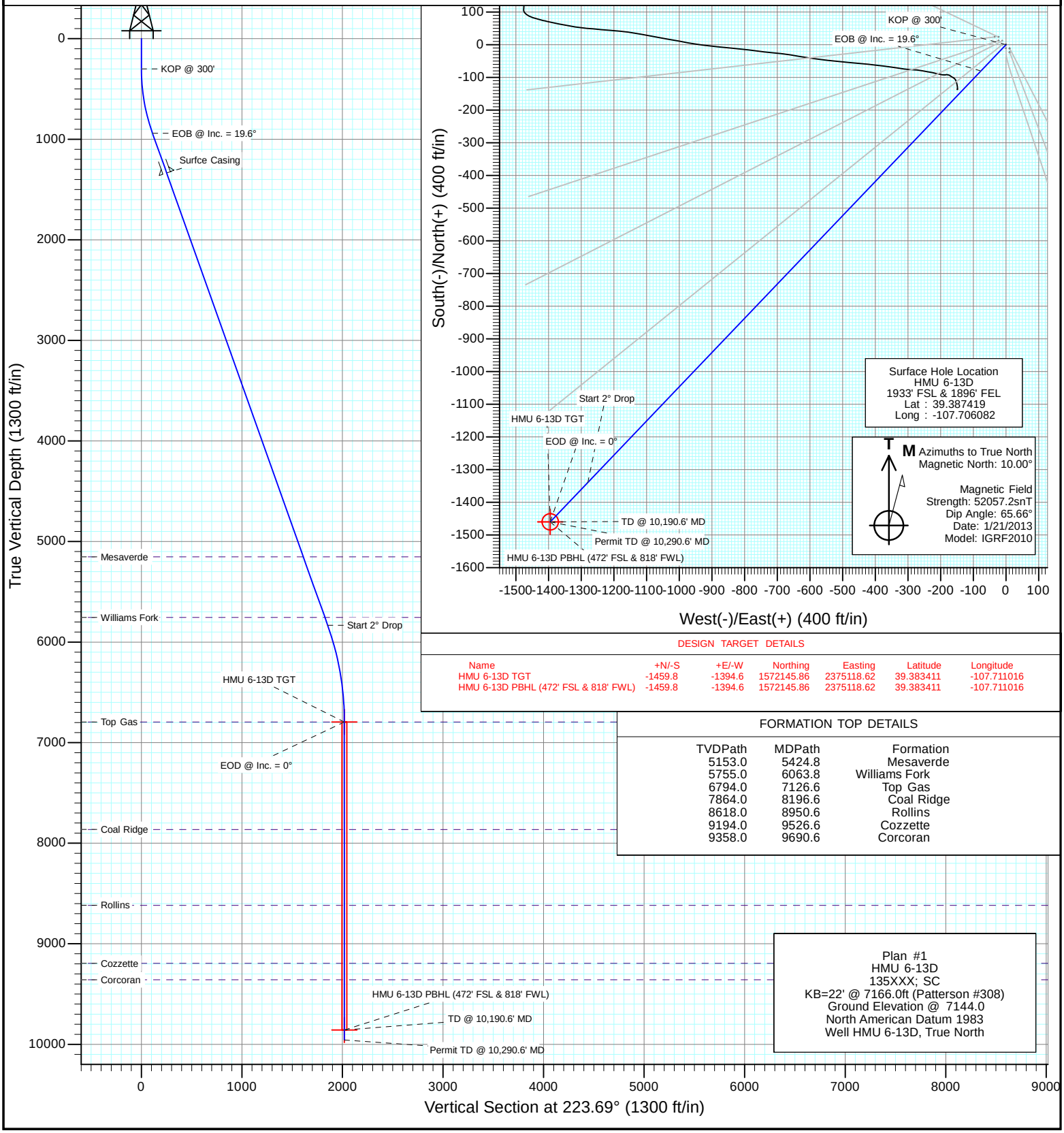
Project: Mamm Creek
Site: J6SEB Pad
Well: HMU 6-13D
Wellbore: OH
Design: Plan #1

CATHEDRAL

SECTION DETAILS

| Sec | MD | Inc | Azi | TVD | +N/-S | +E/-W | Dleg | TFace | VSect | Target |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0.0 | |
| 2 | 300.0 | 0.00 | 0.00 | 300.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0.0 | |
| 3 | 953.4 | 19.60 | 223.69 | 940.7 | -80.0 | -76.5 | 3.00 | 223.69 | 110.7 | |
| 4 | 6146.6 | 19.60 | 223.69 | 5832.9 | -1339.7 | -1279.9 | 0.00 | 0.00 | 1852.9 | |
| 5 | 7126.6 | 0.00 | 0.00 | 6794.0 | -1459.8 | -1394.6 | 2.00 | 180.00 | 2018.9 | HMU 6-13D TGT |
| 6 | 10190.6 | 0.00 | 0.00 | 9858.0 | -1459.8 | -1394.6 | 0.00 | 0.00 | 2018.9 | HMU 6-13D PBHL (472' FSL & 818' FWL) |
| 7 | 10290.6 | 0.00 | 0.00 | 9958.0 | -1459.8 | -1394.6 | 0.00 | 0.00 | 2018.9 | |




DESIGN TARGET DETAILS

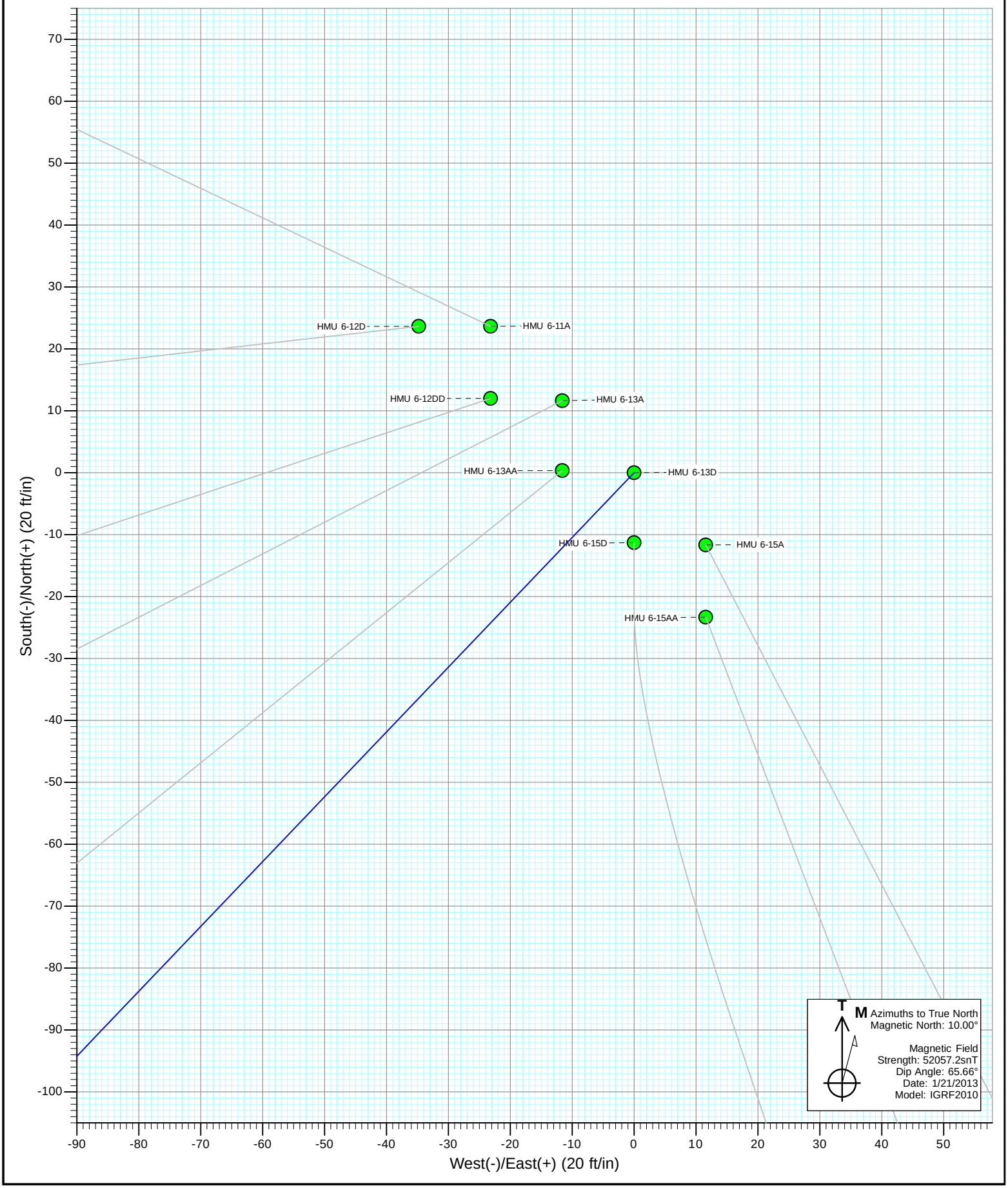
| Name | +N/-S | +E/-W | Northing | Easting | Latitude | Longitude |
|---|---|---|---|---|---|---|
| HMU 6-13D TGT | -1459.8 | -1394.6 | 1572145.86 | 2375118.62 | 39.383411 | -107.711016 |
| HMU 6-13D PBHL (472' FSL & 818' FWL) | -1459.8 | -1394.6 | 1572145.86 | 2375118.62 | 39.383411 | -107.711016 |

FORMATION TOP DETAILS

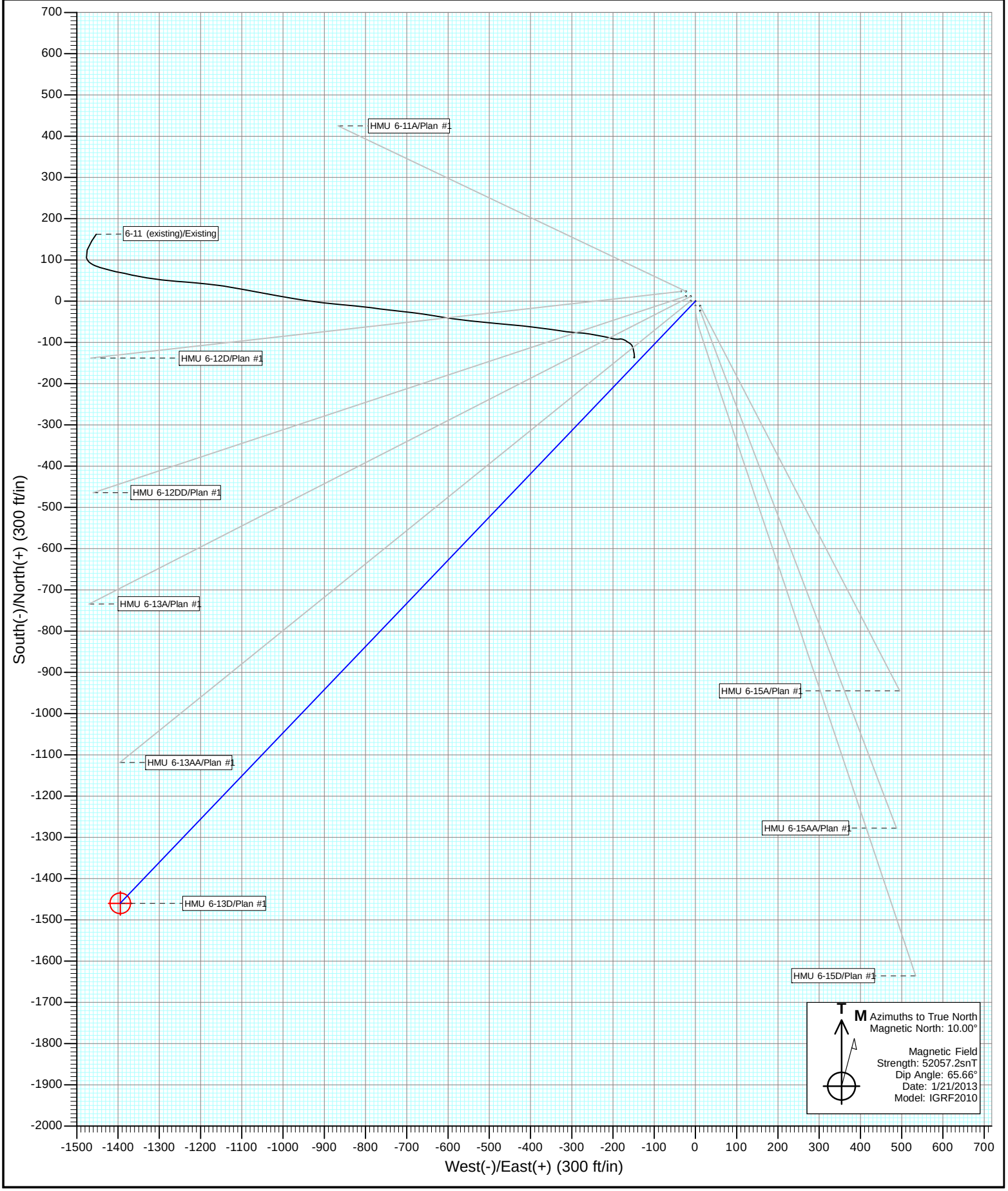
| TVDPath | MDPath | Formation |
|---|---|---|
| 5153.0 | 5424.8 | Mesaverde |
| 5755.0 | 6063.8 | Williams Fork |
| 6794.0 | 7126.6 | Top Gas |
| 7864.0 | 8196.6 | Coal Ridge |
| 8618.0 | 8950.6 | Rollins |
| 9194.0 | 9526.6 | Cozzette |
| 9358.0 | 9690.6 | Corcoran |

Plan #1
HMU 6-13D
135XXX; SC
KB=22' @ 7166.0ft (Patterson #308)
Ground Elevation @ 7144.0
North American Datum 1983
Well HMU 6-13D, True North

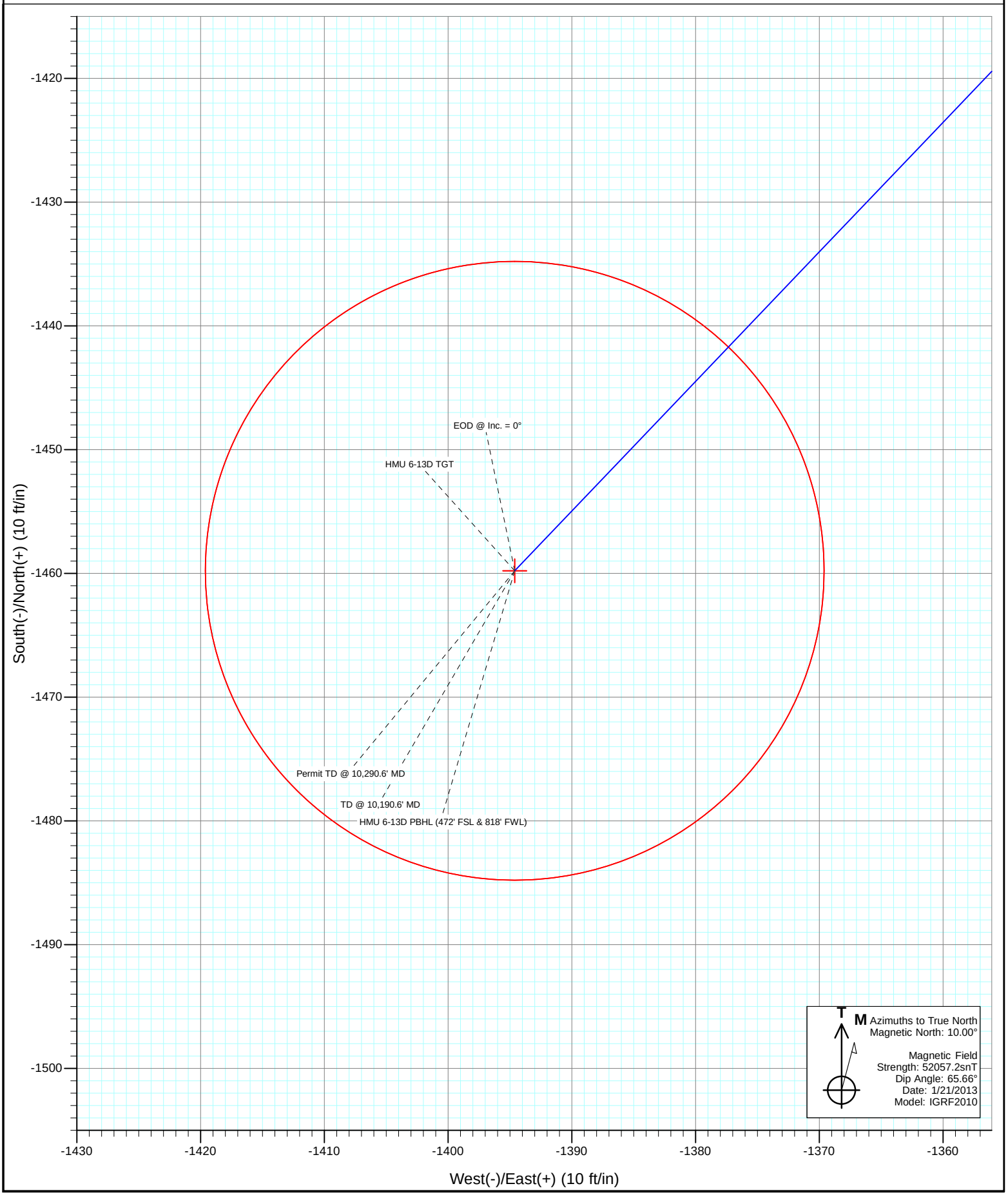
Project: Mamm Creek
Site: J6SEB Pad
Well: HMU 6-13D
Wellbore: OH
Design: Plan #1



Project: Mamm Creek
Site: J6SEB Pad
Well: HMU 6-13D
Wellbore: OH
Design: Plan #1



Project: Mamm Creek
Site: J6SEB Pad
Well: HMU 6-13D
Wellbore: OH
Design: Plan #1



# Cathedral Energy Services

Planning Report

| | | | |
|---|---|---|---|
| **Database:** | USA EDM 5000 Multi Users DB | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Company:** | EnCana Oil & Gas (USA) Inc | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Project:** | Mamm Creek | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site:** | J6SEB Pad | **North Reference:** | True |
| **Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | OH | | |
| **Design:** | Plan #1 | | |

**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** J6SEB Pad

| | | | | | |
|---|---|---|---|---|---|
| **Site Position:** | | **Northing:** | 1,573,595.87 ft | **Latitude:** | 39.387484 |
| **From:** | Lat/Long | **Easting:** | 2,376,514.08 ft | **Longitude:** | -107.706205 |
| **Position Uncertainty:** | 0.0 ft | **Slot Radius:** | 13.200 in | **Grid Convergence:** | -1.39 ° |

**Well** HMU 6-13D

| | | | | | | |
|---|---|---|---|---|---|---|
| **Well Position** | **+N/-S** | 0.0 ft | **Northing:** | 1,573,571.35 ft | **Latitude:** | 39.387419 |
| | **+E/-W** | 0.0 ft | **Easting:** | 2,376,548.26 ft | **Longitude:** | -107.706082 |
| **Position Uncertainty** | | 0.0 ft | **Wellhead Elevation:** | ft | **Ground Level:** | 7,144.0 ft |

**Wellbore** OH

| Magnetics | Model Name | Sample Date | Declination (°) | Dip Angle (°) | Field Strength (nT) |
|---|---|---|---|---|---|
| | IGRF2010 | 1/21/2013 | 10.00 | 65.66 | 52,057 |

**Design** Plan #1

**Audit Notes:**

| | | | | | |
|---|---|---|---|---|---|
| **Version:** | | **Phase:** | PLAN | **Tie On Depth:** | 0.0 |

| Vertical Section: | Depth From (TVD) (ft) | +N/-S (ft) | +E/-W (ft) | Direction (°) |
|---|---|---|---|---|
| | 0.0 | 0.0 | 0.0 | 223.69 |

**Plan Sections**

| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Turn Rate (°/100ft) | TFO (°) | Target |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 300.0 | 0.00 | 0.00 | 300.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 953.4 | 19.60 | 223.69 | 940.7 | -80.0 | -76.5 | 3.00 | 3.00 | 0.00 | 223.69 | |
| 6,146.6 | 19.60 | 223.69 | 5,832.9 | -1,339.7 | -1,279.9 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 7,126.6 | 0.00 | 0.00 | 6,794.0 | -1,459.8 | -1,394.6 | 2.00 | -2.00 | 0.00 | 180.00 | HMU 6-13D TGT |
| 10,190.6 | 0.00 | 0.00 | 9,858.0 | -1,459.8 | -1,394.6 | 0.00 | 0.00 | 0.00 | 0.00 | HMU 6-13D PBHL (47 |
| 10,290.6 | 0.00 | 0.00 | 9,958.0 | -1,459.8 | -1,394.6 | 0.00 | 0.00 | 0.00 | 0.00 | |

| | | | |
|---|---|---|---|
| **Database:** | USA EDM 5000 Multi Users DB | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Company:** | EnCana Oil & Gas (USA) Inc | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Project:** | Mamm Creek | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site:** | J6SEB Pad | **North Reference:** | True |
| **Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | OH | | |
| **Design:** | Plan #1 | | |

**Planned Survey**

| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Comments / Formations |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | |
| 100.0 | 0.00 | 0.00 | 100.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | |
| 200.0 | 0.00 | 0.00 | 200.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | |
| 300.0 | 0.00 | 0.00 | 300.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | KOP @ 300' |
| 400.0 | 3.00 | 223.69 | 400.0 | -1.9 | -1.8 | 2.6 | 3.00 | 3.00 | |
| 500.0 | 6.00 | 223.69 | 499.6 | -7.6 | -7.2 | 10.5 | 3.00 | 3.00 | |
| 600.0 | 9.00 | 223.69 | 598.8 | -17.0 | -16.2 | 23.5 | 3.00 | 3.00 | |
| 700.0 | 12.00 | 223.69 | 697.1 | -30.2 | -28.8 | 41.7 | 3.00 | 3.00 | |
| 800.0 | 15.00 | 223.69 | 794.3 | -47.1 | -45.0 | 65.1 | 3.00 | 3.00 | |
| 900.0 | 18.00 | 223.69 | 890.2 | -67.6 | -64.6 | 93.5 | 3.00 | 3.00 | |
| 953.4 | 19.60 | 223.69 | 940.7 | -80.0 | -76.5 | 110.7 | 3.00 | 3.00 | EOB @ Inc. = 19.6° |
| 1,000.0 | 19.60 | 223.69 | 984.6 | -91.3 | -87.3 | 126.3 | 0.00 | 0.00 | |
| 1,100.0 | 19.60 | 223.69 | 1,078.8 | -115.6 | -110.4 | 159.9 | 0.00 | 0.00 | |
| 1,200.0 | 19.60 | 223.69 | 1,173.0 | -139.9 | -133.6 | 193.4 | 0.00 | 0.00 | |
| 1,300.0 | 19.60 | 223.69 | 1,267.2 | -164.1 | -156.8 | 227.0 | 0.00 | 0.00 | |
| 1,371.9 | 19.60 | 223.69 | 1,335.0 | -181.6 | -173.4 | 251.1 | 0.00 | 0.00 | Surfce Casing |
| 1,400.0 | 19.60 | 223.69 | 1,361.4 | -188.4 | -180.0 | 260.5 | 0.00 | 0.00 | |
| 1,500.0 | 19.60 | 223.69 | 1,455.7 | -212.6 | -203.1 | 294.1 | 0.00 | 0.00 | |
| 1,600.0 | 19.60 | 223.69 | 1,549.9 | -236.9 | -226.3 | 327.6 | 0.00 | 0.00 | |
| 1,700.0 | 19.60 | 223.69 | 1,644.1 | -261.1 | -249.5 | 361.2 | 0.00 | 0.00 | |
| 1,800.0 | 19.60 | 223.69 | 1,738.3 | -285.4 | -272.7 | 394.7 | 0.00 | 0.00 | |
| 1,900.0 | 19.60 | 223.69 | 1,832.5 | -309.7 | -295.8 | 428.2 | 0.00 | 0.00 | |
| 2,000.0 | 19.60 | 223.69 | 1,926.7 | -333.9 | -319.0 | 461.8 | 0.00 | 0.00 | |
| 2,100.0 | 19.60 | 223.69 | 2,020.9 | -358.2 | -342.2 | 495.3 | 0.00 | 0.00 | |
| 2,200.0 | 19.60 | 223.69 | 2,115.1 | -382.4 | -365.3 | 528.9 | 0.00 | 0.00 | |
| 2,300.0 | 19.60 | 223.69 | 2,209.3 | -406.7 | -388.5 | 562.4 | 0.00 | 0.00 | |
| 2,400.0 | 19.60 | 223.69 | 2,303.5 | -430.9 | -411.7 | 596.0 | 0.00 | 0.00 | |
| 2,500.0 | 19.60 | 223.69 | 2,397.7 | -455.2 | -434.9 | 629.5 | 0.00 | 0.00 | |
| 2,600.0 | 19.60 | 223.69 | 2,491.9 | -479.4 | -458.0 | 663.1 | 0.00 | 0.00 | |
| 2,700.0 | 19.60 | 223.69 | 2,586.1 | -503.7 | -481.2 | 696.6 | 0.00 | 0.00 | |
| 2,800.0 | 19.60 | 223.69 | 2,680.3 | -528.0 | -504.4 | 730.2 | 0.00 | 0.00 | |
| 2,900.0 | 19.60 | 223.69 | 2,774.5 | -552.2 | -527.6 | 763.7 | 0.00 | 0.00 | |
| 3,000.0 | 19.60 | 223.69 | 2,868.7 | -576.5 | -550.7 | 797.3 | 0.00 | 0.00 | |
| 3,100.0 | 19.60 | 223.69 | 2,962.9 | -600.7 | -573.9 | 830.8 | 0.00 | 0.00 | |
| 3,200.0 | 19.60 | 223.69 | 3,057.1 | -625.0 | -597.1 | 864.4 | 0.00 | 0.00 | |
| 3,300.0 | 19.60 | 223.69 | 3,151.3 | -649.2 | -620.3 | 897.9 | 0.00 | 0.00 | |
| 3,400.0 | 19.60 | 223.69 | 3,245.5 | -673.5 | -643.4 | 931.5 | 0.00 | 0.00 | |
| 3,500.0 | 19.60 | 223.69 | 3,339.7 | -697.8 | -666.6 | 965.0 | 0.00 | 0.00 | |
| 3,600.0 | 19.60 | 223.69 | 3,434.0 | -722.0 | -689.8 | 998.6 | 0.00 | 0.00 | |
| 3,700.0 | 19.60 | 223.69 | 3,528.2 | -746.3 | -713.0 | 1,032.1 | 0.00 | 0.00 | |
| 3,800.0 | 19.60 | 223.69 | 3,622.4 | -770.5 | -736.1 | 1,065.7 | 0.00 | 0.00 | |
| 3,900.0 | 19.60 | 223.69 | 3,716.6 | -794.8 | -759.3 | 1,099.2 | 0.00 | 0.00 | |
| 4,000.0 | 19.60 | 223.69 | 3,810.8 | -819.0 | -782.5 | 1,132.7 | 0.00 | 0.00 | |
| 4,100.0 | 19.60 | 223.69 | 3,905.0 | -843.3 | -805.7 | 1,166.3 | 0.00 | 0.00 | |
| 4,200.0 | 19.60 | 223.69 | 3,999.2 | -867.6 | -828.8 | 1,199.8 | 0.00 | 0.00 | |
| 4,300.0 | 19.60 | 223.69 | 4,093.4 | -891.8 | -852.0 | 1,233.4 | 0.00 | 0.00 | |
| 4,400.0 | 19.60 | 223.69 | 4,187.6 | -916.1 | -875.2 | 1,266.9 | 0.00 | 0.00 | |
| 4,500.0 | 19.60 | 223.69 | 4,281.8 | -940.3 | -898.4 | 1,300.5 | 0.00 | 0.00 | |
| 4,600.0 | 19.60 | 223.69 | 4,376.0 | -964.6 | -921.5 | 1,334.0 | 0.00 | 0.00 | |
| 4,700.0 | 19.60 | 223.69 | 4,470.2 | -988.8 | -944.7 | 1,367.6 | 0.00 | 0.00 | |
| 4,800.0 | 19.60 | 223.69 | 4,564.4 | -1,013.1 | -967.9 | 1,401.1 | 0.00 | 0.00 | |
| 4,900.0 | 19.60 | 223.69 | 4,658.6 | -1,037.4 | -991.0 | 1,434.7 | 0.00 | 0.00 | |

| | | | |
|---|---|---|---|
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| **Project:** | Mamm Creek | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site:** | J6SEB Pad | **North Reference:** | True |
| **Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | OH | | |
| **Design:** | Plan #1 | | |

**Planned Survey**

| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Comments / Formations |
|---|---|---|---|---|---|---|---|---|---|
| 5,000.0 | 19.60 | 223.69 | 4,752.8 | -1,061.6 | -1,014.2 | 1,468.2 | 0.00 | 0.00 | |
| 5,100.0 | 19.60 | 223.69 | 4,847.0 | -1,085.9 | -1,037.4 | 1,501.8 | 0.00 | 0.00 | |
| 5,200.0 | 19.60 | 223.69 | 4,941.2 | -1,110.1 | -1,060.6 | 1,535.3 | 0.00 | 0.00 | |
| 5,300.0 | 19.60 | 223.69 | 5,035.4 | -1,134.4 | -1,083.7 | 1,568.9 | 0.00 | 0.00 | |
| 5,400.0 | 19.60 | 223.69 | 5,129.6 | -1,158.6 | -1,106.9 | 1,602.4 | 0.00 | 0.00 | |
| 5,424.8 | 19.60 | 223.69 | 5,153.0 | -1,164.7 | -1,112.7 | 1,610.7 | 0.00 | 0.00 | Mesaverde |
| 5,500.0 | 19.60 | 223.69 | 5,223.8 | -1,182.9 | -1,130.1 | 1,636.0 | 0.00 | 0.00 | |
| 5,600.0 | 19.60 | 223.69 | 5,318.1 | -1,207.2 | -1,153.3 | 1,669.5 | 0.00 | 0.00 | |
| 5,700.0 | 19.60 | 223.69 | 5,412.3 | -1,231.4 | -1,176.4 | 1,703.1 | 0.00 | 0.00 | |
| 5,800.0 | 19.60 | 223.69 | 5,506.5 | -1,255.7 | -1,199.6 | 1,736.6 | 0.00 | 0.00 | |
| 5,900.0 | 19.60 | 223.69 | 5,600.7 | -1,279.9 | -1,222.8 | 1,770.2 | 0.00 | 0.00 | |
| 6,000.0 | 19.60 | 223.69 | 5,694.9 | -1,304.2 | -1,246.0 | 1,803.7 | 0.00 | 0.00 | |
| 6,063.8 | 19.60 | 223.69 | 5,755.0 | -1,319.7 | -1,260.8 | 1,825.1 | 0.00 | 0.00 | Williams Fork |
| 6,100.0 | 19.60 | 223.69 | 5,789.1 | -1,328.4 | -1,269.1 | 1,837.2 | 0.00 | 0.00 | |
| 6,146.6 | 19.60 | 223.69 | 5,832.9 | -1,339.7 | -1,279.9 | 1,852.9 | 0.00 | 0.00 | Start 2° Drop |
| 6,200.0 | 18.53 | 223.69 | 5,883.4 | -1,352.4 | -1,292.0 | 1,870.3 | 2.00 | -2.00 | |
| 6,300.0 | 16.53 | 223.69 | 5,978.8 | -1,374.1 | -1,312.8 | 1,900.4 | 2.00 | -2.00 | |
| 6,400.0 | 14.53 | 223.69 | 6,075.1 | -1,393.5 | -1,331.3 | 1,927.2 | 2.00 | -2.00 | |
| 6,500.0 | 12.53 | 223.69 | 6,172.4 | -1,410.4 | -1,347.5 | 1,950.6 | 2.00 | -2.00 | |
| 6,600.0 | 10.53 | 223.69 | 6,270.3 | -1,424.9 | -1,361.3 | 1,970.6 | 2.00 | -2.00 | |
| 6,700.0 | 8.53 | 223.69 | 6,368.9 | -1,436.9 | -1,372.7 | 1,987.2 | 2.00 | -2.00 | |
| 6,800.0 | 6.53 | 223.69 | 6,468.1 | -1,446.3 | -1,381.8 | 2,000.3 | 2.00 | -2.00 | |
| 6,900.0 | 4.53 | 223.69 | 6,567.6 | -1,453.3 | -1,388.4 | 2,009.9 | 2.00 | -2.00 | |
| 7,000.0 | 2.53 | 223.69 | 6,667.4 | -1,457.8 | -1,392.7 | 2,016.1 | 2.00 | -2.00 | |
| 7,100.0 | 0.53 | 223.69 | 6,767.4 | -1,459.7 | -1,394.5 | 2,018.8 | 2.00 | -2.00 | |
| 7,126.6 | 0.00 | 0.00 | 6,794.0 | -1,459.8 | -1,394.6 | 2,018.9 | 2.00 | -2.00 | EOD @ Inc. = 0° - Top Gas |
| 7,200.0 | 0.00 | 0.00 | 6,867.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 7,300.0 | 0.00 | 0.00 | 6,967.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 7,400.0 | 0.00 | 0.00 | 7,067.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 7,500.0 | 0.00 | 0.00 | 7,167.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 7,600.0 | 0.00 | 0.00 | 7,267.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 7,700.0 | 0.00 | 0.00 | 7,367.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 7,800.0 | 0.00 | 0.00 | 7,467.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 7,900.0 | 0.00 | 0.00 | 7,567.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 8,000.0 | 0.00 | 0.00 | 7,667.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 8,100.0 | 0.00 | 0.00 | 7,767.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 8,196.6 | 0.00 | 0.00 | 7,864.0 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | Coal Ridge |
| 8,200.0 | 0.00 | 0.00 | 7,867.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 8,300.0 | 0.00 | 0.00 | 7,967.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 8,400.0 | 0.00 | 0.00 | 8,067.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 8,500.0 | 0.00 | 0.00 | 8,167.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 8,600.0 | 0.00 | 0.00 | 8,267.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 8,700.0 | 0.00 | 0.00 | 8,367.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 8,800.0 | 0.00 | 0.00 | 8,467.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 8,900.0 | 0.00 | 0.00 | 8,567.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 8,950.6 | 0.00 | 0.00 | 8,618.0 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | Rollins |
| 9,000.0 | 0.00 | 0.00 | 8,667.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 9,100.0 | 0.00 | 0.00 | 8,767.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 9,200.0 | 0.00 | 0.00 | 8,867.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 9,300.0 | 0.00 | 0.00 | 8,967.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 9,400.0 | 0.00 | 0.00 | 9,067.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 9,500.0 | 0.00 | 0.00 | 9,167.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |

| | | | |
|---|---|---|---|
| **Database:** | USA EDM 5000 Multi Users DB | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Company:** | EnCana Oil & Gas (USA) Inc | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Project:** | Mamm Creek | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site:** | J6SEB Pad | **North Reference:** | True |
| **Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | OH | | |
| **Design:** | Plan #1 | | |

**Planned Survey**

| Measured Depth (ft) | Inclination (°) | Azimuth (°) | Vertical Depth (ft) | +N/-S (ft) | +E/-W (ft) | Vertical Section (ft) | Dogleg Rate (°/100ft) | Build Rate (°/100ft) | Comments / Formations |
|---|---|---|---|---|---|---|---|---|---|
| 9,526.6 | 0.00 | 0.00 | 9,194.0 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | Cozzette |
| 9,600.0 | 0.00 | 0.00 | 9,267.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 9,690.6 | 0.00 | 0.00 | 9,358.0 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | Corcoran |
| 9,700.0 | 0.00 | 0.00 | 9,367.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 9,800.0 | 0.00 | 0.00 | 9,467.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 9,900.0 | 0.00 | 0.00 | 9,567.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 10,000.0 | 0.00 | 0.00 | 9,667.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 10,100.0 | 0.00 | 0.00 | 9,767.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 10,190.6 | 0.00 | 0.00 | 9,858.0 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | TD @ 10,190.6' MD |
| 10,200.0 | 0.00 | 0.00 | 9,867.4 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | |
| 10,290.6 | 0.00 | 0.00 | 9,958.0 | -1,459.8 | -1,394.6 | 2,018.9 | 0.00 | 0.00 | Permit TD @ 10,290.6' 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 |
|---|---|---|---|---|---|---|---|---|---|
| HMU 6-13D TGT<br>- plan hits target center<br>- Point | 0.00 | 0.00 | 6,794.0 | -1,459.8 | -1,394.6 | 1,572,145.86 | 2,375,118.62 | 39.383411 | -107.711016 |
| HMU 6-13D PBHL (472'<br>- plan hits target center<br>- Circle (radius 25.0) | 0.00 | 0.00 | 9,858.0 | -1,459.8 | -1,394.6 | 1,572,145.86 | 2,375,118.62 | 39.383411 | -107.711016 |

**Casing Points**

| Measured Depth (ft) | Vertical Depth (ft) | Name | Casing Diameter (in) | Hole Diameter (in) |
|---|---|---|---|---|
| 1,371.9 | 1,335.0 | Surfce Casing | | |

**Formations**

| Measured Depth (ft) | Vertical Depth (ft) | Name | Lithology | Dip (°) | Dip Direction (°) |
|---|---|---|---|---|---|
| 5,424.8 | 5,153.0 | Mesaverde | | | |
| 6,063.8 | 5,755.0 | Williams Fork | | | |
| 7,126.6 | 6,794.0 | Top Gas | | | |
| 8,196.6 | 7,864.0 | Coal Ridge | | | |
| 8,950.6 | 8,618.0 | Rollins | | | |
| 9,526.6 | 9,194.0 | Cozzette | | | |
| 9,690.6 | 9,358.0 | Corcoran | | | |

| | | | |
|---|---|---|---|
| **Database:** | USA EDM 5000 Multi Users DB | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Company:** | EnCana Oil & Gas (USA) Inc | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Project:** | Mamm Creek | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site:** | J6SEB Pad | **North Reference:** | True |
| **Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Wellbore:** | OH | | |
| **Design:** | Plan #1 | | |

**Plan Annotations**

| Measured Depth (ft) | Vertical Depth (ft) | Local Coordinates +N/-S (ft) | Local Coordinates +E/-W (ft) | Comment |
|---|---|---|---|---|
| 300.0 | 300.0 | 0.0 | 0.0 | KOP @ 300' |
| 953.4 | 940.7 | -80.0 | -76.5 | EOB @ Inc. = 19.6° |
| 6,146.6 | 5,832.9 | -1,339.7 | -1,279.9 | Start 2° Drop |
| 7,126.6 | 6,794.0 | -1,459.8 | -1,394.6 | EOD @ Inc. = 0° |
| 10,190.6 | 9,858.0 | -1,459.8 | -1,394.6 | TD @ 10,190.6' MD |
| 10,290.6 | 9,958.0 | -1,459.8 | -1,394.6 | Permit TD @ 10,290.6' MD |

# EnCana Oil & Gas (USA) Inc

**Mamm Creek**
**J6SEB Pad**
**HMU 6-13D**
**OH**
**Plan #1**

# Anticollision Report

**21 January, 2013**

# Cathedral Energy Services

## Anticollision Report

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Project:** | Mamm Creek | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Reference Site:** | J6SEB Pad | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site Error:** | 0.0ft | **North Reference:** | True |
| **Reference Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Well Error:** | 0.0ft | **Output errors are at** | 2.00 sigma |
| **Reference Wellbore** | OH | **Database:** | USA EDM 5000 Multi Users DB |
| **Reference Design:** | Plan #1 | **Offset TVD Reference:** | Offset Datum |

**Reference** Plan #1

| | | | |
|---|---|---|---|
| **Filter type:** | NO GLOBAL FILTER: Using user defined selection & filtering criteria | | |
| **Interpolation Method:** | MD Interval 100.0ft | **Error Model:** | Systematic Ellipse |
| **Depth Range:** | Unlimited | **Scan Method:** | Closest Approach 3D |
| **Results Limited by:** | Maximum center-center distance of 500.0ft | **Error Surface:** | Elliptical Conic |
| **Warning Levels Evaluated at:** | 2.00 **Sigma** | | |

**Survey Tool Program** **Date** 1/21/2013

| From (ft) | To (ft) | Survey (Wellbore) | Tool Name | Description |
|---|---|---|---|---|
| 0.0 | 10,290.6 | Plan #1 (OH) | MWD | Geolink MWD |

**Summary**

| Site Name<br>Offset Well - Wellbore - Design | Reference Measured Depth (ft) | Offset Measured Depth (ft) | Distance Between Centres (ft) | Distance Between Ellipses (ft) | Separation Factor | Warning |
|---|---|---|---|---|---|---|
| J6SE | | | | | | |
| 6-11 (existing) - Existing - Existing | 1,160.2 | 1,108.2 | 51.9 | 45.9 | 8.733 | CC, ES |
| 6-11 (existing) - Existing - Existing | 1,200.0 | 1,145.4 | 53.6 | 47.4 | 8.634 | SF |
| J6SEB Pad | | | | | | |
| HMU 6-11A - OH - Plan #1 | 233.4 | 233.4 | 33.1 | 32.4 | 44.895 | CC, ES |
| HMU 6-11A - OH - Plan #1 | 500.0 | 494.7 | 48.8 | 47.0 | 28.377 | SF |
| HMU 6-12D - OH - Plan #1 | 200.0 | 200.0 | 42.1 | 41.4 | 67.681 | CC, ES |
| HMU 6-12D - OH - Plan #1 | 1,400.0 | 1,372.9 | 201.4 | 191.8 | 20.859 | SF |
| HMU 6-12DD - OH - Plan #1 | 200.0 | 200.0 | 26.1 | 25.5 | 42.018 | CC, ES |
| HMU 6-12DD - OH - Plan #1 | 1,200.0 | 1,186.4 | 112.4 | 104.4 | 14.071 | SF |
| HMU 6-13A - OH - Plan #1 | 255.8 | 255.8 | 16.4 | 15.6 | 20.142 | CC |
| HMU 6-13A - OH - Plan #1 | 300.0 | 299.9 | 16.5 | 15.5 | 16.991 | ES |
| HMU 6-13A - OH - Plan #1 | 1,000.0 | 995.6 | 58.1 | 52.2 | 9.771 | SF |
| HMU 6-13AA - OH - Plan #1 | 234.3 | 234.3 | 11.6 | 10.9 | 15.648 | CC, ES |
| HMU 6-13AA - OH - Plan #1 | 1,400.0 | 1,394.1 | 41.0 | 30.2 | 3.810 | SF |
| HMU 6-15A - OH - Plan #1 | 300.0 | 300.0 | 16.4 | 15.5 | 16.934 | CC, ES |
| HMU 6-15A - OH - Plan #1 | 400.0 | 399.3 | 17.9 | 16.6 | 13.503 | SF |
| HMU 6-15AA - OH - Plan #1 | 200.0 | 200.0 | 26.0 | 25.4 | 41.897 | CC, ES |
| HMU 6-15AA - OH - Plan #1 | 400.0 | 396.7 | 35.4 | 34.1 | 26.825 | SF |
| HMU 6-15D - OH - Plan #1 | 200.0 | 200.0 | 11.3 | 10.7 | 18.165 | CC, ES |
| HMU 6-15D - OH - Plan #1 | 300.0 | 299.5 | 12.8 | 11.8 | 13.133 | SF |

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Project:** | Mamm Creek | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Reference Site:** | J6SEB Pad | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site Error:** | 0.0ft | **North Reference:** | True |
| **Reference Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Well Error:** | 0.0ft | **Output errors are at** | 2.00 sigma |
| **Reference Wellbore** | OH | **Database:** | USA EDM 5000 Multi Users DB |
| **Reference Design:** | Plan #1 | **Offset TVD Reference:** | Offset Datum |

**Offset Design** J6SE - 6-11 (existing) - Existing - Existing — **Offset Site Error:** 0.0 ft

**Survey Program:** 160-MWD — **Offset Well Error:** 0.0 ft

| Reference Measured Depth (ft) | Reference Vertical Depth (ft) | Offset Measured Depth (ft) | Offset Vertical Depth (ft) | Semi Major Axis Reference (ft) | Semi Major Axis Offset (ft) | Highside Toolface (°) | Offset Wellbore Centre +N/-S (ft) | Offset Wellbore Centre +E/-W (ft) | Distance Between Centres (ft) | Distance Between Ellipses (ft) | Total Uncertainty Axis | Separation Factor | Warning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -132.52 | -136.4 | -148.8 | 203.6 | | | | |
| 100.0 | 100.0 | 74.6 | 74.6 | 0.1 | 0.1 | -132.51 | -136.2 | -148.6 | 201.6 | 201.4 | 0.26 | 789.847 | |
| 200.0 | 200.0 | 176.3 | 176.3 | 0.3 | 0.3 | -132.45 | -135.4 | -148.0 | 200.6 | 200.0 | 0.59 | 337.340 | |
| 300.0 | 300.0 | 278.1 | 278.1 | 0.5 | 0.5 | -131.90 | -132.7 | -147.9 | 198.7 | 197.8 | 0.95 | 209.731 | |
| 400.0 | 400.0 | 379.6 | 379.4 | 0.7 | 0.7 | 5.81 | -127.4 | -148.7 | 193.3 | 192.0 | 1.33 | 144.845 | |
| 500.0 | 499.6 | 478.8 | 478.4 | 0.9 | 0.9 | 7.90 | -121.1 | -150.1 | 182.5 | 180.8 | 1.71 | 107.005 | |
| 600.0 | 598.8 | 577.0 | 576.4 | 1.1 | 1.1 | 10.61 | -114.7 | -151.4 | 166.8 | 164.7 | 2.08 | 80.340 | |
| 700.0 | 697.1 | 672.3 | 671.5 | 1.5 | 1.3 | 14.07 | -109.5 | -153.1 | 147.4 | 145.0 | 2.45 | 60.269 | |
| 800.0 | 794.3 | 767.4 | 766.5 | 1.9 | 1.5 | 19.03 | -105.5 | -155.6 | 125.1 | 122.3 | 2.84 | 43.993 | |
| 900.0 | 890.2 | 862.5 | 861.5 | 2.5 | 1.6 | 26.84 | -102.7 | -158.7 | 100.4 | 97.1 | 3.34 | 30.079 | |
| 1,000.0 | 984.6 | 957.3 | 956.3 | 3.0 | 1.8 | 40.23 | -101.0 | -161.2 | 74.6 | 70.5 | 4.10 | 18.176 | |
| 1,100.0 | 1,078.8 | 1,051.5 | 1,050.4 | 3.6 | 2.0 | 63.84 | -99.6 | -163.7 | 55.7 | 50.4 | 5.27 | 10.574 | |
| 1,160.2 | 1,135.6 | 1,108.2 | 1,107.1 | 4.0 | 2.1 | 83.66 | -98.5 | -165.4 | 51.9 | 45.9 | 5.94 | 8.733 | CC, ES |
| 1,200.0 | 1,173.0 | 1,145.4 | 1,144.3 | 4.3 | 2.1 | 97.03 | -97.6 | -166.6 | 53.6 | 47.4 | 6.21 | 8.634 | SF |
| 1,300.0 | 1,267.2 | 1,239.4 | 1,238.1 | 4.9 | 2.3 | 123.10 | -94.9 | -170.3 | 70.5 | 64.2 | 6.37 | 11.074 | |
| 1,400.0 | 1,361.4 | 1,334.8 | 1,333.4 | 5.5 | 2.5 | 137.36 | -92.8 | -175.0 | 95.7 | 89.3 | 6.41 | 14.929 | |
| 1,500.0 | 1,455.7 | 1,430.8 | 1,429.3 | 6.1 | 2.7 | 146.00 | -91.7 | -179.1 | 123.3 | 116.8 | 6.51 | 18.945 | |
| 1,600.0 | 1,549.9 | 1,527.1 | 1,525.5 | 6.7 | 2.8 | 151.77 | -91.7 | -182.7 | 151.6 | 144.9 | 6.67 | 22.737 | |
| 1,700.0 | 1,644.1 | 1,622.4 | 1,620.7 | 7.3 | 3.0 | 155.74 | -92.2 | -186.2 | 180.4 | 173.5 | 6.88 | 26.230 | |
| 1,800.0 | 1,738.3 | 1,717.4 | 1,715.7 | 8.0 | 3.2 | 158.24 | -92.2 | -190.9 | 209.8 | 202.6 | 7.16 | 29.288 | |
| 1,900.0 | 1,832.5 | 1,812.6 | 1,810.6 | 8.6 | 3.4 | 159.61 | -91.4 | -197.4 | 239.5 | 232.0 | 7.52 | 31.833 | |
| 2,000.0 | 1,926.7 | 1,908.4 | 1,906.0 | 9.2 | 3.6 | 160.19 | -89.5 | -206.1 | 269.3 | 261.3 | 7.95 | 33.854 | |
| 2,100.0 | 2,020.9 | 2,005.9 | 2,002.8 | 9.8 | 3.8 | 160.17 | -87.1 | -217.2 | 298.6 | 290.2 | 8.45 | 35.320 | |
| 2,200.0 | 2,115.1 | 2,104.2 | 2,100.1 | 10.4 | 4.1 | 159.74 | -84.3 | -230.8 | 327.3 | 318.3 | 9.02 | 36.277 | |
| 2,300.0 | 2,209.3 | 2,202.4 | 2,197.1 | 11.1 | 4.4 | 159.02 | -81.3 | -246.7 | 355.2 | 345.5 | 9.65 | 36.800 | |
| 2,400.0 | 2,303.5 | 2,303.9 | 2,296.8 | 11.7 | 4.7 | 158.12 | -78.3 | -265.0 | 382.4 | 372.1 | 10.34 | 36.969 | |
| 2,500.0 | 2,397.7 | 2,406.2 | 2,397.0 | 12.3 | 5.0 | 157.16 | -76.6 | -285.2 | 408.0 | 396.9 | 11.08 | 36.806 | |
| 2,600.0 | 2,491.9 | 2,501.4 | 2,490.0 | 12.9 | 5.4 | 156.15 | -74.9 | -305.7 | 433.0 | 421.2 | 11.85 | 36.527 | |
| 2,700.0 | 2,586.1 | 2,593.7 | 2,579.8 | 13.6 | 5.7 | 155.05 | -71.9 | -326.9 | 459.0 | 446.3 | 12.66 | 36.249 | |
| 2,800.0 | 2,680.3 | 2,692.0 | 2,675.4 | 14.2 | 6.1 | 153.99 | -68.4 | -349.5 | 485.5 | 471.9 | 13.51 | 35.925 | |

# Cathedral Energy Services

## Anticollision Report

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Project:** | Mamm Creek | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Reference Site:** | J6SEB Pad | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site Error:** | 0.0ft | **North Reference:** | True |
| **Reference Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Well Error:** | 0.0ft | **Output errors are at** | 2.00 sigma |
| **Reference Wellbore** | OH | **Database:** | USA EDM 5000 Multi Users DB |
| **Reference Design:** | Plan #1 | **Offset TVD Reference:** | Offset Datum |

**Offset Design** J6SEB Pad - HMU 6-11A - OH - Plan #1

**Offset Site Error:** 0.0 ft

**Survey Program:** 0-MWD

**Offset Well Error:** 0.0 ft

| Reference Measured Depth (ft) | Reference Vertical Depth (ft) | Offset Measured Depth (ft) | Offset Vertical Depth (ft) | Semi Major Axis Reference (ft) | Semi Major Axis Offset (ft) | Highside Toolface (°) | Offset Wellbore Centre +N/-S (ft) | Offset Wellbore Centre +E/-W (ft) | Distance Between Centres (ft) | Distance Between Ellipses (ft) | Total Uncertainty Axis | Separation Factor | Warning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -44.39 | 23.7 | -23.2 | 33.1 | | | | |
| 100.0 | 100.0 | 100.0 | 100.0 | 0.1 | 0.1 | -44.39 | 23.7 | -23.2 | 33.1 | 32.9 | 0.27 | 121.682 | |
| 200.0 | 200.0 | 200.0 | 200.0 | 0.3 | 0.3 | -44.39 | 23.7 | -23.2 | 33.1 | 32.5 | 0.62 | 53.321 | |
| 233.4 | 233.4 | 233.4 | 233.4 | 0.4 | 0.4 | -44.39 | 23.7 | -23.2 | 33.1 | 32.4 | 0.74 | 44.895 | CC, ES |
| 300.0 | 300.0 | 299.2 | 299.2 | 0.5 | 0.5 | -44.76 | 23.9 | -23.7 | 33.7 | 32.8 | 0.97 | 34.812 | |
| 400.0 | 400.0 | 397.3 | 397.2 | 0.7 | 0.7 | 92.68 | 26.1 | -28.3 | 38.7 | 37.3 | 1.32 | 29.204 | |
| 500.0 | 499.6 | 494.7 | 494.0 | 0.9 | 0.9 | 97.18 | 30.4 | -37.3 | 48.8 | 47.0 | 1.72 | 28.377 | SF |
| 600.0 | 598.8 | 592.4 | 590.7 | 1.1 | 1.2 | 102.70 | 36.5 | -50.1 | 63.8 | 61.6 | 2.19 | 29.169 | |
| 700.0 | 697.1 | 690.4 | 687.6 | 1.5 | 1.5 | 109.26 | 42.8 | -63.3 | 81.3 | 78.5 | 2.74 | 29.609 | |
| 800.0 | 794.3 | 787.7 | 783.8 | 1.9 | 1.8 | 115.94 | 49.0 | -76.5 | 101.7 | 98.3 | 3.37 | 30.144 | |
| 900.0 | 890.2 | 883.8 | 878.8 | 2.5 | 2.1 | 122.14 | 55.2 | -89.4 | 125.8 | 121.7 | 4.04 | 31.105 | |
| 1,000.0 | 984.6 | 978.7 | 972.7 | 3.0 | 2.3 | 127.80 | 61.3 | -102.2 | 153.8 | 149.1 | 4.71 | 32.627 | |
| 1,100.0 | 1,078.8 | 1,073.4 | 1,066.3 | 3.6 | 2.6 | 132.16 | 67.4 | -115.0 | 183.5 | 178.1 | 5.37 | 34.186 | |
| 1,200.0 | 1,173.0 | 1,168.1 | 1,160.0 | 4.3 | 2.9 | 135.30 | 73.5 | -127.8 | 213.8 | 207.8 | 6.00 | 35.609 | |
| 1,300.0 | 1,267.2 | 1,262.9 | 1,253.6 | 4.9 | 3.2 | 137.67 | 79.5 | -140.6 | 244.6 | 237.9 | 6.63 | 36.878 | |
| 1,400.0 | 1,361.4 | 1,357.6 | 1,347.3 | 5.5 | 3.5 | 139.51 | 85.6 | -153.4 | 275.6 | 268.4 | 7.25 | 38.001 | |
| 1,500.0 | 1,455.7 | 1,452.3 | 1,440.9 | 6.1 | 3.8 | 140.97 | 91.7 | -166.2 | 306.9 | 299.1 | 7.87 | 38.993 | |
| 1,600.0 | 1,549.9 | 1,547.0 | 1,534.6 | 6.7 | 4.1 | 142.17 | 97.8 | -179.0 | 338.4 | 329.9 | 8.49 | 39.872 | |
| 1,700.0 | 1,644.1 | 1,641.7 | 1,628.2 | 7.3 | 4.4 | 143.16 | 103.9 | -191.7 | 369.9 | 360.8 | 9.10 | 40.655 | |
| 1,800.0 | 1,738.3 | 1,736.4 | 1,721.9 | 8.0 | 4.7 | 144.00 | 110.0 | -204.5 | 401.5 | 391.8 | 9.71 | 41.355 | |
| 1,900.0 | 1,832.5 | 1,831.2 | 1,815.5 | 8.6 | 5.0 | 144.72 | 116.0 | -217.3 | 433.2 | 422.9 | 10.32 | 41.983 | |
| 2,000.0 | 1,926.7 | 1,925.9 | 1,909.2 | 9.2 | 5.3 | 145.34 | 122.1 | -230.1 | 465.0 | 454.0 | 10.93 | 42.550 | |
| 2,100.0 | 2,020.9 | 2,020.6 | 2,002.8 | 9.8 | 5.6 | 145.88 | 128.2 | -242.9 | 496.7 | 485.2 | 11.53 | 43.064 | |

# Cathedral Energy Services

## Anticollision Report

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Project:** | Mamm Creek | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Reference Site:** | J6SEB Pad | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site Error:** | 0.0ft | **North Reference:** | True |
| **Reference Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Well Error:** | 0.0ft | **Output errors are at** | 2.00 sigma |
| **Reference Wellbore** | OH | **Database:** | USA EDM 5000 Multi Users DB |
| **Reference Design:** | Plan #1 | **Offset TVD Reference:** | Offset Datum |

**Offset Design** J6SEB Pad - HMU 6-12D - OH - Plan #1

**Offset Site Error:** 0.0 ft

**Survey Program:** 0-MWD

**Offset Well Error:** 0.0 ft

| Reference Measured Depth (ft) | Reference Vertical Depth (ft) | Offset Measured Depth (ft) | Offset Vertical Depth (ft) | Semi Major Axis Reference (ft) | Semi Major Axis Offset (ft) | Highside Toolface (°) | Offset Wellbore Centre +N/-S (ft) | Offset Wellbore Centre +E/-W (ft) | Distance Between Centres (ft) | Distance Between Ellipses (ft) | Total Uncertainty Axis | Separation Factor | Warning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -55.76 | 23.7 | -34.8 | 42.1 | | | | |
| 100.0 | 100.0 | 100.0 | 100.0 | 0.1 | 0.1 | -55.76 | 23.7 | -34.8 | 42.1 | 41.8 | 0.27 | 154.451 | |
| 200.0 | 200.0 | 200.0 | 200.0 | 0.3 | 0.3 | -55.76 | 23.7 | -34.8 | 42.1 | 41.4 | 0.62 | 67.681 | CC, ES |
| 300.0 | 300.0 | 298.3 | 298.2 | 0.5 | 0.5 | -57.91 | 23.4 | -37.3 | 44.0 | 43.1 | 0.97 | 45.516 | |
| 400.0 | 400.0 | 396.2 | 395.8 | 0.7 | 0.7 | 75.70 | 22.5 | -44.8 | 49.6 | 48.3 | 1.34 | 37.077 | |
| 500.0 | 499.6 | 493.6 | 492.4 | 0.9 | 1.0 | 75.55 | 21.1 | -57.1 | 58.0 | 56.3 | 1.76 | 33.046 | |
| 600.0 | 598.8 | 590.4 | 587.7 | 1.1 | 1.3 | 76.99 | 19.2 | -74.3 | 69.3 | 67.0 | 2.27 | 30.528 | |
| 700.0 | 697.1 | 687.7 | 682.6 | 1.5 | 1.7 | 79.43 | 16.8 | -95.8 | 83.1 | 80.2 | 2.91 | 28.563 | |
| 800.0 | 794.3 | 786.5 | 778.6 | 1.9 | 2.2 | 83.84 | 14.2 | -118.4 | 97.0 | 93.2 | 3.70 | 26.169 | |
| 900.0 | 890.2 | 884.8 | 874.3 | 2.5 | 2.6 | 89.70 | 11.7 | -141.0 | 111.2 | 106.6 | 4.66 | 23.886 | |
| 1,000.0 | 984.6 | 982.5 | 969.4 | 3.0 | 3.0 | 96.34 | 9.1 | -163.3 | 126.9 | 121.3 | 5.70 | 22.290 | |
| 1,100.0 | 1,078.8 | 1,080.1 | 1,064.4 | 3.6 | 3.4 | 101.97 | 6.6 | -185.7 | 144.2 | 137.5 | 6.72 | 21.456 | |
| 1,200.0 | 1,173.0 | 1,177.7 | 1,159.3 | 4.3 | 3.9 | 106.37 | 4.1 | -208.0 | 162.6 | 154.9 | 7.72 | 21.056 | |
| 1,300.0 | 1,267.2 | 1,275.3 | 1,254.3 | 4.9 | 4.3 | 109.88 | 1.6 | -230.4 | 181.8 | 173.1 | 8.70 | 20.891 | |
| 1,400.0 | 1,361.4 | 1,372.9 | 1,349.3 | 5.5 | 4.7 | 112.72 | -1.0 | -252.7 | 201.4 | 191.8 | 9.66 | 20.859 | SF |
| 1,500.0 | 1,455.7 | 1,470.5 | 1,444.3 | 6.1 | 5.2 | 115.05 | -3.5 | -275.1 | 221.5 | 210.9 | 10.60 | 20.900 | |
| 1,600.0 | 1,549.9 | 1,568.1 | 1,539.3 | 6.7 | 5.6 | 116.99 | -6.0 | -297.4 | 241.8 | 230.3 | 11.52 | 20.983 | |
| 1,700.0 | 1,644.1 | 1,665.7 | 1,634.2 | 7.3 | 6.0 | 118.63 | -8.5 | -319.8 | 262.4 | 250.0 | 12.44 | 21.089 | |
| 1,800.0 | 1,738.3 | 1,763.3 | 1,729.2 | 8.0 | 6.5 | 120.04 | -11.0 | -342.1 | 283.2 | 269.8 | 13.35 | 21.205 | |
| 1,900.0 | 1,832.5 | 1,860.9 | 1,824.2 | 8.6 | 6.9 | 121.25 | -13.6 | -364.5 | 304.0 | 289.8 | 14.26 | 21.326 | |
| 2,000.0 | 1,926.7 | 1,958.5 | 1,919.2 | 9.2 | 7.3 | 122.30 | -16.1 | -386.8 | 325.1 | 309.9 | 15.16 | 21.447 | |
| 2,100.0 | 2,020.9 | 2,056.1 | 2,014.1 | 9.8 | 7.8 | 123.23 | -18.6 | -409.2 | 346.2 | 330.1 | 16.05 | 21.566 | |
| 2,200.0 | 2,115.1 | 2,153.7 | 2,109.1 | 10.4 | 8.2 | 124.05 | -21.1 | -431.5 | 367.3 | 350.4 | 16.94 | 21.681 | |
| 2,300.0 | 2,209.3 | 2,251.3 | 2,204.1 | 11.1 | 8.7 | 124.79 | -23.7 | -453.9 | 388.6 | 370.8 | 17.83 | 21.792 | |
| 2,400.0 | 2,303.5 | 2,348.9 | 2,299.1 | 11.7 | 9.1 | 125.44 | -26.2 | -476.2 | 409.9 | 391.2 | 18.72 | 21.898 | |
| 2,500.0 | 2,397.7 | 2,446.5 | 2,394.0 | 12.3 | 9.5 | 126.03 | -28.7 | -498.6 | 431.2 | 411.6 | 19.60 | 21.999 | |
| 2,600.0 | 2,491.9 | 2,544.1 | 2,489.0 | 12.9 | 10.0 | 126.57 | -31.2 | -520.9 | 452.6 | 432.1 | 20.49 | 22.095 | |
| 2,700.0 | 2,586.1 | 2,641.7 | 2,584.0 | 13.6 | 10.4 | 127.06 | -33.8 | -543.3 | 474.0 | 452.7 | 21.37 | 22.186 | |
| 2,800.0 | 2,680.3 | 2,739.4 | 2,679.0 | 14.2 | 10.8 | 127.50 | -36.3 | -565.6 | 495.5 | 473.2 | 22.25 | 22.273 | |

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Project:** | Mamm Creek | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Reference Site:** | J6SEB Pad | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site Error:** | 0.0ft | **North Reference:** | True |
| **Reference Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Well Error:** | 0.0ft | **Output errors are at** | 2.00 sigma |
| **Reference Wellbore** | OH | **Database:** | USA EDM 5000 Multi Users DB |
| **Reference Design:** | Plan #1 | **Offset TVD Reference:** | Offset Datum |

**Offset Design** J6SEB Pad - HMU 6-12DD - OH - Plan #1

**Offset Site Error:** 0.0 ft

**Survey Program:** 0-MWD

**Offset Well Error:** 0.0 ft

| Reference Measured Depth (ft) | Reference Vertical Depth (ft) | Offset Measured Depth (ft) | Offset Vertical Depth (ft) | Semi Major Axis Reference (ft) | Semi Major Axis Offset (ft) | Highside Toolface (°) | Offset Wellbore Centre +N/-S (ft) | Offset Wellbore Centre +E/-W (ft) | Distance Between Centres (ft) | Distance Between Ellipses (ft) | Total Uncertainty Axis | Separation Factor | Warning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -62.59 | 12.0 | -23.2 | 26.1 | | | | |
| 100.0 | 100.0 | 100.0 | 100.0 | 0.1 | 0.1 | -62.59 | 12.0 | -23.2 | 26.1 | 25.8 | 0.27 | 95.888 | |
| 200.0 | 200.0 | 200.0 | 200.0 | 0.3 | 0.3 | -62.59 | 12.0 | -23.2 | 26.1 | 25.5 | 0.62 | 42.018 | CC, ES |
| 300.0 | 300.0 | 299.3 | 299.2 | 0.5 | 0.5 | -64.77 | 11.6 | -24.5 | 27.1 | 26.2 | 0.97 | 28.010 | |
| 400.0 | 400.0 | 398.0 | 397.8 | 0.7 | 0.7 | 67.82 | 9.6 | -30.6 | 31.1 | 29.7 | 1.33 | 23.275 | |
| 500.0 | 499.6 | 496.5 | 495.6 | 0.9 | 0.9 | 67.36 | 6.0 | -41.5 | 37.0 | 35.3 | 1.75 | 21.172 | |
| 600.0 | 598.8 | 594.6 | 592.3 | 1.1 | 1.3 | 68.91 | 0.8 | -57.0 | 45.0 | 42.7 | 2.26 | 19.913 | |
| 700.0 | 697.1 | 692.2 | 687.5 | 1.5 | 1.7 | 71.37 | -5.9 | -77.1 | 54.9 | 52.0 | 2.91 | 18.904 | |
| 800.0 | 794.3 | 791.4 | 783.8 | 1.9 | 2.1 | 75.69 | -13.5 | -100.1 | 65.4 | 61.7 | 3.72 | 17.599 | |
| 900.0 | 890.2 | 890.5 | 879.9 | 2.5 | 2.6 | 82.61 | -21.1 | -123.1 | 75.4 | 70.7 | 4.73 | 15.965 | |
| 1,000.0 | 984.6 | 989.2 | 975.6 | 3.0 | 3.0 | 90.97 | -28.7 | -145.9 | 86.3 | 80.5 | 5.85 | 14.768 | |
| 1,100.0 | 1,078.8 | 1,087.8 | 1,071.2 | 3.6 | 3.5 | 97.93 | -36.2 | -168.8 | 98.8 | 91.9 | 6.94 | 14.238 | |
| 1,200.0 | 1,173.0 | 1,186.4 | 1,166.8 | 4.3 | 3.9 | 103.28 | -43.8 | -191.6 | 112.4 | 104.4 | 7.99 | 14.071 | SF |
| 1,300.0 | 1,267.2 | 1,285.0 | 1,262.4 | 4.9 | 4.4 | 107.46 | -51.4 | -214.5 | 126.7 | 117.7 | 9.00 | 14.086 | |
| 1,400.0 | 1,361.4 | 1,383.5 | 1,358.0 | 5.5 | 4.9 | 110.79 | -59.0 | -237.3 | 141.6 | 131.6 | 9.98 | 14.192 | |
| 1,500.0 | 1,455.7 | 1,482.1 | 1,453.6 | 6.1 | 5.3 | 113.47 | -66.5 | -260.1 | 156.8 | 145.9 | 10.94 | 14.341 | |
| 1,600.0 | 1,549.9 | 1,580.7 | 1,549.2 | 6.7 | 5.8 | 115.68 | -74.1 | -283.0 | 172.4 | 160.5 | 11.88 | 14.510 | |
| 1,700.0 | 1,644.1 | 1,679.3 | 1,644.8 | 7.3 | 6.2 | 117.52 | -81.7 | -305.8 | 188.1 | 175.3 | 12.81 | 14.683 | |
| 1,800.0 | 1,738.3 | 1,777.9 | 1,740.4 | 8.0 | 6.7 | 119.08 | -89.2 | -328.7 | 204.0 | 190.3 | 13.73 | 14.855 | |
| 1,900.0 | 1,832.5 | 1,876.5 | 1,836.0 | 8.6 | 7.2 | 120.42 | -96.8 | -351.5 | 220.0 | 205.4 | 14.65 | 15.020 | |
| 2,000.0 | 1,926.7 | 1,975.1 | 1,931.6 | 9.2 | 7.6 | 121.57 | -104.4 | -374.3 | 236.2 | 220.6 | 15.56 | 15.178 | |
| 2,100.0 | 2,020.9 | 2,073.7 | 2,027.2 | 9.8 | 8.1 | 122.57 | -111.9 | -397.2 | 252.4 | 235.9 | 16.46 | 15.328 | |
| 2,200.0 | 2,115.1 | 2,172.2 | 2,122.8 | 10.4 | 8.5 | 123.45 | -119.5 | -420.0 | 268.6 | 251.3 | 17.37 | 15.469 | |
| 2,300.0 | 2,209.3 | 2,270.8 | 2,218.4 | 11.1 | 9.0 | 124.24 | -127.1 | -442.9 | 285.0 | 266.7 | 18.27 | 15.601 | |
| 2,400.0 | 2,303.5 | 2,369.4 | 2,314.1 | 11.7 | 9.5 | 124.93 | -134.6 | -465.7 | 301.4 | 282.2 | 19.16 | 15.725 | |
| 2,500.0 | 2,397.7 | 2,468.0 | 2,409.7 | 12.3 | 9.9 | 125.56 | -142.2 | -488.5 | 317.8 | 297.7 | 20.06 | 15.842 | |
| 2,600.0 | 2,491.9 | 2,566.6 | 2,505.3 | 12.9 | 10.4 | 126.12 | -149.8 | -511.4 | 334.2 | 313.3 | 20.95 | 15.951 | |
| 2,700.0 | 2,586.1 | 2,665.2 | 2,600.9 | 13.6 | 10.9 | 126.63 | -157.4 | -534.2 | 350.7 | 328.8 | 21.84 | 16.054 | |
| 2,800.0 | 2,680.3 | 2,763.8 | 2,696.5 | 14.2 | 11.3 | 127.10 | -164.9 | -557.0 | 367.2 | 344.5 | 22.74 | 16.151 | |
| 2,900.0 | 2,774.5 | 2,862.4 | 2,792.1 | 14.8 | 11.8 | 127.52 | -172.5 | -579.9 | 383.7 | 360.1 | 23.62 | 16.242 | |
| 3,000.0 | 2,868.7 | 2,960.9 | 2,887.7 | 15.4 | 12.3 | 127.91 | -180.1 | -602.7 | 400.3 | 375.7 | 24.51 | 16.327 | |
| 3,100.0 | 2,962.9 | 3,059.5 | 2,983.3 | 16.1 | 12.7 | 128.27 | -187.6 | -625.6 | 416.8 | 391.4 | 25.40 | 16.408 | |
| 3,200.0 | 3,057.1 | 3,158.1 | 3,078.9 | 16.7 | 13.2 | 128.60 | -195.2 | -648.4 | 433.4 | 407.1 | 26.29 | 16.485 | |
| 3,300.0 | 3,151.3 | 3,256.7 | 3,174.5 | 17.3 | 13.6 | 128.91 | -202.8 | -671.2 | 450.0 | 422.8 | 27.18 | 16.557 | |
| 3,400.0 | 3,245.5 | 3,355.3 | 3,270.1 | 17.9 | 14.1 | 129.20 | -210.3 | -694.1 | 466.6 | 438.5 | 28.06 | 16.625 | |
| 3,500.0 | 3,339.7 | 3,453.9 | 3,365.7 | 18.6 | 14.6 | 129.46 | -217.9 | -716.9 | 483.2 | 454.2 | 28.95 | 16.690 | |
| 3,600.0 | 3,434.0 | 3,552.5 | 3,461.3 | 19.2 | 15.0 | 129.71 | -225.5 | -739.8 | 499.8 | 470.0 | 29.84 | 16.751 | |

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Project:** | Mamm Creek | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Reference Site:** | J6SEB Pad | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site Error:** | 0.0ft | **North Reference:** | True |
| **Reference Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Well Error:** | 0.0ft | **Output errors are at** | 2.00 sigma |
| **Reference Wellbore** | OH | **Database:** | USA EDM 5000 Multi Users DB |
| **Reference Design:** | Plan #1 | **Offset TVD Reference:** | Offset Datum |

**Offset Design** J6SEB Pad - HMU 6-13A - OH - Plan #1

**Offset Site Error:** 0.0 ft

**Survey Program:** 0-MWD

**Offset Well Error:** 0.0 ft

| Reference Measured Depth (ft) | Reference Vertical Depth (ft) | Offset Measured Depth (ft) | Offset Vertical Depth (ft) | Semi Major Axis Reference (ft) | Semi Major Axis Offset (ft) | Highside Toolface (°) | Offset Wellbore Centre +N/-S (ft) | Offset Wellbore Centre +E/-W (ft) | Distance Between Centres (ft) | Distance Between Ellipses (ft) | Total Uncertainty Axis | Separation Factor | Warning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -44.83 | 11.7 | -11.6 | 16.4 | | | | |
| 100.0 | 100.0 | 100.0 | 100.0 | 0.1 | 0.1 | -44.83 | 11.7 | -11.6 | 16.4 | 16.2 | 0.27 | 60.365 | |
| 200.0 | 200.0 | 200.0 | 200.0 | 0.3 | 0.3 | -44.83 | 11.7 | -11.6 | 16.4 | 15.8 | 0.62 | 26.452 | |
| 255.8 | 255.8 | 255.8 | 255.8 | 0.4 | 0.4 | -44.83 | 11.7 | -11.6 | 16.4 | 15.6 | 0.82 | 20.142 | CC |
| 300.0 | 300.0 | 299.9 | 299.9 | 0.5 | 0.5 | -45.37 | 11.6 | -11.7 | 16.5 | 15.5 | 0.97 | 16.991 | ES |
| 400.0 | 400.0 | 399.6 | 399.5 | 0.7 | 0.7 | 87.36 | 9.8 | -15.2 | 17.8 | 16.5 | 1.33 | 13.333 | |
| 500.0 | 499.6 | 499.2 | 498.7 | 0.9 | 0.9 | 85.54 | 5.7 | -23.3 | 20.8 | 19.1 | 1.76 | 11.823 | |
| 600.0 | 598.8 | 598.6 | 597.0 | 1.1 | 1.2 | 85.21 | -0.8 | -35.9 | 25.6 | 23.3 | 2.30 | 11.101 | |
| 700.0 | 697.1 | 697.8 | 694.3 | 1.5 | 1.6 | 85.72 | -9.6 | -53.1 | 31.9 | 29.0 | 2.99 | 10.672 | |
| 800.0 | 794.3 | 796.8 | 790.3 | 1.9 | 2.0 | 86.59 | -20.6 | -74.6 | 40.0 | 36.1 | 3.85 | 10.376 | |
| 900.0 | 890.2 | 896.3 | 886.2 | 2.5 | 2.5 | 90.66 | -32.7 | -98.4 | 48.7 | 43.9 | 4.86 | 10.021 | |
| 1,000.0 | 984.6 | 995.6 | 981.9 | 3.0 | 3.0 | 98.11 | -44.8 | -122.0 | 58.1 | 52.2 | 5.95 | 9.771 | SF |
| 1,100.0 | 1,078.8 | 1,094.9 | 1,077.5 | 3.6 | 3.5 | 104.13 | -56.9 | -145.7 | 68.5 | 61.5 | 7.00 | 9.777 | |
| 1,200.0 | 1,173.0 | 1,194.1 | 1,173.2 | 4.3 | 4.0 | 108.55 | -69.0 | -169.3 | 79.3 | 71.3 | 8.02 | 9.893 | |
| 1,300.0 | 1,267.2 | 1,293.4 | 1,268.8 | 4.9 | 4.5 | 111.89 | -81.1 | -192.9 | 90.6 | 81.5 | 9.01 | 10.049 | |
| 1,400.0 | 1,361.4 | 1,392.6 | 1,364.4 | 5.5 | 5.0 | 114.48 | -93.2 | -216.6 | 102.0 | 92.0 | 9.99 | 10.215 | |
| 1,500.0 | 1,455.7 | 1,491.9 | 1,460.1 | 6.1 | 5.5 | 116.55 | -105.3 | -240.2 | 113.7 | 102.7 | 10.95 | 10.377 | |
| 1,600.0 | 1,549.9 | 1,591.1 | 1,555.7 | 6.7 | 6.0 | 118.24 | -117.4 | -263.9 | 125.4 | 113.5 | 11.91 | 10.530 | |
| 1,700.0 | 1,644.1 | 1,690.4 | 1,651.3 | 7.3 | 6.5 | 119.63 | -129.5 | -287.5 | 137.3 | 124.4 | 12.86 | 10.672 | |
| 1,800.0 | 1,738.3 | 1,789.6 | 1,746.9 | 8.0 | 7.0 | 120.81 | -141.5 | -311.1 | 149.2 | 135.4 | 13.81 | 10.804 | |
| 1,900.0 | 1,832.5 | 1,888.8 | 1,842.6 | 8.6 | 7.5 | 121.80 | -153.6 | -334.8 | 161.1 | 146.4 | 14.75 | 10.924 | |
| 2,000.0 | 1,926.7 | 1,988.1 | 1,938.2 | 9.2 | 8.0 | 122.67 | -165.7 | -358.4 | 173.1 | 157.4 | 15.69 | 11.035 | |
| 2,100.0 | 2,020.9 | 2,087.3 | 2,033.8 | 9.8 | 8.5 | 123.42 | -177.8 | -382.1 | 185.2 | 168.5 | 16.63 | 11.136 | |
| 2,200.0 | 2,115.1 | 2,186.6 | 2,129.4 | 10.4 | 9.0 | 124.07 | -189.9 | -405.7 | 197.2 | 179.7 | 17.56 | 11.229 | |
| 2,300.0 | 2,209.3 | 2,285.8 | 2,225.1 | 11.1 | 9.5 | 124.66 | -202.0 | -429.3 | 209.3 | 190.8 | 18.50 | 11.315 | |
| 2,400.0 | 2,303.5 | 2,385.1 | 2,320.7 | 11.7 | 10.0 | 125.17 | -214.1 | -453.0 | 221.4 | 202.0 | 19.43 | 11.394 | |
| 2,500.0 | 2,397.7 | 2,484.3 | 2,416.3 | 12.3 | 10.5 | 125.64 | -226.2 | -476.6 | 233.5 | 213.2 | 20.36 | 11.468 | |
| 2,600.0 | 2,491.9 | 2,583.6 | 2,512.0 | 12.9 | 11.0 | 126.06 | -238.3 | -500.3 | 245.7 | 224.4 | 21.30 | 11.536 | |
| 2,700.0 | 2,586.1 | 2,682.8 | 2,607.6 | 13.6 | 11.5 | 126.44 | -250.4 | -523.9 | 257.8 | 235.6 | 22.23 | 11.599 | |
| 2,800.0 | 2,680.3 | 2,782.1 | 2,703.2 | 14.2 | 12.0 | 126.78 | -262.5 | -547.6 | 270.0 | 246.8 | 23.16 | 11.657 | |
| 2,900.0 | 2,774.5 | 2,881.3 | 2,798.8 | 14.8 | 12.5 | 127.10 | -274.5 | -571.2 | 282.1 | 258.0 | 24.09 | 11.712 | |
| 3,000.0 | 2,868.7 | 2,980.5 | 2,894.5 | 15.4 | 13.0 | 127.39 | -286.6 | -594.8 | 294.3 | 269.3 | 25.02 | 11.763 | |
| 3,100.0 | 2,962.9 | 3,079.8 | 2,990.1 | 16.1 | 13.5 | 127.65 | -298.7 | -618.5 | 306.5 | 280.5 | 25.95 | 11.811 | |
| 3,200.0 | 3,057.1 | 3,179.0 | 3,085.7 | 16.7 | 14.0 | 127.90 | -310.8 | -642.1 | 318.7 | 291.8 | 26.88 | 11.856 | |
| 3,300.0 | 3,151.3 | 3,278.3 | 3,181.4 | 17.3 | 14.5 | 128.13 | -322.9 | -665.8 | 330.9 | 303.1 | 27.81 | 11.899 | |
| 3,400.0 | 3,245.5 | 3,377.5 | 3,277.0 | 17.9 | 15.1 | 128.34 | -335.0 | -689.4 | 343.1 | 314.3 | 28.74 | 11.939 | |
| 3,500.0 | 3,339.7 | 3,476.8 | 3,372.6 | 18.6 | 15.6 | 128.54 | -347.1 | -713.0 | 355.3 | 325.6 | 29.66 | 11.976 | |
| 3,600.0 | 3,434.0 | 3,576.0 | 3,468.2 | 19.2 | 16.1 | 128.72 | -359.2 | -736.7 | 367.5 | 336.9 | 30.59 | 12.012 | |
| 3,700.0 | 3,528.2 | 3,675.3 | 3,563.9 | 19.8 | 16.6 | 128.89 | -371.3 | -760.3 | 379.7 | 348.2 | 31.52 | 12.045 | |
| 3,800.0 | 3,622.4 | 3,774.5 | 3,659.5 | 20.4 | 17.1 | 129.05 | -383.4 | -784.0 | 391.9 | 359.4 | 32.45 | 12.077 | |
| 3,900.0 | 3,716.6 | 3,873.8 | 3,755.1 | 21.1 | 17.6 | 129.21 | -395.4 | -807.6 | 404.1 | 370.7 | 33.38 | 12.107 | |
| 4,000.0 | 3,810.8 | 3,973.0 | 3,850.7 | 21.7 | 18.1 | 129.35 | -407.5 | -831.2 | 416.3 | 382.0 | 34.30 | 12.136 | |
| 4,100.0 | 3,905.0 | 4,072.3 | 3,946.4 | 22.3 | 18.6 | 129.48 | -419.6 | -854.9 | 428.5 | 393.3 | 35.23 | 12.163 | |
| 4,200.0 | 3,999.2 | 4,171.5 | 4,042.0 | 22.9 | 19.1 | 129.61 | -431.7 | -878.5 | 440.8 | 404.6 | 36.16 | 12.189 | |
| 4,300.0 | 4,093.4 | 4,270.7 | 4,137.6 | 23.6 | 19.6 | 129.73 | -443.8 | -902.2 | 453.0 | 415.9 | 37.09 | 12.214 | |
| 4,400.0 | 4,187.6 | 4,370.0 | 4,233.3 | 24.2 | 20.1 | 129.85 | -455.9 | -925.8 | 465.2 | 427.2 | 38.01 | 12.238 | |
| 4,500.0 | 4,281.8 | 4,469.2 | 4,328.9 | 24.8 | 20.6 | 129.95 | -468.0 | -949.4 | 477.4 | 438.5 | 38.94 | 12.260 | |
| 4,600.0 | 4,376.0 | 4,568.5 | 4,424.5 | 25.4 | 21.1 | 130.06 | -480.1 | -973.1 | 489.7 | 449.8 | 39.87 | 12.282 | |

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Project:** | Mamm Creek | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Reference Site:** | J6SEB Pad | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site Error:** | 0.0ft | **North Reference:** | True |
| **Reference Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Well Error:** | 0.0ft | **Output errors are at** | 2.00 sigma |
| **Reference Wellbore** | OH | **Database:** | USA EDM 5000 Multi Users DB |
| **Reference Design:** | Plan #1 | **Offset TVD Reference:** | Offset Datum |

**Offset Design** J6SEB Pad - HMU 6-13AA - OH - Plan #1 — **Offset Site Error:** 0.0 ft

**Survey Program:** 0-MWD — **Offset Well Error:** 0.0 ft

| Reference Measured Depth (ft) | Reference Vertical Depth (ft) | Offset Measured Depth (ft) | Offset Vertical Depth (ft) | Semi Major Axis Reference (ft) | Semi Major Axis Offset (ft) | Highside Toolface (°) | Offset Wellbore Centre +N/-S (ft) | Offset Wellbore Centre +E/-W (ft) | Distance Between Centres (ft) | Distance Between Ellipses (ft) | Total Uncertainty Axis | Separation Factor | Warning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -88.18 | 0.4 | -11.6 | 11.6 | | | | |
| 100.0 | 100.0 | 100.0 | 100.0 | 0.1 | 0.1 | -88.18 | 0.4 | -11.6 | 11.6 | 11.3 | 0.27 | 42.582 | |
| 200.0 | 200.0 | 200.0 | 200.0 | 0.3 | 0.3 | -88.18 | 0.4 | -11.6 | 11.6 | 11.0 | 0.62 | 18.660 | |
| 234.3 | 234.3 | 234.3 | 234.3 | 0.4 | 0.4 | -88.18 | 0.4 | -11.6 | 11.6 | 10.9 | 0.74 | 15.648 | CC, ES |
| 300.0 | 300.0 | 299.8 | 299.8 | 0.5 | 0.5 | -90.18 | 0.0 | -12.1 | 12.1 | 11.1 | 0.97 | 12.469 | |
| 400.0 | 400.0 | 399.2 | 399.0 | 0.7 | 0.7 | 40.63 | -3.3 | -16.1 | 14.4 | 13.1 | 1.33 | 10.865 | |
| 500.0 | 499.6 | 498.4 | 497.7 | 0.9 | 0.9 | 38.60 | -9.8 | -24.1 | 17.2 | 15.5 | 1.71 | 10.063 | |
| 600.0 | 598.8 | 597.6 | 595.6 | 1.1 | 1.2 | 38.73 | -19.5 | -36.1 | 20.3 | 18.1 | 2.13 | 9.511 | |
| 700.0 | 697.1 | 696.5 | 692.5 | 1.5 | 1.6 | 40.17 | -32.3 | -52.0 | 23.7 | 21.1 | 2.64 | 8.990 | |
| 800.0 | 794.3 | 795.4 | 788.0 | 1.9 | 2.1 | 42.35 | -48.2 | -71.7 | 27.5 | 24.3 | 3.27 | 8.422 | |
| 900.0 | 890.2 | 895.0 | 883.4 | 2.5 | 2.6 | 46.90 | -66.4 | -94.2 | 30.5 | 26.4 | 4.11 | 7.411 | |
| 1,000.0 | 984.6 | 994.9 | 978.9 | 3.0 | 3.1 | 57.26 | -84.7 | -116.9 | 30.9 | 25.5 | 5.37 | 5.753 | |
| 1,100.0 | 1,078.8 | 1,094.7 | 1,074.4 | 3.6 | 3.7 | 68.27 | -103.0 | -139.5 | 32.0 | 25.2 | 6.80 | 4.699 | |
| 1,200.0 | 1,173.0 | 1,194.5 | 1,169.8 | 4.3 | 4.2 | 78.22 | -121.3 | -162.1 | 34.1 | 25.9 | 8.23 | 4.150 | |
| 1,300.0 | 1,267.2 | 1,294.3 | 1,265.3 | 4.9 | 4.8 | 86.75 | -139.6 | -184.7 | 37.2 | 27.7 | 9.55 | 3.896 | |
| 1,400.0 | 1,361.4 | 1,394.1 | 1,360.8 | 5.5 | 5.3 | 93.86 | -157.9 | -207.3 | 41.0 | 30.2 | 10.76 | 3.810 | SF |
| 1,500.0 | 1,455.7 | 1,493.9 | 1,456.3 | 6.1 | 5.8 | 99.70 | -176.1 | -229.9 | 45.3 | 33.4 | 11.86 | 3.819 | |
| 1,600.0 | 1,549.9 | 1,593.8 | 1,551.8 | 6.7 | 6.4 | 104.49 | -194.4 | -252.6 | 50.0 | 37.1 | 12.87 | 3.880 | |
| 1,700.0 | 1,644.1 | 1,693.6 | 1,647.3 | 7.3 | 6.9 | 108.44 | -212.7 | -275.2 | 54.9 | 41.1 | 13.83 | 3.971 | |
| 1,800.0 | 1,738.3 | 1,793.4 | 1,742.7 | 8.0 | 7.5 | 111.72 | -231.0 | -297.8 | 60.1 | 45.4 | 14.75 | 4.076 | |
| 1,900.0 | 1,832.5 | 1,893.2 | 1,838.2 | 8.6 | 8.0 | 114.47 | -249.3 | -320.4 | 65.5 | 49.8 | 15.63 | 4.187 | |
| 2,000.0 | 1,926.7 | 1,993.0 | 1,933.7 | 9.2 | 8.6 | 116.81 | -267.5 | -343.0 | 70.9 | 54.4 | 16.49 | 4.300 | |
| 2,100.0 | 2,020.9 | 2,092.8 | 2,029.2 | 9.8 | 9.1 | 118.80 | -285.8 | -365.6 | 76.5 | 59.2 | 17.34 | 4.411 | |
| 2,200.0 | 2,115.1 | 2,192.6 | 2,124.7 | 10.4 | 9.7 | 120.53 | -304.1 | -388.2 | 82.2 | 64.0 | 18.18 | 4.519 | |
| 2,300.0 | 2,209.3 | 2,292.4 | 2,220.1 | 11.1 | 10.2 | 122.03 | -322.4 | -410.9 | 87.9 | 68.9 | 19.01 | 4.623 | |
| 2,400.0 | 2,303.5 | 2,392.2 | 2,315.6 | 11.7 | 10.8 | 123.35 | -340.7 | -433.5 | 93.7 | 73.8 | 19.83 | 4.722 | |
| 2,500.0 | 2,397.7 | 2,492.1 | 2,411.1 | 12.3 | 11.3 | 124.51 | -358.9 | -456.1 | 99.5 | 78.8 | 20.65 | 4.816 | |
| 2,600.0 | 2,491.9 | 2,591.9 | 2,506.6 | 12.9 | 11.9 | 125.54 | -377.2 | -478.7 | 105.3 | 83.9 | 21.47 | 4.906 | |
| 2,700.0 | 2,586.1 | 2,691.7 | 2,602.1 | 13.6 | 12.4 | 126.47 | -395.5 | -501.3 | 111.2 | 88.9 | 22.28 | 4.991 | |
| 2,800.0 | 2,680.3 | 2,791.5 | 2,697.5 | 14.2 | 12.9 | 127.30 | -413.8 | -523.9 | 117.1 | 94.0 | 23.09 | 5.071 | |
| 2,900.0 | 2,774.5 | 2,891.3 | 2,793.0 | 14.8 | 13.5 | 128.05 | -432.1 | -546.5 | 123.0 | 99.1 | 23.91 | 5.147 | |
| 3,000.0 | 2,868.7 | 2,991.1 | 2,888.5 | 15.4 | 14.0 | 128.74 | -450.3 | -569.2 | 129.0 | 104.3 | 24.71 | 5.220 | |
| 3,100.0 | 2,962.9 | 3,090.9 | 2,984.0 | 16.1 | 14.6 | 129.36 | -468.6 | -591.8 | 135.0 | 109.4 | 25.52 | 5.288 | |
| 3,200.0 | 3,057.1 | 3,190.7 | 3,079.5 | 16.7 | 15.1 | 129.93 | -486.9 | -614.4 | 141.0 | 114.6 | 26.33 | 5.353 | |
| 3,300.0 | 3,151.3 | 3,290.6 | 3,175.0 | 17.3 | 15.7 | 130.45 | -505.2 | -637.0 | 146.9 | 119.8 | 27.14 | 5.415 | |
| 3,400.0 | 3,245.5 | 3,390.4 | 3,270.4 | 17.9 | 16.2 | 130.93 | -523.5 | -659.6 | 153.0 | 125.0 | 27.95 | 5.473 | |
| 3,500.0 | 3,339.7 | 3,490.2 | 3,365.9 | 18.6 | 16.8 | 131.38 | -541.7 | -682.2 | 159.0 | 130.2 | 28.75 | 5.529 | |
| 3,600.0 | 3,434.0 | 3,590.0 | 3,461.4 | 19.2 | 17.3 | 131.79 | -560.0 | -704.8 | 165.0 | 135.4 | 29.56 | 5.582 | |
| 3,700.0 | 3,528.2 | 3,689.8 | 3,556.9 | 19.8 | 17.9 | 132.18 | -578.3 | -727.5 | 171.0 | 140.7 | 30.37 | 5.632 | |
| 3,800.0 | 3,622.4 | 3,789.6 | 3,652.4 | 20.4 | 18.4 | 132.54 | -596.6 | -750.1 | 177.1 | 145.9 | 31.17 | 5.680 | |
| 3,900.0 | 3,716.6 | 3,889.4 | 3,747.8 | 21.1 | 19.0 | 132.87 | -614.9 | -772.7 | 183.1 | 151.1 | 31.98 | 5.726 | |
| 4,000.0 | 3,810.8 | 3,989.2 | 3,843.3 | 21.7 | 19.5 | 133.18 | -633.1 | -795.3 | 189.2 | 156.4 | 32.79 | 5.770 | |
| 4,100.0 | 3,905.0 | 4,089.0 | 3,938.8 | 22.3 | 20.1 | 133.48 | -651.4 | -817.9 | 195.2 | 161.6 | 33.59 | 5.812 | |
| 4,200.0 | 3,999.2 | 4,188.9 | 4,034.3 | 22.9 | 20.6 | 133.75 | -669.7 | -840.5 | 201.3 | 166.9 | 34.40 | 5.852 | |
| 4,300.0 | 4,093.4 | 4,288.7 | 4,129.8 | 23.6 | 21.2 | 134.01 | -688.0 | -863.1 | 207.4 | 172.2 | 35.21 | 5.890 | |
| 4,400.0 | 4,187.6 | 4,388.5 | 4,225.3 | 24.2 | 21.7 | 134.26 | -706.3 | -885.8 | 213.4 | 177.4 | 36.01 | 5.927 | |
| 4,500.0 | 4,281.8 | 4,488.3 | 4,320.7 | 24.8 | 22.3 | 134.49 | -724.5 | -908.4 | 219.5 | 182.7 | 36.82 | 5.962 | |
| 4,600.0 | 4,376.0 | 4,588.1 | 4,416.2 | 25.4 | 22.8 | 134.71 | -742.8 | -931.0 | 225.6 | 188.0 | 37.63 | 5.995 | |
| 4,700.0 | 4,470.2 | 4,687.9 | 4,511.7 | 26.1 | 23.4 | 134.91 | -761.1 | -953.6 | 231.7 | 193.2 | 38.43 | 6.028 | |
| 4,800.0 | 4,564.4 | 4,787.7 | 4,607.2 | 26.7 | 23.9 | 135.11 | -779.4 | -976.2 | 237.7 | 198.5 | 39.24 | 6.059 | |
| 4,900.0 | 4,658.6 | 4,887.5 | 4,702.7 | 27.3 | 24.5 | 135.30 | -797.7 | -998.8 | 243.8 | 203.8 | 40.05 | 6.089 | |
| 5,000.0 | 4,752.8 | 4,987.3 | 4,798.1 | 27.9 | 25.0 | 135.48 | -815.9 | -1,021.4 | 249.9 | 209.1 | 40.85 | 6.118 | |

CC - Min centre to center distance or covergent point, SF - min separation factor, ES - min ellipse separation

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Project:** | Mamm Creek | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Reference Site:** | J6SEB Pad | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site Error:** | 0.0ft | **North Reference:** | True |
| **Reference Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Well Error:** | 0.0ft | **Output errors are at** | 2.00 sigma |
| **Reference Wellbore** | OH | **Database:** | USA EDM 5000 Multi Users DB |
| **Reference Design:** | Plan #1 | **Offset TVD Reference:** | Offset Datum |

**Offset Design** J6SEB Pad - HMU 6-13AA - OH - Plan #1

**Offset Site Error:** 0.0 ft

**Survey Program:** 0-MWD

**Offset Well Error:** 0.0 ft

| Reference Measured Depth (ft) | Reference Vertical Depth (ft) | Offset Measured Depth (ft) | Offset Vertical Depth (ft) | Semi Major Axis Reference (ft) | Semi Major Axis Offset (ft) | Highside Toolface (°) | Offset Wellbore Centre +N/-S (ft) | Offset Wellbore Centre +E/-W (ft) | Distance Between Centres (ft) | Distance Between Ellipses (ft) | Total Uncertainty Axis | Separation Factor | Warning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5,100.0 | 4,847.0 | 5,087.2 | 4,893.6 | 28.6 | 25.6 | 135.65 | -834.2 | -1,044.1 | 256.0 | 214.4 | 41.66 | 6.145 | |
| 5,200.0 | 4,941.2 | 5,187.0 | 4,989.1 | 29.2 | 26.1 | 135.81 | -852.5 | -1,066.7 | 262.1 | 219.6 | 42.47 | 6.172 | |
| 5,300.0 | 5,035.4 | 5,286.8 | 5,084.6 | 29.8 | 26.7 | 135.96 | -870.8 | -1,089.3 | 268.2 | 224.9 | 43.27 | 6.198 | |
| 5,400.0 | 5,129.6 | 5,386.6 | 5,180.1 | 30.4 | 27.2 | 136.11 | -889.1 | -1,111.9 | 274.3 | 230.2 | 44.08 | 6.223 | |
| 5,500.0 | 5,223.8 | 5,486.4 | 5,275.6 | 31.1 | 27.8 | 136.25 | -907.4 | -1,134.5 | 280.4 | 235.5 | 44.89 | 6.247 | |
| 5,600.0 | 5,318.1 | 5,586.2 | 5,371.0 | 31.7 | 28.3 | 136.38 | -925.6 | -1,157.1 | 286.5 | 240.8 | 45.69 | 6.270 | |
| 5,700.0 | 5,412.3 | 5,686.0 | 5,466.5 | 32.3 | 28.8 | 136.51 | -943.9 | -1,179.7 | 292.6 | 246.1 | 46.50 | 6.292 | |
| 5,800.0 | 5,506.5 | 5,785.8 | 5,562.0 | 33.0 | 29.4 | 136.64 | -962.2 | -1,202.4 | 298.7 | 251.4 | 47.31 | 6.314 | |
| 5,900.0 | 5,600.7 | 5,885.7 | 5,657.5 | 33.6 | 29.9 | 136.76 | -980.5 | -1,225.0 | 304.8 | 256.7 | 48.12 | 6.335 | |
| 6,000.0 | 5,694.9 | 5,985.5 | 5,753.0 | 34.2 | 30.5 | 136.87 | -998.8 | -1,247.6 | 310.9 | 262.0 | 48.92 | 6.355 | |
| 6,100.0 | 5,789.1 | 6,085.3 | 5,848.4 | 34.8 | 31.0 | 136.98 | -1,017.0 | -1,270.2 | 317.0 | 267.3 | 49.73 | 6.375 | |
| 6,200.0 | 5,883.4 | 6,185.1 | 5,943.9 | 35.4 | 31.6 | 137.07 | -1,035.3 | -1,292.8 | 322.8 | 272.2 | 50.56 | 6.384 | |
| 6,300.0 | 5,978.8 | 6,280.1 | 6,035.1 | 36.0 | 32.1 | 136.92 | -1,052.2 | -1,313.7 | 326.8 | 275.3 | 51.47 | 6.349 | |
| 6,400.0 | 6,075.1 | 6,373.2 | 6,125.1 | 36.4 | 32.5 | 136.77 | -1,067.1 | -1,332.1 | 330.3 | 278.0 | 52.28 | 6.317 | |
| 6,500.0 | 6,172.4 | 6,466.3 | 6,215.9 | 36.9 | 32.9 | 136.64 | -1,080.0 | -1,348.1 | 333.3 | 280.3 | 53.01 | 6.287 | |
| 6,600.0 | 6,270.3 | 6,559.4 | 6,307.3 | 37.2 | 33.2 | 136.53 | -1,091.1 | -1,361.8 | 335.8 | 282.2 | 53.64 | 6.261 | |
| 6,700.0 | 6,368.9 | 6,652.4 | 6,399.2 | 37.5 | 33.5 | 136.43 | -1,100.3 | -1,373.2 | 337.9 | 283.7 | 54.18 | 6.236 | |
| 6,800.0 | 6,468.1 | 6,745.5 | 6,491.5 | 37.8 | 33.7 | 136.34 | -1,107.7 | -1,382.3 | 339.5 | 284.8 | 54.63 | 6.214 | |
| 6,900.0 | 6,567.6 | 6,838.5 | 6,584.1 | 37.9 | 33.9 | 136.26 | -1,113.1 | -1,389.1 | 340.6 | 285.6 | 54.99 | 6.193 | |
| 7,000.0 | 6,667.4 | 6,931.6 | 6,677.0 | 38.1 | 34.0 | 136.19 | -1,116.7 | -1,393.5 | 341.2 | 285.9 | 55.26 | 6.174 | |
| 7,100.0 | 6,767.4 | 7,024.6 | 6,770.0 | 38.1 | 34.1 | 136.14 | -1,118.4 | -1,395.6 | 341.3 | 285.9 | 55.45 | 6.156 | |
| 7,200.0 | 6,867.4 | 7,122.0 | 6,867.4 | 38.2 | 34.1 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 285.7 | 55.61 | 6.138 | |
| 7,300.0 | 6,967.4 | 7,222.0 | 6,967.4 | 38.3 | 34.2 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 285.5 | 55.76 | 6.120 | |
| 7,400.0 | 7,067.4 | 7,322.0 | 7,067.4 | 38.3 | 34.2 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 285.4 | 55.92 | 6.103 | |
| 7,500.0 | 7,167.4 | 7,422.0 | 7,167.4 | 38.4 | 34.3 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 285.2 | 56.08 | 6.085 | |
| 7,600.0 | 7,267.4 | 7,522.0 | 7,267.4 | 38.4 | 34.4 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 285.0 | 56.25 | 6.068 | |
| 7,700.0 | 7,367.4 | 7,622.0 | 7,367.4 | 38.5 | 34.4 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 284.9 | 56.41 | 6.050 | |
| 7,800.0 | 7,467.4 | 7,722.0 | 7,467.4 | 38.6 | 34.5 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 284.7 | 56.58 | 6.032 | |
| 7,900.0 | 7,567.4 | 7,822.0 | 7,567.4 | 38.6 | 34.6 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 284.5 | 56.74 | 6.015 | |
| 8,000.0 | 7,667.4 | 7,922.0 | 7,667.4 | 38.7 | 34.6 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 284.4 | 56.91 | 5.997 | |
| 8,100.0 | 7,767.4 | 8,022.0 | 7,767.4 | 38.7 | 34.7 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 284.2 | 57.08 | 5.979 | |
| 8,200.0 | 7,867.4 | 8,122.0 | 7,867.4 | 38.8 | 34.8 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 284.0 | 57.26 | 5.961 | |
| 8,300.0 | 7,967.4 | 8,222.0 | 7,967.4 | 38.9 | 34.9 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 283.9 | 57.43 | 5.943 | |
| 8,400.0 | 8,067.4 | 8,322.0 | 8,067.4 | 38.9 | 34.9 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 283.7 | 57.60 | 5.925 | |
| 8,500.0 | 8,167.4 | 8,422.0 | 8,167.4 | 39.0 | 35.0 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 283.5 | 57.78 | 5.906 | |
| 8,600.0 | 8,267.4 | 8,522.0 | 8,267.4 | 39.1 | 35.1 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 283.3 | 57.96 | 5.888 | |
| 8,700.0 | 8,367.4 | 8,622.0 | 8,367.4 | 39.1 | 35.2 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 283.1 | 58.14 | 5.870 | |
| 8,800.0 | 8,467.4 | 8,722.0 | 8,467.4 | 39.2 | 35.2 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 283.0 | 58.32 | 5.852 | |
| 8,900.0 | 8,567.4 | 8,822.0 | 8,567.4 | 39.3 | 35.3 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 282.8 | 58.51 | 5.833 | |
| 9,000.0 | 8,667.4 | 8,922.0 | 8,667.4 | 39.3 | 35.4 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 282.6 | 58.69 | 5.815 | |
| 9,100.0 | 8,767.4 | 9,022.0 | 8,767.4 | 39.4 | 35.5 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 282.4 | 58.88 | 5.797 | |
| 9,200.0 | 8,867.4 | 9,122.0 | 8,867.4 | 39.5 | 35.5 | -0.19 | -1,118.5 | -1,395.7 | 341.3 | 282.2 | 59.06 | 5.778 | |
| 9,300.0 | 8,967.4 | 9,133.6 | 8,879.0 | 39.6 | 35.5 | -0.19 | -1,118.5 | -1,395.7 | 352.5 | 293.4 | 59.17 | 5.958 | |
| 9,400.0 | 9,067.4 | 9,133.6 | 8,879.0 | 39.6 | 35.5 | -0.19 | -1,118.5 | -1,395.7 | 389.8 | 330.6 | 59.27 | 6.577 | |
| 9,500.0 | 9,167.4 | 9,133.6 | 8,879.0 | 39.7 | 35.5 | -0.19 | -1,118.5 | -1,395.7 | 446.8 | 387.4 | 59.36 | 7.527 | |

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Project:** | Mamm Creek | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Reference Site:** | J6SEB Pad | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site Error:** | 0.0ft | **North Reference:** | True |
| **Reference Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Well Error:** | 0.0ft | **Output errors are at** | 2.00 sigma |
| **Reference Wellbore** | OH | **Database:** | USA EDM 5000 Multi Users DB |
| **Reference Design:** | Plan #1 | **Offset TVD Reference:** | Offset Datum |

**Offset Design** J6SEB Pad - HMU 6-15A - OH - Plan #1

**Offset Site Error:** 0.0 ft

**Survey Program:** 0-MWD

**Offset Well Error:** 0.0 ft

| Reference Measured Depth (ft) | Reference Vertical Depth (ft) | Offset Measured Depth (ft) | Offset Vertical Depth (ft) | Semi Major Axis Reference (ft) | Semi Major Axis Offset (ft) | Highside Toolface (°) | Offset Wellbore Centre +N/-S (ft) | Offset Wellbore Centre +E/-W (ft) | Distance Between Centres (ft) | Distance Between Ellipses (ft) | Total Uncertainty Axis | Separation Factor | Warning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 135.15 | -11.7 | 11.6 | 16.4 | | | | |
| 100.0 | 100.0 | 100.0 | 100.0 | 0.1 | 0.1 | 135.15 | -11.7 | 11.6 | 16.4 | 16.2 | 0.27 | 60.353 | |
| 200.0 | 200.0 | 200.0 | 200.0 | 0.3 | 0.3 | 135.15 | -11.7 | 11.6 | 16.4 | 15.8 | 0.62 | 26.447 | |
| 300.0 | 300.0 | 300.0 | 300.0 | 0.5 | 0.5 | 135.15 | -11.7 | 11.6 | 16.4 | 15.5 | 0.97 | 16.934 | CC, ES |
| 400.0 | 400.0 | 399.3 | 399.3 | 0.7 | 0.7 | -95.44 | -12.9 | 12.3 | 17.9 | 16.6 | 1.32 | 13.503 | SF |
| 500.0 | 499.6 | 498.0 | 497.8 | 0.9 | 0.9 | -106.96 | -18.6 | 15.2 | 25.1 | 23.3 | 1.71 | 14.621 | |
| 600.0 | 598.8 | 595.8 | 594.9 | 1.1 | 1.1 | -114.94 | -28.7 | 20.4 | 38.7 | 36.5 | 2.17 | 17.807 | |
| 700.0 | 697.1 | 692.6 | 690.4 | 1.5 | 1.4 | -119.38 | -42.8 | 27.7 | 58.3 | 55.6 | 2.71 | 21.495 | |
| 800.0 | 794.3 | 789.7 | 785.9 | 1.9 | 1.7 | -123.76 | -58.0 | 35.6 | 81.7 | 78.4 | 3.33 | 24.560 | |
| 900.0 | 890.2 | 885.7 | 880.4 | 2.5 | 2.0 | -128.14 | -73.0 | 43.4 | 108.5 | 104.5 | 3.99 | 27.223 | |
| 1,000.0 | 984.6 | 980.5 | 973.8 | 3.0 | 2.3 | -132.30 | -87.8 | 51.1 | 138.8 | 134.1 | 4.66 | 29.805 | |
| 1,100.0 | 1,078.8 | 1,075.2 | 1,067.0 | 3.6 | 2.7 | -135.40 | -102.6 | 58.7 | 170.1 | 164.7 | 5.33 | 31.930 | |
| 1,200.0 | 1,173.0 | 1,169.8 | 1,160.1 | 4.3 | 3.0 | -137.54 | -117.4 | 66.4 | 201.7 | 195.7 | 6.00 | 33.638 | |
| 1,300.0 | 1,267.2 | 1,264.5 | 1,253.3 | 4.9 | 3.3 | -139.10 | -132.2 | 74.1 | 233.5 | 226.8 | 6.66 | 35.032 | |
| 1,400.0 | 1,361.4 | 1,359.1 | 1,346.5 | 5.5 | 3.6 | -140.29 | -147.0 | 81.7 | 265.4 | 258.0 | 7.33 | 36.188 | |
| 1,500.0 | 1,455.7 | 1,453.8 | 1,439.6 | 6.1 | 4.0 | -141.22 | -161.8 | 89.4 | 297.3 | 289.3 | 8.00 | 37.159 | |
| 1,600.0 | 1,549.9 | 1,548.4 | 1,532.8 | 6.7 | 4.3 | -141.97 | -176.6 | 97.1 | 329.4 | 320.7 | 8.67 | 37.986 | |
| 1,700.0 | 1,644.1 | 1,643.1 | 1,626.0 | 7.3 | 4.6 | -142.59 | -191.4 | 104.8 | 361.5 | 352.1 | 9.34 | 38.698 | |
| 1,800.0 | 1,738.3 | 1,737.7 | 1,719.1 | 8.0 | 5.0 | -143.11 | -206.2 | 112.4 | 393.6 | 383.6 | 10.01 | 39.317 | |
| 1,900.0 | 1,832.5 | 1,832.4 | 1,812.3 | 8.6 | 5.3 | -143.55 | -221.0 | 120.1 | 425.7 | 415.1 | 10.68 | 39.860 | |
| 2,000.0 | 1,926.7 | 1,927.0 | 1,905.5 | 9.2 | 5.6 | -143.93 | -235.8 | 127.8 | 457.9 | 446.5 | 11.35 | 40.340 | |
| 2,100.0 | 2,020.9 | 2,021.6 | 1,998.6 | 9.8 | 6.0 | -144.25 | -250.6 | 135.4 | 490.1 | 478.1 | 12.02 | 40.768 | |

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Project:** | Mamm Creek | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Reference Site:** | J6SEB Pad | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site Error:** | 0.0ft | **North Reference:** | True |
| **Reference Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Well Error:** | 0.0ft | **Output errors are at** | 2.00 sigma |
| **Reference Wellbore** | OH | **Database:** | USA EDM 5000 Multi Users DB |
| **Reference Design:** | Plan #1 | **Offset TVD Reference:** | Offset Datum |

**Offset Design** J6SEB Pad - HMU 6-15AA - OH - Plan #1

**Offset Site Error:** 0.0 ft

**Survey Program:** 0-MWD

**Offset Well Error:** 0.0 ft

| Reference Measured Depth (ft) | Reference Vertical Depth (ft) | Offset Measured Depth (ft) | Offset Vertical Depth (ft) | Semi Major Axis Reference (ft) | Semi Major Axis Offset (ft) | Highside Toolface (°) | Offset Wellbore Centre +N/-S (ft) | Offset Wellbore Centre +E/-W (ft) | Distance Between Centres (ft) | Distance Between Ellipses (ft) | Total Uncertainty Axis | Separation Factor | Warning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 153.57 | -23.3 | 11.6 | 26.0 | | | | |
| 100.0 | 100.0 | 100.0 | 100.0 | 0.1 | 0.1 | 153.57 | -23.3 | 11.6 | 26.0 | 25.8 | 0.27 | 95.611 | |
| 200.0 | 200.0 | 200.0 | 200.0 | 0.3 | 0.3 | 153.57 | -23.3 | 11.6 | 26.0 | 25.4 | 0.62 | 41.897 | CC, ES |
| 300.0 | 300.0 | 298.6 | 298.5 | 0.5 | 0.5 | 154.07 | -25.7 | 12.5 | 28.6 | 27.6 | 0.97 | 29.404 | |
| 400.0 | 400.0 | 396.7 | 396.3 | 0.7 | 0.7 | -72.23 | -32.8 | 15.2 | 35.4 | 34.1 | 1.32 | 26.825 | SF |
| 500.0 | 499.6 | 494.0 | 492.8 | 0.9 | 1.0 | -78.91 | -44.4 | 19.6 | 46.1 | 44.4 | 1.71 | 26.929 | |
| 600.0 | 598.8 | 590.0 | 587.3 | 1.1 | 1.3 | -86.00 | -60.4 | 25.7 | 61.4 | 59.2 | 2.19 | 28.033 | |
| 700.0 | 697.1 | 686.5 | 681.4 | 1.5 | 1.7 | -92.38 | -80.1 | 33.1 | 81.1 | 78.3 | 2.79 | 29.040 | |
| 800.0 | 794.3 | 783.5 | 776.1 | 1.9 | 2.1 | -98.82 | -100.3 | 40.8 | 102.5 | 99.0 | 3.53 | 29.080 | |
| 900.0 | 890.2 | 879.7 | 869.8 | 2.5 | 2.5 | -105.03 | -120.2 | 48.3 | 126.2 | 121.9 | 4.37 | 28.915 | |
| 1,000.0 | 984.6 | 974.9 | 962.7 | 3.0 | 2.9 | -110.99 | -140.0 | 55.8 | 152.7 | 147.5 | 5.25 | 29.079 | |
| 1,100.0 | 1,078.8 | 1,070.0 | 1,055.4 | 3.6 | 3.3 | -115.69 | -159.8 | 63.3 | 180.8 | 174.7 | 6.13 | 29.505 | |
| 1,200.0 | 1,173.0 | 1,165.1 | 1,148.1 | 4.3 | 3.7 | -119.13 | -179.5 | 70.8 | 209.7 | 202.7 | 6.99 | 30.017 | |
| 1,300.0 | 1,267.2 | 1,260.1 | 1,240.8 | 4.9 | 4.1 | -121.74 | -199.2 | 78.3 | 239.2 | 231.3 | 7.83 | 30.533 | |
| 1,400.0 | 1,361.4 | 1,355.2 | 1,333.5 | 5.5 | 4.5 | -123.78 | -219.0 | 85.8 | 269.0 | 260.3 | 8.67 | 31.022 | |
| 1,500.0 | 1,455.7 | 1,450.3 | 1,426.1 | 6.1 | 4.9 | -125.41 | -238.7 | 93.3 | 299.0 | 289.5 | 9.50 | 31.473 | |
| 1,600.0 | 1,549.9 | 1,545.3 | 1,518.8 | 6.7 | 5.3 | -126.75 | -258.5 | 100.8 | 329.2 | 318.9 | 10.33 | 31.884 | |
| 1,700.0 | 1,644.1 | 1,640.4 | 1,611.5 | 7.3 | 5.7 | -127.86 | -278.2 | 108.3 | 359.6 | 348.5 | 11.15 | 32.257 | |
| 1,800.0 | 1,738.3 | 1,735.5 | 1,704.2 | 8.0 | 6.1 | -128.80 | -298.0 | 115.7 | 390.1 | 378.1 | 11.97 | 32.595 | |
| 1,900.0 | 1,832.5 | 1,830.5 | 1,796.9 | 8.6 | 6.5 | -129.60 | -317.7 | 123.2 | 420.6 | 407.9 | 12.78 | 32.902 | |
| 2,000.0 | 1,926.7 | 1,925.6 | 1,889.6 | 9.2 | 6.9 | -130.30 | -337.5 | 130.7 | 451.3 | 437.7 | 13.60 | 33.181 | |
| 2,100.0 | 2,020.9 | 2,020.6 | 1,982.3 | 9.8 | 7.3 | -130.90 | -357.2 | 138.2 | 481.9 | 467.5 | 14.41 | 33.435 | |

# Cathedral Energy Services

## Anticollision Report

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Project:** | Mamm Creek | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Reference Site:** | J6SEB Pad | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site Error:** | 0.0ft | **North Reference:** | True |
| **Reference Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Well Error:** | 0.0ft | **Output errors are at** | 2.00 sigma |
| **Reference Wellbore** | OH | **Database:** | USA EDM 5000 Multi Users DB |
| **Reference Design:** | Plan #1 | **Offset TVD Reference:** | Offset Datum |

**Offset Design** J6SEB Pad - HMU 6-15D - OH - Plan #1

**Offset Site Error:** 0.0 ft

**Survey Program:** 0-MWD

**Offset Well Error:** 0.0 ft

| Reference Measured Depth (ft) | Reference Vertical Depth (ft) | Offset Measured Depth (ft) | Offset Vertical Depth (ft) | Semi Major Axis Reference (ft) | Semi Major Axis Offset (ft) | Highside Toolface (°) | Offset Wellbore Centre +N/-S (ft) | Offset Wellbore Centre +E/-W (ft) | Distance Between Centres (ft) | Distance Between Ellipses (ft) | Total Uncertainty Axis | Separation Factor | Warning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 180.00 | -11.3 | 0.0 | 11.3 | | | | |
| 100.0 | 100.0 | 100.0 | 100.0 | 0.1 | 0.1 | 180.00 | -11.3 | 0.0 | 11.3 | 11.0 | 0.27 | 41.454 | |
| 200.0 | 200.0 | 200.0 | 200.0 | 0.3 | 0.3 | 180.00 | -11.3 | 0.0 | 11.3 | 10.7 | 0.62 | 18.165 | CC, ES |
| 300.0 | 300.0 | 299.5 | 299.5 | 0.5 | 0.5 | 180.00 | -12.7 | 0.0 | 12.8 | 11.8 | 0.97 | 13.133 | SF |
| 400.0 | 400.0 | 398.6 | 398.4 | 0.7 | 0.7 | -49.50 | -19.2 | 0.0 | 17.4 | 16.1 | 1.32 | 13.208 | |
| 500.0 | 499.6 | 497.2 | 496.3 | 0.9 | 0.9 | -62.04 | -30.5 | 0.6 | 24.5 | 22.8 | 1.71 | 14.343 | |
| 600.0 | 598.8 | 594.8 | 592.5 | 1.1 | 1.3 | -76.53 | -46.1 | 3.5 | 35.7 | 33.5 | 2.19 | 16.291 | |
| 700.0 | 697.1 | 690.7 | 686.3 | 1.5 | 1.6 | -87.83 | -65.6 | 8.7 | 52.7 | 49.9 | 2.83 | 18.662 | |
| 800.0 | 794.3 | 784.7 | 777.1 | 1.9 | 2.1 | -95.51 | -88.8 | 15.9 | 75.7 | 72.1 | 3.60 | 21.066 | |
| 900.0 | 890.2 | 879.8 | 868.2 | 2.5 | 2.6 | -101.31 | -114.7 | 24.6 | 103.2 | 98.7 | 4.49 | 22.994 | |
| 1,000.0 | 984.6 | 974.7 | 959.1 | 3.0 | 3.1 | -106.68 | -140.6 | 33.2 | 132.7 | 127.2 | 5.45 | 24.343 | |
| 1,100.0 | 1,078.8 | 1,069.4 | 1,049.8 | 3.6 | 3.5 | -110.65 | -166.4 | 41.9 | 163.2 | 156.8 | 6.42 | 25.432 | |
| 1,200.0 | 1,173.0 | 1,164.1 | 1,140.5 | 4.3 | 4.0 | -113.37 | -192.3 | 50.6 | 194.2 | 186.9 | 7.38 | 26.319 | |
| 1,300.0 | 1,267.2 | 1,258.8 | 1,231.2 | 4.9 | 4.5 | -115.34 | -218.2 | 59.2 | 225.6 | 217.2 | 8.34 | 27.043 | |
| 1,400.0 | 1,361.4 | 1,353.6 | 1,321.9 | 5.5 | 5.0 | -116.83 | -244.0 | 67.9 | 257.1 | 247.8 | 9.30 | 27.642 | |
| 1,500.0 | 1,455.7 | 1,448.3 | 1,412.6 | 6.1 | 5.5 | -118.00 | -269.9 | 76.5 | 288.7 | 278.4 | 10.26 | 28.144 | |
| 1,600.0 | 1,549.9 | 1,543.0 | 1,503.3 | 6.7 | 6.0 | -118.94 | -295.7 | 85.2 | 320.4 | 309.2 | 11.22 | 28.568 | |
| 1,700.0 | 1,644.1 | 1,637.7 | 1,594.0 | 7.3 | 6.5 | -119.70 | -321.6 | 93.9 | 352.2 | 340.0 | 12.17 | 28.932 | |
| 1,800.0 | 1,738.3 | 1,732.4 | 1,684.8 | 8.0 | 7.0 | -120.35 | -347.5 | 102.5 | 384.0 | 370.9 | 13.13 | 29.247 | |
| 1,900.0 | 1,832.5 | 1,827.2 | 1,775.5 | 8.6 | 7.5 | -120.89 | -373.3 | 111.2 | 415.9 | 401.8 | 14.09 | 29.523 | |
| 2,000.0 | 1,926.7 | 1,921.9 | 1,866.2 | 9.2 | 8.1 | -121.35 | -399.2 | 119.8 | 447.8 | 432.7 | 15.04 | 29.765 | |
| 2,100.0 | 2,020.9 | 2,016.6 | 1,956.9 | 9.8 | 8.6 | -121.76 | -425.0 | 128.5 | 479.7 | 463.7 | 16.00 | 29.979 | |

| | | | |
|---|---|---|---|
| **Company:** | EnCana Oil & Gas (USA) Inc | **Local Co-ordinate Reference:** | Well HMU 6-13D |
| **Project:** | Mamm Creek | **TVD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Reference Site:** | J6SEB Pad | **MD Reference:** | KB=22' @ 7166.0ft (Patterson #308) |
| **Site Error:** | 0.0ft | **North Reference:** | True |
| **Reference Well:** | HMU 6-13D | **Survey Calculation Method:** | Minimum Curvature |
| **Well Error:** | 0.0ft | **Output errors are at** | 2.00 sigma |
| **Reference Wellbore** | OH | **Database:** | USA EDM 5000 Multi Users DB |
| **Reference Design:** | Plan #1 | **Offset TVD Reference:** | Offset Datum |

Reference Depths are relative to KB=22' @ 7166.0ft (Patterson #308)
Offset Depths are relative to Offset Datum
Central Meridian is -105.500000 °

Coordinates are relative to: HMU 6-13D
Coordinate System is US State Plane 1983, Colorado Central Zone
Grid Convergence at Surface is: -1.39°