

Petroleum Potential of Cambrian Mount Clark/Mount Cap Formations and Devonian Horn River Group in Northern Mackenzie Plain Area, Northwest Territories

Leanne J. Pyle*

VI Geoscience Services Ltd., Brentwood Bay, BC

lpyle@vigeoscience.com

and

Len P. Gal

Courtenay, BC

and

Ryan T. Lemiski and Adrienne L. Jones

Northwest Territories Geoscience Office, Yellowknife, NT

Mackenzie Plain is a petroleum producing and exploration area that lies within the central Mackenzie Valley, Northwest Territories. The area contains the Devonian oil fields at Norman Wells and has potential for additional conventional and unconventional petroleum resources. A five-year (2009-2014), field-based project initiated by the Northwest Territories Geoscience Office (NTGO) is aimed at updating and improving geoscience knowledge of key petroleum plays. Information from outcrop studies will be integrated with subsurface data from exploration wells across Mackenzie Plain. Project details are available at http://www.nwtgeoscience.ca/petroleum/Mackenzie_Plain.html. Field work in 2010 focused on outcrop studies within Cambrian Mount Clark/Mount Cap formations and Devonian Horn River Group in the northern Mackenzie Mountains and Franklin Mountains that flank Mackenzie Plain to the west and east, respectively.

The Cambrian Mount Clark/Mount Cap formations extend throughout the northern Interior Plains of the Northwest Territories. The succession has proven oil, gas, and condensate discoveries in the Colville Hills area northeast of Mackenzie Plain. A total of eight previously measured sections in the northern Mackenzie Mountains were examined. Samples of black shale from Mount Cap Formation were collected for analysis of total organic carbon, thermal maturity, hydrocarbon types, and elemental geochemistry. Sandstones were collected from Mount Clark/Mount Cap formations for porosity-permeability analysis. The goal is to obtain new data on source rock potential and reservoir facies in basal Cambrian clastics, a conceptualized play in Mackenzie Plain area.

The Devonian Horn River Group in Mackenzie Plain area consists of Hare Indian, Ramparts, and Canol formations (Givetian to Frasnian in age). This stratigraphic interval is equivalent to strata of the shale gas play currently being developed in the Horn River Basin of northeastern British Columbia. The objective of new field and subsurface studies is to examine the potential for conventional and unconventional petroleum plays within the succession in Mackenzie Plain. The Kee Scarp play is established in Mackenzie Plain where a reef structure (Kee Scarp Member) within the Ramparts Formation is the primary reservoir for the oil field located at Norman Wells. The source for this petroleum system is the Canol Formation shale. Field studies in 2010 focused on measurement and detailed sampling of four Horn River Group sections in the northern Mackenzie Mountains. Throughout each section, spectral gamma ray measurements were taken

with a hand-held scintillometer. Chip samples from outcrop, core, and cuttings were collected for analysis of total organic carbon, thermal maturity, hydrocarbon types, mineralogy, and elemental geochemistry.