CASCADE CASE STUDY

Aggressive Approach to Brownfield Site Accelerates Redevelopment Timeline

Injection of CleanER iZVI™ Proves Ideal Treatment in Challenging Conditions

PROJECT DETAILS

PROJECT: Former aircraft parts manufacturer

CLIENT: Landmark Environmental Inc.

LOCATION: Denver, Colorado

SERVICE: Injection of CleanER iZVI

CHALLENGE

Brownfield Site with Increased CVOC Concentrations Targeted for Redevelopment

A former aircraft parts manufacturing facility near Denver was identified as a Resource Conservation and Recovery Act (RCRA) Corrective Measures site and was targeted for redevelopment. Overseen at the regulatory level by the Colorado Department of Public Health and Environment (CDPHE), quarterly groundwater monitoring of the site indicated an increase in chlorinated volatile organic compound (CVOC) concentrations compared to previous measurements, requiring active remediation to allow redevelopment to continue. Specifically, 1,1-dichloroethene exceeded the Colorado Basic Groundwater Standard (CBGS).

The regulated contaminants also included trichloroethene (TCE) and 1,1,1-TCA. Remediation considerations were made more challenging by high groundwater velocity through coarse sands and gravel, and low contamination concentrations.

Although a monitored natural attenuation (MNA) approach may have been feasible, consultant Landmark Environmental proposed an

"For a complex project with a lot at stake and many eyes on the outcome, I highly recommended to my client that we should use Cascade..."

- Craig Bruno, P.G.

aggressive approach to treat the area with the goal of removing all land use restrictions and obtaining a No Further Action (NFA) ruling.

Prior to working at Landmark Environmental, Craig Bruno had previously partnered with Cascade on three successful in situ reductive dechlorination projects treating N-nitrosodimethylamine (NDMA), trichloroethylene (TCE) and in







CASCADE CASE STUDY

some cases hexavalent chromium, at the Lockheed Martin Space Systems Waterton Canyon Plant from 2010 to 2015. "For a complex project with a lot at stake and many eyes on the outcome, I highly recommended to my client that we should use Cascade as a sole-sourced specialty subcontractor to complete this work," Craig indicated.

THE RIGHT APPROACH

The Right Approach for the Conditions and the Client's Timeline

CleanER iZVI, part of the Cascade Chemistries product line, is an injectable zero valent iron (ZVI), injected via direct push technology (DPT) or injection wells, to address CVOCs and heavy metal contaminants, such as hexavalent chromium, arsenic, and selenium.

Craig explained why CleanER iZVI was the right product for this project: "The reactivity is strong and fast, the surfactant properties are key for long-term efficacy in fast flowing groundwater through sands and gravel, and dispersant properties are ideal for treating the entire area from an upgradient location."

While MNA was considered, Cascade and Landmark determined that the length of time required to achieve NFA status and the inherent risk of asymptotic or increasing CVOC concentration could lead to several years of monitoring, with the potential to require some kind of remedial action down the road anyway. Injection of CleanER iZVI was expected to reduce the length of time until closure to one year or less. This approach was designed to eliminate unexpected conditions or remedial action in the future and reduce risk to the client.

"The reactivity is strong and fast, the surfactant properties are key for long-term efficacy in fast flowing groundwater through sands and gravel."



CASCADE CASE STUDY

EXECUTION

Successful Execution on Site

At the site, located twenty minutes from downtown Denver, Cascade executed the project over five days. First, a design optimization test (DOT) was performed, using a Geoprobe 8040, to determine that DPT could achieve target depths in difficult drilling conditions. The successful DOT confirmed that the client could avoid the cost of installing injection wells. In addition to CleanER iZVI, Cascade provided turnkey services including design support (ZVI dosing, ROI, injection locations, injection volumes, and pressure and flow parameters for optimal distribution and contact), mixing, and injection through DPT. Project implementation was completed on budget, on time and within Cascade's industry-leading safety standards.

RESULTS

Performance Measurements Showed Powerful Results

Field performance indicators of efficacy, including measurements for pH, conductivity, ORP, DO, and methane were collected on a weekly basis. Concentrations of 1,1,1-TCA, 1,1-DCE, 1,1-DCA, TCE, and dissolved methane, ethane, ethene, and acetylene in groundwater were analyzed.

Post-injection groundwater monitoring of field performance indicated strong chemical reactivity and creation of an anaerobic dechlorination environment. Approximately one month after One month after injection, monitoring data triggered a CDPHE evaluation that resulted in a No Further Action determination.

injection completion, monitoring results showed that analyzed chlorinated solvent concentrations decreased below Colorado Basic Groundwater Standards. Chlorinated concentrations decreased even further—all remaining below Colorado Basic Groundwater Standards—four months post-injection.

These results triggered a CDPHE evaluation of the favorable quarterly groundwater monitoring data and resulted in a No Further Action determination for groundwater at the site, allowing for unrestricted use of soil and groundwater.

OUTSTANDING PERFORMANCE LEADS TO AN ENVIRONMENTAL WIN AND HAPPY CLIENTS

On the Road to Redevelopment

The client's goals for this remediation project were to reduce or eliminate CVOC concentrations, verified through groundwater monitoring, and successfully achieve a NFA determination from the CDPHE, removing a groundwater use restriction at this area planned for future residential development. With Cascade's support, Landmark's client has achieved their goals and can move forward with development plans.

OPTIMIZED SOLUTIONS for all your remediation needs