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Distribution of Arsenic in Groundwater in Alberta

Courtney, L, Kruschel, Jean Birks, Francisco Castrillon, and Mike Moncur
InnoTech Alberta

Summary

Arsenic (As) is colloquially known for the history surrounding its use as a poison and these toxic properties make it an important mineral when it comes to human health. It is the 20th most abundant natural element in the Earth's crust and can be mobilized through a variety of both natural and anthropogenic processes. Arsenic's abundance and mobility can lead to high concentrations of naturally occurring arsenic in groundwater, which has become a major global health concern. The World Health Organization has set a limit on the maximum concentration of arsenic in drinking water of 10 µg/L for safe consumption, however there are elevated geogenic arsenic concentrations in groundwater occurring across Canada. There are several surveys of local-scale baseline arsenic concentrations in groundwater in Alberta (Stein et al., 2000; Lemay, 2003; Alberta Health and Wellness, 2014), however there is a need for a comprehensive baseline survey that describes the entire province. Having baseline parameters for arsenic concentrations will provide insight into areas with naturally elevated concentrations and areas with potential anthropogenic impacts on groundwater quality and help to identify and mitigate them in the future. A dataset has been compiled by researchers from InnoTech Alberta with sources from government, industry, and research organizations. The set contains 2472 samples with arsenic concentrations in groundwater from 40 formations from all over the province. The goal of this project is to map arsenic concentrations across the geological formations in Alberta in order to generate a baseline understanding of arsenic in the province and potential geochemical and geological controls. The data are assessed for reliability using ion balance error as well as the Hitchon culling criteria (Hitchon, 1985) to ensure that the results are accurately represented. The spatial distribution of arsenic is compared with geological features, mineral saturation indices and other geochemical parameters to improve understanding of the potential geological controls on distribution.

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