Intercepting Salinity Impacted Groundwater from a Former Salt Storage Site via Extraction Wells Prior to Reaching a Highly Valued Community Recreational Surface Waterbody

This case study outlines a successful approach to mitigate salinity-impacted groundwater from reaching a popular urban lake in northern Alberta. The case study will present environmental site assessments (ESAs), risk assessment, remedial options analysis, groundwater modelling, extraction well installation, and ongoing plume modelling and monitoring at a former salt storage site adjacent to a large surface waterbody within an urban environment.

The salinity source was a municipality-owned salt storage facility. Several ESAs identified an excessive volume of impacted soil and impacts to groundwater quality under and around current infrastructure. Groundwater flow indicated impending risk to an urban lake that is highly valued by the community for recreation. Implementing a cost-effective solution was priority since funding was coming from taxpaying citizens. With that in mind, additional investigation work, including a Supplemental Phase II ESA and a preliminary subsoil salinity tool (SST) evaluation, was completed to further determine the risk associated with the salinity. This evaluation provided the foundation for a technical feasibility and cost analysis of groundwater remedial options. The selected remedial solution was the installation of an extraction well network to intercept migrating salinity impacted groundwater before it could reach the adjacent surface waterbody.

Following the ESA activities, risk assessment, and remedial options cost analysis, a groundwater modelling assessment was completed to optimize locations, screen depths, and pumping rates for the extraction system to effectively capture the impacted groundwater plume. Three extraction wells were installed and have been intercepting the salinity impacted groundwater before it could reach the adjacent surface waterbody.

Ongoing groundwater monitoring and modelling has been conducted biannually since the inception of the extraction system to confirm its efficacy. Recently, modeling identified potential risk of the plume extending beyond the capture zone laterally, so an additional extraction well has been planned for installation and addition to the network.

Through the use of ESA activities, SST risk assessment, remedial options cost analysis, and groundwater modelling assessment, a feasible and effective groundwater remediation option was enacted, and it continues to ensure salinity impacted groundwater does not reach the sensitive waterbody. This cost-effective remedial option was deemed successful, as the lake's protection from salinity impacted groundwater has been empirically supported, while meeting public funding limitations.

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John Forbes is an Environmental Scientist and Project Manager with Trace. John has over 12 years of experience in the industry and manages a wide variety of projects for clients in the upstream and midstream oil and gas industry, real estate and development, government, and industrial sectors. John completes proposals and cost estimates for clients, complex ESAs, soil and groundwater remediation, hazardous building materials assessments, data evaluation, technical report writing, and mentors and trains junior staff. John is also a certified SST practitioner and completes complex salinity assessments for clients.