



CASE STUDY #0202 UNNAMED FEDERAL SITE

SITE OVERVIEW

Confidential Location Southeast US Facility

CONTAMINATION

Chlorinated Solvents in ground water

HISTORY

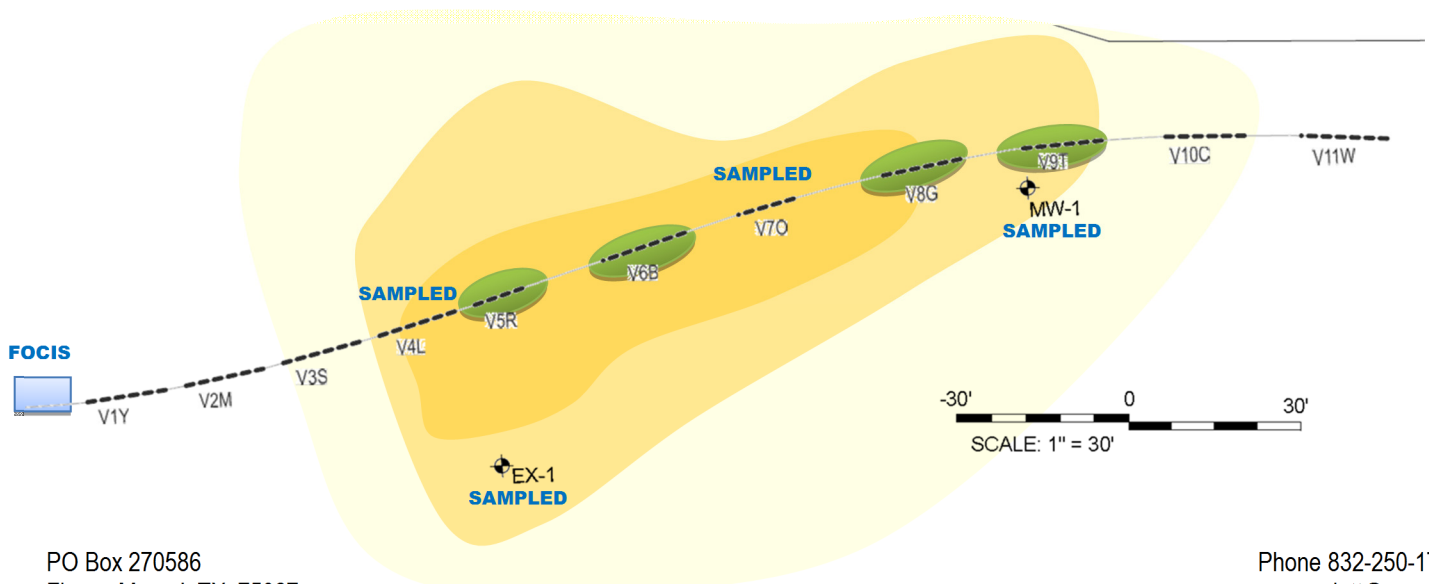
A known release of solvents at this facility led to ground water contamination. A pilot test was requested from EN Rx to show two objectives; 1) the impact to the treatment to the existing pump and treat system and 2) the oxidative capabilities on chlorinated hydrocarbon compounds. These two objectives were tested by a short pilot test and sampling program.

PRE-CLEAN DATA

In multiple wells across the site, concentrations of chlorinated solvents (HVOC) and their breakdown products were in the parts per million (ppm) range. A Pump and Treat (P&T) system has been at work for many years but has had decreased in efficiency.

REMEDIATION ACTIVITIES

- The pilot test was conducted in September 2014 with EN Rx Reagent™ and FOCIS™ (Feedback Optimized Continuous Injection System) injection utilizing a Vertebrae™ well string. EN Rx injected 6,000 pounds of activated reagent over 45 days of injection. Four injection well segments were used V5R, V6B, V8G, and V9T for injection and reagent was delivered to them equally.
- This dosage (proportion of oxidant to mass of contaminant) was undersized from a mass basis. The injection was applied to the source area. Therefore it was not anticipated that large amounts of reduction and prolonged effect would be rendered given the pilot specifics. The dosage was based some providing enough oxidation to determine the effects.
- Two types of wells were sampled to monitor the progress of the injection; conventional vertically screened monitoring points (MW and EW) to develop radius of influence data, and inline horizontal vertebrae wells (10 ft from the injection segments).
- Wells were sampled during the pilot test to determine if oxidation and matrix diffusion were occurring to increase the efficiency of the P&T system.

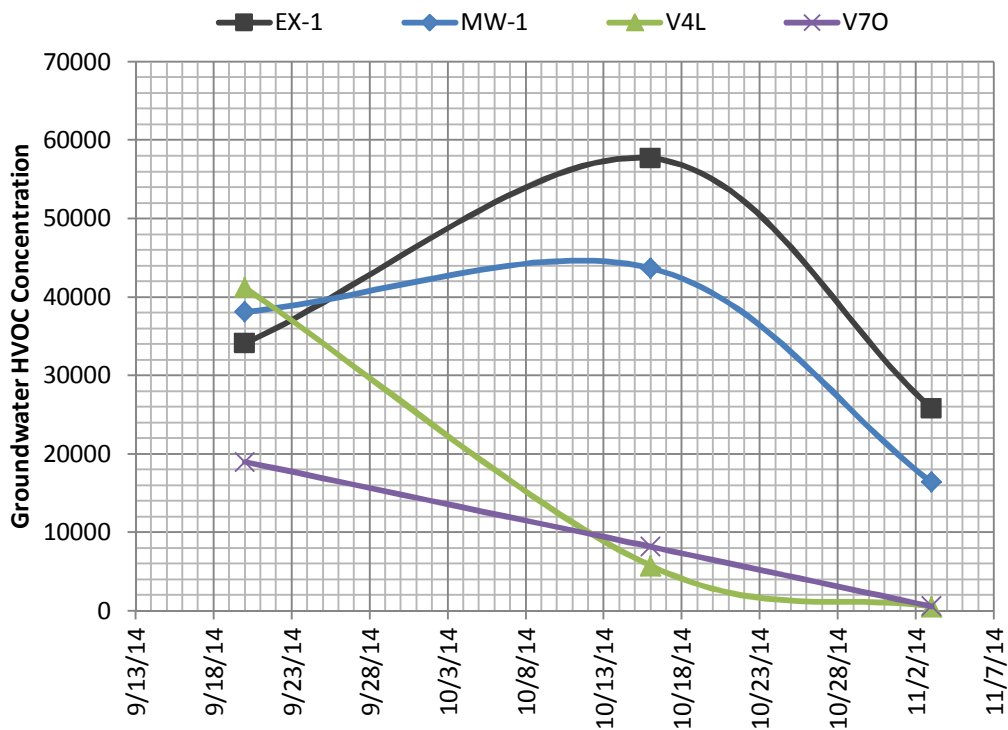


RESULTS SUMMARY

The two objectives were clearly met described below.

- The monitoring receptors (MW and EW) located 10 and 30 ft from the injection demonstrated both a matrix diffusion effect within 3 weeks of the injection and oxidative effects were proven thereafter. Increased matrix diffusion effects were an objective to yield more production and capture out of the P&T system.
- The well segments used for sampling (not injected into) indicated excellent reduction two orders of magnitude demonstrating the strength of the reagent. To be specific HVOC were reduced from 41,200 ppb down to 560 ppm reportedly from V4L (99%) and from 19,000 ppb down to 590 ppm reportedly from V70 (97%).

Analytical Graph During Pilot Test



Additional information collected proved the following.

- Injection rates a magnitude higher were achievable using the horizontal well structure (Vertebrae™) as compared to the traditional vertical wells. Other areas of the site have used EN Rx treatments and injection rates were general 5 to 10 gallons per well under low pressure (less than 5 psi). The horizontal well was able to deliver 100 gallons or more with no pressure feedback.
- No short circuiting was evident. Conceptually a short circuit must travel a much farther distance to daylight with horizontal wells. This was clearly proven with this pilot test and unlike problematic injections at other areas of this site there was no short circuiting, even at the much higher flow rates.
- Vertebrae™ can be sampled and used for data purposes.