WAVEFRONT
PRIMAWAVE

Chemical Oxidant & Electron Acceptor Injection

Location	Former UST in Florida, USA
Operator	Local Direct Push Contractor
Formation	Unconsolidated Sands with Clay Lenses
Aquifer Target	Dissolved Petroleum Contaminants
Application	Chemical Oxidant & Electron Acceptor
Tool used	Surface Deployed Hornet Tool
Date installed	May to June - 2008

Introduction

Primawave is a patented fluid flow process proven to increase the effectiveness of injection approaches both during short term injection treatments, and longer term product recovery operations.

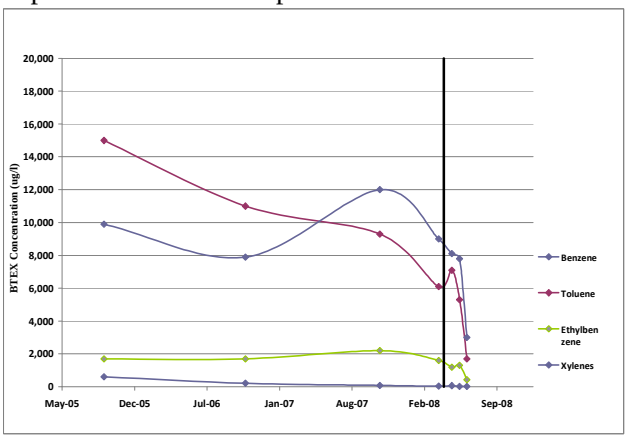
Injection Issue

In this prominent location, high BTEX and Naphthalene concentrations at a former Underground Storage Tank site in Florida required treatment, but buried utilities and sensitive landscaping prohibited any surfacing of injected product.

Primawave Installation

The Primawave Hornet Tool was attached to the top of direct push rod strings, and the commercial remedial products were pumped through the Hornet Tool, down the rods, and out into the aquifer.

A consistent injection flow rate/pressure was used during the treatment, and the target volume of product was introduced into the aquifer without impact to sensitive receptors.



Results

The implementation of Primawave resulted in the successful injection of *in situ* chemical oxidant and slow-release terminal electron acceptor delivery. The results from the Primawave application were immediate, and several long-term benefits were seen:

- Blow-by (and day-lighting) responses at injection points did not occur during any of the 3 injection events.
- Overall injection efficiency was maximized with Primawave, and the targeted volumes of chemicals were delivered when Primawave was utilized.
- The dissolved concentrations of BTEX declined dramatically over a six-month monitoring period in monitoring wells located in the treatment zone.

Monitoring Well	% BTEX Decline
MW-1	98.5
MW-3	99.7
MW-4	71.4
MW-5	99.6