

# REAL ESTATE TRANSACTION REQUIRES FAST-ACTING TREATMENT OF PCE CONTAMINATION

## CASE STUDY:

Combined Remedy Approach  
Delivers Accelerated Results Using  
PlumeStop, BDI Plus and HRC







## OVERVIEW

Due to the owner's objective to sell their property, a multi-tenant commercial plaza in the greater Boston area required remediation of tetra-chloroethylene (PCE) contamination in groundwater associated with a historical operator. Because contamination had been identified during due diligence, it was very important to implement a time-effective remediation strategy with minimal disruption to the various operating businesses.

Wilcox & Barton, Inc. chose a combined remedial approach to treat the PCE contamination. This included liquid activated carbon (PlumeStop®), an enriched, microbial consortium (BDI Plus®), and an engineered, hydrogen release compound (HRC®). They chose this approach because it combines the fast-acting capabilities of PlumeStop with the reductive dechlorination process enhanced by HRC and BDI.

The high traffic at this multi-tenant site created challenges for the remediation team. Specifically, the operational hours of the various businesses required the injections to be performed at night to maximize safety and minimize disruption, while the quick timeline called for the remediation team to complete the injections during the winter. As a result, the injection project was completed over ten days from 10pm to 7am in

freezing conditions. This winter weather challenged the remediation team because they needed to prevent the remediation fluid, water supply, and equipment from freezing. Although the work was being done at night, snow plows and other vehicles commonly use the large parking lot, so visibility and traffic control were vitally important. Heaters were incorporated to keep the injection fluids in liquid form and warming and rest facilities were provided for the injection team. Additionally, the driller provided lighting and traffic control. The injections covered a relatively large area and lasted for two weeks. The application event was successfully completed by January 2018.

There have been four quarters of post-injection monitoring. In the first month following the injections, all but one residual monitoring well in the treatment area experienced drastic reductions of PCE to Non-Detect (ND) levels. Concentrations of residual PCE in the remaining monitoring well are decreasing towards ND and currently barely exceed the drinking water standard. Overall, the combined remedy was considered extremely effective in reducing the PCE contamination in the groundwater at a fast rate.

## HIGHLIGHTS



Due to the high-traffic and operational hours at this site, injections were performed from 10pm-7am in January.



The speed with which Wilcox & Barton, Inc. addressed the contaminants was crucial for the site owners to achieve their goal of marketing the property for sale.



Site engineers innovatively included heating systems, additional lighting, and warming facilities to ensure that the remedial agents stayed in their liquid form and to provide necessary amenities to the injection specialists.



The combined remedy approach of PlumeStop, BDI Plus, and HRC was selected over other remediation strategies for its fast-acting capabilities and its effectiveness in completely dechlorinating contaminants.



# PROJECT TIMELINE

March 2017

Reportable Condition identified during review of previous due diligence investigations conducted for others (120-day reporting obligation)



April 2017

Indoor air sampling initiated to evaluate risk to site occupants. Soil and groundwater sampling initiated to evaluate nature and extent of release.



July 2017

Massachusetts Department of Environmental Protection notified



September 2017

Contacted by Wilcox & Barton REGENESIS prepares preliminary design for PlumeStop - looking for rapid cVOC reductions

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January 2018

Injections were completed at the site (night work)



## BACKGROUND

A dry cleaner that previously operated at this site was the likely source of PCE contamination. In the past, a due diligence investigation identified PCE levels below regulatory levels. However, due to an updated and more stringent regulatory standard, a subsequent due diligence investigation showed the PCE levels above regulatory thresholds. While the PCE concentrations were not extremely elevated, this site is regulated according to drinking water standards due to a town ordinance. These regulatory standards lowered the acceptable threshold for PCE contamination and necessitated remediation efforts.



October 2017

Additional data collected by Wilcox & Barton to further delineate the plume (new wells), minor adjustments to design made.



January 2019

Four quarters of post-injection monitoring have been completed





## TREATMENT APPROACH

Wilcox & Barton, Inc. considered various approaches to remediate the site, including excavation. However, because of the many utilities located in the vicinity this approach was not feasible. Similarly, a standard biodegradation approach was also ultimately unfeasible because of the short time frame for remediation.

After determining a remedial approach, Wilcox & Barton, Inc. conducted design verification testing using Membrane Interface Probe (MIP) borings. This advanced method was used to target the location of their injections and to further delineate the plume. The MIP data showed that the plume was not concentrated

in a single area and was instead distributed and diluted across the site. This required a broader approach, with injection points dispersed within the apparent source area and in the areas upstream of the contaminated wells.

The injections took place over two weeks in January 2018. The plume was treated with PlumeStop, BDI Plus, and HRC. PlumeStop works by sorbing the contaminants onto the Liquid Activated Carbon™ matrix. Once the contaminants are partitioned, BDI Plus and HRC stimulate the rapid and complete dechlorination of the contaminants.





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## RESULTS

Four quarters of post-treatment data have been collected. Prior to the injections, the maximum PCE concentration was at 600 ppb. Immediately following the injections, PCE concentrations in all wells but one decreased to ND levels. The PCE concentration in the final well is decreasing and approaching the regulatory level, but at a slower pace. Overall, the combined remedy has been considered extremely effective in reducing the PCE contamination at a fast rate.

The regulatory expectations are for three to four quarters of data meeting applicable groundwater quality standards. Once PCE concentrations in the final well are maintained at ND levels, Wilcox & Barton, Inc. will file a Permanent Solution Statement for regulatory closure. Although the site is not yet fully closed, the significant improvement in groundwater quality and minimal residual contamination make the property easier to market for the real estate developer and owner.

## ABOUT WILCOX & BARTON, INC

Since 2000, Wilcox & Barton, Inc. has provided clients with a complete range of civil, environmental, and geotechnical engineering services throughout the Northeast. The company has earned a reputation for responsiveness, successful management of complex problems, and for providing innovative, cost-effective solutions. Clients rely on Wilcox & Barton, Inc. to handle the problems that no one can see, that the layman wouldn't anticipate, and that would cost money or create liability if not dealt with swiftly and defensibly. Their experts know how to collect and evaluate environmental data to navigate regulatory hurdles so their clients can focus on their core business.

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## TECHNOLOGY

### PLUME STOP

Liquid Activated Carbon

PlumeStop is an *in situ* technology that rapidly reduces dissolved-phase plumes. PlumeStop behaves as a colloidal matrix binding to the aquifer matrix, rapidly removing contaminants from groundwater, and expediting permanent contaminant biodegradation. The benefit to PlumeStop's dispersive properties is its ability to sorb contaminants, quickly removing them from the mobile phase while providing a high surface area matrix which proves favorable for microbial colonization and growth.

#### Key Benefits:

- *In Situ* remediation technology that rapidly reduces dissolved-phase plumes in days/weeks
- Distributes widely under low injection pressures
- Colloidal biomatrix completely biodegrades contaminants in-place
- Achieves stringent groundwater clean-up standards
- Provides a long-term means of addressing matrix back-diffusion
- Eliminates excessive time and end-point uncertainty associated with groundwater remediation

### BIO-DECHLOR INOCULUM

PLUS BDI

Bio-Dechlor Inoculum Plus (BDI Plus) is designed for use at sites where chlorinated contaminants are present and unable to be completely biodegraded via the existing microbial communities. BDI Plus is an enriched, microbial consortium containing species of the bacteria *dehalococcoides sp.* (DHC) which is capable of completely dechlorinating contaminants during *in situ* anaerobic bioremediation processes. BDI Plus has been shown to stimulate the rapid dechlorination of chlorinated compounds such as tetrachloroethene (PCE), trichloroethene (TCE), dichloroethene (DCE), and vinyl chloride (VC).

#### Key Benefits:

- Micron-scale, zero-valent iron suspended in a colloidal solution allows for easy handling and application on-site.
- Micron-size particles flow through soil pores dispersing outward without the need for fracturing or mechanical mixing in the subsurface.
- Outperforms commodity iron 30-40 times.
- Creates an anoxic and highly reducing environment, providing ideal conditions for sequential enhanced anaerobic biodegradation to destroy chlorinated contaminants.

### HYDROGEN RELEASE COMPOUND

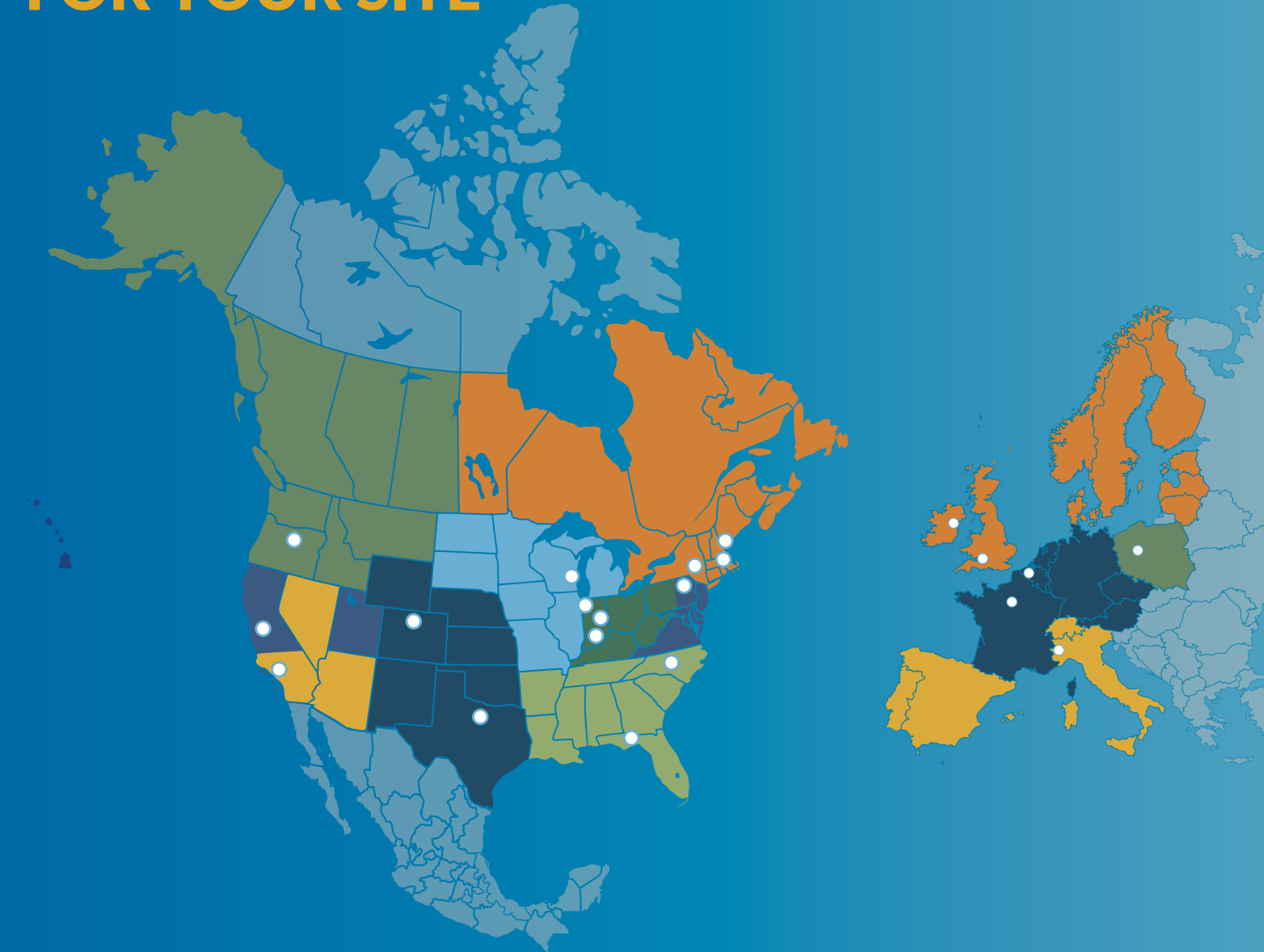
HRC

HRC is an engineered, hydrogen release compound designed specifically for enhanced, *in situ* anaerobic bioremediation of chlorinated compounds in groundwater or highly saturated soils. Upon contact with groundwater, this viscous, poly-lactate ester material becomes hydrated and subject to microbial breakdown producing a controlled-release of hydrogen for periods of up to 18-24 months on a single application. HRC enables enhanced anaerobic biodegradation by adding hydrogen (an electron donor) to groundwater and/or soil to increase the number and vitality of indigenous microorganisms able to perform the naturally occurring process of enhanced reductive dechlorination.

#### Key Benefits:

- Provides controlled-release lactic acid to promote reducing conditions and optimize the anaerobic enhanced reductive dechlorination process
- Highly viscous to viscous versions stay in-place where injected for highly targeted treatment
- A viable, long-term source of staged-release hydrogen, on the order of 2-5 years from a single application
- Highly compatible with anaerobic bioaugmentation approaches using Bio-Dechlor INOCULUM PLUS
- Clean, low-cost, non-disruptive application
- No on-going operations and maintenance needed
- Faster and often lower cost than natural attenuation approaches

# WE'RE READY TO HELP YOU FIND THE RIGHT SOLUTION FOR YOUR SITE



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