

## **A Field Demonstration of Substrate Distribution for Accelerated Anaerobic Biodegradation at Dover AFB, DE**

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Past maintenance activities resulted in chlorinated solvent releases that created large dissolved phase plumes within the shallow water table aquifer at Dover Air Force Base, DE. In the spring of 2006, Oak Ridge National Laboratory (ORNL) and URS Group implemented accelerated anaerobic biodegradation (AAB) to remediate several of the plumes. Organic carbon substrate is delivered to the subsurface using rows of permanent wells installed along transects perpendicular to the flow of groundwater. Groundwater is injected and extracted from alternating wells to create a “push-pull” effect to distribute substrate laterally across the width of the plume.

SRS, a commercially available emulsified vegetable oil (EVO) product produced by Terra Systems, Inc., is added to extracted groundwater before it is reinjected. SRS is prepared with 4 to 6 percent sodium lactate and 60 percent vegetable oil. Sodium lactate, which is 100 percent soluble in water, provides a readily available source of carbon, and is very mobile in the subsurface. EVO is relatively insoluble in water, and provides a longer lasting carbon source to maintain the necessary anaerobic conditions for AAB. It is less mobile than the sodium lactate because it tends to adsorb to soil particles.

Distribution and availability of substrate is monitored by measuring dissolved total organic carbon (TOC) in groundwater. This monitoring provides general data for organic carbon distribution but it does not differentiate its source, i.e., sodium lactate or EVO. To more accurately assess the distribution of EVO during push-pull recirculation, a field demonstration will be conducted during a round of injections scheduled for August 2007. Four groundwater monitoring wells will be installed between an injection well and an extraction well. During the injection event, groundwater samples will be collected daily and analyzed for:

- TOC
- conductivity
- oil and grease (O&G) as an indicator of vegetable oil
- volatile fatty acids (VFAs) as an indicator of sodium lactate
- specific conductivity

These data will be evaluated to determine the following:

1. Confirm or modify the conceptual model of how EVO is distributed in the subsurface.
2. Quantify the different rates at which sodium lactate and EVO are transported during an injection event.
3. Develop a simple protocol for determining distribution of co-injected substrates using O&G and VFA analytical methods.