Control of Off Site Migration In Low Permeability Soil With an Eductor System

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SNC-Lavalin Inc. designed and constructed an eductor extraction system to mitigate downgradient contaminant migration and remediate soil vapour and groundwater at a commercial site slated for redevelopment.

The site consists of a commercial property with several tenants, and is surrounded by commercial and residential properties. Prior site investigations identified the existence of petroleum hydrocarbon and chlorinated solvent contamination in soil vapour, soil and groundwater at the site. The chlorinated solvent contamination is related to former dry cleaning activities at the site, while the petroleum hydrocarbon contamination is related to former nearby service stations. The chlorinated solvent and petroleum hydrocarbon groundwater plumes have migrated downgradient and offsite. Soil at the site is composed of fine-grained dense tills with low hydraulic conductivity.

The project objective was to minimize downgradient contaminant migration at the site prior to eventual redevelopment of the property by extracting groundwater liquids and vapors from 17 closely-spaced wells installed along the downgradient edge of the site. 5 years after the installation and operation of the eductor system there have been many learnings and insights into the operation and performance in achieving its objectives for the mitigation and remediation of chlorinated solvents and petroleum hydrocarbons associated with the site. Results from the monitoring of groundwater conditions at the site have identified reductions in observed concentrations and degradation of the chlorinated solvent and petroleum hydrocarbons in the zone of influence of the system. Experience with the operation and maintenance of the eductor system which has operated with high uptime, low maintenance, and low power consumption will also be discussed. The system was modified in 2021 to limit operation of the system when sewer capacity was limited by precipitation.

Key project challenges include the following:

- Remediation in an urban setting: The continued occupation of commercial tenants at the site required a very small footprint within an existing parking lot, as well as very low noise levels, to not disturb the commercial properties and nearby residents. The eductor system was able to meet these limitations.
- Active remediation in tight soils: The low permeability till soils at the site required wells with a spacing of two metres. Due to the large number of wells, an eductor system was considered to be the most cost-effective recovery method, as it reduced equipment requirements as compared to other options.
- Regulator oversight: As the site is slated for redevelopment, it receives a high degree of regulatory oversight. It was classified as a high-risk site due to high soil vapour chlorinated solvent concentrations and the presence of dense non-aqueous phase liquid (DNAPL).

Francis Galbraith

Mr. Francis Galbraith is a mechanical engineer and environmental scientist with over 18 years of environmental consulting experience. Mr. Galbraith has extensive experience with mitigating impacts and treating contaminants having designed, installed, and applied a wide variety of remediation approaches across Canada's north and west. He has evaluated treatment and remediation options for a host of sites and is very knowledgeable in the considerations and limitations of applying associated technologies. Experience in pilot testing remediation and treatment options has provided him with insight into site conditions and equipment requirements for making a full-scale application successful, or for identifying issues that preclude effective remediation. Finally, his experience in the ongoing operation and maintenance of in situ remediation and water treatment systems along with the completion of chemical injection programs has provided him with an opportunity to identify means for optimizing remediation, ensuring equipment or programs operate efficiently and remediation objectives are achieved while minimizing the input of resources.