

Fiscally Conscious Phased DNAPL Remediation— Legacy Liability to Managed Closure

SUMMARY

The subject site is a former chemical plant that stored, repackaged, and distributed chemicals, including but not limited to hydrogen peroxide, methyl isobutyl carbinol (MIBC), tetrachloroethene (PCE), acetone, ethanol, and diesel fuel. A multi-year phased combination of ex-situ and in-situ remediation methods were selected to achieve the site clean-up goals. After demonstrating over nine years of mass flux control with the BOS 100 PRB and significant groundwater mass reductions in the source area using CAT 100 (Figure 2), managed closure status has been requested by the consultant and is pending approval from the Regulatory Agency.

PROJECT SNAPSHOT

Key Dates

- Remedial Design Characterization (RDC) – 2011-2021
- ISCO shallow soil mixing - 2013
- Injection of BOS 100® – Off-site PRB 2013 and 2014
- Injection of CAT 100 - 2016 (Pilot), 2018-2021 (Full scale)

Total Treatment Area (Figure 1): 26,500 ft² (PRB length = 300 ft)

Lithology: Fat clay with sparse silt and very fine sand stringers

Depth to Water: Approximately 20 ft below ground surface (bgs)

Contaminants: Mixed plume but primarily chlorinated ethenes

Implementation Method: Direct push injection and shallow soil mixing

CHALLENGES & OBJECTIVES

This project involved a difficult geology (tight clays), a mixed contaminant plume, and significant source area contaminant concentrations. The primary objective was to design a multi-year remedy that was affordable and effective, with an initial goal to mitigate risk at the facility by limiting offsite plume migration. Longevity and efficiency were considered for all remediation technologies being evaluated to maximize available funding and installation opportunities.

APPROACH

- Sixty-two (62) RDC soil borings were advanced at the site in several phases over 10 years.
- 1,170 soil samples and 95 groundwater samples were submitted to the RPI Project Support Laboratory for pro bono analyses.
- Based on the RDC results, the initial remedy (2013) included shallow soil mixing (sodium persulfate/ lime activation) and injection of BOS 100® (22,050 lbs applied into over 230 injection locations).
- Subsequent phases of work (2016-2021) involved the application of CAT 100. In total, over 54,000 lbs. of CAT 100 were applied in over 230 injection locations.

RESULTS

The results from the high-density RDC sampling and quantitative analyses program supported efficient surgical treatment during remediation with predictable expectations. The soil and groundwater RDC investigation also supported the existing conceptual site model (CSM) that indicated the contaminant plume was being geologically controlled by the low-permeability fat clays.

The results from two site wells are presented in Figure 2.

- PDC-3 is in the treatment area of the original BOS 100 PRB installation and has been in place since 2013. To date, the PRB has successfully reduced groundwater contaminant concentrations over 99% from baseline.
- PDC-14 served as an upgradient monitoring well until 2020, when the area was incorporated into a CAT 100 treatment zone. Since the injection of the CAT 100 technology in 2020, CVOC contaminant concentrations have decreased over 98%.

Figure 1. Site Map

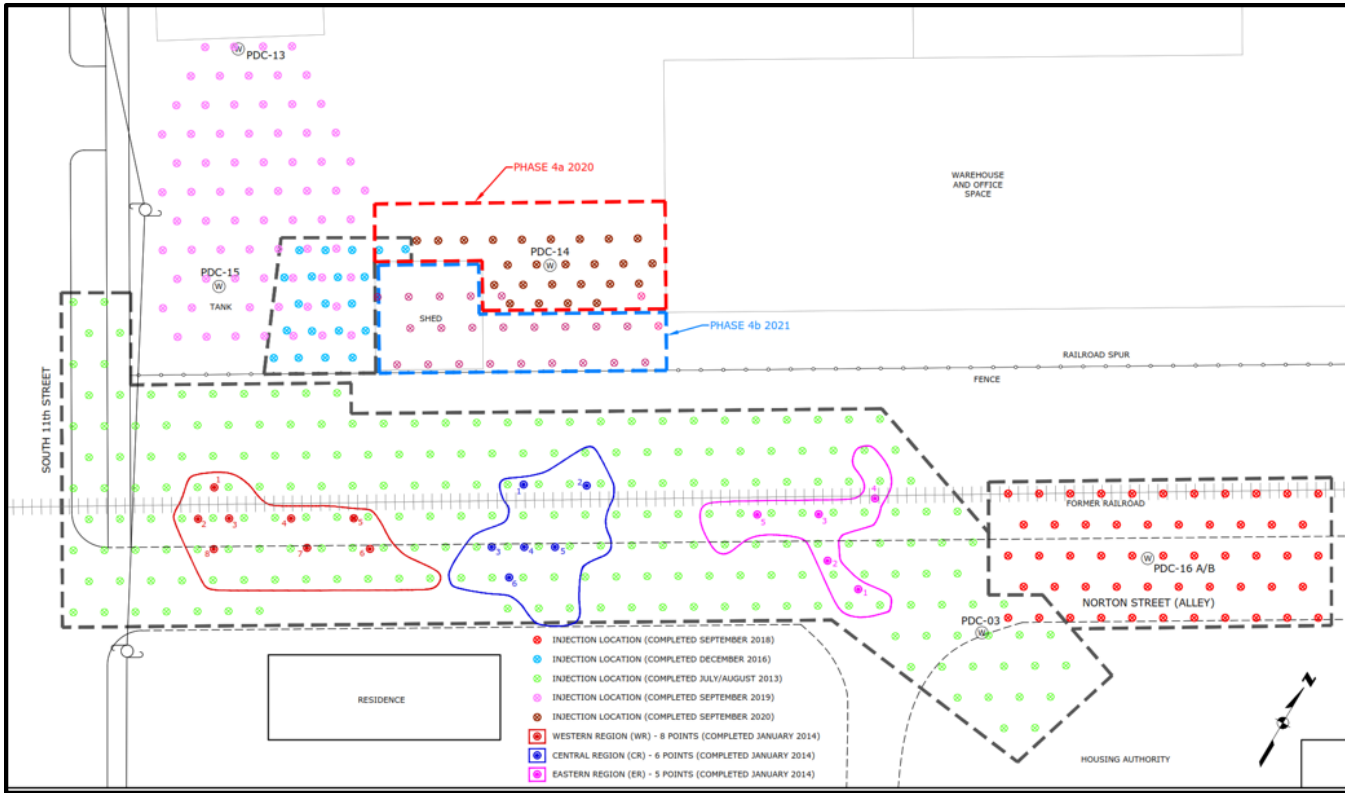


Figure 2. Total CVOCs (Ethenes only) versus Time

