# Combined Technologies Remediate Chlorinated Solvents in a Dense Industrial/Residential Neighborhood with Offsite Commingling Plumes

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**Abstract#: 83**
**GROUP 1**

## Background

Leaking subgrade vapor degreaser at steel fabrication business, Newark, New Jersey.

## Pre-Remediation Conditions

**On-site soil:**
TCE: 4,080 mg/kg
PCE: 36 mg/kg

**Site-related groundwater plume:**
TCE: 17,000 µg/L
PCE: 940 µg/L
VC: 1.1 ug/L
1,4-dioxane: : 75.1 ug/L

**Plume geometry**
~600 feet x 200 feet x 48 feet deep

## Challenges

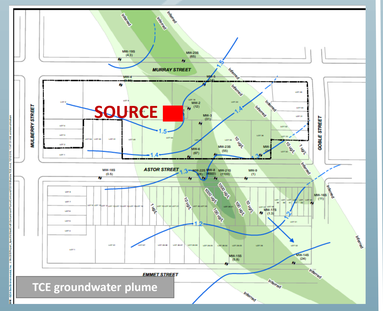
- Three up- and side-gradient comingling plumes migrating onto the Site
- Dense industrial/residential neighborhood limited intrusive investigations and remediation downgradient of Site
- Core of plume left the Site

## Remediation Goals

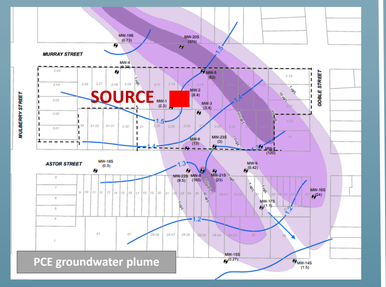
On-site soil:
Restricted Use/
Source Control

Groundwater
TCE: 510 µg/L
PCE: 390 µg/L
1,4-dioxane: 460 µg/L
1,1-DCE: 110 µg/L
VC: 3.8 µg/L

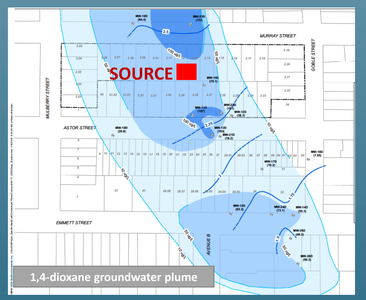
*Regulators allowed remediation goals for groundwater to be defined by off-site upgradient concentrations*



TCE groundwater plume



PCE groundwater plume



1,4-dioxane groundwater plume

## Methodology

A three-area remedial solution was designed and implemented.

**AREA 1: Site**
Soil: Combination of soil-vapor extraction (SVE) system and excavation
Groundwater: Monitored natural attenuation (MNA) following removal of source in soil

**AREA 2: City block immediately downgradient of Area 1**
Groundwater: Active groundwater remediation can not be conducted in Area 2 due to densely packed buildings and narrow accessways. Soil gas and indoor air monitoring are performed periodically.

**AREA 3: Off-site industrial/residential neighborhood downgradient of Area 2**
Groundwater: Site-related plume has not yet reached this area yet, proactive preventative injection of a bio-barrier (colloidal activated carbon, organic carbon electron donor, and a dechlorinating microbial culture, measuring 200 feet long by 20 to 60 feet deep was implemented

Products: Regenesis' PlumeStop® Liquid Activated Carbon™ (PlumeStop), Bio-Dechlor INOCULUM® Plus (BDI) Hydrogen Release Compound (HRC™)

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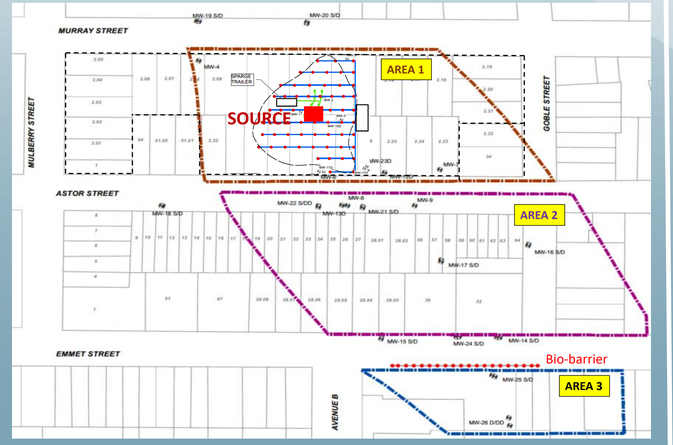
BDI PLUS HRC PLUME STOP Liquid Activated Carbon





SVE system operated in Area 1


Soil Excavation in Area 1


Bio-barrier injection between Area 2 and 3


Dense neighborhood, Area 2

## Results

**AREA 1: Site**
- SVE system operated for 2 years:
  - TCE and PCE in soil reduced by 64% to 99% reduction
  - TCE and PCE in groundwater reduced by 71% to 98%
- Supplement: 125 tons of soil excavated
- Site constituents in groundwater are now below site cleanup goals

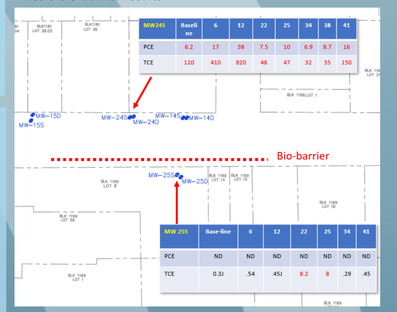
**AREA 2: City block immediately downgradient of Area 1**
- No remediation performed
- On-going receptor monitoring for VI reported no impacts

**AREA 3: Off-site industrial/residential neighborhood downgradient of Area 2**
- Core of plume "emerging" from Area 2;
- Biobarrier in place and ready to intercept
- Performance monitoring indicates only VC is increasing around biobarrier
- Remedial Action Permit for Long-term Monitoring (LTM) proposed

Area 1 geo-chemical parameters

| | | Primary parameters | | | | Secondary parameters | |
|---|---|---|---|---|---|---|---|
| Well | Location | PCE trend | PCE below baseline conc.? | TCE trend | TCE below baseline conc.? | Degradation product? Trend? (DCE and/or VC) | Favorable geochemistry? (pH, DO, ORP, dissolved iron, TOC, MEE) |
| MW-3 | Source | Decreasing | Yes | Increasing | Yes | Yes | No |
| MW-10D | Source | Increasing | Yes | Increasing | Yes | Yes | Yes |
| MW-8 | Down-grad | Stable | Yes | Decreasing | Yes | Yes, w/increasing trend | Yes |
| MW-13D | Down-grad | Stable | Yes | Stable | Yes | Yes | Yes |

Area 3 bio-barrier results




## Conclusions

- Site soils reduced and stabilized groundwater contamination to concentrations below the defined Site-specific remediation goals for each media (i.e. MNA is occurring).
- VC is temporarily elevated around bio-barrier, but directly related to the injection of the remedial additives. VC will decrease in less than 4 years.
- Proposed LTM plan will be protective of the stated contaminants relative to the nearby receptors.

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