

Buried Bedrock Channels in the Athabasca Oil Sands Region – Conceptual Understanding and Implications to Water Supply

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Abstract

Quaternary and Tertiary Period buried bedrock channels are present throughout the Athabasca Oil Sands region. Detailed geologic mapping of these channels has been completed by the Alberta Geologic Survey and various oil sand operators within the region. These channels can incise into the top of the Cretaceous bedrock surface greater than 150 m and can vary in width from less than 500 m to greater than 30 km. Channel length can vary from less than 10 km to greater than 200 km. Coarse grained sediments within the buried bedrock channels are often considered prolific non-saline aquifers. A hydrogeological case study will be reviewed that incorporates Quaternary, Tertiary and Cretaceous geological, hydraulic head and groundwater chemistry mapping that suggests the presence of these buried bedrock channels can strongly influence local and regional groundwater flow patterns and groundwater chemistry distributions. The depth of incision and subcropping Cretaceous units strongly influence the hydraulic head distribution within the channel sediments as well as the underlying Grand Rapids Formation. The distribution of total dissolved solids concentrations within the Grand Rapids and Clearwater Formations also appear to be influenced by the presence of the channels where overlying aquitards of the Colorado Group have been eroded. The conceptual model of the hydrogeological conditions will be presented and the implications to water supply will be discussed.

Speaker Biography

Scott Rayner is a Senior Groundwater Consultant at Matrix Solutions Inc. and has 7 years of environmental and groundwater supply experience in Alberta and Ontario. He holds a First Class Honors B.Sc. in Geology from St. Francis Xavier University and a M.Sc. in Hydrogeology from the University of Calgary. He currently provides project management and technical expertise to environmental impact assessments and groundwater resource development projects, has developed regional and local scale groundwater flow and transport analytical and numerical models for numerous in-situ oil sands projects, has conducted extensive regional geologic and hydrogeologic mapping of the Athabasca Oil Sands region and has supervised water well drilling and aquifer testing activities throughout Alberta.