

Noble Energy

Weld County, CO (NAD 83)

Sec. 1-T6N-R63W (Crow Creek 1/AA01 PAD)

Crow Creek AA01-766

05-123-40158

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

22 January, 2015

Surface UWI : 05-123-40158

Well Coordinates: 1,434,940.30 N, 3,308,003.74 E (40° 31' 19.31" N, 104° 23' 31.49" W)

Ground Level: 4,799.00 usft

Local Coordinate Origin:

Centered on Well Crow Creek AA01-766

Viewing Datum:

KB=24 @ 4823.00usft (H&P 315)

TVDs to System:

N

North Reference:

Grid

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

HALLIBURTON

Project: Weld County, CO (NAD 83)
 Site: Sec. 1-T6N-R63W (Crow Creek 1/AA01 PAD)
 Well: Crow Creek AA01-766
 Wellbore: Plan A
 Design: Actual Surveys



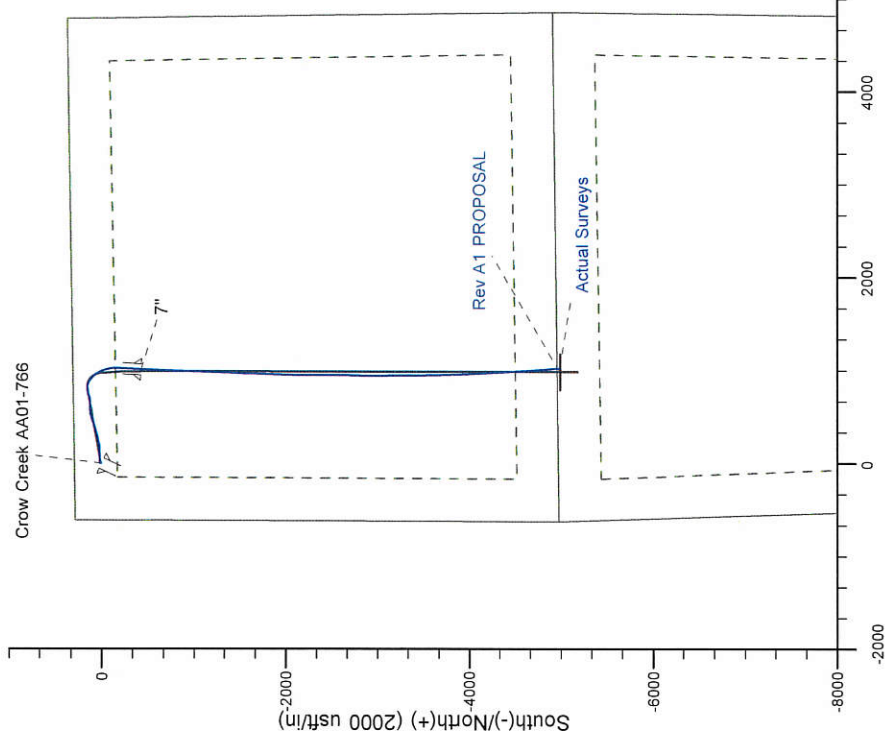
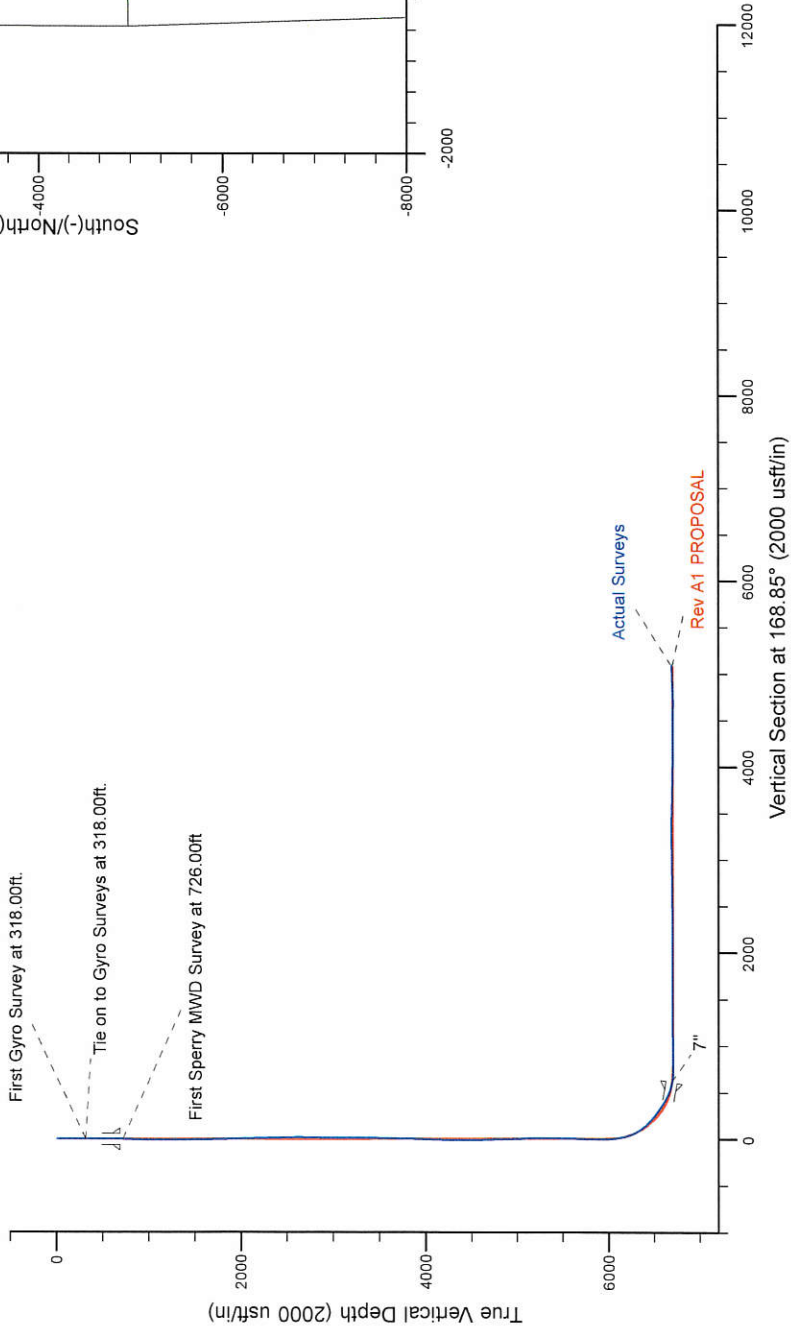
Platted SHL: 290' FNL, 613' FWL
 Platted Lat/Long: 40.52203 N, 104.39208 W
 Location: Sec. 1-T6N-R63W

~7" Casing: 724' FNL, 1026' FWL
 Lat/Long: 40.520826 N, 104.388471 W
 State Planes - CO Northern: 1,434,514.36 N, 3,309,012.61 E
 Location: Sec. 1-T6N-R63W

Platted BHL: 30' FNL, 1610' FWL
 Lat/Long: 40.50831 N, 104.38877 W
 State Planes - CO Northern: 1,429,955.47 N, 3,309,022.99 E
 Location: Sec. 12-T6N-R63W

LEGEND

Crow Creek AA01-766, Plan A, Rev A1 PROPOSAL V0
 Actual Surveys



| |
|--|
| WELL DETAILS: Crow Creek AA01-766 |
| Ground Level: 4759.00 KB=24 @ 4823.00usft (H&P 315) |
| Created By: Tatiana Gomez Created On: 1/22/2015 |

Design Report for Crow Creek AA01-766 - 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 |
| 318.00 | 0.03 | 74.07 | 318.00 | 0.02 | 0.08 | -0.01 | 0.01 |
| First Gyro Survey at 318.00ft. - Tie on to Gyro Surveys at 318.00ft. | | | | | | | |
| 692.00 | 0.61 | 24.14 | 691.99 | 1.86 | 0.98 | -1.63 | 0.16 |
| 9 5/8" | | | | | | | |
| 726.00 | 0.66 | 23.96 | 725.99 | 2.20 | 1.14 | -1.94 | 0.16 |
| First Sperry MWD Survey at 726.00ft | | | | | | | |
| 820.00 | 0.77 | 13.30 | 819.98 | 3.31 | 1.50 | -2.96 | 0.18 |
| 914.00 | 0.77 | 21.55 | 913.97 | 4.51 | 1.88 | -4.06 | 0.12 |
| 1,008.00 | 0.69 | 30.39 | 1,007.97 | 5.59 | 2.40 | -5.02 | 0.15 |
| 1,100.00 | 0.84 | 27.83 | 1,099.96 | 6.66 | 2.99 | -5.96 | 0.17 |
| 1,192.00 | 0.97 | 36.45 | 1,191.95 | 7.88 | 3.77 | -7.01 | 0.20 |
| 1,285.00 | 2.02 | 70.75 | 1,284.92 | 9.06 | 5.79 | -7.77 | 1.44 |
| 1,377.00 | 3.55 | 77.84 | 1,376.81 | 10.19 | 10.10 | -8.05 | 1.70 |
| 1,469.00 | 6.17 | 88.42 | 1,468.47 | 10.93 | 17.83 | -7.27 | 3.00 |
| 1,563.00 | 8.26 | 88.41 | 1,561.72 | 11.26 | 29.63 | -5.31 | 2.22 |
| 1,746.00 | 9.66 | 89.13 | 1,742.48 | 11.85 | 58.12 | -0.39 | 0.77 |
| 1,840.00 | 8.84 | 87.38 | 1,835.26 | 12.30 | 73.22 | 2.09 | 0.92 |
| 1,933.00 | 10.21 | 87.01 | 1,926.97 | 13.06 | 88.60 | 4.32 | 1.47 |
| 2,028.00 | 9.85 | 86.53 | 2,020.52 | 13.99 | 105.11 | 6.60 | 0.39 |
| 2,122.00 | 9.27 | 87.36 | 2,113.22 | 14.83 | 120.70 | 8.79 | 0.63 |
| 2,217.00 | 10.55 | 86.57 | 2,206.80 | 15.70 | 137.03 | 11.09 | 1.35 |
| 2,312.00 | 10.02 | 87.35 | 2,300.27 | 16.60 | 153.97 | 13.48 | 0.58 |
| 2,407.00 | 8.59 | 87.66 | 2,394.02 | 17.27 | 169.31 | 15.79 | 1.51 |
| 2,501.00 | 7.46 | 87.65 | 2,487.10 | 17.81 | 182.42 | 17.80 | 1.20 |
| 2,596.00 | 9.37 | 79.01 | 2,581.07 | 19.54 | 196.18 | 18.77 | 2.41 |
| 2,691.00 | 10.26 | 75.83 | 2,674.68 | 23.08 | 211.97 | 18.34 | 1.10 |
| 2,786.00 | 12.22 | 78.67 | 2,767.86 | 27.13 | 230.04 | 17.87 | 2.14 |
| 2,881.00 | 11.66 | 78.37 | 2,860.80 | 31.04 | 249.30 | 17.75 | 0.59 |
| 2,976.00 | 10.97 | 76.96 | 2,953.95 | 35.01 | 267.51 | 17.37 | 0.78 |
| 3,070.00 | 10.95 | 76.04 | 3,046.24 | 39.19 | 284.88 | 16.64 | 0.19 |
| 3,165.00 | 10.13 | 76.59 | 3,139.63 | 43.30 | 301.77 | 15.87 | 0.87 |
| 3,259.00 | 9.40 | 75.59 | 3,232.27 | 47.13 | 317.24 | 15.11 | 0.80 |
| 3,354.00 | 8.48 | 75.45 | 3,326.12 | 50.82 | 331.54 | 14.25 | 0.97 |
| 3,449.00 | 9.23 | 76.33 | 3,419.98 | 54.38 | 345.72 | 13.50 | 0.80 |
| 3,544.00 | 11.03 | 72.52 | 3,513.50 | 58.91 | 361.79 | 12.16 | 2.02 |
| 3,639.00 | 10.16 | 71.64 | 3,606.88 | 64.28 | 378.42 | 10.11 | 0.93 |
| 3,733.00 | 10.98 | 70.51 | 3,699.28 | 69.88 | 394.72 | 7.77 | 0.90 |
| 3,828.00 | 11.81 | 71.59 | 3,792.41 | 75.97 | 412.48 | 5.23 | 0.90 |
| 3,923.00 | 12.90 | 71.64 | 3,885.21 | 82.38 | 431.77 | 2.67 | 1.15 |
| 4,018.00 | 13.71 | 71.08 | 3,977.66 | 89.37 | 452.48 | -0.18 | 0.86 |
| 4,113.00 | 13.08 | 69.62 | 4,070.07 | 96.76 | 473.21 | -3.43 | 0.75 |
| 4,207.00 | 12.35 | 68.12 | 4,161.77 | 104.21 | 492.51 | -7.01 | 0.85 |
| 4,302.00 | 12.38 | 76.79 | 4,254.57 | 110.33 | 511.85 | -9.27 | 1.95 |
| 4,397.00 | 10.04 | 73.65 | 4,347.75 | 114.99 | 529.71 | -10.38 | 2.54 |
| 4,492.00 | 11.56 | 85.31 | 4,441.08 | 118.10 | 547.15 | -10.06 | 2.79 |
| 4,587.00 | 10.27 | 86.08 | 4,534.36 | 119.45 | 565.09 | -7.93 | 1.37 |
| 4,682.00 | 9.43 | 82.04 | 4,627.96 | 121.11 | 581.24 | -6.43 | 1.14 |
| 4,871.00 | 9.13 | 88.84 | 4,814.49 | 123.56 | 611.57 | -2.96 | 0.60 |
| 4,966.00 | 7.88 | 98.49 | 4,908.45 | 122.75 | 625.55 | 0.53 | 1.99 |

Design Report for Crow Creek AA01-766 - Actual Surveys

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) |
|-----------------------|-----------------|-------------|-----------------------|--------------|--------------|-------------------------|-------------------------|
| 5,061.00 | 9.63 | 95.27 | 5,002.34 | 121.06 | 639.90 | 4.97 | 1.91 |
| 5,156.00 | 9.06 | 97.25 | 5,096.08 | 119.38 | 655.23 | 9.57 | 0.69 |
| 5,251.00 | 8.37 | 89.53 | 5,189.98 | 118.50 | 669.57 | 13.22 | 1.43 |
| 5,345.00 | 8.66 | 75.13 | 5,282.96 | 120.37 | 683.25 | 14.03 | 2.28 |
| 5,535.00 | 8.61 | 71.98 | 5,470.81 | 128.44 | 710.60 | 11.40 | 0.25 |
| 5,630.00 | 9.76 | 68.09 | 5,564.59 | 133.64 | 724.84 | 9.04 | 1.38 |
| 5,725.00 | 11.24 | 73.44 | 5,658.00 | 139.29 | 741.18 | 6.67 | 1.86 |
| 5,819.00 | 10.02 | 74.58 | 5,750.38 | 144.07 | 757.85 | 5.19 | 1.32 |
| 5,914.00 | 10.30 | 71.87 | 5,843.89 | 148.91 | 773.89 | 3.54 | 0.58 |
| 6,009.00 | 7.88 | 73.55 | 5,937.69 | 153.40 | 788.20 | 1.91 | 2.56 |
| 6,104.00 | 15.44 | 96.96 | 6,030.71 | 153.71 | 807.04 | 5.25 | 9.23 |
| 6,199.00 | 21.59 | 103.27 | 6,120.76 | 148.16 | 836.64 | 16.41 | 6.80 |
| 6,294.00 | 27.50 | 117.06 | 6,207.21 | 134.15 | 873.24 | 37.24 | 8.63 |
| 6,389.00 | 33.87 | 128.00 | 6,288.93 | 107.83 | 913.71 | 70.89 | 8.89 |
| 6,484.00 | 39.67 | 142.59 | 6,365.14 | 67.33 | 953.10 | 118.24 | 11.00 |
| 6,579.00 | 45.80 | 156.30 | 6,435.04 | 11.89 | 985.31 | 178.87 | 11.70 |
| 6,674.00 | 51.77 | 164.49 | 6,497.67 | -55.37 | 1,009.02 | 249.44 | 9.02 |
| 6,768.00 | 54.28 | 173.86 | 6,554.28 | -129.00 | 1,022.99 | 324.39 | 8.40 |
| 6,816.00 | 55.66 | 180.76 | 6,581.85 | -168.22 | 1,024.81 | 363.22 | 12.11 |
| 6,863.00 | 59.58 | 183.22 | 6,607.02 | -207.88 | 1,023.42 | 401.86 | 9.44 |
| 6,958.00 | 65.71 | 184.02 | 6,650.65 | -292.05 | 1,018.08 | 483.40 | 6.50 |
| 7,050.00 | 77.39 | 183.98 | 6,679.72 | -378.95 | 1,012.00 | 567.49 | 12.70 |
| 7,098.00 | 80.50 | 183.57 | 6,688.92 | -425.96 | 1,008.90 | 613.01 | 6.53 |
| 7" | | | | | | | |
| 7,221.00 | 88.46 | 182.55 | 6,700.75 | -548.11 | 1,002.38 | 731.60 | 6.53 |
| 7,316.00 | 91.82 | 182.93 | 6,700.52 | -642.99 | 997.84 | 823.80 | 3.56 |
| 7,411.00 | 89.11 | 181.74 | 6,699.75 | -737.89 | 993.97 | 916.17 | 3.12 |
| 7,506.00 | 90.31 | 181.79 | 6,700.23 | -832.85 | 991.04 | 1,008.77 | 1.26 |
| 7,601.00 | 91.51 | 181.82 | 6,698.72 | -927.79 | 988.05 | 1,101.34 | 1.26 |
| 7,695.00 | 90.99 | 181.59 | 6,696.67 | -1,021.72 | 985.25 | 1,192.96 | 0.60 |
| 7,791.00 | 89.97 | 181.50 | 6,695.86 | -1,117.68 | 982.66 | 1,286.61 | 1.07 |
| 7,885.00 | 89.57 | 181.35 | 6,696.24 | -1,211.65 | 980.33 | 1,378.35 | 0.45 |
| 7,980.00 | 91.33 | 181.48 | 6,695.49 | -1,306.62 | 977.98 | 1,471.07 | 1.86 |
| 8,075.00 | 89.97 | 182.59 | 6,694.42 | -1,401.55 | 974.61 | 1,563.55 | 1.85 |
| 8,170.00 | 90.55 | 183.48 | 6,693.99 | -1,496.41 | 969.58 | 1,655.66 | 1.12 |
| 8,265.00 | 88.80 | 181.41 | 6,694.52 | -1,591.31 | 965.53 | 1,747.98 | 2.85 |
| 8,360.00 | 89.26 | 181.54 | 6,696.13 | -1,686.27 | 963.08 | 1,840.67 | 0.50 |
| 8,455.00 | 90.37 | 182.81 | 6,696.44 | -1,781.20 | 959.48 | 1,933.11 | 1.78 |
| 8,550.00 | 90.00 | 181.99 | 6,696.13 | -1,876.11 | 955.50 | 2,025.47 | 0.95 |
| 8,645.00 | 90.40 | 181.70 | 6,695.80 | -1,971.06 | 952.44 | 2,118.03 | 0.52 |
| 8,740.00 | 90.65 | 181.67 | 6,694.93 | -2,066.02 | 949.65 | 2,210.66 | 0.27 |
| 8,835.00 | 89.45 | 179.97 | 6,694.85 | -2,161.00 | 948.29 | 2,303.59 | 2.19 |
| 8,929.00 | 90.68 | 180.55 | 6,694.74 | -2,255.00 | 947.86 | 2,395.73 | 1.45 |
| 9,024.00 | 88.61 | 179.95 | 6,695.33 | -2,349.99 | 947.44 | 2,488.84 | 2.27 |
| 9,119.00 | 89.08 | 179.59 | 6,697.24 | -2,444.97 | 947.83 | 2,582.10 | 0.62 |
| 9,214.00 | 90.52 | 179.57 | 6,697.58 | -2,539.96 | 948.52 | 2,675.44 | 1.52 |
| 9,309.00 | 90.06 | 180.79 | 6,697.10 | -2,634.96 | 948.22 | 2,768.59 | 1.37 |
| 9,404.00 | 94.59 | 182.48 | 6,693.24 | -2,729.82 | 945.52 | 2,861.13 | 5.09 |
| 9,499.00 | 91.63 | 181.88 | 6,688.09 | -2,824.60 | 941.91 | 2,953.42 | 3.18 |
| 9,594.00 | 88.83 | 180.63 | 6,687.71 | -2,919.56 | 939.83 | 3,046.19 | 3.23 |
| 9,688.00 | 89.04 | 179.57 | 6,689.45 | -3,013.54 | 939.67 | 3,138.37 | 1.15 |

Design Report for Crow Creek AA01-766 - Actual Surveys

| Measured Depth (usft) | Inclination (°) | Azimuth (°) | Vertical Depth (usft) | +N/-S (usft) | +E/-W (usft) | Vertical Section (usft) | Dogleg Rate (°/100usft) |
|---|-----------------|-------------|-----------------------|--------------|--------------|-------------------------|-------------------------|
| 9,783.00 | 89.63 | 179.20 | 6,690.56 | -3,108.53 | 940.69 | 3,231.76 | 0.73 |
| 9,878.00 | 91.42 | 179.37 | 6,689.69 | -3,203.52 | 941.87 | 3,325.18 | 1.89 |
| 9,973.00 | 90.40 | 178.83 | 6,688.18 | -3,298.49 | 943.36 | 3,418.65 | 1.21 |
| 10,068.00 | 89.14 | 179.66 | 6,688.56 | -3,393.48 | 944.62 | 3,512.09 | 1.59 |
| 10,163.00 | 88.71 | 179.58 | 6,690.34 | -3,488.46 | 945.25 | 3,605.40 | 0.46 |
| 10,258.00 | 88.80 | 178.93 | 6,692.41 | -3,583.43 | 946.48 | 3,698.82 | 0.69 |
| 10,353.00 | 89.01 | 178.64 | 6,694.22 | -3,678.39 | 948.49 | 3,792.37 | 0.38 |
| 10,447.00 | 89.11 | 178.22 | 6,695.76 | -3,772.34 | 951.07 | 3,885.05 | 0.46 |
| 10,542.00 | 89.17 | 178.31 | 6,697.19 | -3,867.29 | 953.95 | 3,978.76 | 0.11 |
| 10,637.00 | 89.11 | 177.90 | 6,698.61 | -3,962.22 | 957.09 | 4,072.51 | 0.44 |
| 10,732.00 | 89.01 | 177.51 | 6,700.17 | -4,057.13 | 960.89 | 4,166.37 | 0.42 |
| 10,827.00 | 89.60 | 177.49 | 6,701.33 | -4,152.04 | 965.03 | 4,260.28 | 0.62 |
| 10,922.00 | 89.17 | 176.29 | 6,702.35 | -4,246.89 | 970.19 | 4,354.34 | 1.34 |
| 11,017.00 | 89.51 | 176.06 | 6,703.44 | -4,341.67 | 976.52 | 4,448.56 | 0.43 |
| 11,111.00 | 89.66 | 176.47 | 6,704.12 | -4,435.47 | 982.65 | 4,541.77 | 0.46 |
| 11,206.00 | 90.68 | 176.39 | 6,703.84 | -4,530.28 | 988.56 | 4,635.94 | 1.08 |
| 11,301.00 | 91.63 | 175.74 | 6,701.92 | -4,625.04 | 995.08 | 4,730.16 | 1.21 |
| 11,396.00 | 93.02 | 175.51 | 6,698.07 | -4,719.68 | 1,002.32 | 4,824.42 | 1.48 |
| 11,491.00 | 91.17 | 176.22 | 6,694.60 | -4,814.37 | 1,009.17 | 4,918.64 | 2.09 |
| 11,604.00 | 91.82 | 176.80 | 6,691.65 | -4,927.12 | 1,016.04 | 5,030.59 | 0.77 |
| Final Sperry MWD Survey at 11604.00ft | | | | | | | |
| 11,661.20 | 91.82 | 176.80 | 6,689.83 | -4,984.20 | 1,019.23 | 5,087.21 | 0.00 |
| Crow Creek AA01-766_BHL | | | | | | | |
| 11,662.00 | 91.82 | 176.80 | 6,689.81 | -4,985.00 | 1,019.28 | 5,088.01 | 0.00 |
| Straight Line Projection to TD at 11662.00ft. | | | | | | | |

Design Annotations

| Measured Depth (usft) | Vertical Depth (usft) | Local Coordinates | | Comment |
|-----------------------|-----------------------|-------------------|--------------|---|
| | | +N/-S (usft) | +E/-W (usft) | |
| 318.00 | 318.00 | 0.02 | 0.08 | First Gyro Survey at 318.00ft. |
| 318.00 | 318.00 | 0.02 | 0.08 | Tie on to Gyro Surveys at 318.00ft. |
| 726.00 | 725.99 | 2.20 | 1.14 | First Sperry MWD Survey at 726.00ft |
| 11,604.00 | 6,691.65 | -4,927.12 | 1,016.04 | Final Sperry MWD Survey at 11604.00ft |
| 11,662.00 | 6,689.81 | -4,985.00 | 1,019.28 | Straight Line Projection to TD at 11662.00ft. |

Vertical Section Information

| Angle Type | Target | Azimuth (°) | Origin Type | Origin | | Start TVD (usft) |
|------------|-------------------------|-------------|-------------|--------------|--------------|------------------|
| | | | | +N/-S (usft) | +E/-W (usft) | |
| Target | Crow Creek AA01-766_BHL | 168.85 | Slot | 0.00 | 0.00 | 0.00 |

Survey tool program

| From (usft) | To (usft) | Survey/Plan | Survey Tool |
|-------------|-----------|----------------------|-------------|
| 318.00 | 318.00 | Surface Surveys | Flexi-Shot |
| 726.00 | 7,050.00 | Intermediate Surveys | MWD |
| 7,221.00 | 11,662.00 | Production Surveys | MWD |

Design Report for Crow Creek AA01-766 - Actual Surveys

Casing Details

| Measured Depth (usft) | Vertical Depth (usft) | Name | Casing Diameter (") | Hole Diameter (") |
|-----------------------------|-----------------------------|--------|---------------------------|-------------------------|
| 692.00 | 691.99 | 9 5/8" | 9-5/8 | 13-3/4 |
| 7,098.00 | 6,688.92 | 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 |
|---|---------------------|--------------------|---------------|-----------------|-----------------|--------------------|-------------------|-----------|-------------|
| Crow Creek AA01-766 | 0.00 | 0.00 | 6,699.00 | -4,986.53 | 982.80 | 1,429,953.94 | 3,308,986.51 | 40.508310 | -104.388770 |
| - actual wellpath misses target center by 37.64usft at 11661.20usft MD (6689.83 TVD, -4984.20 N, 1019.23 E) | | | | | | | | | |
| - Point | | | | | | | | | |

Directional Difficulty Index

| | | | |
|-------------------------------------|----------------|-------------------------------|----------------------------------|
| Average Dogleg over Survey: | 1.98 °/100usft | Maximum Dogleg over Survey: | 12.70 °/100usft at 7,050.00 usft |
| Net Tortousity applicable to Plans: | 1.03 °/100usft | Directional Difficulty Index: | 6.389 |

Audit Info

North Reference Sheet for Sec. 1-T6N-R63W (Crow Creek 1/AA01 PAD) - Crow Creek AA01-766 - 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 @ 4823.00usft (H&P 315). Northing and Easting are relative to Crow Creek AA01-766

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: 0.99996803

Grid Coordinates of Well: 1,434,940.30 usft N, 3,308,003.74 usft E

Geographical Coordinates of Well: 40° 31' 19.31" N, 104° 23' 31.49" W

Grid Convergence at Surface is: 0.72°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,662.00usft the Bottom Hole Displacement is 5,088.14usft in the Direction of 168.44° (Grid).

Magnetic Convergence at surface is: -7.59° (9 November 2014, , BGGM2014)

