

# Hydrogeology of the Bakken Formation and the Relation to Production Behaviour

Daniel J Skoreyko<sup>1</sup> and Benjamin J Rostron<sup>1</sup>

## Abstract

*The Bakken Formation is the most productive formation in the Williston Basin and one of the most productive tight oil plays in all North America. Oil in the Bakken Formation has been shown to migrate from the mature, central portion of the Williston Basin outwards towards the less mature portions of the basin, and north into Canada. A clear understanding of the hydrodynamics within the Bakken Formation is crucial for development; however, its regional hydrogeology, and the influences of regional groundwater flow on hydrocarbon migration in the Bakken Formation have been relatively poorly studied.*

*To further the understanding of the regional hydrogeology of the Bakken Formation, newly created databases spanning the entire Williston Basin were compiled. Pressure and chemistry data from both the Canadian and U.S portions of the Williston Basin were obtained from drill stem tests, and water analyses. This data was subjected to an intense multiple stage culling procedure eliminating non-representative data. From the remaining data, detailed regional potentiometric surface maps, water driving force maps, and hydrochemistry maps were generated. Results show a large closed potentiometric high located in the central portion of the basin with hydraulic head values generally decreasing toward the northeast. Total dissolved solids content is highest in the central portion of the Bakken Formation reaching values > 300,000 mg/l and decreases radially outward from the center where values are < 10,000 mg/l. Also located in the center of Bakken Formation is a large area with greater than hydrostatic pressure. Production data has been combined with hydrogeological interpretations to identify an area within the Bakken Formation where oil is the dominant mobile fluid. This area correlates to the mature portion of the basin and is currently undergoing active oil generation. These areas can be preferentially targeted for further detailed investigation and hydrocarbon exploration.*

*This study provides the most complete depiction of the regional hydrogeology of the Bakken Formation to date across the entire Williston Basin.*

<sup>1</sup>University of Alberta – Department of Earth and Atmospheric Sciences

**Daniel Skoreyko** received his Bachelor of Science Specialization in geology at the University of Alberta. He is currently a Master of Science student at the University of Alberta expecting completion in Spring 2017. His research focuses on the regional hydrogeological and hydrogeochemical characterization of the Bakken Formation across entire Williston Basin.