

ColloidalChem™ and ZVI Injection Mitigates CVOC Plume Migration

A Combined Remedy Approach to Control Offsite Impacts at a Former Dry Cleaner Site

PROJECT: Former Dry Cleaner Site

LOCATION: Pennsylvania

SERVICE: Injection, Cascade Chemistries (ColloidalChem™, Colloidal iZVI™)

CONTAMINANTS: CVOCs (PCE, TCE)

PROJECT DURATION: 25 Days

CHALLENGE

Managing a Migrating CVOC Plume in a Commercial Setting

At a 3.4-acre commercial property, CVOC impacts linked to a former dry cleaner were identified in soil and groundwater between 2018 and 2019. Initial impacts were detected near the former source area, but monitoring over time showed that elevated PCE and TCE were moving downgradient in the direction of the groundwater flow. By 2024, the plume had migrated beneath an adjacent property, though it had not extended beyond it.

With offsite impacts confirmed, the client needed a proactive approach to reduce contaminant concentrations and prevent further plume migration.

SOLUTION

Combined Injection Remedy for Immediate and Sustained Treatment

To address both dissolved and sorbed contaminants and support long-term performance, a multi-layered treatment strategy leveraging persistent amendment chemistries was implemented. This approach provides both immediate treatment and sustained performance, offering a more durable solution than soluble substrates that may wash away or be consumed within one to two years.



Courtesy of BL Companies

Cascade implemented a combined remedy approach integrating:

- ColloidalChem™ (colloidal activated carbon) for adsorption
- Colloidal iZVI™ for chemical reduction
- Bioaugmentation culture to support degradation
- Oxygen scavenger to establish anaerobic conditions

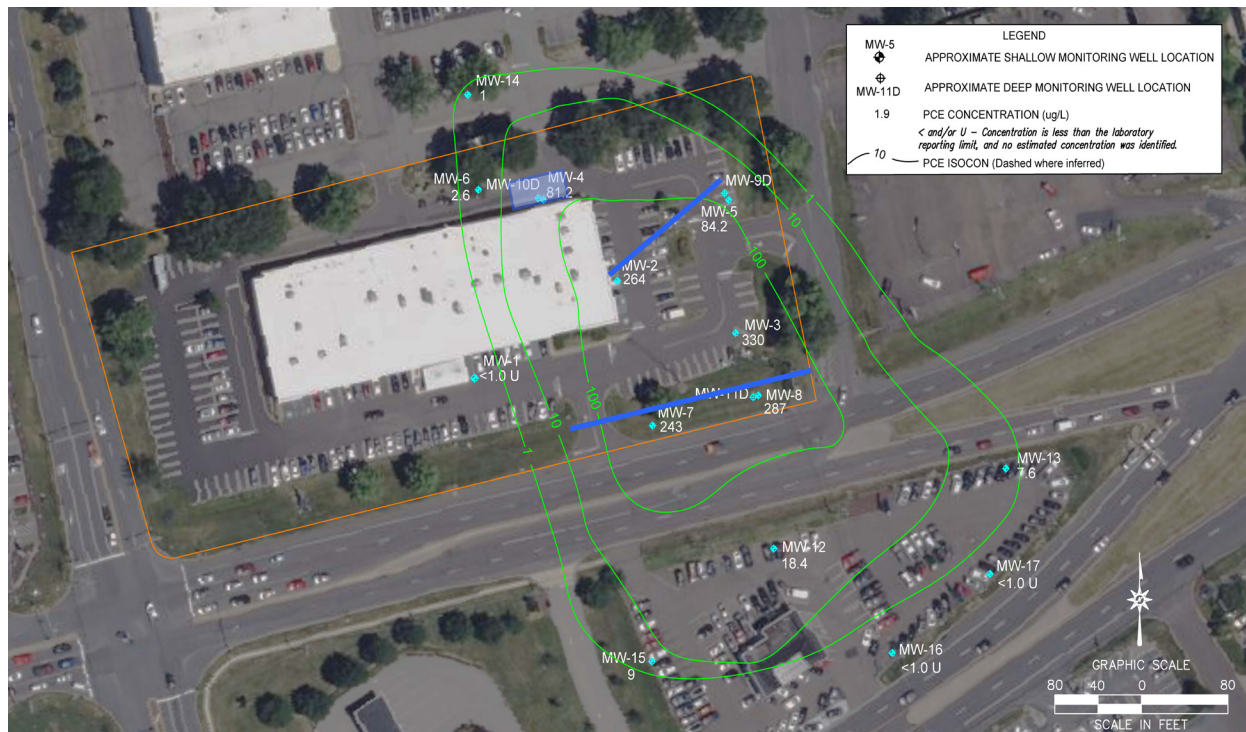
PROJECT EXECUTION

Adapting Field Strategy to Subsurface Conditions

Targeted injections were performed across the source area and two downgradient permeable reactive barriers (PRBs) were installed to control plume migration.

The initial design for one PRB included the installation of injection wells based on anticipated subsurface conditions. However, field observations revealed silty sand rather than the expected weathered rock. The team adapted in real time, pivoting from planned injection wells to direct push technology (DPT) to improve amendment distribution and ensure full implementation of the treatment design.

Injection activities were completed over 25 field days, with all materials successfully emplaced and no safety incidents reported.



Courtesy of BL Companies

RESULTS

Early Reductions and Controlled Migration

Early results indicate plume migration has been controlled, meeting performance expectations, with continued monitoring expected to confirm reductions in downgradient wells.

Preliminary results five months after injection:

- PCE and TCE were non-detect in 3 of 6 onsite wells
- A 64% reduction was observed in the source area

While results from one key monitoring location remain pending due to well re-installation, additional sampling is expected to further confirm downgradient performance over time.

MW-3		
ug/L	Pre-Injection	5 Months Post-Injection
PCE	330	ND
TCE	15	ND
1,1 DCE	ND	ND
cis 1,2 DCE	4.3	1.1
VC	ND	6.3

MW-4		
ug/L	Pre-Injection	5 Months Post-Injection
PCE	81.2	29
TCE	13.9	5.1
1,1 DCE	ND	ND
cis 1,2 DCE	13.7	29.1
VC	ND	ND

MW-5		
ug/L	Pre-Injection	5 Months Post-Injection
PCE	84.2	2.6
TCE	3.9	ND
1,1 DCE	ND	ND
cis 1,2 DCE	3.9	ND
VC	ND	ND

MW-7		
ug/L	Pre-Injection	5 Months Post-Injection
PCE	243	ND
TCE	10.5	ND
1,1 DCE	ND	ND
cis 1,2 DCE	2.9	1.1
VC	ND	ND

MW-8		
ug/L	Pre-Injection	5 Months Post-Injection
PCE	287	ND
TCE	12.5	ND
1,1 DCE	ND	ND
cis 1,2 DCE	3.4	ND
VC	ND	ND

CONCLUSION

Integrated Chemistries and Field Adaptability Drive Performance

By combining persistent injection chemistries with adaptive field execution, Cascade delivered a solution capable of addressing evolving plume conditions and reducing offsite risk, demonstrating the strength of integrated design, amendment selection, and injection capabilities in a complex groundwater setting.



Courtesy of BL Companies