



CASE STUDY #0308 JACKSONVILLE C-STORE, FL

SITE OVERVIEW

Convenience Store Facility, Jacksonville, FL

CONTAMINATION

Gasoline fuel in ground water

BACKGROUND

A known release of gasoline fuel at this facility led to ground water contamination. Due to site activities, the length of the plume, and multiple properties being involved, typical technologies were determined to not be feasible. A pilot test and full scale implementation was completed using Vertebrae™ and FOCIS™ technologies. The process is on-going. First quarter results proceeded 80% toward goal. Several major accomplishments are noted.

PRE-CLEAN DATA

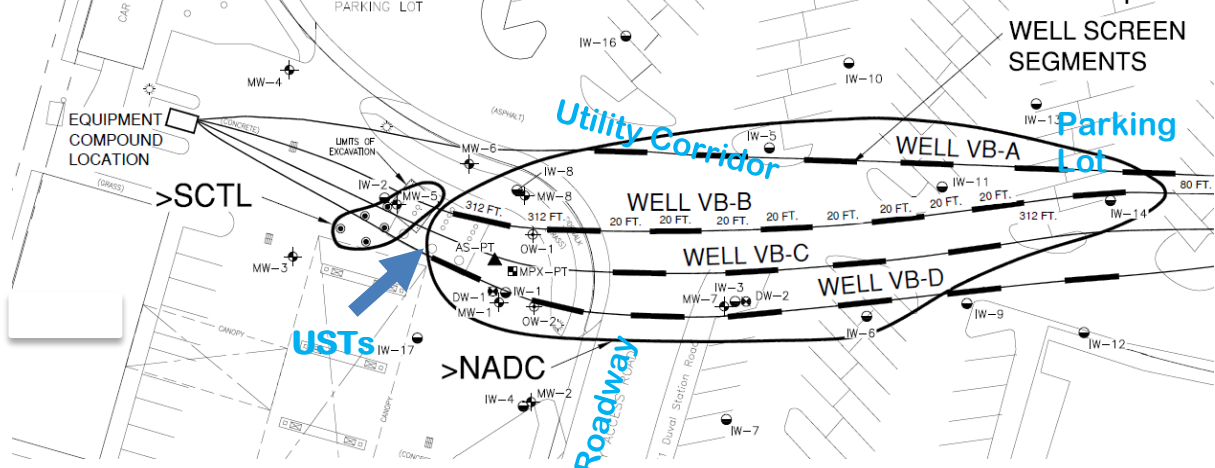
In multiple wells across the site, concentrations of BTEX constituents were in the parts per million (ppm) range. The plume traveled at a depth of 15-23 ft, which is below the top of the water table (5 ft). The lithology and hydrologic factors caused this occurrence. The lithology is fine sand on top of a clayey sand at 23 ft.

INSTALLATION COST COMPARISON (CONVENTIONAL WELLS VS. VERTEBRAE SYSTEM)

The remediation technology typically chosen for BTEX sites is air sparging using conventional wells. However, at this site the client quickly realized traditional trenching and system installation would be very disruptive to multiple businesses due to a busy parking lot and the plumes transport under the main entrance intersection. Furthermore, the businesses in this area are open late and therefore performing the work at night would not be a valid option. Vertebrae™ was chosen for these reasons. Regardless, the installation cost of an air sparge well network was compared to a Vertebrae™ system.

	Mobilization	Drilling	Time	Trenching	Oversight	Total Cost
HSA	\$500	\$32,200	4 wks	\$88,960	\$20,000	\$141,660
Vertebrae™	\$1,500	\$106,500	2 wks	included	\$10,000	\$118,000

Cost assumptions: There are 34 wells in the network. Four home runs are used for trenching them back to the system location. The cost for trenching is \$80 per linear foot. Well costs are derived directly from the Florida preapproval template. Oversight is \$1000 per day. Night work is not included. Vertebrae™ are installed in one mobilization. No SVE costs are included or markup.



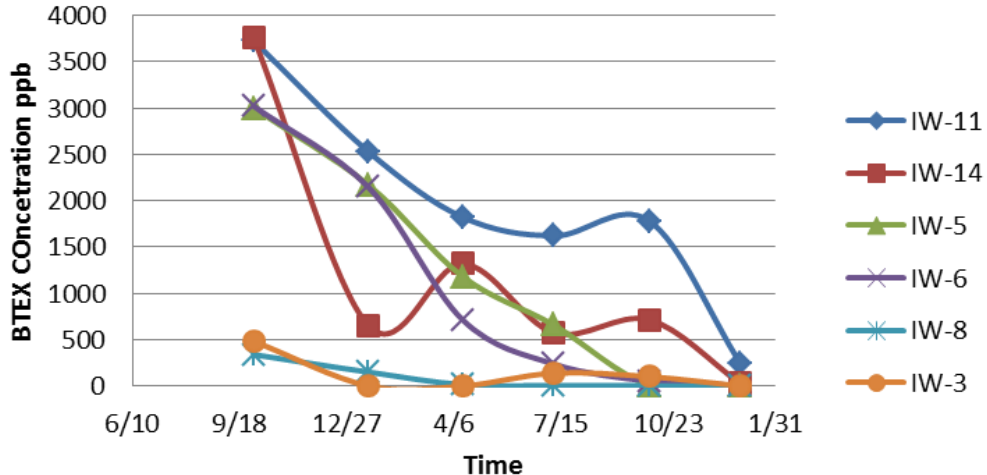
REMEDIATION ACTIVITIES

- A pilot test was conducted in September 2014 with EN Rx Reagent™ and FOCIS™ (Feedback Optimized Continuous Injection System) injection utilizing a Vertebrae™ system. EN Rx injected 3,000 pounds of activated reagent over 45 days of injection. Seven injection segments were used to target the spine of the plume in well VB-B.
- The full scale implementation was completed in February 2015 with Vertebrae™ and FOCIS™ injection utilizing EN Rx Reagent™. EN Rx injected 3,000 pounds of activated reagent over 45 days of injection. Twenty five injection segments (500 feet of well screen) were adjusted to target areas based on feedback data.
- In both installations, the drilling went under 3 underground storage tanks, a roadway, gas, sewer, water, electric, and irrigation lines, and under 3 rows of a parking lot. Business disruption was minimized. The system was placed in a desirable location. The installation of the wells and system took 7 days.
- Monitoring wells were sampled during the process to monitor the progress.

RESULTS SUMMARY

The reduction at the site is evident and we expect to meet Natural Attenuation goals on time. The benefits of implementing a Vertebrae™ and FOCIS™ are clearly evident in this application. The easy to implement installation minimized business disruption by running under several properties and a busy traffic area. The system applied reagent in a controlled and robust way, with little O&M and site time, and the mass was quickly reduced.

Milestone Well Reductions



The advantages of this technology scheme over air sparge or ozone systems are numerous.

- Costs less (For this case study the costs were reduced by 17%)
- Less impactful (Drilling can be completed in alternate locations)
- System has a smaller footprint than most systems
- Less power (The system uses solar power)
- Faster (To date there has been a 98% reduction in BTEX in one year of operation)

CONCLUSION

Vertebrae™ is a better solution than conventional wells. It provides more contact with the plume, minimizes business disruptions, and removes unsightly well vaults, all while being faster, safer and more cost effective. FOCIS™ is versatile and gets the job done.