

Noble Energy

Weld County, CO (NAD 83)

Sec. 34-T9N-R59W (FAITH, ANN LC34, REMORA)

Ann LC34-765

05-123-40639

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

06 January, 2016

Surface UWI : 05-123-40639

Well Coordinates: 1,505,885.59 N, 3,424,829.00 E (40° 42' 43.09" N, 103° 58' 03.04" W)

Ground Level: 4,827.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 73

Centered on Well Ann LC34-765

KB = 24' @ 4851.00usft (H&P 273)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

HALLIBURTON

Project: Weld County, CO (NAD 83)
 Site: Sec. 34-T9N-R59W (FAITH, ANN LC34, REMORA)
 Well: Ann LC34-765
 Wellbore: Plan A
 Design: Actual Surveys



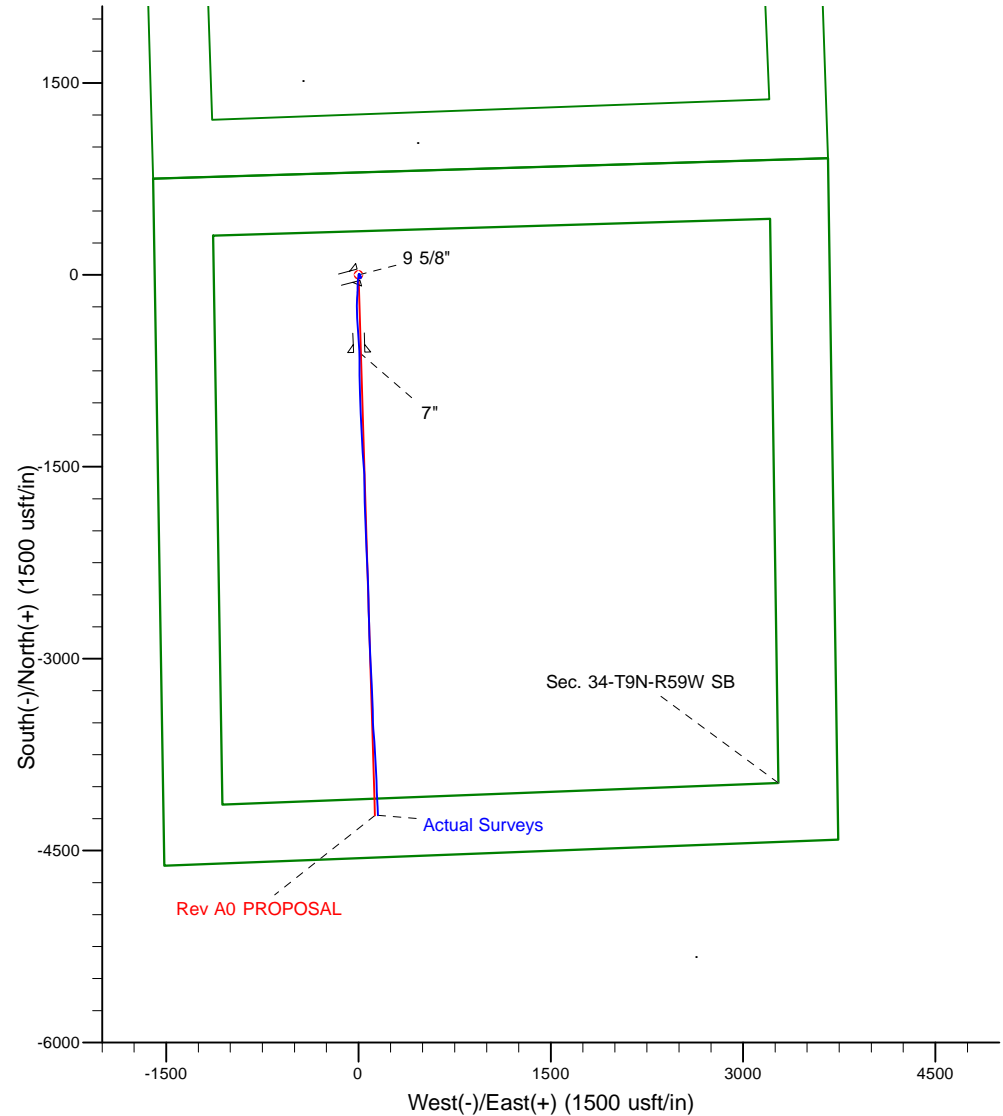
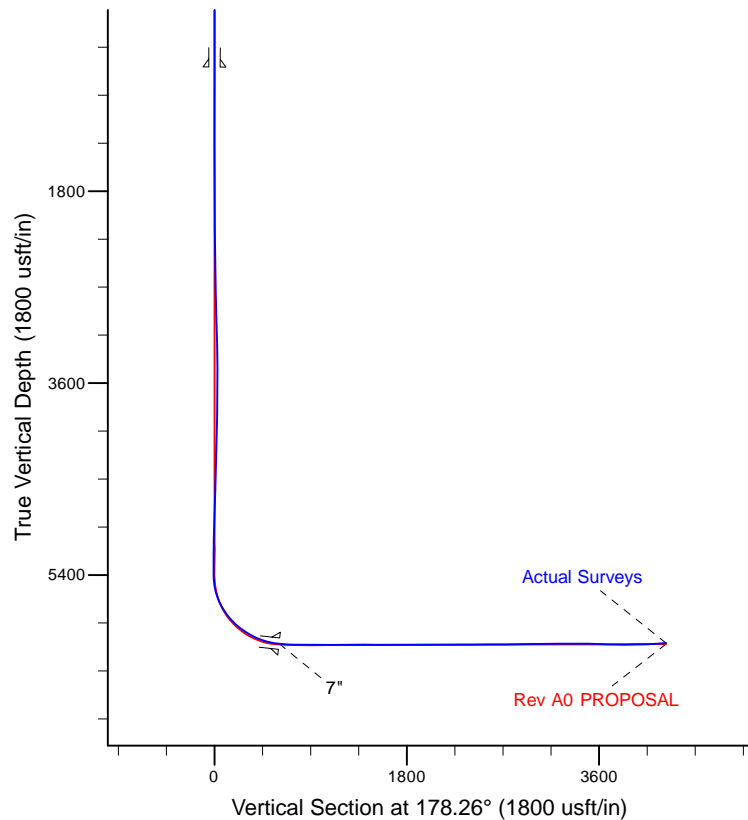
Platted SHL: 810' FNL, 1590' FWL
 Platted Lat/Long: 40.71197, -103.96751
 Location: Sec. 34-T9N-R59W

~7" Casing: 1398' FNL, 1575' FWL
 Lat/Long: 40.710310 N, -103.967527 W
 State Planes - CO Northern: 1,505,280.79 N, 3,424,834.95 E
 Location: Sec. 34-T9N-R59W

Platted BHL: 330' FSL, 1650' FWL
 Platted Lat/Long: 40.700556 N, -103.967233 W
 State Planes - CO Northern: 1,501,728.94 N, 3,424,977.74 E
 Location: Sec. 34-T9N-R59W

LEGEND

- ◇ Ann LC34-765, Plan A, Rev A0 PROPOSAL V0
- Actual Surveys



WELL DETAILS: Ann LC34-765	
Ground Level:	4827.00
KB = 24' @ 4851.00usft (H&P 273)	
Created By:	Tatiana Gomez
Created On:	1-6-2016

Design Report for Ann LC34-765 - 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
250.00	0.09	75.23	250.00	0.05	0.19	-0.04	0.04
First Sperry MWD Survey at 250.00ft							
500.00	0.17	75.23	500.00	0.19	0.74	-0.17	0.03
635.00	0.22	75.23	635.00	0.31	1.18	-0.27	0.03
9 5/8"							
645.00	0.22	75.23	645.00	0.32	1.22	-0.28	0.03
725.00	0.25	75.23	725.00	0.40	1.53	-0.36	0.04
914.00	0.43	70.01	913.99	0.75	2.60	-0.67	0.10
1,009.00	0.44	69.11	1,008.99	1.00	3.27	-0.90	0.01
1,287.00	0.48	100.08	1,286.98	1.18	5.42	-1.02	0.09
1,469.00	0.17	78.29	1,468.98	1.10	6.43	-0.91	0.18
1,744.00	0.25	129.94	1,743.98	0.80	7.29	-0.58	0.07
1,836.00	0.43	136.81	1,835.98	0.42	7.68	-0.19	0.20
1,927.00	0.44	160.45	1,926.97	-0.16	8.03	0.40	0.20
2,019.00	0.31	141.98	2,018.97	-0.69	8.30	0.94	0.19
2,110.00	0.43	176.24	2,109.97	-1.22	8.48	1.48	0.27
2,201.00	0.79	165.47	2,200.97	-2.17	8.66	2.43	0.41
2,293.00	0.79	179.31	2,292.96	-3.42	8.82	3.69	0.21
2,384.00	0.99	182.88	2,383.95	-4.83	8.79	5.10	0.23
2,476.00	1.10	184.24	2,475.93	-6.51	8.69	6.77	0.12
2,568.00	1.09	175.54	2,567.91	-8.26	8.69	8.52	0.18
2,660.00	1.03	187.02	2,659.90	-9.95	8.66	10.21	0.24
2,846.00	1.29	180.82	2,845.86	-13.70	8.42	13.95	0.16
2,940.00	1.41	180.10	2,939.83	-15.92	8.41	16.17	0.13
3,035.00	1.38	177.95	3,034.81	-18.23	8.44	18.48	0.06
3,129.00	1.35	181.95	3,128.78	-20.47	8.45	20.72	0.11
3,224.00	1.20	170.17	3,223.76	-22.57	8.58	22.82	0.32
3,319.00	0.97	100.39	3,318.74	-23.69	9.54	23.97	1.32
3,508.00	0.76	108.60	3,507.72	-24.38	12.30	24.74	0.13
3,603.00	0.86	106.67	3,602.71	-24.79	13.58	25.19	0.11
3,698.00	0.81	106.13	3,697.70	-25.18	14.91	25.62	0.05
3,792.00	0.82	103.28	3,791.69	-25.52	16.20	26.00	0.04
3,887.00	1.13	355.58	3,886.68	-24.74	16.79	25.24	1.67
3,981.00	1.15	12.54	3,980.66	-22.89	16.93	23.40	0.36
4,076.00	1.45	17.78	4,075.64	-20.82	17.50	21.34	0.34
4,171.00	1.43	31.76	4,170.61	-18.67	18.49	19.22	0.37
4,265.00	1.60	30.69	4,264.58	-16.54	19.78	17.13	0.18
4,360.00	2.21	320.89	4,359.54	-13.98	19.30	14.56	2.35
4,455.00	2.14	327.33	4,454.47	-11.06	17.19	11.58	0.27
4,550.00	2.20	330.06	4,549.40	-7.99	15.32	8.45	0.13
4,644.00	2.15	332.82	4,643.33	-4.86	13.61	5.27	0.12
4,739.00	2.05	336.97	4,738.27	-1.71	12.13	2.08	0.19
4,833.00	1.98	332.44	4,832.21	1.28	10.73	-0.95	0.19
4,928.00	1.95	324.76	4,927.15	4.05	9.03	-3.78	0.28
5,022.00	2.01	333.49	5,021.10	6.83	7.37	-6.61	0.33
5,118.00	0.68	272.89	5,117.07	8.37	6.05	-8.18	1.85
5,211.00	0.50	288.67	5,210.07	8.53	5.12	-8.37	0.26
5,306.00	0.37	268.47	5,305.07	8.65	4.42	-8.51	0.21
5,401.00	0.25	247.98	5,400.06	8.56	3.92	-8.44	0.17

Design Report for Ann LC34-765 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,496.00	8.35	189.16	5,494.72	1.67	2.63	-1.58	8.66
5,590.00	17.99	189.52	5,586.14	-19.44	-0.87	19.40	10.26
5,685.00	26.92	184.36	5,673.86	-55.43	-4.94	55.25	9.62
5,779.00	35.15	181.55	5,754.34	-103.78	-7.29	103.51	8.89
5,874.00	42.83	183.09	5,828.12	-163.45	-9.78	163.08	8.15
5,968.00	51.95	181.62	5,891.70	-232.50	-12.55	232.01	9.77
6,063.00	58.46	176.63	5,945.90	-310.42	-11.23	309.94	8.09
6,158.00	65.71	176.03	5,990.35	-394.14	-5.84	393.78	7.65
6,252.00	74.25	176.39	6,022.50	-482.18	-0.02	481.96	9.09
6,332.00	81.44	177.35	6,039.33	-560.22	4.24	560.09	9.06
6,377.00	83.66	178.26	6,045.17	-604.81	5.95	604.71	5.33
7"							
6,449.00	87.22	179.71	6,050.89	-676.55	7.22	676.46	5.33
6,512.00	88.00	179.49	6,053.52	-739.50	7.65	739.39	1.29
6,605.00	89.14	178.32	6,055.84	-832.45	9.43	832.35	1.76
6,700.00	90.65	178.66	6,056.01	-927.41	11.94	927.35	1.63
6,794.00	90.22	178.05	6,055.30	-1,021.37	14.63	1,021.34	0.79
6,889.00	89.82	177.24	6,055.26	-1,116.29	18.54	1,116.34	0.95
6,983.00	89.75	176.97	6,055.62	-1,210.17	23.28	1,210.32	0.30
7,077.00	89.85	177.06	6,055.95	-1,304.04	28.18	1,304.29	0.14
7,170.00	90.00	176.64	6,056.07	-1,396.90	33.29	1,397.26	0.48
7,265.00	89.41	175.01	6,056.56	-1,491.64	40.21	1,492.17	1.82
7,359.00	90.15	178.29	6,056.92	-1,585.47	45.70	1,586.12	3.58
7,454.00	89.82	178.53	6,056.94	-1,680.43	48.33	1,681.12	0.43
7,548.00	90.12	178.85	6,056.99	-1,774.40	50.48	1,775.12	0.47
7,737.00	91.57	178.55	6,054.20	-1,963.33	54.77	1,964.09	0.78
7,832.00	90.18	177.43	6,052.75	-2,058.26	58.10	2,059.07	1.88
7,927.00	90.00	176.99	6,052.60	-2,153.14	62.73	2,154.06	0.50
8,021.00	89.88	176.51	6,052.70	-2,246.99	68.05	2,248.02	0.53
8,116.00	89.88	178.03	6,052.90	-2,341.88	72.58	2,343.01	1.60
8,211.00	90.37	178.60	6,052.69	-2,436.84	75.37	2,438.00	0.79
8,306.00	90.25	178.48	6,052.18	-2,531.81	77.79	2,533.00	0.18
8,400.00	90.28	178.76	6,051.75	-2,625.78	80.06	2,627.00	0.30
8,494.00	90.71	178.83	6,050.93	-2,719.75	82.03	2,720.99	0.46
8,589.00	90.74	177.93	6,049.73	-2,814.71	84.72	2,815.98	0.95
8,684.00	90.18	177.12	6,048.97	-2,909.61	88.82	2,910.97	1.04
8,778.00	90.52	177.09	6,048.39	-3,003.49	93.57	3,004.95	0.36
8,873.00	90.93	177.04	6,047.19	-3,098.36	98.43	3,099.92	0.43
8,968.00	91.51	177.68	6,045.17	-3,193.24	102.81	3,194.89	0.91
9,062.00	89.63	177.93	6,044.23	-3,287.16	106.41	3,288.87	2.02
9,157.00	89.97	178.32	6,044.57	-3,382.11	109.52	3,383.87	0.54
9,252.00	89.72	178.05	6,044.82	-3,477.06	112.52	3,478.87	0.39
9,346.00	87.75	175.51	6,046.90	-3,570.88	117.80	3,572.81	3.42
9,441.00	88.61	176.90	6,049.92	-3,665.62	124.09	3,667.69	1.72
9,536.00	88.37	175.70	6,052.42	-3,760.38	130.21	3,762.60	1.29
9,631.00	90.25	177.71	6,053.56	-3,855.21	135.67	3,857.55	2.90
9,726.00	91.23	177.96	6,052.34	-3,950.13	139.26	3,952.54	1.06
9,820.00	92.34	177.43	6,049.41	-4,044.01	143.04	4,046.49	1.31
9,914.00	93.58	176.87	6,044.55	-4,137.77	147.71	4,140.34	1.45
9,933.00	93.76	176.87	6,043.34	-4,156.70	148.74	4,159.30	0.95
Final Sperry MWD Survey at 9933.00ft							

Design Report for Ann LC34-765 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,000.00	93.76	176.87	6,038.94	-4,223.46	152.39	4,226.14	0.00
Straight Line Projection to TD at 10000.00ft							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
250.00	250.00	0.05	0.19	First Sperry MWD Survey at 250.00ft
9,933.00	6,043.34	-4,156.70	148.74	Final Sperry MWD Survey at 9933.00ft
10,000.00	6,038.94	-4,223.46	152.39	Straight Line Projection to TD at 10000.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Ann LC34-765_Rev A0_BHL	178.26	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
250.00	6,332.00	Intermediate Sperry MWD Surveys	MWD
6,449.00	10,000.00	Production Sperry MWD Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
635.00	635.00	9 5/8"	9-5/8	13-3/4
6,377.00	6,045.17	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
Ann LC34-765_Rev A(0.00	0.00	0.00	0.01	0.00	1,505,885.60	3,424,829.00	40.711970	-103.967510
- actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Ann LC34-765_Rev A(0.00	0.00	6,048.00	-4,224.64	128.48	1,501,661.00	3,424,957.48	40.700370	-103.967310
- actual wellpath misses target center by 25.59usft at 9999.28usft MD (6038.99 TVD, -4222.74 N, 152.35 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.43 °/100usft	Maximum Dogleg over Survey:	10.26 °/100usft at 5,590.00 usft
Net Tortousity applicable to Plans:	0.52 °/100usft	Directional Difficulty Index:	6.007

Audit Info

North Reference Sheet for Sec. 34-T9N-R59W (FAITH, ANN LC34, REMORA) - Ann LC34-765 - 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' @ 4851.00usft (H&P 273). Northing and Easting are relative to Ann LC34-765

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: 0.99998920

Grid Coordinates of Well: 1,505,885.59 usft N, 3,424,829.00 usft E

Geographical Coordinates of Well: 40° 42' 43.09" N, 103° 58' 03.04" W

Grid Convergence at Surface is: 0.99°

Based upon Minimum Curvature type calculations, at a Measured Depth of 10,000.00usft the Bottom Hole Displacement is 4,226.20usft in the Direction of 177.93° (Grid).

Magnetic Convergence at surface is: -7.06° (9 December 2015, , BGGM2015)

