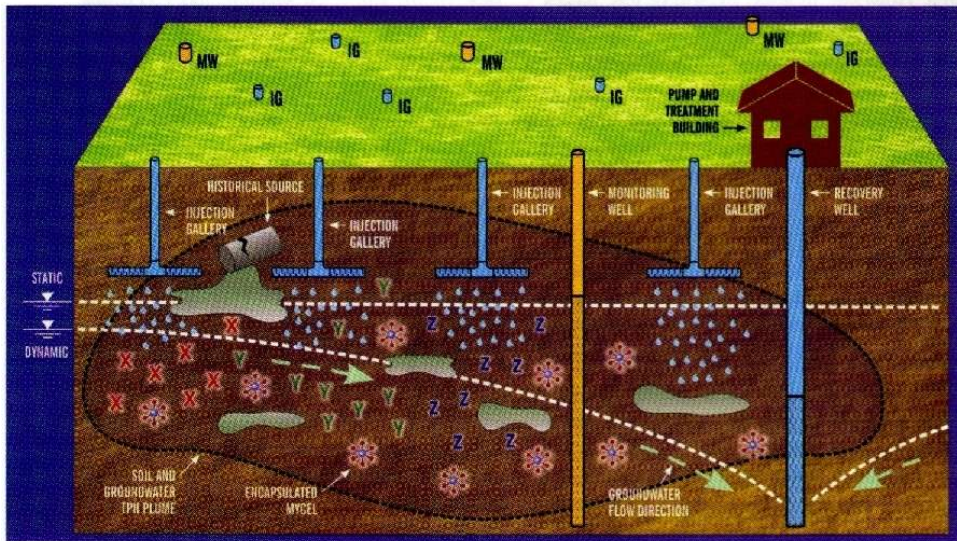


Grade "A" Remediation

Selective phase transfer technology cleans up college in Moncton, New Brunswick



Flow diagram of Ivey-Sol® (SPTT®) In-Situ technology.

Remediating sensitive areas or population dense areas can be tricky at the best of times. So it's important to utilize a remediation technology with a proven record of reducing environmental and health and safety risks in order to avoid associated legal liability for project stakeholders, among other reasons.

Ivey International Inc. is a Canadian company with offices in Campbell River, B.C., Grand Prairie, Alberta, Ottawa, Ontario, Fredericton, New Brunswick and Newington, Connecticut, that offers a proven remediation technology for onsite and offsite cleanup requirements. Specializing in technology to restore air, soil and groundwater quality, the company's patented selective phase transfer technology (SPTT®) removes petroleum hydrocarbons (gasoline, fuel oil, diesel, and Bunker C) and polycyclic aromatic hydrocarbons (PAH), and chlorinated contaminants from soil, groundwater and fractured bedrock.

SPTT® incorporates patented phase transfer mixtures that selectively interact with a specific class or type of organic non-aqueous phase liquid (NAPL) contaminant. The system effectively liberates contaminants from the soil, bedrock, and/or free-floating phase and encapsulates the hydrocarbons. Referred to as "micelles," the hydrocarbon particles of various sizes and compositions make the

NAPL contaminants water soluble, allowing for their rapid recovery from the site.

On average, the company remediates more than 95 per cent of small to medium size contaminated sites in-situ in less than 18 months. Ex-situ projects can be complete within hours.

George A. Ivey, founder and senior environmental specialist with Ivey International, was nominated for a 2004 GLOBE Corporate Award for Technology Innovation and/or Application. The internationally recognized award distinguishes leading companies and



"Before" and "after" photographs of the cleanup project at Oulton's Business College in Moncton, New Brunswick.

industry groups that use economically viable sustainable business strategies. Mr. Ivey did not make the finalist round, but was honoured by the nomination nonetheless.

The technology, which was granted a U.S. patent last year, was also granted a Canadian patent on March 2, 2004.

Case study

Ivey International has been involved in a range of challenging projects over the years, including wetland sites, structurally sensitive sites and bedrock projects. One recent project in particular raised concerns about a high traffic area populated by a steady stream of students.

In May 2001, Suzanne and Jim Denton, owners of the building of the former Oulton Business College in Moncton, New Brunswick, were faced with a fuel-oil spill estimated at approximately 600 gallons.

"We began receiving complaints from the students saying they could smell gasoline in the classroom," said Ms. Denton. "We hired environmental inspectors to check it out, and much to our dismay, we discovered there was an oil slick under the building."

After further investigation, Ms. Denton says she found out that the building used to be an office and garage for Shell Oil. They bought the building from previous owners in 1988 in "good faith," completely unaware of the historical hydrocarbon spill.

Montclair Consulting provided investigation reports that included site geology, type and extent of soil and groundwater contamination plumes onsite. The reports revealed that the foundation of the two-storey building was impacted, under two classrooms in particular, and that off-gassing had contaminated the air quality.

Various remediation methods were contemplated. A pump and treat was estimated to take about five years and bioremediation was estimated to take about four years (but it was suggested that site conditions for this approach were not favourable anyway). It was also decided that a shallow soil vapour

extraction system (VES) alone would not address the hydrocarbon contamination in the soil and groundwater. After considering all the options, SPTT® was selected to help remediate the property.

With its team of environmental engineers and local contract workers, Ivey International designed a comprehensive treatment system to remediate the soil and groundwater contamination. Luc Bernard was appointed project manager responsible for the coordination of sub-contractors, supervision of field work, design of remediation approaches, collection of soil and groundwater samples, and liaison with the building tenants and government agencies.

First, Mr. Bernard ordered a brief evacuation of the site, which lasted one week, to allow the team to break through the concrete floor to install an injection gallery system in the area of the spill.

"It was quite a difficult project," says Mr. Bernard. "As the building was occupied by an active private college, work had to be completed during off-hours, mostly through the night."

Much of the work was performed in the evening over a two-week period to avoid disturbing the approximately 350 students traversing its corridors during the day.

The majority of the sub-surface contamination was found to be under one of the corner-classrooms of the building. This classroom was temporarily sealed off from the rest of the building for health and safety reasons. A large window and section of the brick wall was then removed to allow a mini-excavator access to the classroom. The concrete floor was also removed and the excavation was completed to a depth of approximately two to four metres in some areas. Excavated contaminated soil was disposed of at an approved offsite facility.

Prior to back-filling, a network of injection galleries as well as a recovery well were installed. A pump and treat system was used to contain and recover the contaminated water after each injection.

Closer to the surface, a VES was also installed to remove hydrocarbon vapours. The excavated area was filled to grade, the concrete floor poured, the exterior wall was repaired, the window reinstalled and carpet laid. Screened piping was also placed under the vacuum to recover vapours pumped to the external air treatment system.

The system was activated and the room was then made available to the college as a classroom again during the entire subsequent remediation process.

Monthly injections of the SPTT® solution and water were conducted to increase the solubility of remaining sub-surface petroleum contamination. The injected solution along

with extracted petroleum contaminants would then be recovered in the recovery well for treatment, with the treatment system located in a small shed adjacent to the college.

The influent from the recovery well was treated by granular activated carbon (GAC) filtration and discharged to the municipal sewer. The sub floor VES system extracted vapours that may have otherwise seeped into the ambient indoor air. The extracted air was treated by GAC and discharged outside.

In addition to the challenging late working hours and sensitive student population, Mr. Bernard and his team also encountered complications with regard to the native types of soils present.

"The clays and tills that are less permeable soils and if left in the area, are difficult to treat by recovery well type remediation systems," says Mr. Bernard. The remediation system was expected to help in transporting petroleum contaminants along with water to the recovery well, but he was concerned that if the water couldn't get through the soil matrix, the solution would be less effective.

With this in mind, a large amount of contaminated soil was excavated and removed from this site. However, not all of the contaminated soil however could be practically removed; excavation was limited in areas surrounding and under bearing walls. In addition, residual contamination that seeped into the high permeable (crushed stone) back-filled area was quickly drawn into the recovery well for subsequent treatment.

According to Mr. Bernard, SPTT® is an effective tool to accelerate remediation of pump and treat type systems under certain conditions. But he also notes that hydraulic conductivity greatly affects the efficiency of such a system.

The remediation of the site took approximately 18 months of injections (approximately 18) at a cost of \$150,000. The cost breakdown is as follows: the pump and treatment system, VES and monitoring cost about \$80,000 - 90,000 and the approximately 18 SPTT injections cost about \$50,000 - \$60,000.

Cameron Ells, an environmental engineer with Cameron Consulting was retained to complete site closure process. Mr. Ells' risk assessment determined that no further action was required and that there would not be a health risk to those living and working in the area. The New Brunswick Department of Environment authorized a record of site condition in spring 2002. The business school has since closed and the site now accommodates a fish market and a restaurant. **HMM**

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