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Anhydrite Dissolution, Subsidence and Critical Minerals in the Manson Oil Field, Williston Basin, Manitoba

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Summary

The Reston-Amaranth-Lodgepole pool in the Manson Field produces oil from a continuous reservoir spanning the Mississippian Lodgepole Formation to the Jurassic Lower Melita Member of the Melita Formation in Manitoba. The Manson Field currently has 101 producing oil wells and a total cumulative oil production of 888 223 m^3. Producing formations within this reservoir are Mississippian Lodgepole Formation mudstone, wackestone and packstone intervals, Middle Jurassic Reston Formation mudstone and sandstone units, Melita Formation sandstones and siliceous layers from the Mississippian to the Jurassic.

The rocks in this interval display sedimentary, post-depositional, diagenetic and structural characteristics that suggest enhanced fluid movement and faulting may have influenced the reservoir thickness, composition, oil location and the potential for local oil generation. Unusual features observed in the core include sandstone units, breccia zones, anhydrite dissolution, siliceous layers, sulphide precipitation and enhanced porosity development. Further work will be conducted to better understand this reservoir, the structural regime of the area and the potential for critical minerals and new oil accumulations within the sedimentary succession of Manitoba.

Methodology

Between 2015 and 2025, 58 drill-core from Township 12 to 13 and Range 26 to 27W1 were examined and photographed. The core came from formations between the Whitewater Lake Member of the Lodgepole Formation to the Lower Melita Member of the Melita Formation. Core were chosen based on their length within the formations of interest, their location within the study area and their availability for viewing at the Manitoba Geological Survey Midland Sample and Core Library (Winnipeg, Manitoba). The results of the core examinations have been collated, plotted and compared to the available data on the area.

Observations

The eastern part of the Manson Field occurs over regional Precambrian faults which have affected the overlying sediments. An area of anhydrite dissolution, the rocks record where Amaranth Formation anhydrites are absent and the Amaranth Formation is reduced in thickness (Figure 1). The area also records layers of zoned silica/chert, silica replacement of packstone layers, enhanced porosity, areas of colour bleaching, sulphide precipitation along fractures and bedding planes, green alteration, breccias, fining and coarsening up cycles and dolomitization. The oil coming from this zone is high in sulfur and visual observation indicates minor amounts of pyrite, sphalerite, chalcopyrite and silver are present in select core.

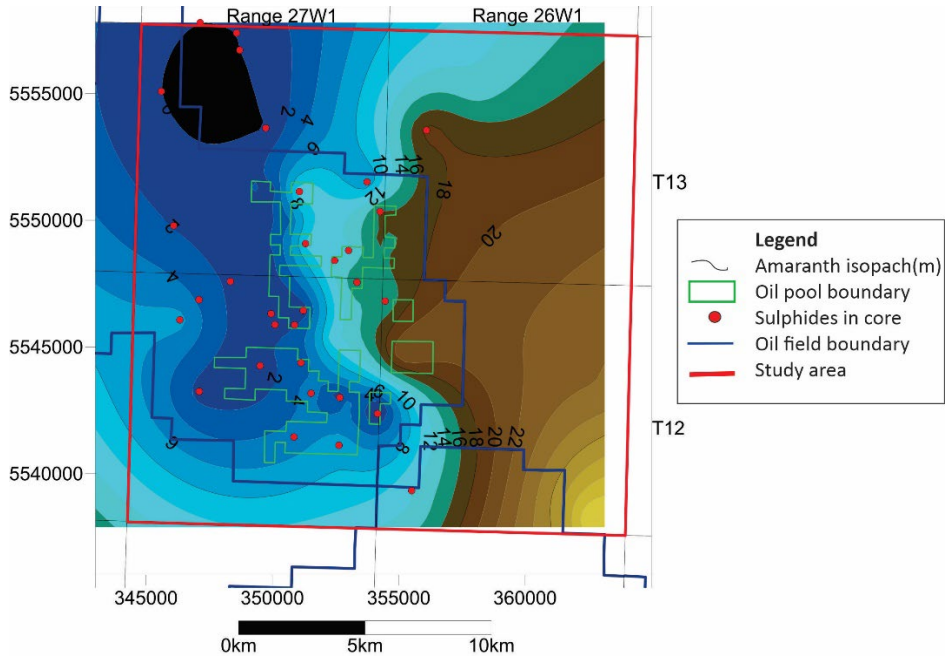

Figure 1 – Preliminary distribution of the Amaranth Formation with sulphide locations in core. Plotted on the NAD83 Zone 14 grid showing DLS Township (T) and Range values. Isopachs were generated with a kriging gridding method in Golden Software Surfer 13.

Preliminary Interpretations

Upper Mississippian to Jurassic rocks of the eastern part of the Manson field exhibit features consistent with warm hydrothermal fluid movement and episodic subsidence or fault movement during the Jurassic. This may indicate past local generation of oil, further stratigraphically high oil accumulations along the Birdtail Waskada Zone, and deposits of critical minerals (copper and zinc) within the sedimentary section in the Williston Basin of Manitoba.

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References

Reference Style (use Arial 9pt normal)
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