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A re-examination of regional groundwater flow regimes in part of the Western Canadian Sedimentary Basin

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Abstract

Many aspects of large-scale groundwater circulation have been studied in the Western Canadian Sedimentary Basin (WCSB), often through projects having unique objectives and deliverables. Early scientific contributions identified the regional hydrostratigraphy, and later work more closely examined basin-scale hydrodynamics. Collectively, these studies have influenced our understanding of such large groundwater flow regimes, including patterns of movement and relation to economic resources within the WCSB. Recently, formation-scale hydrogeological mapping has been conducted by the Alberta Geological Survey in west-central Alberta, centered on the town of Fox Creek. In this area, oil and gas activity, and the associated need for industrial water sources and disposal zones has led to an increased demand for hydrogeological knowledge. For 23 individual formations, mapping has led to both classic hydrogeological outputs (i.e., potentiometric surfaces, distributions of total dissolved solids), and assessment of density effects on the water driving force. Mapping was achieved using drill stem test (DST) data that underwent strict culling, resulting in only the highest quality data being used. The effect of fluid production was analyzed to identify regions having fluid pressures that had been affected by ongoing production. The resulting map products provide fundamental reference information for a variety of stakeholders and industries, particularly where potential water source and fluid disposal targets may be of interest. The map products also provide an opportunity to explore knowledge obtained from previous authors findings, and re-interpret regional groundwater flow regimes and the hydrostratigraphy for a portion of the WCSB.