

Hydrogeological Mapping of Saline Formations in the Fox Creek Area, West-Central Alberta

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Summary

Through the Provincial Groundwater Inventory Program, the Alberta Geological Survey has mapped groundwater conditions for 22 saline formations in west-central Alberta. Using a standardized workflow, spatial distributions of salinity, hydraulic head, and water driving force were created that account for disparate data coverage. The resulting series of maps provide a common data source for industry and the regulators to describe the groundwater conditions of bedrock aquifers, in an area where demand for source water and the need for adequate disposal zones has increased.

Introduction

In west-central Alberta, particularly the area centred on the Town of Fox Creek, the oil and gas industry is developing unconventional resource plays in the Duvernay and Montney formations. Multi-stage hydraulic fracturing has led to an increase in water demand, which has been sourced from both surface water and shallow groundwater in the early stages of development. However, the Alberta government discourages use of surface water and high quality groundwater for oilfield use, meaning that industry should consider alternative water sources such as deep aquifers having less desirable chemical quality.

To better define groundwater conditions in the Fox Creek area, hydrogeological mapping of saline formations has been completed by the Alberta Geological Survey (AGS). The study area extends from Twp.70 R.5 W6 in the northwest corner to Twp. 52 R.7 W5 in the southeast corner (Figure 1). Twenty-two formations were examined including bedrock aquifers from the Wapiti Formation down to the Precambrian basement (Figure 2).

Method

Hydrogeological mapping was completed using publically available chemistry and pressure data obtained from drill stem tests (DSTs). Water chemistry and pressure data were assigned to formations based on stratigraphic surfaces modelled as part of the Alberta Geological Survey's 3D bedrock framework activities (MacCormack 2014). The workflow applies a rigorous culling procedure, identifies the potential effects of production/injection on the pressure regime, and indicates where density-dependent effects may be prevalent. With these data, the AGS was able to map hydrogeological characteristics of potential saline aquifers including the following properties: total dissolved solids (TDS), equivalent freshwater hydraulic heads, and water driving force.

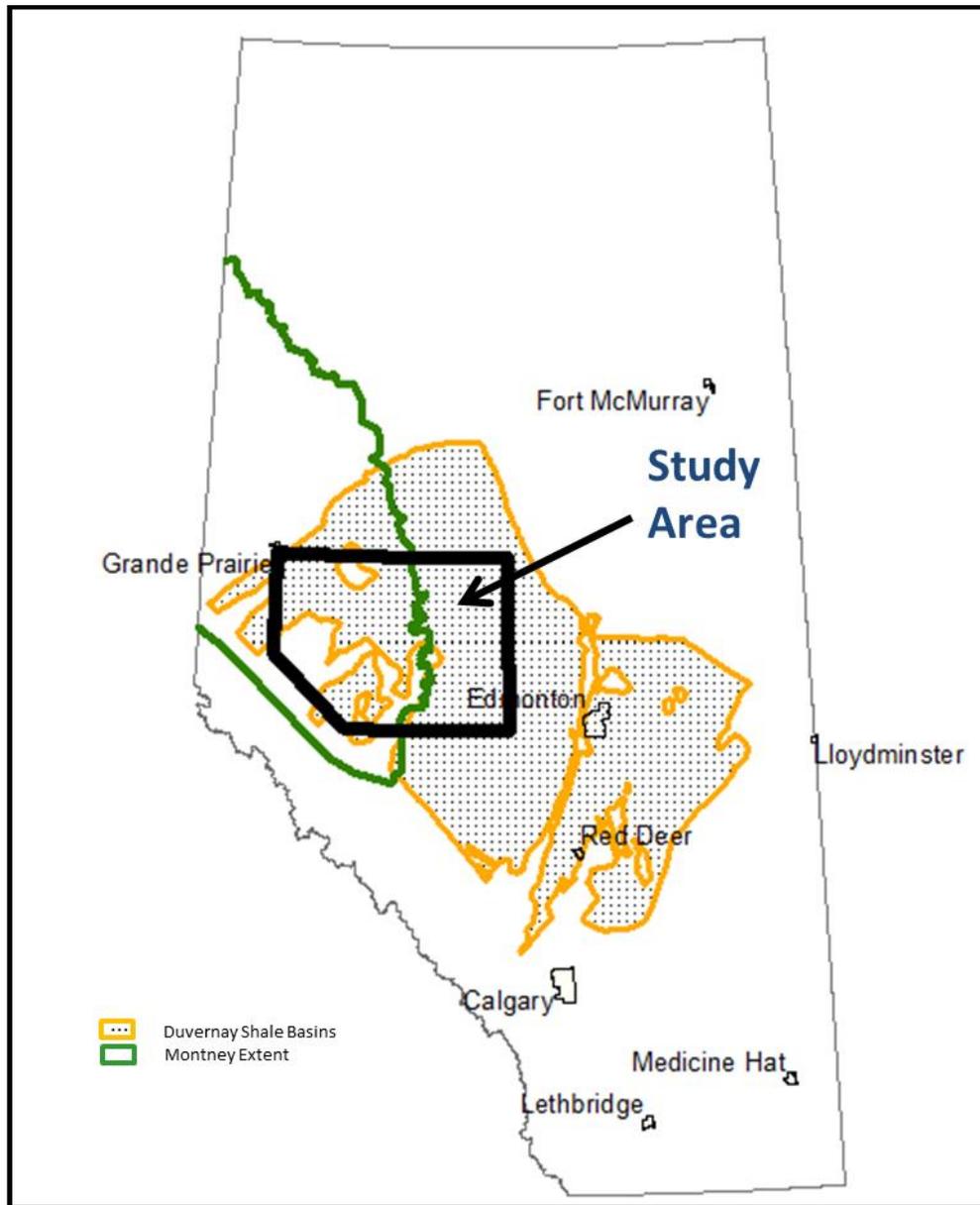


Figure 1. Study area location

Conclusions

This poster will provide some insight into the methodology and results of regional-scale hydrogeological mapping in west-central Alberta. Map products will illustrate the delineation of aquifers within saline formations and associated groundwater conditions including the direction of fluid movement.

