

GLOBAL RETAILER ENTERS INTO ELECTIVE SITE CLEANUP AGREEMENT AND ACHIEVES NFA

CASE STUDY:

Persistent PCE Plume Bioremediated to Move Development of Corporate Headquarters Forward





Overview

High-Profile Site Slated for Development Granted NFA to Make Way for Global Retailer's Corporate Campus



Site owner entered into an Elective Site Clean-up Agreement (ESCA) to remediate this site and to contribute to the area's revitalization.



PlumeStop, HRC, and BDI Plus successfully remediated persistent PCE, VC, and Cis-1,2,Dichloroethene contamination



ESGI and REGENESIS adapted the injection design according to the difficult site geology and weather conditions.



After one round of injections, successful results led to the site achieving No Further Action

At the site of a global retailer based in Arkansas, historic offsite dry cleaning operations caused tetrachloroethylene (PCE) contamination in the groundwater. The current site owner entered into an Elective Site Cleanup Agreement (ESCA) with the Arkansas Department of Environmental Quality (ADEQ) in order to address the contamination. The owner is remediating the contamination as part of their larger goal of contributing to the revitalization of the downtown area and the creation of a new corporate campus.

A previous bioremediation attempt successfully remediated a majority of the site but one persistent well remained. In order to achieve site closure, Environmental Services Group Incorporated (ESGI) had to continue quarterly monitoring until sufficient data existed to conclude that there was no potential for offsite migration of PCE above the acceptable groundwater screening levels. After time passed with little change to the B-45 well, ESGI sought out a bioremediation strategy that would work quickly with long term success. ESGI partnered with REGENESIS® to design a bioremediation plan that would apply PlumeStop®, Liquid activated Carbon, Hyrdogren Release Compound® (HRC) and Bio-Dechlor Inoculum® (BDI Plus) to eliminate the remaining contaminants of concern (COCs).

After the PlumeStop, HRC, and BDI Plus injection, ESGI conducted multiple rounds of sampling. By the fourth quarter sampling in 2018, results showed that all COCs were below the acceptable threshold levels. These results were maintained through the fifth sampling event. Due to these successful results the site achieved No Further Action (NFA) in January 2020.



Background Uniquely Challenging Site Conditions

A 2012 Phase 1 Environmental Site Assessment (ESA) identified Recognized Environmental Conditions (RECs) associated with two onsite, historic filling stations, a former onsite dry-cleaning facility as well as several offsite and up-gradient former filling stations. The current site owner is not affiliated with these past operations in any way, but they voluntarily entered into an Elective Site Clean-up Agreement (ESCA) LIS 13-042 with the Arkansas Department of Environmental Quality (ADEQ). The ESCA governs remediation of the site and offers a means to address historic contamination from former onsite activities without penalty and with known objectives.



Since 2012, the owner has performed groundwater sampling across the site over multiple sampling events and confirmed that the petroleum hydrocarbon contamination detected in the southwest portion of the site originated from historic, offsite operations. Sampling also concluded that chlorinated solvent contamination on the northeastern portion of the site originated from historic, onsite operations as well.



The owner implemented dual-phase extraction (DPE) which removed the floating "free" petroleum product near the southwestern portion of the site. Following this, bioremediation of the groundwater on the northeastern portion of the site resulted in drastically-reduced concentrations of chlorinated solvents and the promotion of degradation and attenuation. Upon completion of active remediation, the ECA required quarterly groundwater sampling. This sampling showed that all COCs were below threshold levels except the B-45 well. After a year of monitoring this well remained as the only well with persistent contamination which led ESGI to seek out an alternative bioremediation strategy.





Timeline

Persistent PCE Plume Effectively Reduced with PlumeStop, HRC, and BDI Plus to Achieve NFA Status



● **2012**

Phase I ESA identified Recognized Environmental Conditions (RECs)



● **2012**

A limited site investigation (LSI) indicated petroleum hydrocarbon contamination near the southwest and south-central site boundaries, and chlorinated solvents were detected in the groundwater.



● **March 2013**

the site owner voluntarily entered into Elective Site Clean-up Agreement (ESCA) with the ADEQ.



● **March 2018**

A bioremediation plan to address the remaining COCs around B-45 well was authorized and implemented.



● **August 2019**

The fifth sampling event post the PlumeStop, HRC and BDI Plus bioremediation plan shows that all remaining COCs in B-45 were brought below acceptable threshold levels.



● **November 2019**

Plug and abandonment for the final B-45 well



● **January 2020**

The site achieved No Further Action (NFA)

Treatment

Effective Bioremediation Strategy Using PlumeStop, HRC, and BDI Plus Achieves Cleanup Goals



Although previous efforts had successfully remediated a majority of the site, one well remained above target levels. In order to eliminate the remaining COCs around the B-45 well, a bioremediation plan involving PlumeStop, HRC, and BDI Plus was designed and implemented. Due to the challenging rocky geology, several wells had to be adjusted in the design in order to reach the target depth. Despite cold and rainy weather, the remedial solutions were successfully injected over two days.





Technology Used

PlumeStop, BDI Plus and HRC



PlumeStop® Liquid Activated Carbon™ is an innovative groundwater remediation technology designed to address the challenges of excessive time and end-point uncertainty in the *in situ* remediation of groundwater contaminants. PlumeStop is composed of very fine particles of activated carbon (1-2µm) suspended in water through the use of unique organic polymer dispersion chemistry. Once in the subsurface, the material behaves as a colloidal biomatrix binding to the aquifer matrix, rapidly removing contaminants from groundwater, and expediting permanent contaminant biodegradation.



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).



Hydrogen Release Compound provides controlled-release lactic acid to promote reducing conditions and optimize the anaerobic enhanced reductive dechlorination process. It is available in various viscosities to stay in-place where injected for highly targeted treatment HRC provides a viable, long-term source of staged-release hydrogen, on the order of 2-5 years from a single application. It is highly compatible with anaerobic bioaugmentation approaches using Bio-Dechlor INOCULUM PLUS.

Treatment Process

2,400 Pounds of PlumeStop
240 Pounds of HRC
18 Liters of BDI Plus

At the end of 2019, the ADEQ required that ESGI monitor the wells after a 2-inch rain event. In August of 2019 a rain event occurred and sampling showed that all of the wells around B-45 remained below the target levels. However they found an elevated level of PCE across the street in B-46. Previously, this well had been relatively dry and had not produced sampling results. Because this well was outside of the area of concern and its PCE levels were relatively low, ESGI conducted a human health risk assessment survey to prove that the outlying B-46 well would not have any impact on humans. The ADEQ approved the results of the assessment and in November 2019 they allowed the B-46 well to be plugged and abandoned.

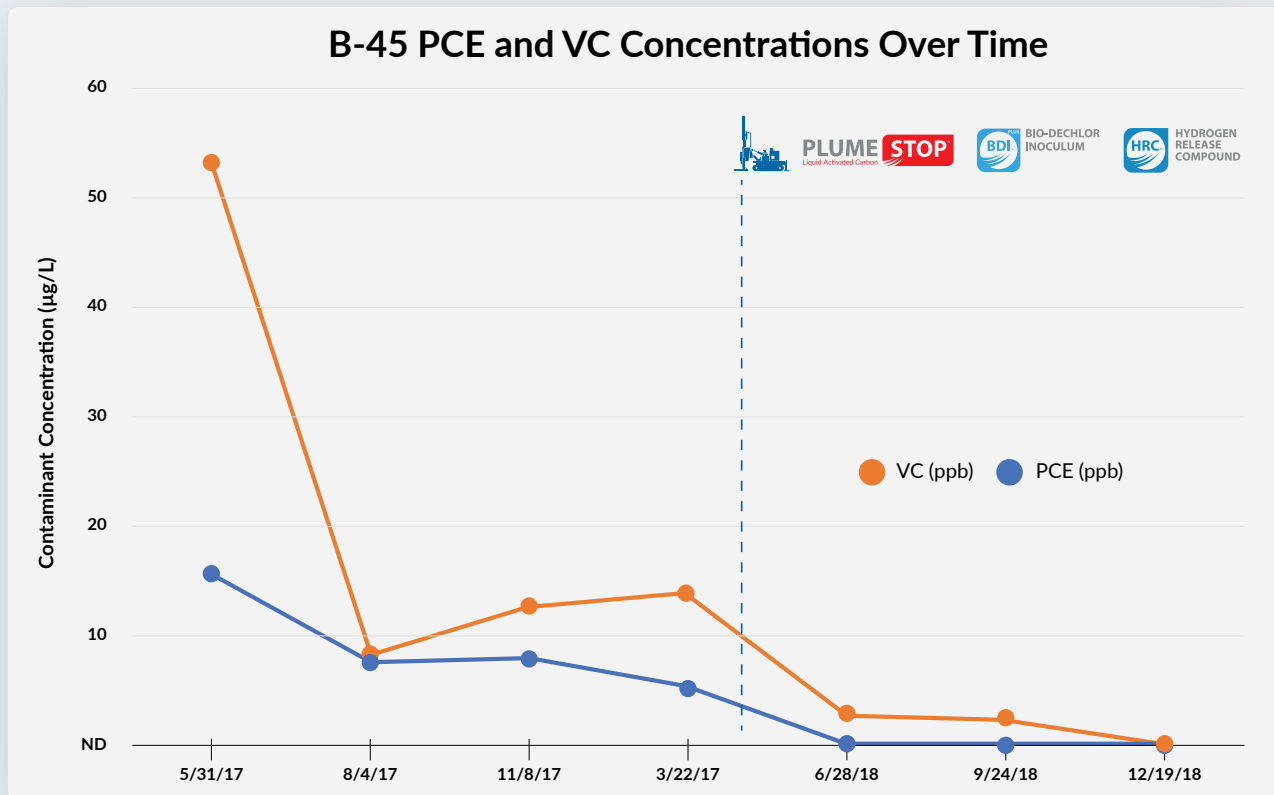


Results

ADEQ Issues No Further Action Following the Successful Remediation Event

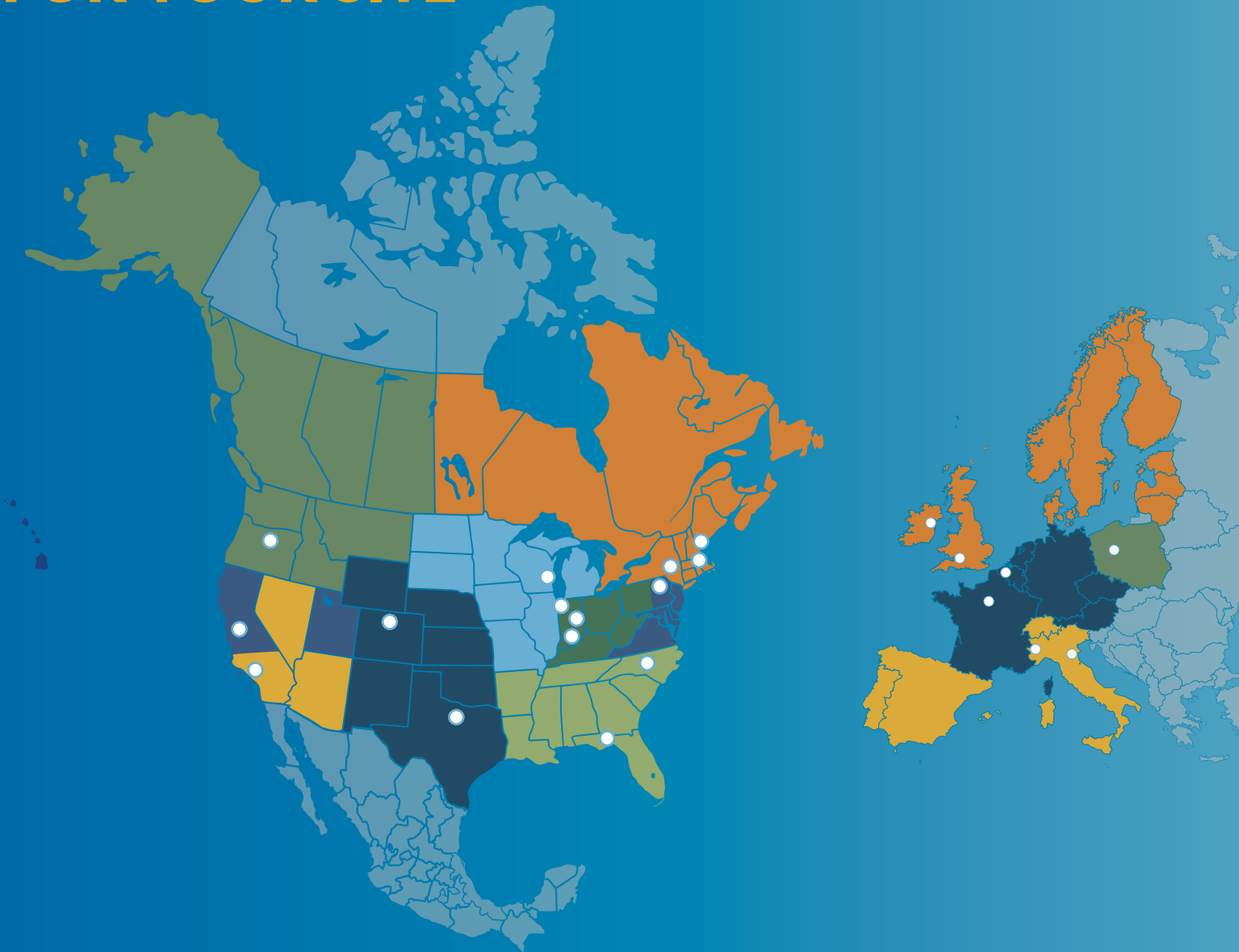


After injecting PlumeStop, HRC, and BDI Plus, the five quarterly water samples indicate successful remediation of the PCE and other COCs. All of the wells were plugged and abandoned in December 2019 and the ADEQ issued a No Further Action (NFA) in January 2020. After multiple years of ongoing efforts, the combined remedy of PlumeStop and BDI Plus has allowed for the remediation to be completed. The global retailer will soon break ground for their new campus.





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



The Consultant

About Environmental Services Group, Inc.



ESGI has extensive experience in Land Remediation. ESGI provides turn-key solutions for remediation of spills and contaminated land. ESGI has qualified technicians that will supervise the removal of the affected soils and will restore the property to its natural setting.

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About The Consultant



Heading ESGI's expansion efforts across the United States, Timothy E. McDonald, P.E. has over 30 years of industry experience spanning energy, technology, engineering and consulting. A Harvard Business School alumnus and Registered Professional Engineer, Tim has broad functional experience covering general management, operations, finance, marketing, engineering and environmental, health and safety.

He held numerous technical and management positions with major oil and gas companies for over 21 years, and has been the president of 3 independent oil & gas companies with holdings in the Southwest and Offshore Gulf of Mexico.

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