



## CASE STUDY

# BTEX, PHC F1 & F2 IN BARRIE, ON

## Background

**CLIENT:** National Retailer

**DURATION:** Ongoing

**LOCATION:** Barrie, Ontario, Canada

**PROJECT VALUE:** < \$60,000 CDN per year

As part of a commercial redevelopment project in Barrie, Ontario, a property located in an active commercial setting, in a major urban area, required remediation to mitigate potential environmental and legal risks associated with a dissolved phase plume consisting of high concentrations of BTEX (Benzene, Toluene, Ethylbenzene, and Xylenes) and PHC (Petroleum Hydrocarbons) F1 and F2 compounds.

The groundwater at the site was impacted at depths greater than 20 m below ground surface due to historical releases of gasoline from leaking underground storage tanks and associated piping. The releases were thought to have occurred over a number of years, thus impacting the thick (i.e. 20 m) vadoze zone, which is acting as a long-term source of PHC contamination. The depth, size, concentration, extent, and presence, of this long-term source limited the available remedial options to the client.

## Approach

The landowner, a large national retailer, contracted an international environmental consulting firm to characterize the site and complete initial sampling. The consultant managed the tendering of the project. IRSL earned the contract with the retailer based on their innovative approach, which cost significantly less than the other methods proposed.

As part of their bid, IRSL conducted a Remedial Option Review of over 25 technologies, including: pump & treat, air sparging, biosparging, soil vapour extraction, multi-phase extraction, chemical oxidation, and aerobic bioremediation. Based on the option review, IRSL worked with the general contractor and environmental consultant to develop a remedial approach that allowed the client to address the source at the same time as the associated plume.

### ENHANCED AEROBIC BIOREMEDIATION

To mitigate the BTEX, PHC F1 and F2 with minimal disruption to the active gas bar and local businesses, IRSL developed and executed a progressive in-situ aerobic bioremediation plan. The surface footprint required was less than 4 m<sup>2</sup>, thus ensuring a very small ecological footprint.

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**GEOLOGY:** Sand

**PLUME SIZE:** Approx. 300 m x 50 m

### APPLIED TECHNOLOGIES

IRSL used Aerobic Bioremediation to mitigate the BTEX (Benzene, Toluene, Ethylbenzene, and Xylenes), along with the PHC (Petroleum Hydrocarbons) F1 and F2 fraction plume.

A total of 29 4"-wells were installed perpendicular to the plume, on a one-metre spacing, to create a semi-passive reactive barrier designed to intercept the plume and treat the compounds of concern using Waterloo Emitters™.

Waterloo Emitters consistently release oxygen into the groundwater without destabilizing the hydrocarbons. Designed to run continuously for extended periods of time, the emitters are low maintenance, require no energy, and leave a very small ecological footprint.

In this aerobic bioremediation technique, the native micro-organisms within the aquifer use the oxygen to biodegrade the BTEX and PHC F1 and F2 fractions into harmless byproducts.

## Challenges

- Due to the presence of an ongoing hydrocarbon source, the project required a long-term remediation system with low operating and maintenance costs, which could operate continuously, 365-days-a-year.
- The location of the contaminated groundwater, at a depth greater than 20 metres below ground surface, made it difficult to reach and treat.
- The petroleum hydrocarbons, entering the permeable reactive zone at concentrations greater than 20 mg/L, required an approach that was both aggressive, in order to mitigate any potential off-site risks and liabilities, as well as discrete, in order to minimize impacts on the local businesses.
- The mass flux of petroleum hydrocarbons through the Emitter barrier has increased 4-fold since the system's commissioning, requiring adjustments and optimization. The IRSL team have responded by changing the materials used in the Emitters and adjusting operating parameters, such as pressure and oxygen concentration.

## Results

- Dissolved oxygen concentrations within the Emitter wells are greater than 12 mg/L.
- Independent sampling of down-gradient wells indicate that all contaminants have been reduced to below the Ministry of Environment's Table 3 Standards for commercial sites for BTEX, PHC F1 and F2 parameters within 10 metres of the permeable barrier.
- Operating and maintenance costs have decreased relative to inflation with time.



InSitu Remediation Services Ltd (IRSL) is one of Canada's most experienced remediation companies. Our team has designed, implemented, and maintained soil and groundwater remediation programs in diverse geological environments in North, Central, and South America, Europe and the Middle East.

We confidently implement innovative solutions, based on sound knowledge, using seasoned field staff. Our pragmatic, flexible approach reduces effort, cost to our clients, and environmental risk.

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