

Noble Energy

Weld County, CO (NAD 83)

Sec. 34-T9N-R59W

Haley LC27-715

Original Wellbore

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

14 September, 2015

Well Coordinates: 1,506,117.92 N, 3,427,719.66 E (40° 42' 44.89" N, 103° 57' 25.45" W)

Ground Level: 4,814.00 usft

Local Coordinate Origin:

Centered on Well Haley LC27-715

Viewing Datum:

KB @ 4838.00usft (HP 343)

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. 34-T9N-R59W
Well: Haley LC27-715
Wellbore: Original Wellbore
Design: Actual Surveys

Noble Energy

HALLIBURTON
Sperry Drilling

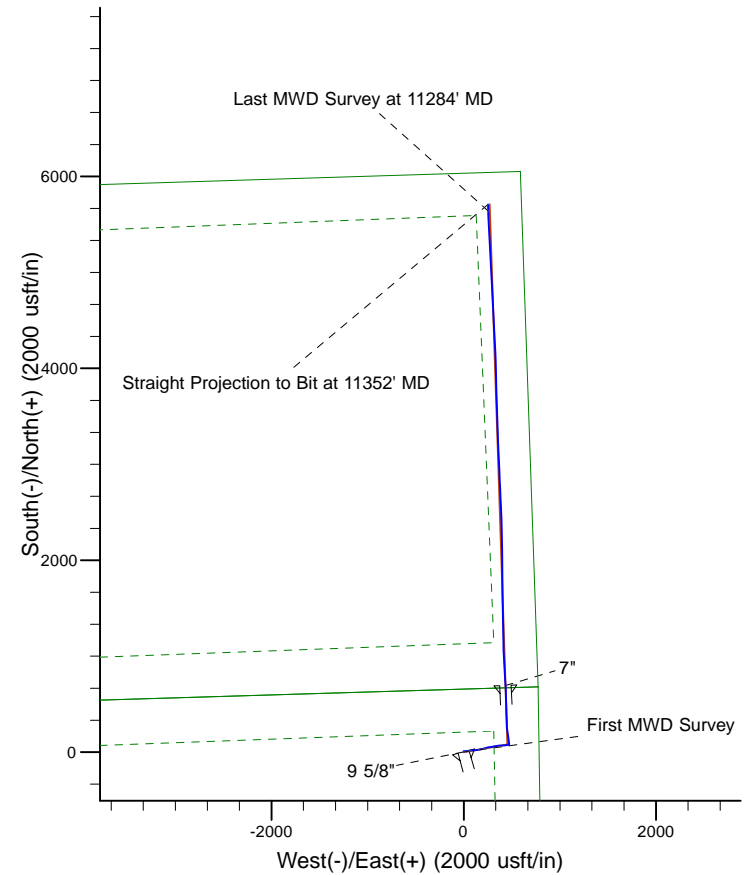
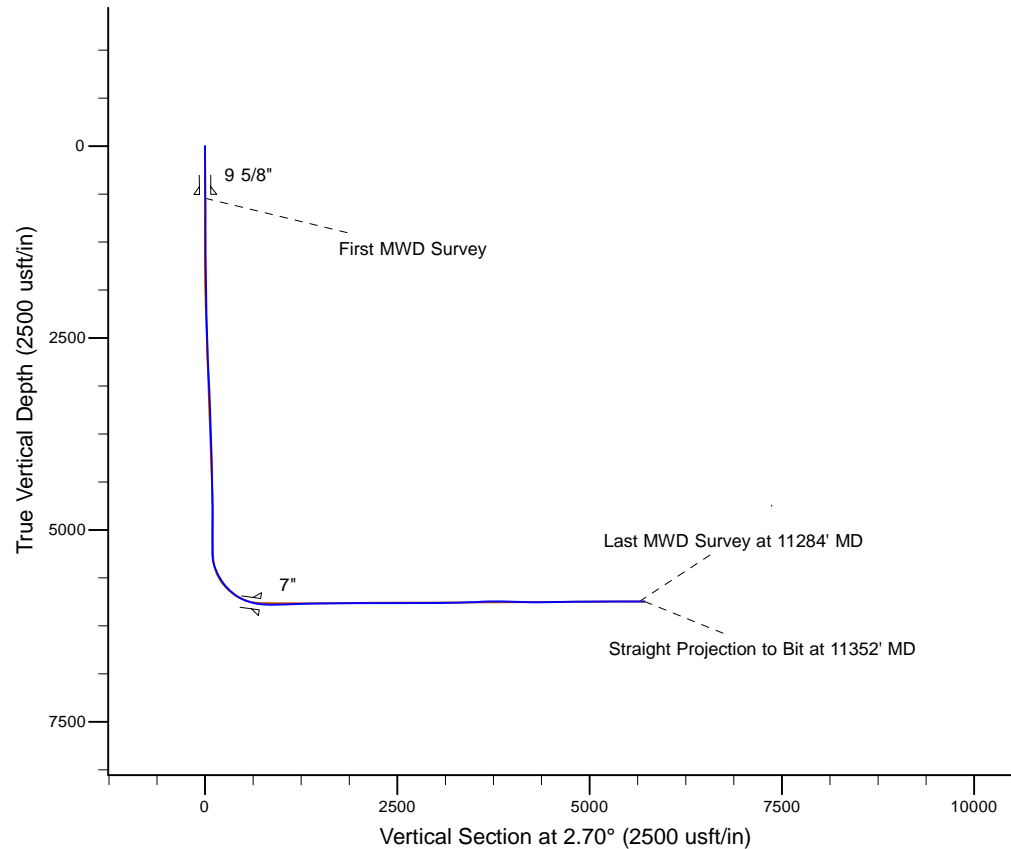
Platted SHL: 660' FNL, 785' FEL
Platted Lat/Long: 40.712470 N, 103.957070 W
Location: Sec. 34-T9N-R59W

~7" Casing: 9' FNL, 334 FEL
Lat/Long: 40.714353 N, 103.955460 W
State Planes - CO Northern: 1506811.78 N, 3428153.97 E
Location: Sec. 34-T9N-R59W

Platted BHL: 330' FNL, 330' FEL
Lat/Long: 40.728130 N, 103.955740 W
State Planes - CO Northern: 1511828.85 N, 3427988.97 E
Location: Sec. 27-T9N-R59W

LEGEND

- △ Haley LC27-715, Original Wellbore, Rev B0 V0
- Actual Surveys



WELL DETAILS: Haley LC27-715	
Ground Level:	4814.00
KB @ 4838.00usft (HP 343)	
Created By:	Amanda Marchand
Created On:	5/13/2015

Design Report for Haley LC27-715 - 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
632.00	0.53	344.60	631.99	2.81	-0.77	2.77	0.08
9 5/8"							
682.00	0.57	344.60	681.99	3.27	-0.90	3.22	0.08
First MWD Survey							
745.00	0.54	332.66	744.99	3.84	-1.12	3.78	0.19
841.00	0.26	320.63	840.98	4.41	-1.47	4.33	0.30
1,030.00	0.56	16.94	1,029.98	5.62	-1.47	5.55	0.25
1,123.00	0.53	51.49	1,122.98	6.32	-1.00	6.27	0.35
1,215.00	0.44	51.33	1,214.97	6.81	-0.39	6.78	0.10
1,399.00	0.53	43.41	1,398.97	7.87	0.74	7.90	0.06
1,491.00	0.24	356.38	1,490.96	8.37	1.03	8.41	0.44
1,584.00	0.78	326.97	1,583.96	9.10	0.67	9.12	0.63
1,676.00	1.35	69.45	1,675.95	10.00	1.34	10.05	1.85
1,770.00	4.58	93.11	1,769.81	10.19	6.13	10.46	3.60
1,862.00	6.26	91.61	1,861.40	9.85	14.81	10.53	1.83
1,955.00	7.07	87.32	1,953.77	9.97	25.59	11.17	1.02
2,047.00	8.61	77.25	2,044.91	11.76	37.97	13.53	2.24
2,141.00	8.71	76.08	2,137.84	15.02	51.74	17.44	0.22
2,235.00	10.09	85.22	2,230.58	17.42	66.86	20.55	2.16
2,326.00	10.04	85.04	2,320.18	18.77	82.70	22.64	0.06
2,418.00	9.91	84.45	2,410.79	20.23	98.57	24.85	0.18
2,605.00	10.30	83.93	2,594.89	23.55	131.21	29.71	0.21
2,697.00	10.55	84.20	2,685.37	25.27	147.77	32.21	0.28
2,790.00	10.08	79.92	2,776.87	27.56	164.25	35.27	0.97
2,884.00	10.47	79.30	2,869.36	30.58	180.74	39.06	0.43
2,979.00	9.45	74.88	2,962.93	34.22	196.76	43.45	1.34
3,074.00	9.46	73.97	3,056.64	38.41	211.79	48.34	0.16
3,169.00	8.97	73.76	3,150.41	42.64	226.40	53.26	0.52
3,264.00	8.79	74.44	3,244.27	46.66	240.50	57.93	0.22
3,359.00	9.05	80.68	3,338.13	49.81	254.87	61.76	1.05
3,454.00	9.43	81.44	3,431.89	52.18	269.94	64.84	0.42
3,550.00	9.65	80.26	3,526.57	54.71	285.65	68.11	0.31
3,645.00	8.37	78.59	3,620.39	57.43	300.27	71.51	1.38
3,740.00	8.67	78.27	3,714.34	60.25	314.06	74.98	0.32
3,835.00	9.19	78.08	3,808.19	63.28	328.49	78.68	0.55
3,929.00	8.33	82.72	3,901.10	65.69	342.59	81.75	1.18
4,025.00	7.53	86.50	3,996.18	66.95	355.77	83.64	0.99
4,119.00	9.15	86.14	4,089.18	67.83	369.38	85.16	1.72
4,214.00	8.09	86.76	4,183.11	68.72	383.59	86.71	1.12
4,309.00	7.76	85.97	4,277.20	69.55	396.66	88.15	0.37
4,404.00	9.15	87.39	4,371.16	70.34	410.60	89.61	1.48
4,499.00	8.82	83.67	4,465.00	71.49	425.39	91.45	0.70
4,594.00	8.75	82.67	4,558.88	73.21	439.79	93.85	0.18
4,689.00	7.13	85.03	4,652.97	74.65	452.83	95.89	1.74
4,784.00	4.12	93.36	4,747.50	74.96	462.12	96.64	3.27
4,879.00	1.89	125.00	4,842.37	73.86	466.81	95.77	2.84
4,974.00	0.46	63.27	4,937.35	73.13	468.43	95.12	1.81
5,069.00	0.34	119.78	5,032.35	73.16	469.02	95.18	0.41
5,164.00	0.72	95.92	5,127.35	72.96	469.85	95.01	0.45

Design Report for Haley LC27-715 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,259.00	1.35	104.01	5,222.33	72.63	471.53	94.76	0.68
5,354.00	0.99	355.06	5,317.32	73.18	472.55	95.35	2.02
5,449.00	11.74	357.16	5,411.59	83.68	472.00	105.82	11.32
5,544.00	21.36	353.00	5,502.55	110.57	469.41	132.56	10.20
5,638.00	27.26	350.37	5,588.18	148.82	463.71	170.49	6.38
5,733.00	34.68	351.70	5,669.59	197.08	456.16	218.35	7.84
5,828.00	42.76	354.71	5,743.65	256.04	449.27	276.92	8.73
5,923.00	48.43	359.67	5,810.12	323.76	446.09	344.42	7.03
6,018.00	57.27	358.93	5,867.43	399.40	445.14	419.93	9.33
6,113.00	66.28	358.10	5,912.32	482.99	442.95	503.32	9.52
6,208.00	75.12	357.62	5,943.68	572.50	439.59	592.57	9.32
6,288.00	79.56	357.55	5,961.21	650.46	436.30	670.29	5.55
6,332.00	82.48	357.19	5,968.08	693.87	434.31	713.56	6.68
7"							
6,420.00	88.31	356.48	5,975.15	781.42	429.46	800.78	6.68
6,513.00	89.97	356.43	5,976.54	874.23	423.72	893.21	1.79
6,606.00	92.22	356.89	5,974.77	967.05	418.30	985.68	2.47
6,698.00	92.59	358.48	5,970.90	1,058.89	414.59	1,077.24	1.77
6,791.00	91.94	359.42	5,967.23	1,151.80	412.88	1,169.97	1.23
6,884.00	91.60	358.99	5,964.36	1,244.74	411.59	1,262.75	0.59
6,976.00	92.00	358.16	5,961.47	1,336.67	409.31	1,354.46	1.00
7,070.00	91.36	358.20	5,958.71	1,430.58	406.32	1,448.13	0.68
7,162.00	91.08	359.67	5,956.75	1,522.54	404.61	1,539.91	1.63
7,255.00	90.06	358.90	5,955.83	1,615.53	403.45	1,632.74	1.37
7,349.00	90.68	359.59	5,955.22	1,709.52	402.21	1,726.56	0.99
7,440.00	91.14	359.91	5,953.77	1,800.50	401.82	1,817.43	0.62
7,533.00	89.69	0.10	5,953.10	1,893.50	401.82	1,910.32	1.57
7,626.00	89.08	0.05	5,954.10	1,986.49	401.95	2,003.22	0.66
7,719.00	88.74	358.48	5,955.87	2,079.46	400.75	2,096.03	1.73
7,811.00	89.48	358.18	5,957.30	2,171.41	398.07	2,187.75	0.87
7,904.00	90.31	358.31	5,957.47	2,264.37	395.22	2,280.47	0.90
7,999.00	90.03	358.42	5,957.19	2,359.33	392.51	2,375.20	0.32
8,094.00	89.97	358.29	5,957.19	2,454.29	389.79	2,469.93	0.15
8,189.00	90.99	357.70	5,956.39	2,549.23	386.46	2,564.60	1.24
8,284.00	90.68	358.04	5,955.01	2,644.15	382.93	2,659.25	0.48
8,379.00	90.77	357.44	5,953.80	2,739.07	379.19	2,753.89	0.64
8,473.00	90.89	356.78	5,952.44	2,832.94	374.45	2,847.43	0.71
8,568.00	90.74	357.88	5,951.09	2,927.82	370.02	2,942.00	1.17
8,663.00	90.52	357.91	5,950.05	3,022.76	366.53	3,036.66	0.23
8,758.00	90.59	357.19	5,949.13	3,117.66	362.47	3,131.28	0.76
8,853.00	89.78	356.07	5,948.82	3,212.50	356.89	3,225.74	1.45
8,948.00	91.45	358.57	5,947.80	3,307.38	352.45	3,320.31	3.16
9,043.00	92.00	358.89	5,944.94	3,402.31	350.34	3,415.03	0.67
9,138.00	92.53	358.19	5,941.18	3,497.20	347.92	3,509.71	0.92
9,233.00	93.05	357.29	5,936.56	3,592.02	344.18	3,604.24	1.09
9,327.00	90.74	357.97	5,933.45	3,685.88	340.30	3,697.81	2.56
9,422.00	91.11	359.05	5,931.92	3,780.83	337.83	3,792.55	1.20
9,516.00	88.06	359.00	5,932.60	3,874.80	336.23	3,886.34	3.25
9,611.00	87.53	358.92	5,936.25	3,969.72	334.51	3,981.07	0.56
9,706.00	88.49	357.81	5,939.55	4,064.62	331.80	4,075.74	1.54
9,801.00	88.86	357.48	5,941.75	4,159.51	327.89	4,170.34	0.52

Design Report for Haley LC27-715 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,895.00	88.52	357.41	5,943.90	4,253.39	323.71	4,263.92	0.37
9,990.00	90.18	356.86	5,944.98	4,348.27	318.96	4,358.46	1.84
10,084.00	90.86	357.25	5,944.12	4,442.14	314.13	4,452.00	0.83
10,179.00	91.32	357.19	5,942.32	4,537.01	309.52	4,546.55	0.49
10,273.00	92.00	356.76	5,939.59	4,630.84	304.56	4,640.04	0.86
10,368.00	90.83	356.91	5,937.25	4,725.66	299.32	4,734.51	1.24
10,463.00	90.15	357.71	5,936.44	4,820.55	294.86	4,829.09	1.11
10,558.00	89.85	357.22	5,936.44	4,915.46	290.66	4,923.69	0.60
10,652.00	89.60	357.13	5,936.89	5,009.34	286.03	5,017.26	0.28
10,747.00	90.37	357.14	5,936.91	5,104.22	281.28	5,111.81	0.81
10,842.00	90.65	356.17	5,936.07	5,199.06	275.74	5,206.27	1.06
10,937.00	90.74	356.65	5,934.91	5,293.86	269.79	5,300.69	0.51
11,032.00	90.28	357.27	5,934.07	5,388.72	264.75	5,395.21	0.81
11,127.00	90.28	357.39	5,933.60	5,483.62	260.32	5,489.80	0.13
11,222.00	90.22	357.76	5,933.19	5,578.53	256.30	5,584.42	0.39
11,284.00	90.31	358.49	5,932.90	5,640.50	254.28	5,646.22	1.19
Last MWD Survey at 11284' MD							
11,352.00	90.31	358.49	5,932.53	5,708.48	252.48	5,714.03	0.00
Straight Projection to Bit at 11352' MD - Haley LC27-7715_BHL							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
682.00	681.99	3.27	-0.90	First MWD Survey
11,284.00	5,932.90	5,640.50	254.28	Last MWD Survey at 11284' MD
11,352.00	5,932.53	5,708.48	252.48	Straight Projection to Bit at 11352' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Haley LC27-7715_BHL	2.70	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
682.00	6,420.00	Intermediate Surveys	MWD
6,513.00	11,352.00	Production Surveys	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
632.00	631.99	9 5/8"	9-5/8	13-3/4
6,332.00	5,968.08	7"	7	8-3/4

Design Report for Haley LC27-715 - Actual 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
Haley LC27-7715_BHL - actual wellpath misses target center by 55.22usft at 11352.00usft MD (5932.53 TVD, 5708.48 N, 252.48 E) - Point	0.00	0.00	5,880.00	5,711.00	269.30	1,511,828.85	3,427,988.97	40.728130	-103.955740

Directional Difficulty Index

Average Dogleg over Survey:	1.61 °/100usft	Maximum Dogleg over Survey:	11.32 °/100usft at 5,449.00 usft
Net Tortousity applicable to Plans:	0.66 °/100usft	Directional Difficulty Index:	6.329

Audit Info

North Reference Sheet for Sec. 34-T9N-R59W - Haley LC27-715 - Original Wellbore

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

Vertical Depths are relative to KB @ 4838.00usft (HP 343). Northing and Easting are relative to Haley LC27-715

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: 0.99998927

Grid Coordinates of Well: 1,506,117.92 usft N, 3,427,719.66 usft E

Geographical Coordinates of Well: 40° 42' 44.89" N, 103° 57' 25.45" W

Grid Convergence at Surface is: 1.00°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,352.00usft the Bottom Hole Displacement is 5,714.06usft in the Direction of 2.53° (Grid).

Magnetic Convergence at surface is: -7.04° (30 March 2015, , BGGM2014)

