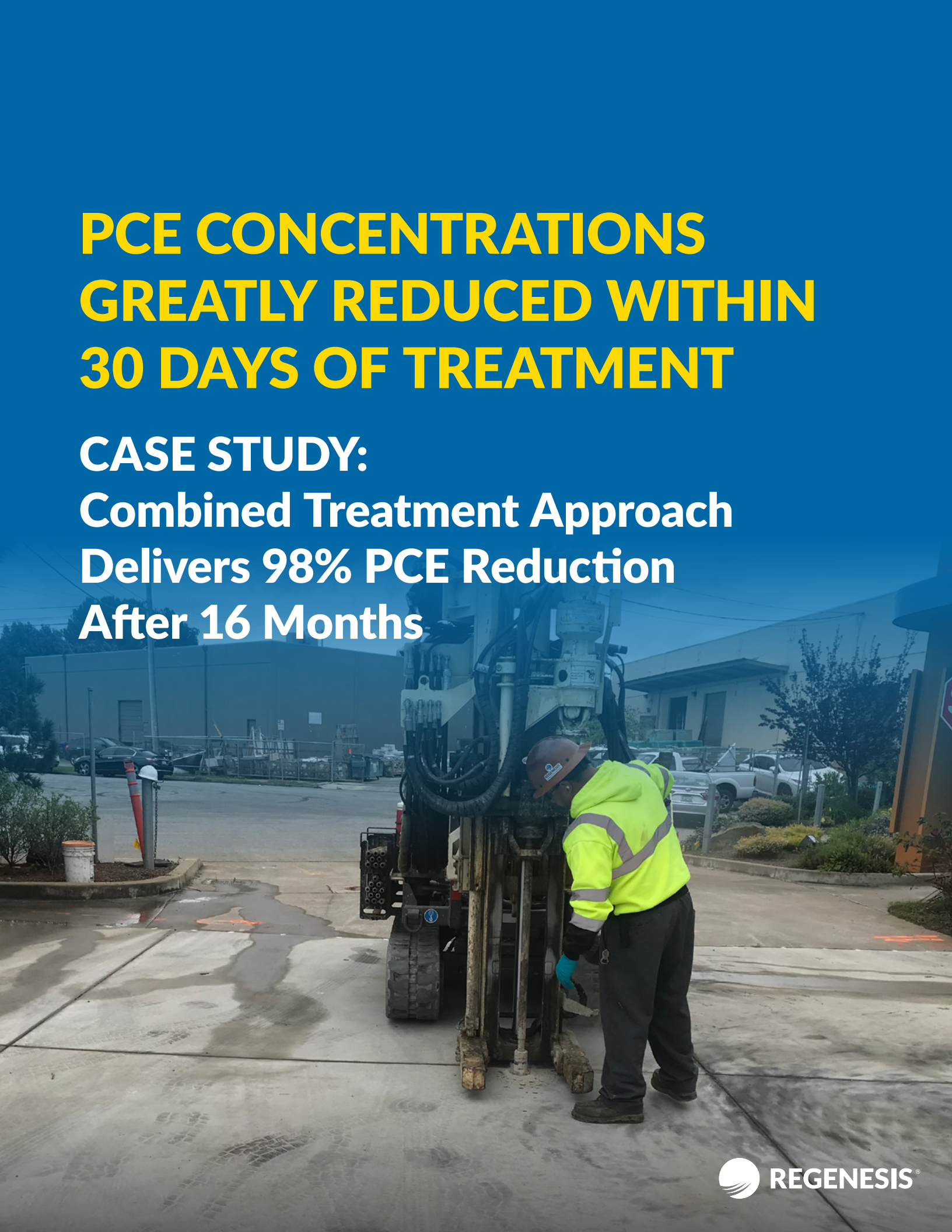
PCE CONCENTRATIONS GREATLY REDUCED WITHIN 30 DAYS OF TREATMENT

CASE STUDY:
Combined Treatment Approach Delivers 98% PCE Reduction After 16 Months



REGENESIS®

Background

High PCE Concentrations Were Detected in Soil and Groundwater During a Dry Cleaner Site Investigation

The site is a former dry-cleaning supply distribution business that operated from 1957 to 2000. The former facility provided laundry chemicals, including detergents and spotting chemicals, packaging products such as hangers and polyethylene bags, and bulk deliveries of tetrachloroethene (PCE). The PCE was stored in a 4,100-gallon aboveground storage tank (AST).

In May 2007, an investigation was conducted in response to a directive from the California Regional Water Quality Control Board (CRWQCB), stemming from environmental assessment work at an adjacent property where chlorinated volatile organic compounds (VOCs) were detected. The results of the 2007 investigation confirmed high concentrations of CVOCs in soil and groundwater at the site, including PCE and its breakdown products. Following several phases of site investigation, the environmental consultant submitted a Remedial Action Plan (RAP) on behalf of the responsible party in 2015. In the RAP, the consultant specified excavation and *in situ* soil mixing utilizing PersulfOx® to address grossly impacted soils at the northern portion of the site.

Remediation

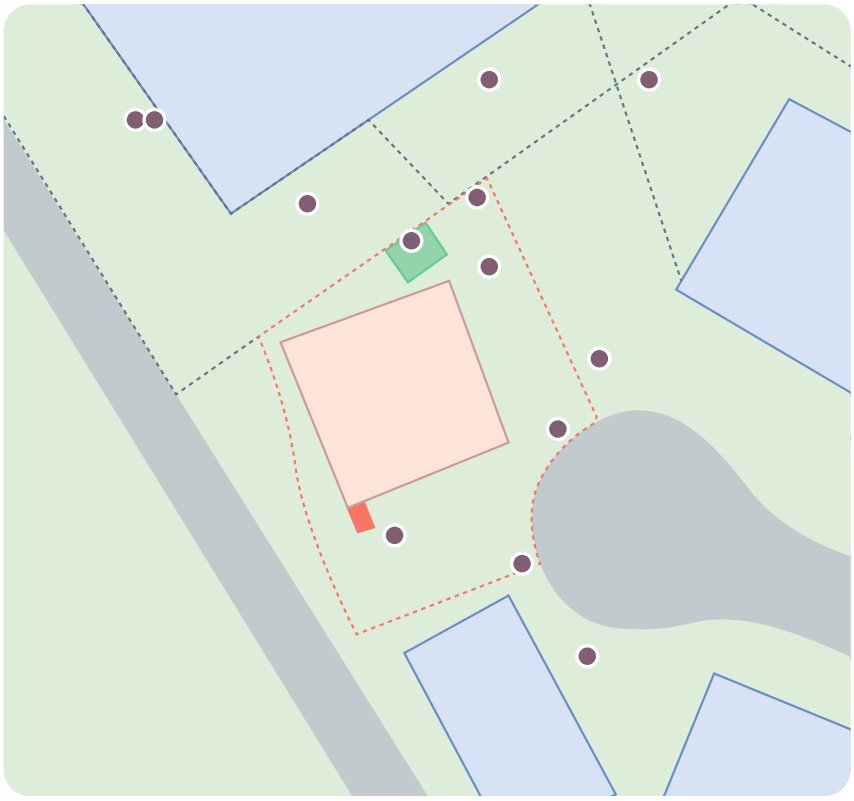
A Pragmatic, Phased Approach Was Used to Target PCE in Soil and Groundwater

Remediation at the site was completed in two primary phases. The first phase was a targeted excavation and soil mixing event focused on addressing the highly impacted shallow soils and smear zone. The second phase was focused on treating the groundwater PCE plume onsite and preventing further plume migration offsite.

PERSULF Ox

Phase 1

The excavation and *in situ* soil mixing event was completed in 2016. Shallow, PCE-impacted soils were removed to a depth of 14 feet below ground surface (bgs). PersulfOx was applied in the smear zone in the bottom of the excavation prior to backfilling.

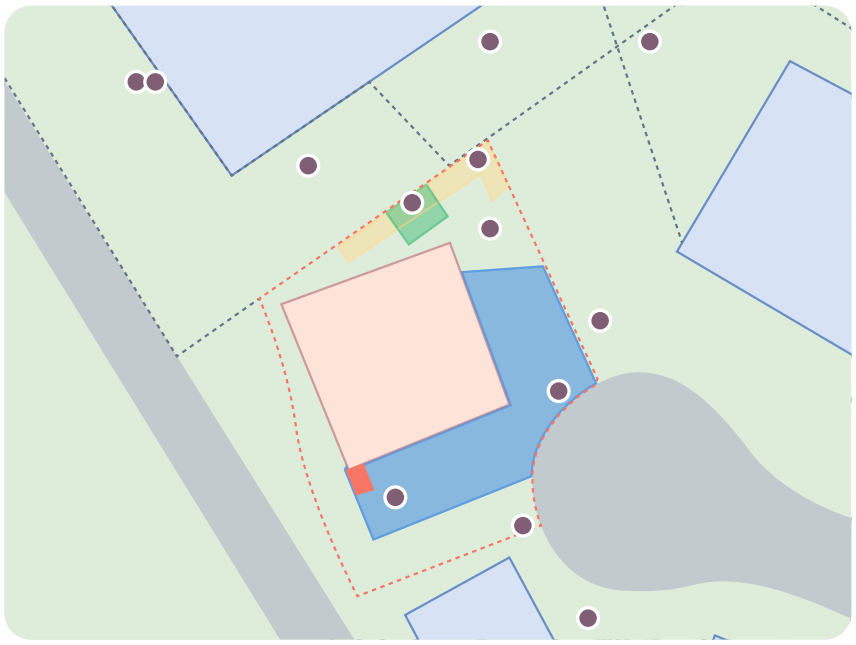


Monitoring Well Location

PersulfOx Treatment Area

Approximate Location of former PCE AST

- Monitoring Well Location
- 3-D Microemulsion Treatment Area
- PersulfOx Treatment Area
- PlumeStop, BDI Plus, HRC, Permeable Barrier
- Approximate Location of former PCE AST



PERSULFOx

3-D MICROEMULSION

CRS CHEMICAL REDUCING SOLUTION

BDI BIO-DECHLOR INOCULUM

PLUMESTOP Liquid Activated Carbon

HRC HYDROGEN RELEASE COMPOUND

BDI BIO-DECHLOR INOCULUM

Phase 2

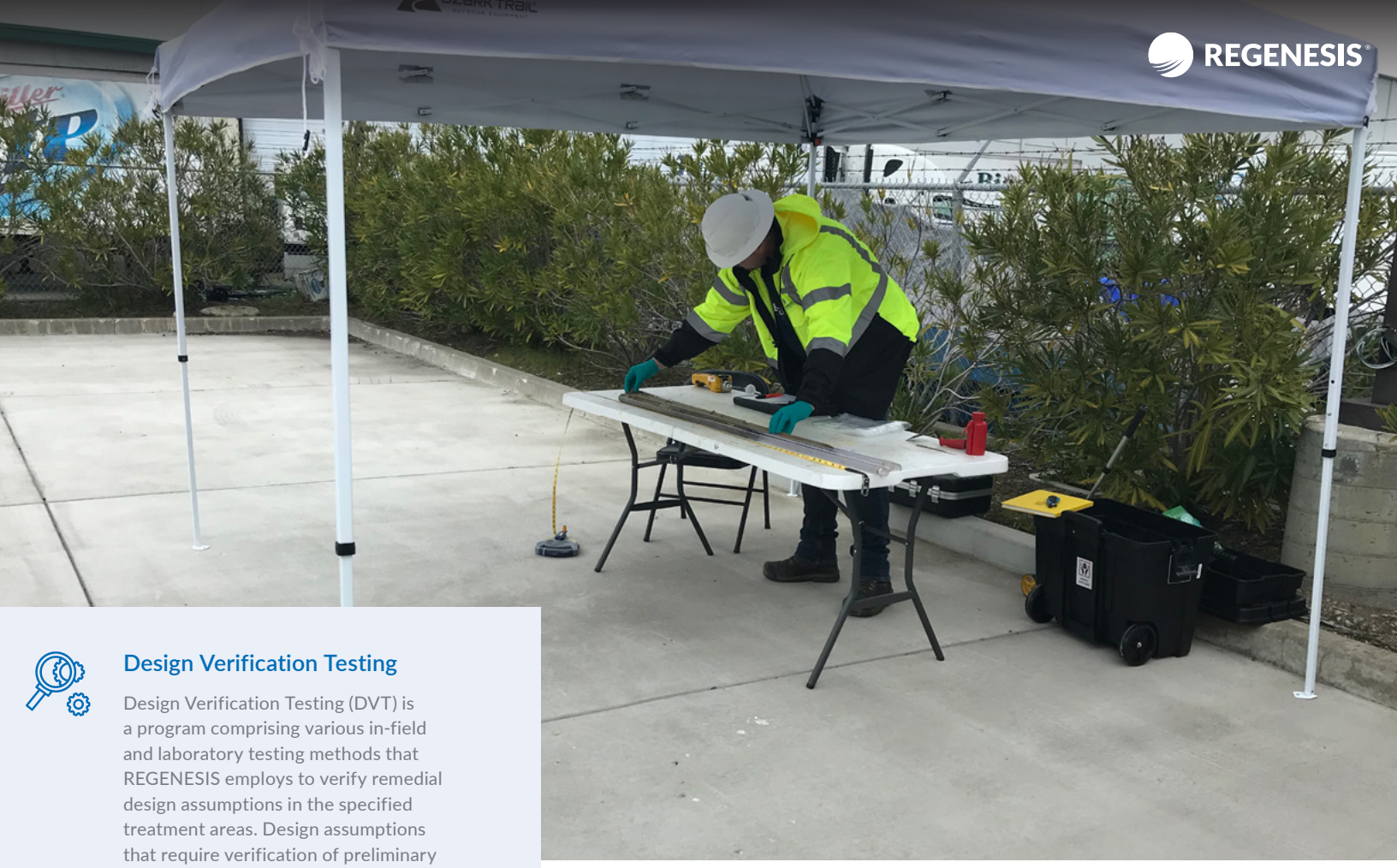
After the targeted soil treatment was completed, the RAP was expanded in 2018 to include treatment of groundwater. The specific groundwater treatment components included:

1. A follow up injection of PersulfOx to treat high remaining dissolved phase PCE concentrations (e.g., 39 mg/L) in the previously excavated area,

2. An enhanced reductive dechlorination (ERD) treatment over the larger on-site dissolved phased plume utilizing 3-D Microemulsion®, Chemical Reducing Solution® (CRS), and Bio-Dechlor INOCULUM Plus® (BDI Plus), and

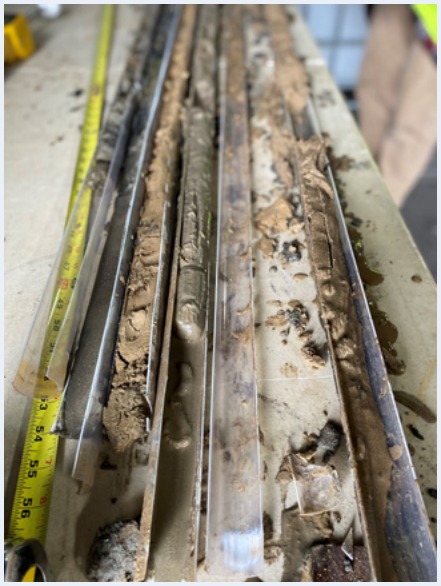
3. A PlumeStop® permeable reactive barrier (PRB), 150 feet in length, along the northern property boundary to halt plume migration. An electron donor and bioaugmentation substrate, HRC Primer and BDI Plus, respectively, were also applied to the PRB to promote sorption-enhanced anaerobic biodegradation of PCE.

Remedial Solution	Surface Area	Vertical Interval	Injection Volume
3DME, CRS, BDI Plus	8,000 ft^2	6-26 ft bgs	14,430 gal
PersulfOx	400 ft^2	5-30 ft bgs	4,250 gal
PlumeStop, HRC, BDI Plus	1,500 ft^2	5-30 ft bgs	13,460 gal



Design Verification Testing

Design Verification Testing (DVT) is a program comprising various in-field and laboratory testing methods that REGENESIS employs to verify remedial design assumptions in the specified treatment areas. Design assumptions that require verification of preliminary modeling estimates on most PlumeStop I-PRB applications include: the treatment depth interval, groundwater velocity and geochemistry.



Prior to the *in situ* injection treatment, REGENESIS completed design verification testing (DVT) to confirm the target treatment zone (TTZ) and other design parameters. As part of the DVT, a clear water injection test was performed to confirm the feasibility of injecting the design volume and to ensure PlumeStop coverage throughout the barrier. Continuous soil cores were also collected over the target treatment interval (i.e., 5 to 30 feet bgs).

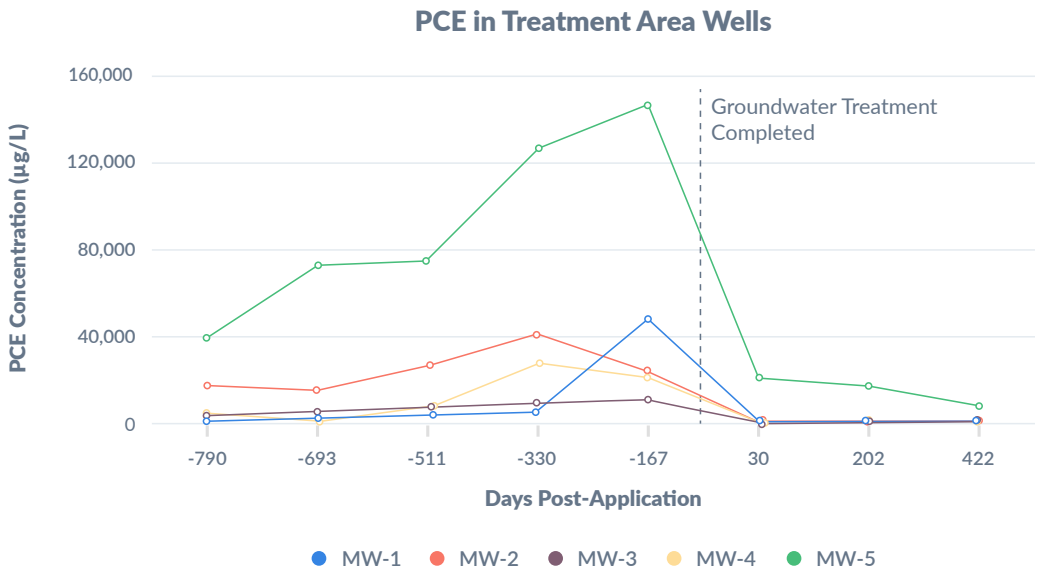
The results of the DVT confirmed the vertical treatment interval for the product application based on the distribution of sand grain sizes (targeting the more permeable flux zones). The hydraulic injection test confirmed that the designed injection point volumes and spacing were sufficient to achieve product distribution and that the tooling selected for injection was suitable to the site conditions. Minor surfacing occurred in the shallow injection intervals during the test. This observation during the test allowed the REGENESIS Remediation Services team to form a plan to manage and minimize surfacing ahead of the application.

Results

The Multi-Component Treatment Was Immediately Effective and has Maintained 98% PCE Reduction in Onsite Groundwater

Following completion of the groundwater treatment program, PCE concentrations were sharply reduced within the first sampling event after approximately 30 days. PCE has remained 98% reduced, on average, after 14 months.

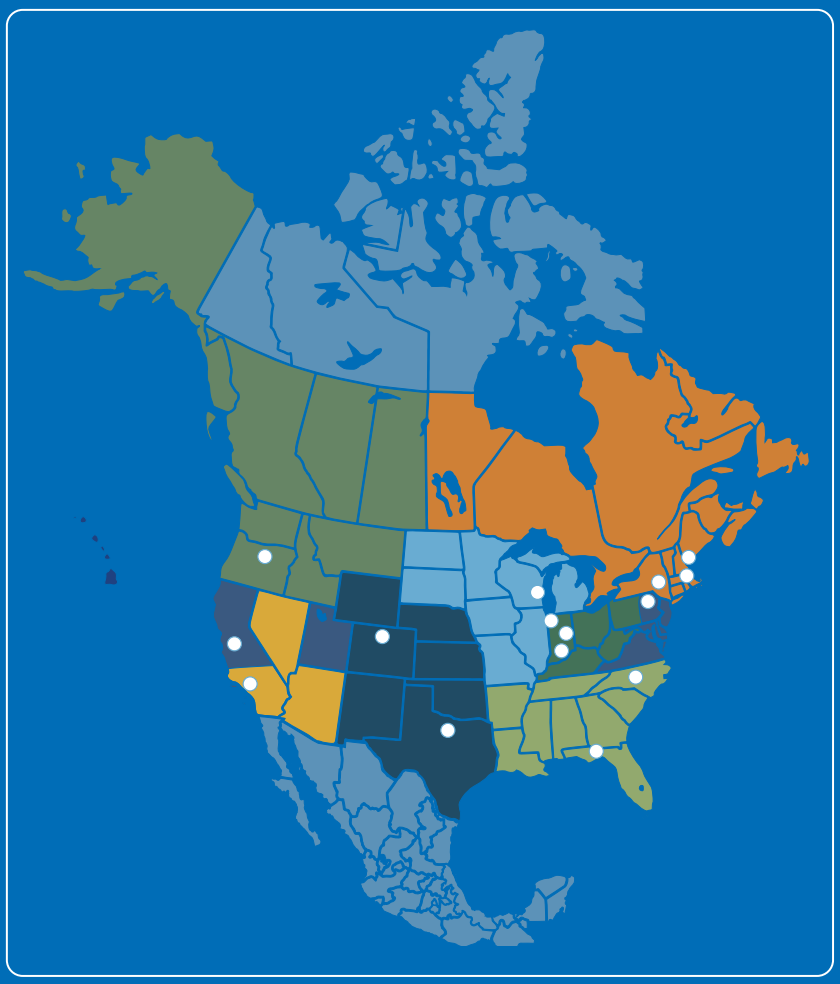
The groundwater treatment program is meeting performance expectations, with the groundwater plume substantially reduced through the combined treatment program. Groundwater monitoring continues at the site. A targeted, supplemental application is currently being considered to further reduce groundwater PCE concentrations at MW-5, which have been reduced by 94% in this well thus far.

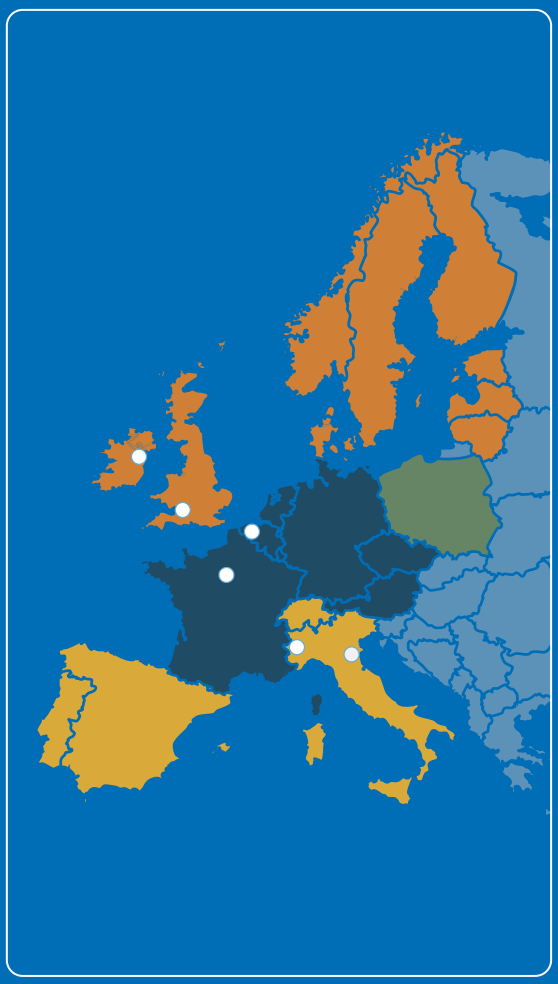


REGENESIS®

We're Ready to Help You

Find the Right Solution For Your Site





Global Headquarters

1011 Calle Sombra
San Clemente, CA 92673 USA
Ph: (949) 366-8000
Fax: (949) 366-8090

Europe

Bristol, United Kingdom
Ph: +44 (0) 1225 61 81 61

Dublin, Ireland
Ph: +353 (0) 1 9059 663

Torino, Italia
Ph: +39 338 8717925

Ieper, België
Ph: +32 (0) 57 35 97 28

Visit www.REGENESIS.com to learn more.

© 2021 All rights reserved. PlumeStop, S-MicroZVI, 3-D Microemulsion, Bio-Dechlor INOCULUM PLUS, CRS, HRC, and REGENESIS are registered trademarks of REGENESIS Bioremediation Products.
All other trademarks are the property of their respective owners.

REGENESIS®

www.REGENESIS.com