

## The Montney Oil-Window of Alberta: Making sense of sources and migration in an organic-lean low permeability reservoir

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The Montney Formation in Alberta is a relatively organic-lean siltstone reservoir that produces economic quantities of hydrocarbons in geochemically mature areas. From Kakwa to Gold Creek, as part of a contiguous depositional corridor, vertically stacked targets are successfully exploited in distal areas for gas and condensate. Up-dip, at Gold Creek, the oil-window of this depositional corridor produces sweet, light oil from wells targeting the turbidite facies of the middle Montney only.

In 2014, the 16-28-66-2W6 well tested medium gravity oil from a distal shelf facies of the Lower Montney Formation. To understand the implication of this observation on the Montney petroleum system, several subsequent cores were retrieved across the Karr sub-basin. Source-rock maturities of approximately 0.8% VRe were confirmed, TOC contents were observed to rarely exceed 1%, and extrapolated S<sub>20</sub> data suggest that the Montney Fm. at Gold Creek, as a locally self-sourcing system, is not capable of achieving complete charge.

Oils extracted from core samples confirmed the presence of two vertically distinct hydrocarbon systems. The more massive and turbidite event-bed rich middle Montney is prone to higher API gravity crudes often exceeding 40 degrees. Terpane distributions indicate the potential for mixed sources. API gravities from less permeable facies of the underlying Lower Montney zones were consistently lower, often by more than 10 degrees. Terpane ratios of produced and extracted oils indicate that these oils are self-sourced.

Vertical variability in the API gravity of extracted oils suggests migratory influences in the charging mechanism. To understand this variability, diamondoid analysis was undertaken on oils extracted from several intervals of each core. The analysis showed that lighter components of middle Montney oils have been influenced by the migration of higher maturity downdip-generated hydrocarbons to a greater extent than oils of the less permeable lower Montney. In contrast, high molecular weight hydrocarbon constituents from both Montney zones show little migratory influence.

Understanding the geochemically distinct nature of oils saturating adjacent Montney Formation facies is critical to the successful targeting of laterals in the oil-window of the Montney Formation at Gold Creek, Alberta.