

Noble Energy

Weld County, CO (NAD 83)

Sec. 34-T9N-R59W

Haley LC27-745

Original Wellbore

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

14 September, 2015

Well Coordinates: 1,506,100.97 N, 3,426,954.70 E (40° 42' 44.86" N, 103° 57' 35.39" W)

Ground Level: 4,816.00 usft

Local Coordinate Origin:

Centered on Well Haley LC27-745

Viewing Datum:

KB @ 4840.00usft (HP343)

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 LC27-745
Wellbore: Original Wellbore
Design: Actual Surveys

Noble Energy

HALLIBURTON
Sperry Drilling

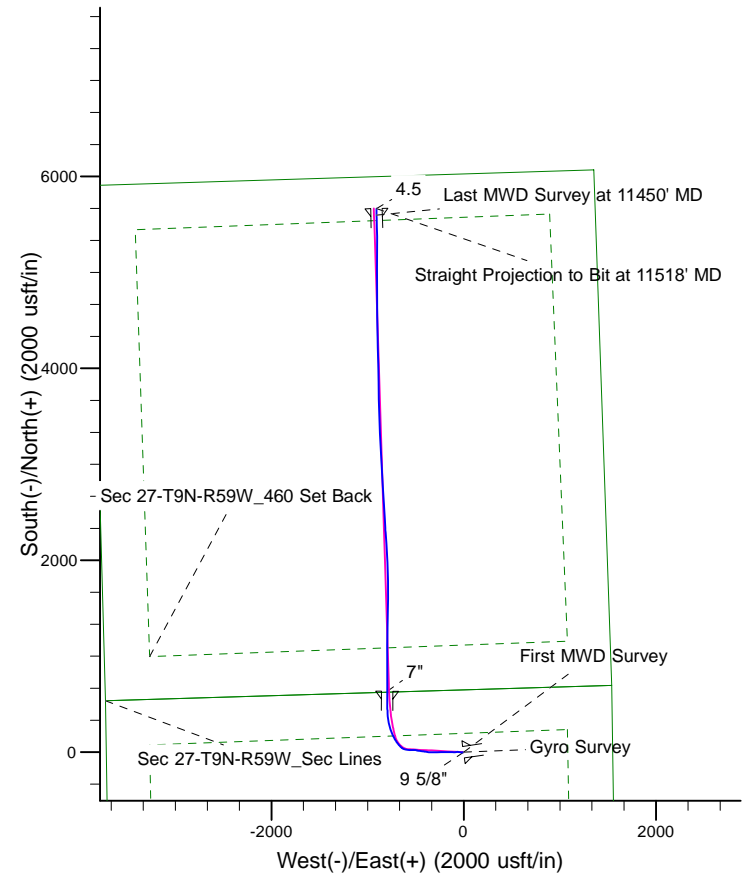
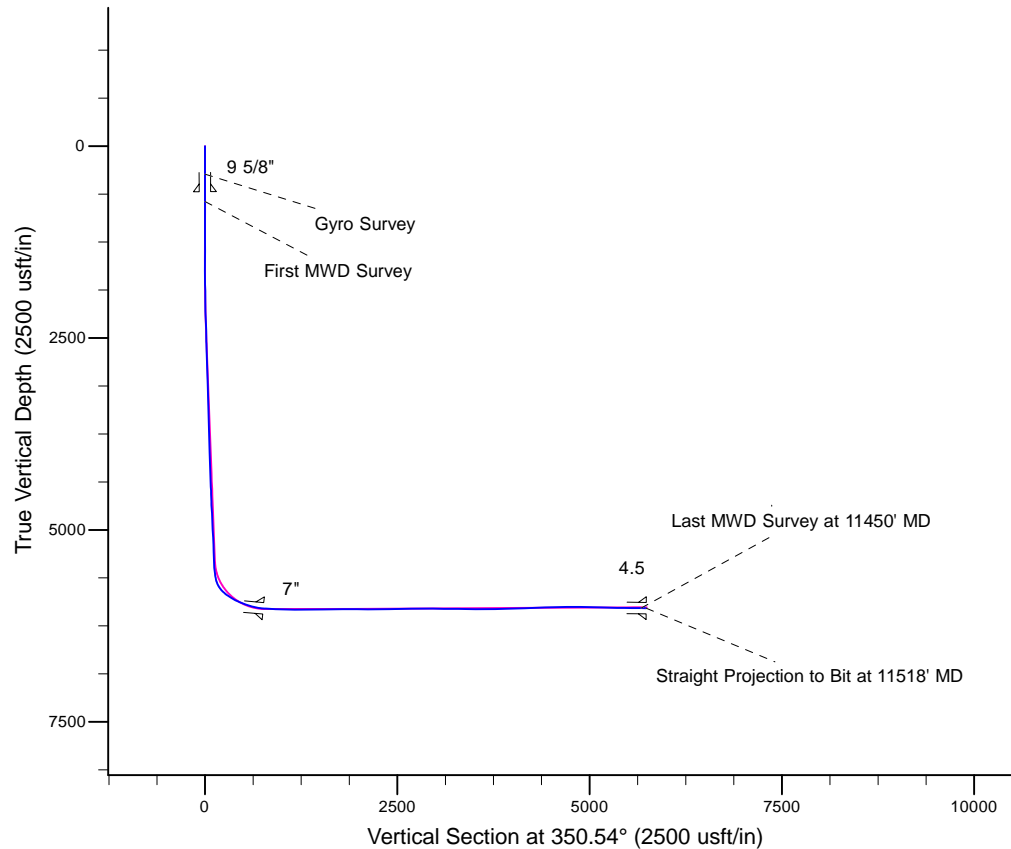
Platted SHL: 660' FNL, 1550' FEL
Platted Lat/Long: 40.712460 N, 103.959830 W
Location: Sec. 34-T9N-R59W

~7" Casing: 7' FNL, 2314 FEL
Lat/Long: 40.714242 N, 103.962658 W
State Planes - CO Northern: 1506736.42 N, 3426159.59 E
Location: Sec. 34-T9N-R59W

Platted BHL: 330' FNL, 2310' FEL
Lat/Long: 40.728050 N, 103.962880 W
State Planes - CO Northern: 1511765.33 N, 3426010.83 E
Location: Sec. 27-T9N-R59W

LEGEND

- ✕ Haley LC27-745, Original Wellbore, Rev B0 V0
- Actual Surveys



WELL DETAILS: Haley LC27-745

Ground Level: 4816.00
KB @ 4840.00usft (HP343)

Created By: Amanda Marchand
Created On: 5/6/2015

Design Report for Haley LC27-745 - 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
367.00	0.10	221.50	367.00	-0.24	-0.21	-0.20	0.03
Gyro Survey							
596.00	0.22	261.67	596.00	-0.45	-0.78	-0.32	0.07
9 5/8"							
724.00	0.30	268.57	724.00	-0.50	-1.35	-0.27	0.07
First MWD Survey							
818.00	0.26	250.51	818.00	-0.57	-1.80	-0.27	0.10
1,008.00	0.44	273.38	1,007.99	-0.67	-2.93	-0.18	0.12
1,194.00	0.56	265.15	1,193.99	-0.71	-4.55	0.05	0.08
1,286.00	0.42	267.77	1,285.98	-0.76	-5.34	0.13	0.15
1,380.00	0.40	260.01	1,379.98	-0.83	-6.01	0.17	0.06
1,472.00	0.37	258.44	1,471.98	-0.95	-6.61	0.15	0.03
1,565.00	0.41	250.41	1,564.98	-1.12	-7.22	0.08	0.07
1,657.00	0.28	258.20	1,656.97	-1.27	-7.75	0.02	0.15
1,750.00	0.17	275.05	1,749.97	-1.31	-8.11	0.04	0.14
1,843.00	3.42	271.78	1,842.92	-1.21	-11.02	0.62	3.49
1,934.00	4.81	266.11	1,933.68	-1.38	-17.54	1.52	1.59
2,027.00	4.81	257.47	2,026.35	-2.50	-25.24	1.69	0.78
2,120.00	5.01	283.84	2,119.02	-2.37	-32.99	3.08	2.41
2,212.00	7.46	283.49	2,210.47	-0.02	-42.70	7.00	2.66
2,305.00	8.78	275.73	2,302.54	2.10	-55.63	11.22	1.84
2,397.00	9.79	264.14	2,393.34	2.00	-70.40	13.55	2.30
2,490.00	9.49	261.60	2,485.03	0.08	-85.85	14.19	0.56
2,583.00	10.81	271.90	2,576.58	-0.75	-102.15	16.05	2.41
2,676.00	11.21	271.19	2,667.87	-0.28	-119.91	19.44	0.45
2,766.00	11.11	270.11	2,756.17	-0.08	-137.33	22.49	0.26
2,956.00	11.68	272.46	2,942.42	0.78	-174.85	29.51	0.39
3,051.00	10.62	268.69	3,035.63	0.99	-193.21	32.74	1.35
3,146.00	9.98	268.74	3,129.10	0.61	-210.19	35.15	0.67
3,241.00	9.71	268.26	3,222.70	0.19	-226.43	37.40	0.30
3,336.00	10.20	268.17	3,316.27	-0.32	-242.84	39.60	0.52
3,431.00	10.76	268.59	3,409.68	-0.81	-260.11	41.96	0.59
3,526.00	10.84	269.56	3,503.00	-1.10	-277.91	44.60	0.21
3,621.00	10.85	271.15	3,596.30	-0.99	-295.78	47.64	0.32
3,716.00	10.80	270.62	3,689.61	-0.71	-313.62	50.85	0.12
3,811.00	10.76	270.39	3,782.93	-0.55	-331.39	53.92	0.06
3,906.00	9.97	269.11	3,876.38	-0.62	-348.48	56.67	0.87
4,001.00	7.58	268.86	3,970.27	-0.87	-362.97	58.80	2.52
4,096.00	4.05	285.28	4,064.77	-0.11	-372.48	61.11	4.07
4,190.00	4.81	285.97	4,158.49	1.85	-379.47	64.19	0.81
4,285.00	5.94	280.88	4,253.07	3.87	-388.12	67.61	1.29
4,380.00	6.33	280.99	4,347.52	5.80	-398.09	71.15	0.41
4,475.00	7.69	274.62	4,441.81	7.31	-409.57	74.53	1.65
4,570.00	8.90	273.58	4,535.82	8.28	-423.24	77.73	1.28
4,665.00	7.23	278.48	4,629.87	9.62	-436.49	81.23	1.90
4,760.00	8.50	286.65	4,723.98	12.51	-449.13	86.16	1.78
4,855.00	9.60	274.97	4,817.81	15.21	-463.75	91.23	2.25
4,950.00	7.44	275.07	4,911.75	16.44	-477.77	94.75	2.27
5,045.00	9.09	290.08	5,005.77	19.56	-490.95	99.99	2.85

Design Report for Haley LC27-745 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,140.00	9.69	276.33	5,099.51	23.02	-505.94	105.87	2.44
5,235.00	9.78	267.67	5,193.15	23.57	-521.95	109.04	1.54
5,330.00	10.28	268.28	5,286.70	22.99	-538.49	111.19	0.54
5,425.00	11.67	269.07	5,379.96	22.58	-556.57	113.75	1.47
5,519.00	15.49	275.66	5,471.32	23.66	-578.57	118.44	4.38
5,614.00	17.99	281.73	5,562.29	27.90	-605.57	127.05	3.21
5,710.00	20.79	300.09	5,652.92	39.47	-634.86	143.28	6.95
5,805.00	35.12	317.59	5,736.75	68.29	-668.10	177.18	17.24
5,899.00	49.02	326.18	5,806.42	118.02	-706.31	232.51	15.98
5,994.00	57.00	337.13	5,863.64	184.75	-741.87	304.18	12.44
6,089.00	61.87	343.08	5,911.97	261.63	-769.58	384.57	7.44
6,184.00	69.42	352.88	5,951.20	346.13	-787.35	470.83	12.30
6,279.00	71.37	358.15	5,983.09	435.30	-794.32	559.94	5.61
6,374.00	77.54	0.01	6,008.54	526.77	-795.76	650.40	6.76
6,440.00	82.27	0.57	6,020.11	591.73	-795.43	714.42	7.22
6,471.89	84.45	0.35	6,023.79	623.40	-795.18	745.62	6.87
Haley LC27-745_LNDPT							
6,484.00	85.28	0.26	6,024.88	635.46	-795.11	757.51	6.87
7"							
6,517.00	87.53	0.03	6,026.95	668.39	-795.03	789.98	6.87
6,609.00	87.81	359.94	6,030.69	760.32	-795.06	880.66	0.32
6,702.00	88.12	359.76	6,033.99	853.26	-795.30	972.37	0.39
6,794.00	87.72	359.70	6,037.33	945.20	-795.73	1,063.13	0.44
6,887.00	88.55	0.53	6,040.36	1,038.15	-795.55	1,154.79	1.26
6,980.00	89.11	359.72	6,042.26	1,131.13	-795.34	1,246.47	1.06
7,071.00	91.45	0.70	6,041.81	1,222.12	-795.01	1,336.17	2.79
7,164.00	91.17	1.31	6,039.68	1,315.08	-793.38	1,427.60	0.72
7,257.00	91.73	1.38	6,037.33	1,408.02	-791.20	1,518.92	0.61
7,349.00	90.92	0.80	6,035.20	1,499.98	-789.45	1,609.34	1.08
7,442.00	90.46	1.07	6,034.08	1,592.96	-787.93	1,700.80	0.57
7,535.00	89.69	0.38	6,033.96	1,685.95	-786.75	1,792.34	1.11
7,627.00	89.57	358.40	6,034.56	1,777.94	-787.73	1,883.23	2.16
7,720.00	90.00	359.06	6,034.90	1,870.91	-789.79	1,975.28	0.85
7,813.00	90.59	357.62	6,034.43	1,963.87	-792.49	2,067.42	1.67
7,903.00	89.60	356.02	6,034.28	2,053.73	-797.48	2,156.88	2.09
7,998.00	89.94	357.07	6,034.66	2,148.55	-803.20	2,251.35	1.16
8,093.00	89.48	355.36	6,035.14	2,243.34	-809.48	2,345.88	1.86
8,188.00	92.19	356.99	6,033.75	2,338.11	-815.81	2,440.40	3.33
8,283.00	91.94	356.57	6,030.33	2,432.90	-821.14	2,534.78	0.51
8,379.00	91.29	356.58	6,027.63	2,528.69	-826.88	2,630.21	0.68
8,473.00	89.91	356.72	6,026.64	2,622.52	-832.37	2,723.66	1.48
8,569.00	89.69	356.18	6,026.98	2,718.33	-838.31	2,819.15	0.61
8,759.00	90.09	356.47	6,027.34	2,907.94	-850.49	3,008.18	0.26
8,854.00	89.54	356.52	6,027.65	3,002.76	-856.30	3,102.67	0.58
8,948.00	90.12	357.52	6,027.93	3,096.63	-861.19	3,196.07	1.23
9,043.00	89.11	356.97	6,028.57	3,191.52	-865.75	3,290.41	1.21
9,138.00	88.55	357.22	6,030.51	3,286.38	-870.57	3,384.77	0.65
9,233.00	89.23	357.75	6,032.35	3,381.27	-874.73	3,479.06	0.91
9,327.00	89.82	358.07	6,033.12	3,475.20	-878.16	3,572.28	0.71
9,422.00	90.49	358.88	6,032.87	3,570.17	-880.69	3,666.37	1.11
9,517.00	90.46	359.08	6,032.08	3,665.15	-882.38	3,760.33	0.21

Design Report for Haley LC27-745 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,613.00	90.74	358.88	6,031.08	3,761.13	-884.09	3,855.29	0.36
9,708.00	91.48	359.43	6,029.23	3,856.10	-885.49	3,949.20	0.97
9,803.00	92.34	358.97	6,026.07	3,951.03	-886.82	4,043.06	1.03
9,897.00	92.53	358.88	6,022.07	4,044.93	-888.58	4,135.97	0.22
9,992.00	92.40	358.39	6,017.99	4,139.82	-890.84	4,229.94	0.53
10,087.00	92.50	358.87	6,013.93	4,234.70	-893.11	4,323.91	0.52
10,182.00	91.36	358.71	6,010.73	4,329.63	-895.11	4,417.87	1.21
10,277.00	91.69	358.58	6,008.20	4,424.57	-897.36	4,511.89	0.37
10,372.00	91.14	358.75	6,005.85	4,519.51	-899.57	4,605.90	0.61
10,467.00	90.65	358.80	6,004.37	4,614.48	-901.60	4,699.91	0.52
10,562.00	89.51	359.55	6,004.24	4,709.47	-902.97	4,793.83	1.44
10,657.00	90.37	0.27	6,004.34	4,804.46	-903.12	4,887.56	1.18
10,752.00	88.27	0.28	6,005.46	4,899.45	-902.66	4,981.18	2.21
10,847.00	88.15	0.51	6,008.43	4,994.40	-902.01	5,074.74	0.27
10,942.00	88.21	0.58	6,011.45	5,089.35	-901.11	5,168.24	0.10
11,038.00	88.33	0.94	6,014.35	5,185.30	-899.83	5,262.68	0.40
11,133.00	89.57	359.18	6,016.09	5,280.28	-899.73	5,356.35	2.27
11,228.00	89.38	359.06	6,016.96	5,375.26	-901.19	5,450.28	0.24
11,323.00	89.17	358.59	6,018.16	5,470.23	-903.14	5,544.28	0.54
11,418.00	89.26	358.45	6,019.46	5,565.19	-905.59	5,638.35	0.18
11,450.00	89.29	358.65	6,019.87	5,597.18	-906.40	5,670.04	0.63
Last MWD Survey at 11450' MD							
11,517.83	89.29	358.65	6,020.71	5,664.99	-908.00	5,737.19	0.00
Haley LC27-745_BHL							
11,518.00	89.29	358.65	6,020.71	5,665.16	-908.01	5,737.35	0.00
Straight Projection to Bit at 11518' MD - 4.5							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
367.00	367.00	-0.24	-0.21	Gyro Survey
724.00	724.00	-0.50	-1.35	First MWD Survey
11,450.00	6,019.87	5,597.18	-906.40	Last MWD Survey at 11450' MD
11,518.00	6,020.71	5,665.16	-908.01	Straight Projection to Bit at 11518' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Haley LC27-745_BHL	350.54	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
367.00	367.00	Gyro Surveys	Flexi-Shot
724.00	6,440.00	Intermediate Surveys	MWD
6,517.00	11,518.00	Production Surveys	MWD

Design Report for Haley LC27-745 - Actual Surveys

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
596.00	596.00	9 5/8"	9-5/8	13-3/4
6,484.00	6,024.88	7"	7	8-3/4
11,518.00	6,020.71	4.5	4-1/2	6-1/8

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 LC27-745_BHL - actual wellpath misses target center by 42.46usft at 11517.83usft MD (6020.71 TVD, 5664.99 N, -908.00 E) - Point	0.00	0.00	5,998.00	5,664.42	-943.88	1,511,765.33	3,426,010.83	40.728050	-103.962880
Haley LC27-745_LNDI - actual wellpath misses target center by 718.13usft at 6471.89usft MD (6023.79 TVD, 623.40 N, -795.18 E) - Point	0.00	0.00	6,000.00	620.80	-77.45	1,506,721.76	3,426,877.25	40.714167	-103.960070

Directional Difficulty Index

Average Dogleg over Survey:	1.70 °/100usft	Maximum Dogleg over Survey:	17.24 °/100usft at 5,805.00 usft
Net Tortosity applicable to Plans:	0.79 °/100usft	Directional Difficulty Index:	6.372

Audit Info

North Reference Sheet for Sec. 34-T9N-R59W - Haley LC27-745 - 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 @ 4840.00usft (HP343). Northing and Easting are relative to Haley LC27-745
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: 1,506,100.97 usft N, 3,426,954.70 usft E
Geographical Coordinates of Well: 40° 42' 44.86" N, 103° 57' 35.39" W
Grid Convergence at Surface is: 1.00°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,518.00usft
the Bottom Hole Displacement is 5,737.46usft in the Direction of 350.89° (Grid).
Magnetic Convergence at surface is: -7.04° (23 April 2015, , BGGM2014)

