INSTALLATION OF A DUAL PHASE EXTRACTION SYSTEM IN A RESIDENTIAL NEIGHBORHOOD

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Background

- Service Station since 1960’s
- Gasoline with benzene being the driver
- Plume extended 150 m off-site
- Below a street, avenue and laneway
- Below residential properties and commercial businesses
Conditions

- 0 – 3 m; Silty Clay
- 3 m – 12 m; Silty Sand
- Groundwater at 6.5 m to 7.5 m
- Unconfined
- \( k = 3 \times 10^{-6} \text{ m/sec} \)
Remedial Approach

Conventional ex-situ technology not feasible

Dual Phase Extraction (DPE) suited to address impacts below streets and private lands

Involves groundwater removal and water table depression with soil vapour extraction

Diagram:

- **VAPOR**
- **VAPOR/ GROUNDWATER/ LNAPL**
- **GROUNDWATER/ LNAPL**

**Groundwater/LNAPL Pump**

**Extraction Well**

**Collection Piping**

**Vacuum Pump/Blower**

**Inlet Vapour Separator**

**Groundwater/LNAPL Treatment/Storage**
Design

- Pilot testing
- Formation air flow
- Applied vacuum
- Pneumatic & hydraulic influence
- Groundwater production rates & water treatment chemistry
- Air emissions chemistry & dispersion modeling
Construction Tender

- General Contractor Requirements
- Scope Definition
- Detailed Schedule
- Change Order Process
- QA/QC
Process Equipment

- A rotary lobe blower
- Downhole pneumatic pumps
- Air sparge tank with granular activated carbon backup
- An air emissions stack
- Two heated & insulated buildings
Distribution Piping

- Compressed Air Piping - Kitec
- Vapour Piping - HDPE
- Groundwater Piping – HDPE

Electrofusion  Buttfusion
Construction Activity

- Phase 1
  - 100 mm Extraction wells (39)
  - Utility, Process & Treatment equipment (2 bldgs & 1 AST)
  - On-site distribution piping
- Phase 2 & 3
  - Off-site distribution along streets, boulevards and laneway
Trenching

- 400 m of open trench to 1.2 m
- 50 m of directional drilling
  - Street crossing
  - Tree root sensitivity
Insulating

- Heat-trace, styrofoam & spray foam insulation
- Cellular concrete insulation “Cematrix™ CMI-475”
- www.cematrix.com
Pipe Integrity

- Pressure applied to Kitec and HDPE pipes
- Conducted after the trenches were backfilled
- Identified some fittings that required tightening or replacement
Summary

Key Factors to Success:

- Communication – client kept residents & businesses in the loop, readily available
- Design – thorough plan & specifications based on pilot data
- Tender Package – defines expectations, materials
- QA/QC – monitoring/inspection
Helpful Tips

- Phase the work
- Develop contingency plans
- Construction boundaries - safety