

Regional hydrogeology of the Bakken formation across the Williston basin

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The Bakken Formation is currently the most productive oil producing formation in the entire Williston Basin and, one of the most productive tight oil plays in North America. Oil in the Bakken Formation has been shown to migrate from the central portion of the basin, which is currently in the oil window, hundreds of km's outward toward the less mature portion of the basin, and north toward Canada. A clear understanding of the fluid migration pathways is crucial for further development of this formation; however, the influences and implications of groundwater flow on oil migration in the Bakken Formation remain unclear. Thus, the purpose of this study is to develop a regional hydrogeological and hydrochemical framework of the Bakken Formation in the entire Williston Basin..

Pressure and chemistry data from both the Canadian and U.S. portions of the basin have been obtained from historic records: drill stem tests, production tests, scientific literature, and government reports. These data were compiled into a database and culled to remove data affected by nearby production/injection or hydraulic fracturing operations. Hydrogeology of the Bakken Formation was determined using newly created potentiometric surface maps, water driving force maps, and water chemistry distribution maps. Results show a large central area with greater than hydrostatic formation pressures while distal areas of the basin show near hydrostatic pressures. Chemistry is highly variable, with total dissolved solids values ranging from less than 10,000 mg/L to greater than 300,000 mg/L with salinities generally increasing toward the central portion of the basin. It is unclear whether there are mobile formation fluids in the deepest, most mature portions of the basin at this time.

Interpretation of these maps is being used to advance our understanding of the role that fluid movement plays in establishing the Bakken Formation hydrocarbon resource in the Williston Basin.

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