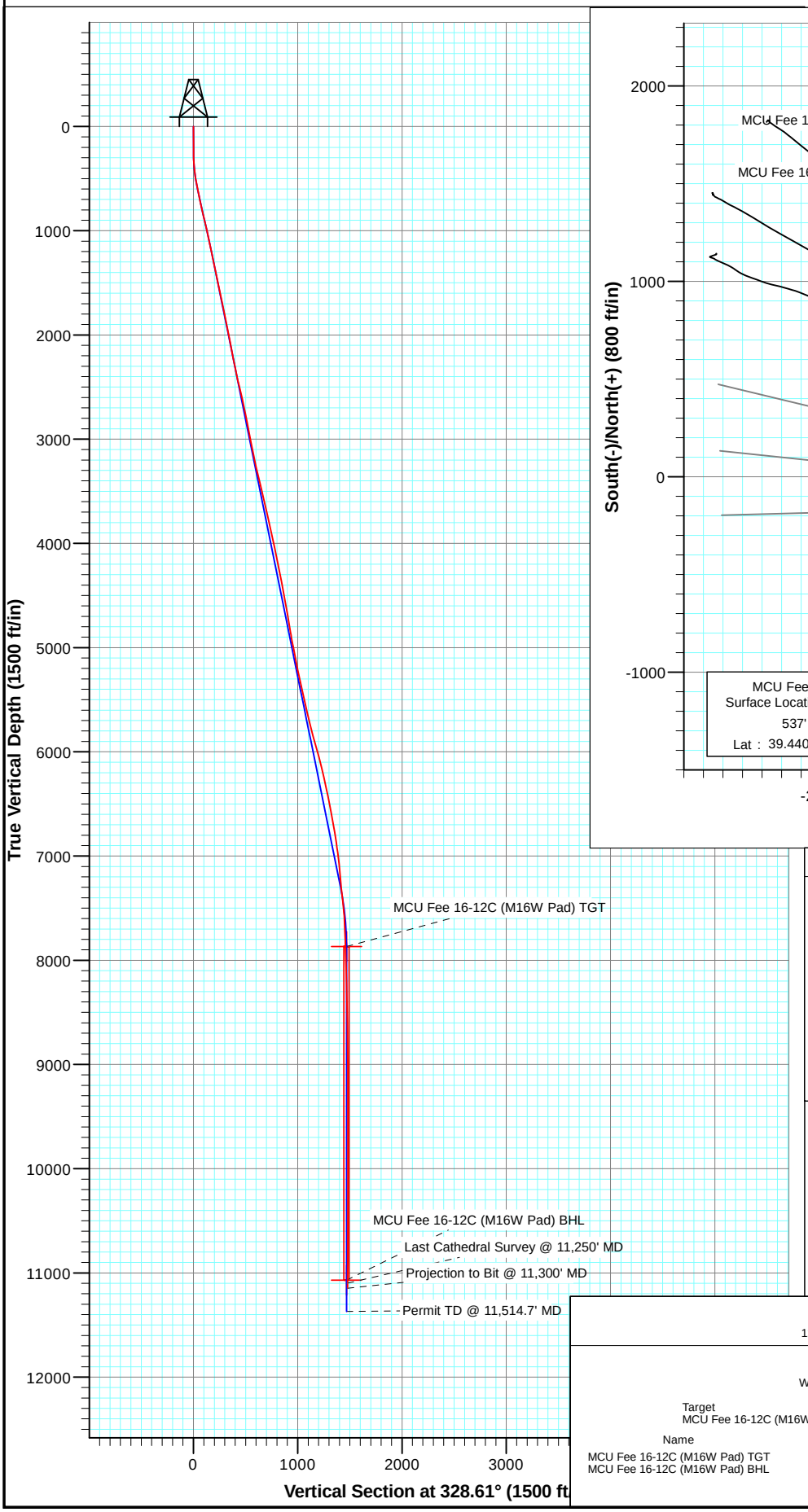
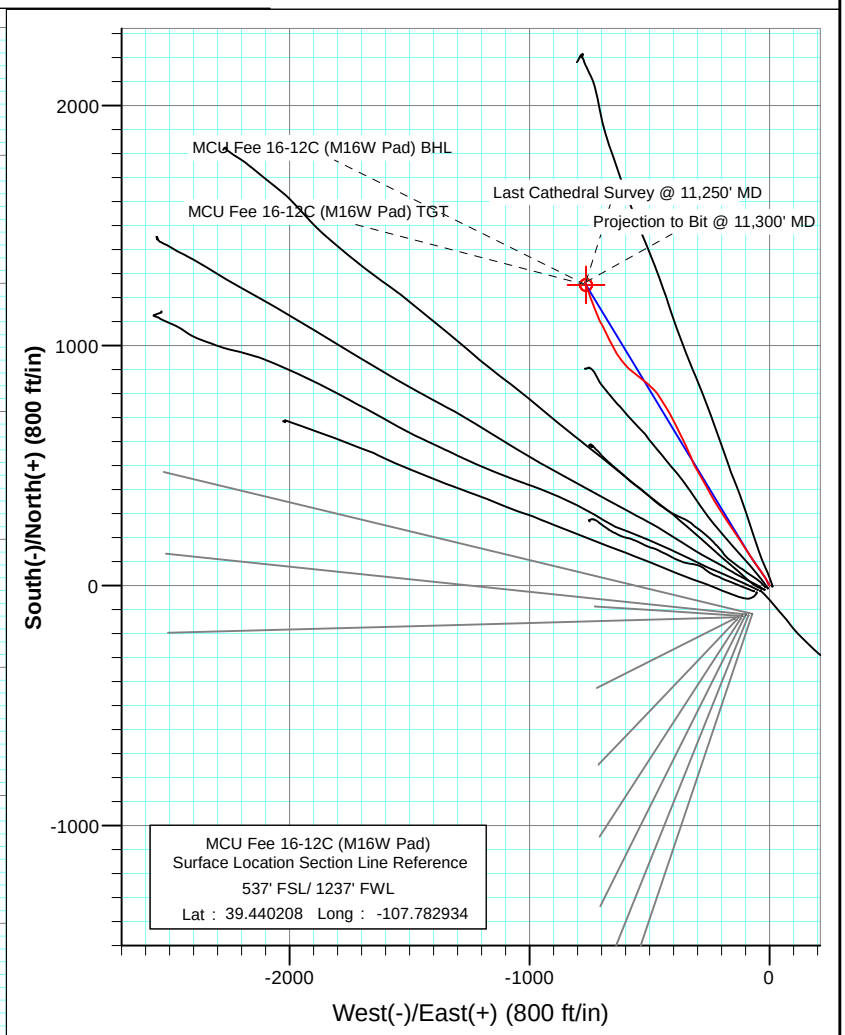
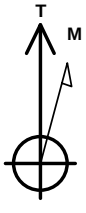
Project: Mamm Creek
Site: M16W Pad (SWSW S16-T7S-R93W)
Well: MCU Fee 16-12C (M16W Pad)
Wellbore: DD
Plan: FINAL




FORMATION TOP DETAILS

No formation data is available




Azimuths to True North
Magnetic North: 10.08°

Magnetic Field
Strength: 52101.2snT
Dip Angle: 65.70°
Date: 10/1/2012
Model: IGRF2010

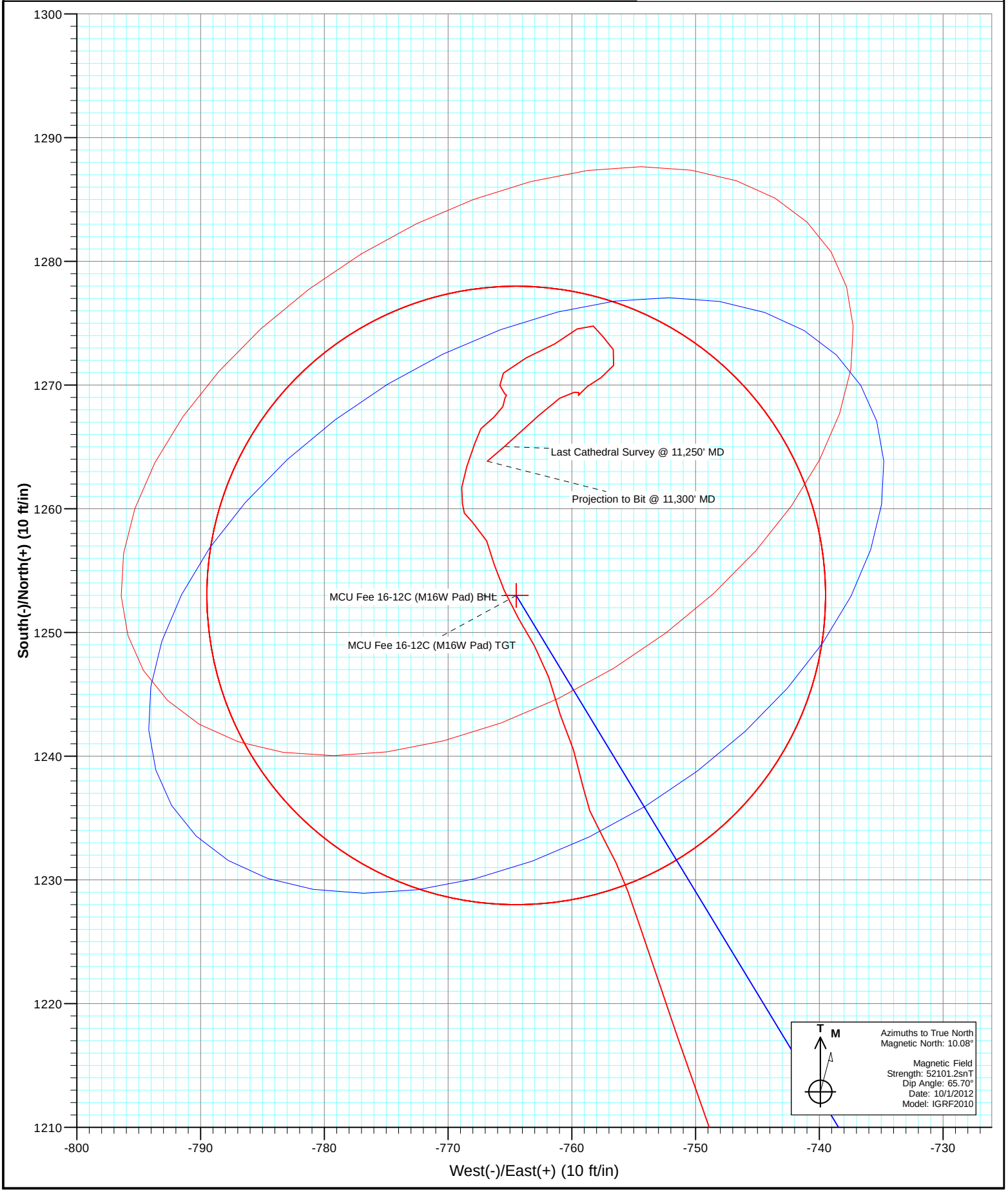
FINAL
MCU Fee 16-12C (M16W Pad)
125451/179355 (SH) 125554/182655 (MH); SC

KBE @ 7903.0ft (Patterson 308)
North American Datum 1983
Well MCU Fee 16-12C (M16W Pad), True North

| Target | Azimuth | Origin Type | N/S |
|---|---|---|---|
| MCU Fee 16-12C (M16W Pad) BHL | 328.61 | Slot | 0.0 |

| Name | TVD | +N/-S | +E/-W | Latitude | Longitude |
|---|---|---|---|---|---|
| MCU Fee 16-12C (M16W Pad) TGT | 7868.0 | 1253.0 | -764.5 | 39.443648 | -107.785641 |
| MCU Fee 16-12C (M16W Pad) BHL | 11069.0 | 1253.0 | -764.5 | 39.443648 | -107.785641 |

Project: Mamm Creek
Site: M16W Pad (SWSW S16-T7S-R93W)
Well: MCU Fee 16-12C (M16W Pad)
Wellbore: DD
Plan: FINAL



# Cathedral Energy Services

## Survey Report

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well MCU Fee 16-12C (M16W Pad) |
| **Project:** | Mamm Creek | **TVD Reference:** | KBE @ 7903.0ft (Patterson 308) |
| **Site:** | M16W Pad (SWSW S16-T7S-R93W) | **MD Reference:** | KBE @ 7903.0ft (Patterson 308) |
| **Well:** | MCU Fee 16-12C (M16W Pad) | **North Reference:** | True |
| **Wellbore:** | DD | **Survey Calculation Method:** | Minimum Curvature |
| **Design:** | FINAL | **Database:** | USA EDM 5000 Multi Users DB |

**Project** Mamm Creek

| | | | |
|---|---|---|---|
| **Map System:** | US State Plane 1983 | **System Datum:** | Mean Sea Level |
| **Geo Datum:** | North American Datum 1983 | | |
| **Map Zone:** | Colorado Central Zone | | |

**Site** M16W Pad (SWSW S16-T7S-R93W)

| | | | | | |
|---|---|---|---|---|---|
| **Site Position:** | | **Northing:** | 1,593,196.15 ft | **Latitude:** | 39.439834 |
| **From:** | Lat/Long | **Easting:** | 2,355,193.71 ft | **Longitude:** | -107.783358 |
| **Position Uncertainty:** | 0.0 ft | **Slot Radius:** | 13.200 in | **Grid Convergence:** | -1.44 ° |

**Well** MCU Fee 16-12C (M16W Pad)

| | | | | | | |
|---|---|---|---|---|---|---|
| **Well Position** | **+N/-S** | 0.0 ft | **Northing:** | 1,593,329.32 ft | **Latitude:** | 39.440208 |
| | **+E/-W** | 0.0 ft | **Easting:** | 2,355,316.85 ft | **Longitude:** | -107.782934 |
| **Position Uncertainty** | | 0.0 ft | **Wellhead Elevation:** | ft | **Ground Level:** | 7,881.0 ft |

**Wellbore** DD

| Magnetics | Model Name | Sample Date | Declination (°) | Dip Angle (°) | Field Strength (nT) |
|---|---|---|---|---|---|
| | IGRF2010 | 10/1/2012 | 10.08 | 65.70 | 52,101 |

**Design** FINAL

**Audit Notes:**

| | | | | | |
|---|---|---|---|---|---|
| **Version:** | 1.0 | **Phase:** | ACTUAL | **Tie On Depth:** | 0.0 |

| Vertical Section: | Depth From (TVD) (ft) | +N/-S (ft) | +E/-W (ft) | Direction (°) |
|---|---|---|---|---|
| | 0.0 | 0.0 | 0.0 | 328.61 |

**Survey Program** **Date** 12/3/2012

| From (ft) | To (ft) | Survey (Wellbore) | Tool Name | Description |
|---|---|---|---|---|
| 206.0 | 1,215.0 | Survey #1 (DD) | MWD | Geolink MWD |
| 1,347.0 | 11,300.0 | Survey #2 (DD) | MWD | Geolink MWD |

**Survey**

| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Formations / Comments |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | |
| 206.0 | 0.40 | 0.00 | 206.0 | 0.7 | 0.0 | 0.6 | 0.19 | 0.19 | |
| 237.0 | 0.10 | 2.60 | 237.0 | 0.9 | 0.0 | 0.7 | 0.97 | -0.97 | |
| 267.0 | 1.10 | 341.40 | 267.0 | 1.2 | -0.1 | 1.0 | 3.36 | 3.33 | |
| 298.0 | 1.90 | 331.40 | 298.0 | 1.9 | -0.4 | 1.8 | 2.71 | 2.58 | |
| 328.0 | 2.70 | 325.50 | 328.0 | 2.9 | -1.1 | 3.0 | 2.78 | 2.67 | |
| 359.0 | 4.10 | 325.00 | 358.9 | 4.4 | -2.1 | 4.9 | 4.52 | 4.52 | |
| 389.0 | 4.90 | 324.50 | 388.8 | 6.3 | -3.5 | 7.2 | 2.67 | 2.67 | |
| 480.0 | 8.30 | 334.10 | 479.2 | 15.4 | -8.6 | 17.6 | 3.92 | 3.74 | |
| 571.0 | 11.20 | 330.40 | 568.9 | 29.0 | -15.8 | 33.0 | 3.26 | 3.19 | |
| 663.0 | 12.40 | 326.70 | 658.9 | 45.0 | -25.7 | 51.8 | 1.54 | 1.30 | |
| 755.0 | 12.40 | 324.40 | 748.8 | 61.3 | -36.9 | 71.5 | 0.54 | 0.00 | |

# Cathedral Energy Services

## Survey Report

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well MCU Fee 16-12C (M16W Pad) |
| **Project:** | Mamm Creek | **TVD Reference:** | KBE @ 7903.0ft (Patterson 308) |
| **Site:** | M16W Pad (SWSW S16-T7S-R93W) | **MD Reference:** | KBE @ 7903.0ft (Patterson 308) |
| **Well:** | MCU Fee 16-12C (M16W Pad) | **North Reference:** | True |
| **Wellbore:** | DD | **Survey Calculation Method:** | Minimum Curvature |
| **Design:** | FINAL | **Database:** | USA EDM 5000 Multi Users DB |

**Survey**

| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Formations / Comments |
|---|---|---|---|---|---|---|---|---|---|
| 846.0 | 12.80 | 324.40 | 837.6 | 77.5 | -48.4 | 91.3 | 0.44 | 0.44 | |
| 937.0 | 13.00 | 325.80 | 926.3 | 94.1 | -60.0 | 111.6 | 0.41 | 0.22 | |
| 1,032.0 | 13.20 | 324.90 | 1,018.8 | 111.8 | -72.3 | 133.1 | 0.30 | 0.21 | |
| 1,123.0 | 11.90 | 328.00 | 1,107.7 | 128.3 | -83.2 | 152.9 | 1.61 | -1.43 | |
| 1,215.0 | 11.90 | 328.90 | 1,197.7 | 144.5 | -93.1 | 171.8 | 0.20 | 0.00 | |
| 1,347.0 | 11.60 | 325.60 | 1,326.9 | 167.1 | -107.7 | 198.7 | 0.56 | -0.23 | |
| 1,439.0 | 11.30 | 324.70 | 1,417.1 | 182.1 | -118.1 | 216.9 | 0.38 | -0.33 | |
| 1,530.0 | 12.90 | 328.80 | 1,506.1 | 198.0 | -128.5 | 236.0 | 1.99 | 1.76 | |
| 1,622.0 | 12.50 | 324.90 | 1,595.8 | 214.9 | -139.6 | 256.2 | 1.03 | -0.43 | |
| 1,713.0 | 12.00 | 324.20 | 1,684.7 | 230.7 | -150.8 | 275.4 | 0.57 | -0.55 | |
| 1,805.0 | 11.70 | 325.90 | 1,774.8 | 246.2 | -161.6 | 294.3 | 0.50 | -0.33 | |
| 1,897.0 | 10.90 | 328.20 | 1,865.0 | 261.3 | -171.4 | 312.3 | 1.00 | -0.87 | |
| 1,988.0 | 10.90 | 329.10 | 1,954.3 | 276.0 | -180.4 | 329.5 | 0.19 | 0.00 | |
| 2,080.0 | 10.50 | 326.40 | 2,044.7 | 290.4 | -189.5 | 346.6 | 0.70 | -0.43 | |
| 2,171.0 | 10.30 | 325.10 | 2,134.3 | 304.0 | -198.7 | 363.0 | 0.34 | -0.22 | |
| 2,263.0 | 12.20 | 329.60 | 2,224.5 | 319.1 | -208.3 | 380.9 | 2.27 | 2.07 | |
| 2,354.0 | 12.20 | 327.20 | 2,313.4 | 335.5 | -218.4 | 400.2 | 0.56 | 0.00 | |
| 2,446.0 | 11.20 | 326.10 | 2,403.5 | 351.1 | -228.7 | 418.8 | 1.11 | -1.09 | |
| 2,537.0 | 13.50 | 332.40 | 2,492.4 | 367.8 | -238.5 | 438.2 | 2.93 | 2.53 | |
| 2,629.0 | 13.30 | 332.30 | 2,581.9 | 386.7 | -248.4 | 459.5 | 0.22 | -0.22 | |
| 2,720.0 | 12.40 | 331.20 | 2,670.6 | 404.6 | -258.0 | 479.7 | 1.02 | -0.99 | |
| 2,812.0 | 11.90 | 331.10 | 2,760.6 | 421.5 | -267.3 | 499.1 | 0.54 | -0.54 | |
| 2,903.0 | 11.60 | 332.80 | 2,849.7 | 437.9 | -276.0 | 517.6 | 0.50 | -0.33 | |
| 2,995.0 | 11.00 | 327.30 | 2,939.9 | 453.5 | -285.0 | 535.6 | 1.34 | -0.65 | |
| 3,086.0 | 10.60 | 327.60 | 3,029.3 | 467.9 | -294.2 | 552.6 | 0.44 | -0.44 | |
| 3,178.0 | 11.30 | 332.20 | 3,119.6 | 483.0 | -302.9 | 570.1 | 1.22 | 0.76 | |
| 3,269.0 | 10.60 | 330.00 | 3,208.9 | 498.1 | -311.3 | 587.3 | 0.90 | -0.77 | |
| 3,361.0 | 14.30 | 338.30 | 3,298.8 | 516.0 | -319.7 | 607.0 | 4.46 | 4.02 | |
| 3,453.0 | 13.80 | 336.60 | 3,388.0 | 536.6 | -328.3 | 629.1 | 0.70 | -0.54 | |
| 3,544.0 | 13.90 | 337.50 | 3,476.4 | 556.7 | -336.7 | 650.6 | 0.26 | 0.11 | |
| 3,636.0 | 13.30 | 336.60 | 3,565.8 | 576.6 | -345.2 | 672.0 | 0.69 | -0.65 | |
| 3,727.0 | 13.10 | 333.80 | 3,654.4 | 595.5 | -353.9 | 692.6 | 0.74 | -0.22 | |
| 3,818.0 | 12.80 | 333.30 | 3,743.1 | 613.7 | -363.0 | 713.0 | 0.35 | -0.33 | |
| 3,910.0 | 12.70 | 331.90 | 3,832.8 | 631.8 | -372.3 | 733.2 | 0.35 | -0.11 | |
| 4,001.0 | 12.50 | 334.20 | 3,921.6 | 649.4 | -381.3 | 753.0 | 0.59 | -0.22 | |
| 4,092.0 | 12.40 | 334.40 | 4,010.5 | 667.1 | -389.8 | 772.5 | 0.12 | -0.11 | |
| 4,184.0 | 11.50 | 333.60 | 4,100.5 | 684.2 | -398.2 | 791.5 | 0.99 | -0.98 | |
| 4,275.0 | 10.60 | 334.00 | 4,189.8 | 699.9 | -405.9 | 808.9 | 0.99 | -0.99 | |
| 4,367.0 | 11.70 | 328.20 | 4,280.0 | 715.4 | -414.5 | 826.6 | 1.71 | 1.20 | |
| 4,458.0 | 11.30 | 328.70 | 4,369.2 | 730.9 | -424.0 | 844.8 | 0.45 | -0.44 | |
| 4,550.0 | 10.90 | 327.50 | 4,459.5 | 745.9 | -433.3 | 862.5 | 0.50 | -0.43 | |
| 4,641.0 | 10.50 | 329.70 | 4,548.9 | 760.3 | -442.1 | 879.4 | 0.63 | -0.44 | |
| 4,733.0 | 10.30 | 327.40 | 4,639.4 | 774.5 | -450.8 | 896.0 | 0.50 | -0.22 | |
| 4,824.0 | 9.30 | 326.80 | 4,729.1 | 787.5 | -459.2 | 911.4 | 1.10 | -1.10 | |
| 4,916.0 | 8.60 | 326.10 | 4,820.0 | 799.4 | -467.1 | 925.7 | 0.77 | -0.76 | |
| 5,007.0 | 10.40 | 315.60 | 4,909.7 | 811.0 | -476.7 | 940.5 | 2.74 | 1.98 | |
| 5,099.0 | 12.00 | 316.00 | 5,000.0 | 823.8 | -489.1 | 958.0 | 1.74 | 1.74 | |
| 5,191.0 | 11.40 | 311.70 | 5,090.0 | 836.7 | -502.6 | 976.0 | 1.15 | -0.65 | |
| 5,282.0 | 11.30 | 310.60 | 5,179.3 | 848.5 | -516.0 | 993.1 | 0.26 | -0.11 | |
| 5,374.0 | 13.60 | 308.50 | 5,269.1 | 861.1 | -531.3 | 1,011.8 | 2.55 | 2.50 | |
| 5,465.0 | 13.70 | 306.50 | 5,357.5 | 874.2 | -548.4 | 1,031.9 | 0.53 | 0.11 | |
| 5,557.0 | 12.80 | 307.90 | 5,447.1 | 886.9 | -565.2 | 1,051.5 | 1.04 | -0.98 | |
| 5,648.0 | 13.20 | 310.90 | 5,535.7 | 899.9 | -581.0 | 1,070.8 | 0.86 | 0.44 | |

# Cathedral Energy Services

Survey Report

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well MCU Fee 16-12C (M16W Pad) |
| **Project:** | Mamm Creek | **TVD Reference:** | KBE @ 7903.0ft (Patterson 308) |
| **Site:** | M16W Pad (SWSW S16-T7S-R93W) | **MD Reference:** | KBE @ 7903.0ft (Patterson 308) |
| **Well:** | MCU Fee 16-12C (M16W Pad) | **North Reference:** | True |
| **Wellbore:** | DD | **Survey Calculation Method:** | Minimum Curvature |
| **Design:** | FINAL | **Database:** | USA EDM 5000 Multi Users DB |

**Survey**

| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Formations / Comments |
|---|---|---|---|---|---|---|---|---|---|
| 5,740.0 | 13.80 | 319.60 | 5,625.2 | 915.1 | -596.0 | 1,091.7 | 2.30 | 0.65 | |
| 5,831.0 | 13.30 | 319.10 | 5,713.7 | 931.3 | -609.9 | 1,112.7 | 0.56 | -0.55 | |
| 5,923.0 | 15.20 | 323.90 | 5,802.8 | 949.1 | -624.0 | 1,135.2 | 2.43 | 2.07 | |
| 6,015.0 | 15.40 | 326.20 | 5,891.6 | 969.0 | -637.9 | 1,159.4 | 0.69 | 0.22 | |
| 6,106.0 | 15.30 | 333.90 | 5,979.4 | 989.8 | -649.9 | 1,183.4 | 2.24 | -0.11 | |
| 6,197.0 | 14.60 | 335.20 | 6,067.3 | 1,011.0 | -660.0 | 1,206.8 | 0.85 | -0.77 | |
| 6,289.0 | 13.60 | 331.30 | 6,156.5 | 1,031.0 | -670.0 | 1,229.1 | 1.50 | -1.09 | |
| 6,380.0 | 13.10 | 334.00 | 6,245.0 | 1,049.6 | -679.7 | 1,250.0 | 0.88 | -0.55 | |
| 6,472.0 | 12.30 | 333.70 | 6,334.8 | 1,067.8 | -688.6 | 1,270.2 | 0.87 | -0.87 | |
| 6,564.0 | 12.30 | 332.30 | 6,424.7 | 1,085.3 | -697.5 | 1,289.7 | 0.32 | 0.00 | |
| 6,655.0 | 10.80 | 331.60 | 6,513.8 | 1,101.3 | -706.1 | 1,307.9 | 1.66 | -1.65 | |
| 6,747.0 | 10.70 | 339.40 | 6,604.2 | 1,116.9 | -713.2 | 1,324.9 | 1.58 | -0.11 | |
| 6,839.0 | 9.70 | 337.20 | 6,694.8 | 1,132.1 | -719.2 | 1,341.0 | 1.17 | -1.09 | |
| 6,930.0 | 9.80 | 337.90 | 6,784.5 | 1,146.3 | -725.1 | 1,356.2 | 0.17 | 0.11 | |
| 7,022.0 | 8.80 | 338.60 | 6,875.2 | 1,160.1 | -730.6 | 1,370.8 | 1.09 | -1.09 | |
| 7,114.0 | 7.30 | 337.60 | 6,966.3 | 1,172.1 | -735.4 | 1,383.5 | 1.64 | -1.63 | |
| 7,205.0 | 6.20 | 340.60 | 7,056.7 | 1,182.0 | -739.2 | 1,394.1 | 1.27 | -1.21 | |
| 7,297.0 | 5.80 | 340.00 | 7,148.2 | 1,191.1 | -742.4 | 1,403.5 | 0.44 | -0.43 | |
| 7,389.0 | 5.00 | 341.90 | 7,239.8 | 1,199.3 | -745.3 | 1,411.9 | 0.89 | -0.87 | |
| 7,480.0 | 6.30 | 341.10 | 7,330.3 | 1,207.8 | -748.1 | 1,420.7 | 1.43 | 1.43 | |
| 7,572.0 | 6.20 | 340.40 | 7,421.8 | 1,217.2 | -751.4 | 1,430.5 | 0.14 | -0.11 | |
| 7,663.0 | 5.90 | 342.20 | 7,512.3 | 1,226.3 | -754.5 | 1,439.8 | 0.39 | -0.33 | |
| 7,755.0 | 3.60 | 329.70 | 7,604.0 | 1,233.3 | -757.4 | 1,447.3 | 2.73 | -2.50 | |
| 7,846.0 | 2.20 | 352.40 | 7,694.9 | 1,237.5 | -759.1 | 1,451.8 | 1.96 | -1.54 | |
| 7,938.0 | 1.70 | 336.50 | 7,786.8 | 1,240.5 | -759.9 | 1,454.7 | 0.80 | -0.54 | |
| 8,019.6 | 2.06 | 341.53 | 7,868.4 | 1,243.0 | -760.8 | 1,457.4 | 0.48 | 0.44 | **MCU Fee 16-12C (M16W Pad) TGT** |
| 8,029.0 | 2.10 | 342.00 | 7,877.8 | 1,243.3 | -760.9 | 1,457.7 | 0.48 | 0.45 | |
| 8,121.0 | 1.90 | 343.40 | 7,969.7 | 1,246.4 | -761.9 | 1,460.8 | 0.22 | -0.22 | |
| 8,213.0 | 1.60 | 326.60 | 8,061.7 | 1,248.9 | -763.0 | 1,463.6 | 0.64 | -0.33 | |
| 8,305.0 | 1.60 | 332.90 | 8,153.6 | 1,251.1 | -764.3 | 1,466.1 | 0.19 | 0.00 | |
| 8,396.0 | 1.60 | 333.40 | 8,244.6 | 1,253.4 | -765.5 | 1,468.7 | 0.02 | 0.00 | |
| 8,488.0 | 1.20 | 345.60 | 8,336.6 | 1,255.5 | -766.3 | 1,470.9 | 0.54 | -0.43 | |
| 8,580.0 | 1.30 | 339.50 | 8,428.5 | 1,257.4 | -766.9 | 1,472.8 | 0.18 | 0.11 | |
| 8,671.0 | 1.30 | 306.20 | 8,519.5 | 1,259.0 | -768.1 | 1,474.8 | 0.82 | 0.00 | |
| 8,763.0 | 1.00 | 5.40 | 8,611.5 | 1,260.4 | -768.8 | 1,476.4 | 1.27 | -0.33 | |
| 8,854.0 | 0.70 | 345.70 | 8,702.5 | 1,261.7 | -768.9 | 1,477.5 | 0.46 | -0.33 | |
| 8,945.0 | 1.60 | 25.50 | 8,793.5 | 1,263.4 | -768.5 | 1,478.8 | 1.27 | 0.99 | |
| 9,036.0 | 0.90 | 7.10 | 8,884.4 | 1,265.3 | -767.8 | 1,480.0 | 0.88 | -0.77 | |
| 9,128.0 | 0.80 | 40.00 | 8,976.4 | 1,266.5 | -767.3 | 1,480.8 | 0.53 | -0.11 | |
| 9,220.0 | 1.00 | 55.40 | 9,068.4 | 1,267.4 | -766.3 | 1,481.0 | 0.34 | 0.22 | |
| 9,311.0 | 0.50 | 7.60 | 9,159.4 | 1,268.3 | -765.6 | 1,481.4 | 0.84 | -0.55 | |
| 9,403.0 | 0.40 | 21.20 | 9,251.4 | 1,269.0 | -765.4 | 1,481.9 | 0.16 | -0.11 | |
| 9,494.0 | 0.10 | 167.50 | 9,342.4 | 1,269.2 | -765.3 | 1,482.0 | 0.53 | -0.33 | |
| 9,586.0 | 0.30 | 319.50 | 9,434.4 | 1,269.3 | -765.4 | 1,482.2 | 0.43 | 0.22 | |
| 9,678.0 | 0.70 | 334.10 | 9,526.4 | 1,270.0 | -765.8 | 1,483.0 | 0.45 | 0.43 | |
| 9,769.0 | 0.90 | 46.90 | 9,617.4 | 1,271.0 | -765.5 | 1,483.7 | 1.06 | 0.22 | |
| 9,861.0 | 1.90 | 60.50 | 9,709.4 | 1,272.2 | -763.7 | 1,483.8 | 1.14 | 1.09 | |
| 9,952.0 | 1.30 | 68.70 | 9,800.3 | 1,273.3 | -761.4 | 1,483.5 | 0.70 | -0.66 | |
| 10,044.0 | 1.50 | 46.50 | 9,892.3 | 1,274.5 | -759.6 | 1,483.6 | 0.62 | 0.22 | |
| 10,136.0 | 0.90 | 144.40 | 9,984.3 | 1,274.8 | -758.3 | 1,483.1 | 2.01 | -0.65 | |
| 10,227.0 | 0.60 | 127.10 | 10,075.3 | 1,273.9 | -757.5 | 1,482.0 | 0.41 | -0.33 | |
| 10,318.0 | 1.10 | 150.30 | 10,166.3 | 1,272.9 | -756.6 | 1,480.7 | 0.66 | 0.55 | |
| 10,410.0 | 0.80 | 218.80 | 10,258.3 | 1,271.6 | -756.6 | 1,479.6 | 1.19 | -0.33 | |

# Cathedral Energy Services

Survey Report

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well MCU Fee 16-12C (M16W Pad) |
| **Project:** | Mamm Creek | **TVD Reference:** | KBE @ 7903.0ft (Patterson 308) |
| **Site:** | M16W Pad (SWSW S16-T7S-R93W) | **MD Reference:** | KBE @ 7903.0ft (Patterson 308) |
| **Well:** | MCU Fee 16-12C (M16W Pad) | **North Reference:** | True |
| **Wellbore:** | DD | **Survey Calculation Method:** | Minimum Curvature |
| **Design:** | FINAL | **Database:** | USA EDM 5000 Multi Users DB |

**Survey**

| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Formations / Comments |
|---|---|---|---|---|---|---|---|---|---|
| 10,502.0 | 1.00 | 231.80 | 10,350.3 | 1,270.6 | -757.6 | 1,479.3 | 0.31 | 0.22 | |
| 10,594.0 | 0.60 | 246.50 | 10,442.3 | 1,269.9 | -758.7 | 1,479.2 | 0.49 | -0.43 | |
| 10,686.0 | 0.40 | 194.00 | 10,534.2 | 1,269.4 | -759.2 | 1,479.1 | 0.52 | -0.22 | |
| 10,777.0 | 0.20 | 295.40 | 10,625.2 | 1,269.2 | -759.5 | 1,479.0 | 0.53 | -0.22 | |
| 10,869.0 | 0.30 | 46.60 | 10,717.2 | 1,269.4 | -759.4 | 1,479.2 | 0.45 | 0.11 | |
| 10,960.0 | 0.70 | 255.80 | 10,808.2 | 1,269.4 | -759.8 | 1,479.4 | 1.07 | 0.44 | |
| 11,052.0 | 0.90 | 240.80 | 10,900.2 | 1,268.9 | -761.0 | 1,479.6 | 0.31 | 0.22 | |
| 11,144.0 | 1.90 | 225.90 | 10,992.2 | 1,267.5 | -762.7 | 1,479.3 | 1.15 | 1.09 | |
| 11,221.1 | 2.04 | 228.59 | 11,069.3 | 1,265.7 | -764.6 | 1,478.7 | 0.22 | 0.19 | **MCU Fee 16-12C (M16W Pad) BHL** |
| 11,250.0 | 2.10 | 229.50 | 11,098.1 | 1,265.0 | -765.4 | 1,478.6 | 0.22 | 0.19 | **Last Cathedral Survey @ 11,250' MD** |
| 11,300.0 | 2.10 | 229.50 | 11,148.1 | 1,263.8 | -766.8 | 1,478.3 | 0.00 | 0.00 | **Projection to Bit @ 11,300' MD** |

**Targets**

| Target Name - hit/miss target - Shape | Dip Angle (°) | Dip Dir. (°) | TVD (ft) | +N/-S (ft) | +E/-W (ft) | Northing (ft) | Easting (ft) | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|---|
| MCU Fee 16-12C (M16\ | 0.00 | 0.00 | 11,069.0 | 1,253.0 | -764.5 | 1,594,601.13 | 2,354,584.09 | 39.443648 | -107.785641 |
| - actual wellpath misses target center by 12.7ft at 11221.1ft MD (11069.3 TVD, 1265.7 N, -764.6 E) | | | | | | | | | |
| - Circle (radius 25.0) | | | | | | | | | |
| MCU Fee 16-12C (M16\ | 0.00 | 0.00 | 7,868.0 | 1,253.0 | -764.5 | 1,594,601.13 | 2,354,584.09 | 39.443648 | -107.785641 |
| - actual wellpath misses target center by 10.7ft at 8019.6ft MD (7868.4 TVD, 1243.0 N, -760.8 E) | | | | | | | | | |
| - Circle (radius 25.0) | | | | | | | | | |

**Design Annotations**

| Measured Depth (ft) | Vertical Depth (ft) | Local Coordinates +N/-S (ft) | Local Coordinates +E/-W (ft) | Comment |
|---|---|---|---|---|
| 11,250.0 | 11,098.1 | 1,265.0 | -765.4 | Last Cathedral Survey @ 11,250' MD |
| 11,300.0 | 11,148.1 | 1,263.8 | -766.8 | Projection to Bit @ 11,300' MD |

Checked By: _____ Approved By: _____ Date: _____