45	3,595.57	53.21	-333.33	332.79	0.17
3,810.00	9.14	285.70	3,783.23	58.95	-362.43	361.83	0.77
3,905.00	9.56	285.51	3,876.97	63.10	-377.29	376.65	0.44
3,999.00	8.81	283.26	3,969.76	66.84	-391.82	391.14	0.88
4,094.00	8.28	281.37	4,063.71	69.85	-405.61	404.90	0.63
4,190.00	7.67	278.86	4,158.78	72.20	-418.72	417.98	0.73
4,284.00	6.54	279.44	4,252.06	74.05	-430.20	429.44	1.20
4,379.00	5.84	278.10	4,346.50	75.62	-440.32	439.55	0.75
4,474.00	5.54	293.78	4,441.04	78.15	-449.30	448.51	1.66
4,569.00	4.94	292.70	4,535.64	81.57	-457.27	456.44	0.64
4,664.00	4.00	300.98	4,630.35	84.86	-463.88	463.02	1.20
4,759.00	3.93	300.48	4,725.13	88.21	-469.53	468.64	0.08
4,854.00	4.04	298.24	4,819.90	91.45	-475.28	474.36	0.20
4,949.00	1.55	231.76	4,914.79	92.24	-479.24	478.31	3.90
5,044.00	0.22	227.00	5,009.78	91.32	-480.39	479.46	1.40
5,233.00	0.65	243.29	5,198.77	90.59	-481.61	480.69	0.23
5,327.00	0.18	253.15	5,292.77	90.31	-482.23	481.31	0.50
5,516.00	0.81	319.94	5,481.76	91.24	-483.37	482.45	0.40
5,610.00	0.82	339.01	5,575.75	92.38	-484.04	483.10	0.29
5,705.00	0.83	324.66	5,670.75	93.57	-484.68	483.73	0.22

Design Report for Colt A13-628 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,800.00	0.87	343.00	5,765.73	94.83	-485.29	484.33	0.29
5,894.00	0.93	334.31	5,859.72	96.20	-485.83	484.85	0.16
5,989.00	1.94	341.83	5,954.69	98.42	-486.66	485.67	1.08
6,084.00	7.02	287.39	6,049.40	101.68	-492.71	491.68	6.42
6,179.00	16.43	279.32	6,142.32	105.60	-511.55	510.48	10.03
6,273.00	20.88	274.00	6,231.36	108.93	-541.40	540.30	5.06
6,368.00	25.84	271.11	6,318.55	110.51	-579.01	577.89	5.36
6,463.00	33.92	270.88	6,400.85	111.32	-626.29	625.16	8.51
6,558.00	45.68	271.38	6,473.71	112.55	-686.98	685.84	12.38
6,652.00	52.78	271.38	6,535.06	114.26	-758.11	756.94	7.55
6,747.00	60.60	267.82	6,587.20	113.60	-837.41	836.25	8.81
6,842.00	66.61	266.04	6,629.42	109.01	-922.34	921.22	6.54
6,936.00	72.05	267.89	6,662.59	104.38	-1,010.13	1,009.05	6.07
6,990.00	77.20	269.18	6,676.90	103.06	-1,062.16	1,061.09	9.81
7,038.00	79.73	269.73	6,686.50	102.61	-1,109.19	1,108.12	5.39
7"							
7,139.00	85.06	270.86	6,699.86	103.13	-1,209.26	1,208.18	5.39
7,231.00	87.84	271.01	6,705.56	104.63	-1,301.06	1,299.97	3.03
7,323.00	88.77	269.14	6,708.28	104.75	-1,393.02	1,391.91	2.27
7,415.00	90.99	268.41	6,708.47	102.78	-1,484.99	1,483.90	2.54
7,508.00	91.94	268.22	6,706.09	100.05	-1,577.92	1,576.85	1.04
7,600.00	91.33	267.49	6,703.47	96.61	-1,669.82	1,668.78	1.03
7,693.00	88.64	266.48	6,703.49	91.72	-1,762.68	1,761.68	3.09
7,785.00	90.74	267.52	6,703.99	86.90	-1,854.54	1,853.59	2.55
7,877.00	89.54	267.50	6,703.76	82.91	-1,946.45	1,945.54	1.30
7,970.00	88.52	267.40	6,705.34	78.77	-2,039.35	2,038.47	1.10
8,062.00	88.74	267.66	6,707.54	74.80	-2,131.24	2,130.39	0.37
8,154.00	89.51	267.81	6,708.94	71.17	-2,223.15	2,222.34	0.85
8,246.00	92.77	269.19	6,707.11	68.76	-2,315.09	2,314.30	3.85
8,337.00	91.29	268.06	6,703.89	66.58	-2,406.00	2,405.23	2.05
8,430.00	88.12	266.37	6,704.37	62.06	-2,498.87	2,498.14	3.86
8,525.00	87.63	265.71	6,707.89	55.50	-2,593.58	2,592.91	0.86
8,620.00	88.55	264.91	6,711.06	47.74	-2,688.21	2,687.61	1.28
8,714.00	88.86	266.70	6,713.18	40.87	-2,781.93	2,781.39	1.93
8,809.00	90.34	267.55	6,713.84	36.10	-2,876.80	2,876.31	1.80
8,904.00	91.82	267.20	6,712.05	31.75	-2,971.69	2,971.23	1.60
8,999.00	91.08	268.04	6,709.65	27.81	-3,066.57	3,066.15	1.18
9,093.00	92.28	267.87	6,706.89	24.46	-3,160.47	3,160.07	1.29
9,188.00	91.29	268.95	6,703.94	21.82	-3,255.38	3,255.01	1.54
9,284.00	91.11	268.29	6,701.92	19.51	-3,351.33	3,350.98	0.71
9,378.00	90.28	269.25	6,700.78	17.49	-3,445.30	3,444.96	1.35
9,473.00	89.66	269.12	6,700.83	16.14	-3,540.29	3,539.96	0.67
9,568.00	89.60	269.27	6,701.45	14.81	-3,635.28	3,634.96	0.17
9,663.00	89.41	268.92	6,702.27	13.31	-3,730.27	3,729.95	0.42
9,757.00	89.51	269.49	6,703.15	12.00	-3,824.25	3,823.95	0.62
9,948.00	89.63	271.60	6,704.59	13.82	-4,015.23	4,014.90	1.11
10,042.00	89.60	272.95	6,705.22	17.55	-4,109.15	4,108.78	1.44
10,137.00	89.75	271.53	6,705.76	21.26	-4,204.07	4,203.66	1.50
10,232.00	90.00	270.86	6,705.97	23.24	-4,299.05	4,298.61	0.75
10,327.00	89.97	271.96	6,705.99	25.58	-4,394.02	4,393.55	1.16
10,422.00	90.31	269.82	6,705.76	27.06	-4,489.00	4,488.52	2.28

Design Report for Colt A13-628 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,517.00	90.09	268.47	6,705.43	25.64	-4,583.99	4,583.51	1.44
10,612.00	90.06	269.31	6,705.30	23.80	-4,678.97	4,678.51	0.88
10,706.00	89.66	265.07	6,705.53	19.19	-4,772.84	4,772.41	4.53
10,800.00	89.78	264.81	6,705.99	10.90	-4,866.47	4,866.12	0.30
10,895.00	89.78	264.72	6,706.36	2.23	-4,961.07	4,960.81	0.09
10,989.00	89.29	263.82	6,707.12	-7.15	-5,054.60	5,054.42	1.09
11,084.00	89.72	266.77	6,707.94	-14.94	-5,149.26	5,149.16	3.14
11,179.00	90.92	267.10	6,707.41	-20.02	-5,244.13	5,244.07	1.31
11,273.00	91.66	266.87	6,705.29	-24.96	-5,337.97	5,337.96	0.82
11,368.00	89.85	268.39	6,704.04	-28.89	-5,432.87	5,432.89	2.49
11,462.00	88.83	268.16	6,705.12	-31.72	-5,526.82	5,526.87	1.11
11,557.00	90.34	269.13	6,705.81	-33.97	-5,621.79	5,621.85	1.89
11,652.00	88.80	269.34	6,706.53	-35.24	-5,716.78	5,716.85	1.64
11,746.00	88.15	268.97	6,709.03	-36.62	-5,810.73	5,810.81	0.80
11,841.00	88.52	268.79	6,711.79	-38.48	-5,905.67	5,905.77	0.43
11,936.00	89.48	268.55	6,713.45	-40.68	-6,000.63	6,000.74	1.04
12,030.00	88.37	268.52	6,715.21	-43.08	-6,094.58	6,094.71	1.18
12,125.00	88.09	268.19	6,718.14	-45.81	-6,189.50	6,189.65	0.46
12,220.00	88.12	268.25	6,721.28	-48.76	-6,284.40	6,284.58	0.07
12,314.00	88.80	267.91	6,723.81	-51.91	-6,378.31	6,378.52	0.81
12,409.00	88.68	267.43	6,725.90	-55.77	-6,473.21	6,473.45	0.52
12,504.00	89.38	267.25	6,727.51	-60.18	-6,568.10	6,568.37	0.76
12,599.00	91.11	267.66	6,727.10	-64.40	-6,663.00	6,663.31	1.87
12,672.00	91.33	267.26	6,725.55	-67.63	-6,735.91	6,736.25	0.63
Final Sperry MWD Survey at 12672.00ft							
12,737.00	91.33	267.26	6,724.04	-70.74	-6,800.82	6,801.18	0.00
Straight Line Projection to TD at 12737.00ft - Colt A13-628_BHL							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
380.00	380.00	0.43	-1.25	First Gyro Survey at 380.00ft
925.00	924.99	-0.93	-3.72	Tie on to Gyro Surveys at 925.00ft
1,202.00	1,201.98	-0.80	-4.41	First Sperry MWD Survey at 1202.00ft
12,672.00	6,725.55	-67.63	-6,735.91	Final Sperry MWD Survey at 12672.00ft
12,737.00	6,724.04	-70.74	-6,800.82	Straight Line Projection to TD at 12737.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Colt A13-628_BHL	269.43	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
380.00	650.00	Surface Surveys	Flexi-Shot
925.00	6,990.00	Intermediate Survey	MWD+IFR1+MS_WY
7,139.00	12,737.00	Production Surveys	MWD+IFR1+MS_WY

Design Report for Colt A13-628 - Actual Surveys

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
918.00	917.99	9 5/8"	9-5/8	13-3/4
7,038.00	6,686.50	7"	7	8-3/4

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
Colt A13-628_SHL	0.00	0.00	0.00	0.01	0.00	1,420,155.54	3,286,845.39	40.482150	-104.468800
- actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Colt A13-628_BHL	0.00	0.00	6,705.00	-67.22	-6,801.24	1,420,088.32	3,280,044.39	40.482180	-104.493250
- actual wellpath misses target center by 19.37usft at 12737.00usft MD (6724.04 TVD, -70.74 N, -6800.82 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.67 °/100usft	Maximum Dogleg over Survey:	12.38 °/100usft at 6,558.00 usft
Net Tortousity applicable to Plans:	0.82 °/100usft	Directional Difficulty Index:	6.440

Audit Info

North Reference Sheet for Sec. 17-T6N-R63W (Aggie State AA17) - Colt A13-628 - Plan A

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' @ 4689.00usft (H&P 273). Northing and Easting are relative to Colt A 13-628

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: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99996498

Grid Coordinates of Well: 1,420,155.53 usft N, 3,286,845.39 usft E

Geographical Coordinates of Well: 40° 28' 55.74" N, 104° 28' 07.68" W

Grid Convergence at Surface is: 0.67°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,737.00usft

the Bottom Hole Displacement is 6,801.19usft in the Direction of 269.40° (Grid).

Magnetic Convergence at surface is: -7.66° (26 January 2015, , BGGM2014)