

Geology and petroleum potential of Cambrian strata, Northwest Territories

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Cambrian strata in the Interior Plains of the Northwest Territories consist of, in ascending order, the Mount Clark, Mount Cap and Saline River formations. These strata were deposited in a semi-enclosed, epicontinental, marine basin opening to the west onto a continental margin. The basin was divided into several depocentres by basement ridges against which initial coarse clastic sediments of the Mount Clark and Mount Cap formations overlapped and finally overlapped. A regional unconformity separates the Saline River from underlying strata and subsequent sedimentation was marked by restricted marine conditions and the development of extensive evaporite beds (Saline River Formation). A Late Cambrian transgression ended evaporite deposition and was followed by open marine carbonate sedimentation.

Gas and condensates have been recovered from a number of wells in the northern part of the basin but until recently a potential source for the hydrocarbons was unknown. The shales of the Mount Cap Formation are lean in organic carbon and would not be considered potential source rocks. In 1990, Wielans et al. reported the presence of a thin bed (a few centimetres thick) rich in algal material (kukersite) from the Colville D-45 core that could be a suitable source rock. Subsequent studies (Dixon and Stasiuk (1998) reaffirmed this discovery and located similar algal-rich intervals within the Mount Clark to Mount Cap transitional beds. In all instances the organic-rich layers are only a few centimetres thick and appear to be local in distribution. The thermal maturity of the organic matter in the northern depocentres ranges from immature to mature, increasing from northeast to southwest.

Sandstones of the Mount Clark Formation can be very porous in the northern depocentres, with up to 20% porosity. Porosity is generally secondary in origin, formed by the dissolution of carbonate cement.

Although part of the largely undeformed Lower Paleozoic platform succession, a north-trending belt of Tertiary compressional structures extends from the Fort Norman area into the Colville Hills. The potential for stratigraphic traps, or a combination of structural and stratigraphic trapping is significant, with up-dip pinchout of sandstones against basement highs, possibly enhanced by structural closure.

References

Wielans, J.B.W., van der Dick, H., Fowler, M.G., Brooks, P.W., and Monnier, F. 1990. Geochemical comparison of a Cambrian alginite source rock, and hydrocarbons from the Colville/Tweed Lake area, Northwest Territories. Bulletin

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