Case History HX-1

Hydrogen Release Compound (HRC-X®)

PCE and TCE Remediation at a Dry Cleaning Facility

SITE SUMMARY

A focused Site Investigation was completed for a dry cleaner site in Portland, OR. Results showed contamination levels of PCE as high as 120,000 ug/L in groundwater and 320,000 ug/L in soil. It is believed that the source of the contamination was a leaking sewer line beneath the facility. The high concentrations suggested the presence of Dense Non-Aqueous Phase Liquid (DNAPL) and a remedial technology was needed to address the distinctive contaminant concentrations. The HRC® application at this site is significant since it was the first time HRC-X® was injected, along with HRC, to treat VOCs. The extended life expectancy of HRC-X, 2 times-3 times that of HRC, made for a feasible option to reduce the high concentration of PCE. A pilot study was implemented using HRC to target the area near wells MW-1, MW-2, and MW-4 while HRC-X was injected near JEMW-4, the projected area of DNAPL.

Figure 1. HRC Injection

REMEDIATION APPROACH

- **Remediation Objective**: Pilot Study to prove HRC applicability at the site**.**
- **Application Type:** Grid (Direct-Push Injection) for both applications
- **Product:** HRC and HRC-X
- **Quantity Applied:** 1,920 lb of HRC and 1,680 lb of HRC-X
- **Application Rate:** HRC – 6 lb/ft; HRC-X – 9 lb/ft
- **Injection Spacing:** Variable distances, see site map
- **Product Cost:** $11,520 HRC; $11,760 HRC-X

Table 1. Cleanup Goals

Contaminant	Concentration
PCE	5 µg/L
TCE	5 µg/L
DCE	70 µg/L
VC	2 µg/L

SITE CHARACTERISTICS

General

- **Name:** Springdale Cleaners
- **Location:** Portland, OR
- **Industry:** Dry Cleaning
- **Contaminants of Concern:**

Contaminant	MW-2 Concentrations	JEMW-4 Concentrations
PCE	11,600 µg/L	98,000 µg/L
TCE	330 µg/L	8,300 µg/L

Hydrogeology

- **Treatment Area:** 9,100 ft^2
- **Soil Type:** silty clay and silty sand
- **Groundwater Velocity:** 0.68 ft/day
- **Groundwater Flow Direction:** Southwest
- **Depth to Groundwater:** Variable

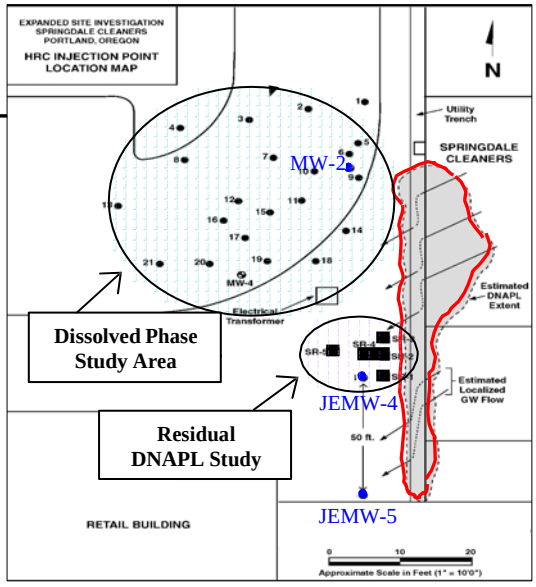
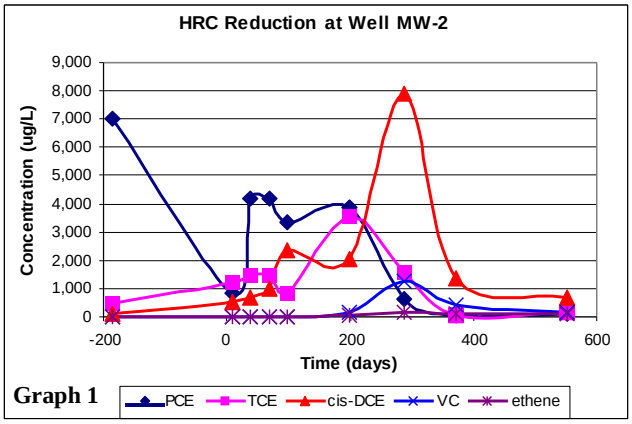


Figure 2. Site Map

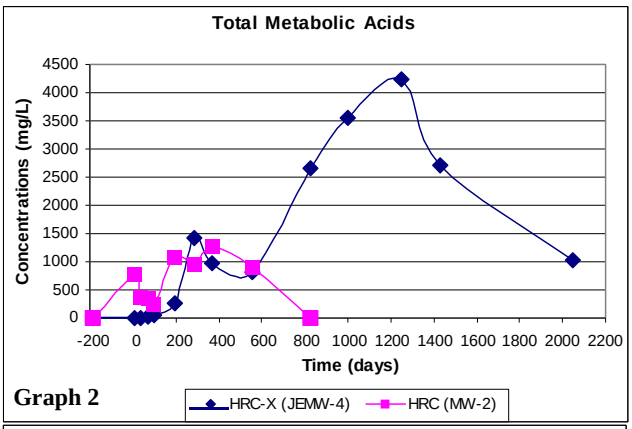
RESULTS

	Percent Contaminant Reduction		Post Treatment Concentrations	
	Contaminant	**Percent Reduction**	**Contaminant**	**Concentration**
MW-2	PCE	99%	PCE	<10 µg/L
	TCE	64%	TCE	120 µg/L
JEMW-4	PCE	99%	PCE	2.9 µg/L
	TCE	99%	TCE	1.2 µg/L

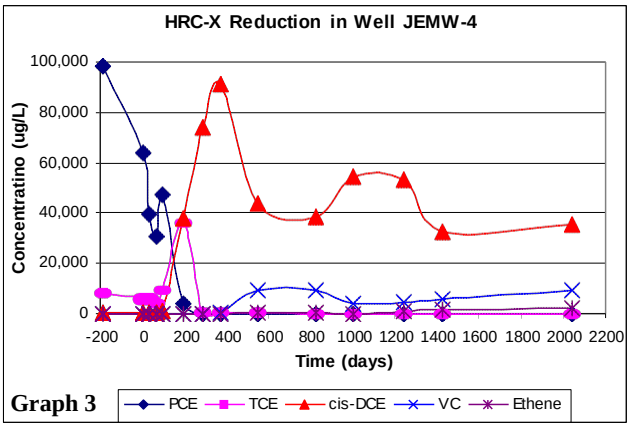
Concentrations vs. Time



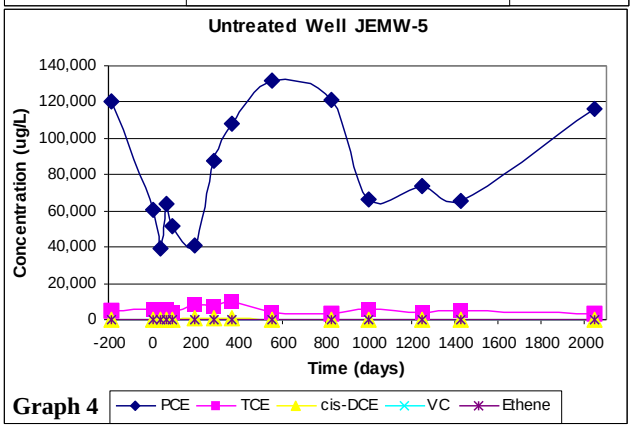
Graph 1



Graph 2



Graph 3



Graph 4

CONCLUSION

HRC performance in MW-2 produced sustained degradation of PCE and TCE as well as their breakdown products over roughly a two year period (Graph 1). HRC metabolic acids peaked around 1300 mg/L after a year then tapered off over time (Graph 2). HRC-X performance in JEMW-4 and JEMW-5 indicates unprecedented performance in terms of contaminant reduction and total metabolic acid production and longevity. JEMW-4 shows significant reductions in high concentrations of 100,000 ug/L PCE to near non-detect (ND) levels in approximately 300 days (Graph 3). PCE levels continue to remain at very low levels for greater than 5 years after HRC-X application. TCE was also reduced significantly from 90,000 ug/L to approximately 35,000 ug/L in close to 4 years. Daughter products such as cis-DCE and VC have been produced as a result of the parent product breakdown and are eventually expected to dissipate. Metabolic acids remain high (1000 mg/L) as a result of the HRC-X application. HRC-X continues to reduce high concentration PCE and daughter products TCE, cis-DCE, and VC more than 5 years after injection.