

Palynology and TOC/Rock-Eval of Late Devonian Imperial Formation, Southern Peel Plateau and Plain, NWT

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Late Devonian stratigraphy of the Peel Plateau and Plain is comprised of the upper portion of the Hare Indian Formation, the Canol Formation, and the Imperial Formation. The Imperial Formation is overlain unconformably by the Cretaceous Martin House Formation.

Field work conducted in 2006 consisted of measuring stratigraphic sections on Imperial River, Powell Creek, an Elbow Creek tributary as well as an Arctic Red River tributary. These sections occur on NTS map sheets 96 E/4, 106 H/5 and H/7, and 106 G/7. Samples were collected from Imperial Formation for analysis of permeability, porosity, palynology, and Rock-Eval/TOC. To enhance the regional picture of Imperial Formation additional samples for Rock-Eval/TOC and palynology were collected from map sheets 105P and 95M.

Imperial Formation is interpreted as a turbidite sequence that can be coarsely described as three, thick resistant cliff-forming sandstone units, which are separated by less resistant to recessive thick silty shale packages. The sandstones are very fine to fine-grained and show abundant bioturbation near the base of beds including both horizontal tracks and traces as well as vertical burrows. Bioturbation decreases up section and sedimentary structures are better preserved. Imperial Formation sandstone is locally fossiliferous containing rugose horn corals, colonial corals, and brachiopods. Sandstone units at the Imperial River section are locally petroliferous. Recent palynology work indicates environment of deposition as marine in the more northern localities to terrestrial to near-shore marine in the south (105P and 95M). Thermal Alteration Index (3 – 4) and equivalent vitrinite reflectance (1.4 - 2.0%) all indicate postmature dry gas zone.

The sandstones of Imperial Formation are medium grey, green grey, and olive green in colour. The greyer sandstones occur in the basal sand unit in the Shortcut Creek and Monument section to the west. In these two sections there is a distinct lack of green sand in the basal member. The western sections also exhibit a notable decrease in coral and shell abundances. This possibly indicates a movement away from a shelf edge bioclastic sediment source, which may correspond to a northern extension of the Jungle Ridge member recognized further south.

Initial results from 2006 field season yielded porosity values between 14% and 25% on sandstones from Imperial River Section. One sample of Imperial Formation on Powell Creek yielded TOC 3.6%, Tmax 438 C, S1 0.83 and S2 9.42. These Rock-Eval results are well within the oil window and are excellent indicators of potential source rock, and provide direction for future field work. Petrographic examinations are pending.