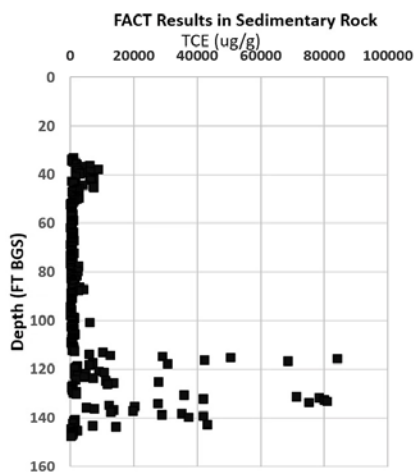




## FACT – Flute Activated Carbon Technique

Our FACT service is an innovative method developed by Flute for mapping the dissolved phase contaminant distribution in a sealed borehole with 6" to 3' resolution.



FACT results for TCE on a 6" scale.



FACT Construction, with the FACT stitched between the NAPL Flute cover (striped) and a diffusion barrier (silver).

## How the Service Works

The FACT engineering service involves the use of a 1.5" continuous strip of activated carbon felt that is added to the NAPL Flute and emplaced against the borehole wall during the eversion of a blank liner or installation through GeoProbe rods (for overburden applications). Once positioned against the borehole wall, the FACT services procedure wicks by diffusion, contaminants in pore spaces and fracture flows. As the diffusion process takes place in a sealed borehole, the concentrations recorded during the FACT services are not influenced by cross contamination and/or leakage issues often associated with packer-based characterization. After 2 weeks, the FACT

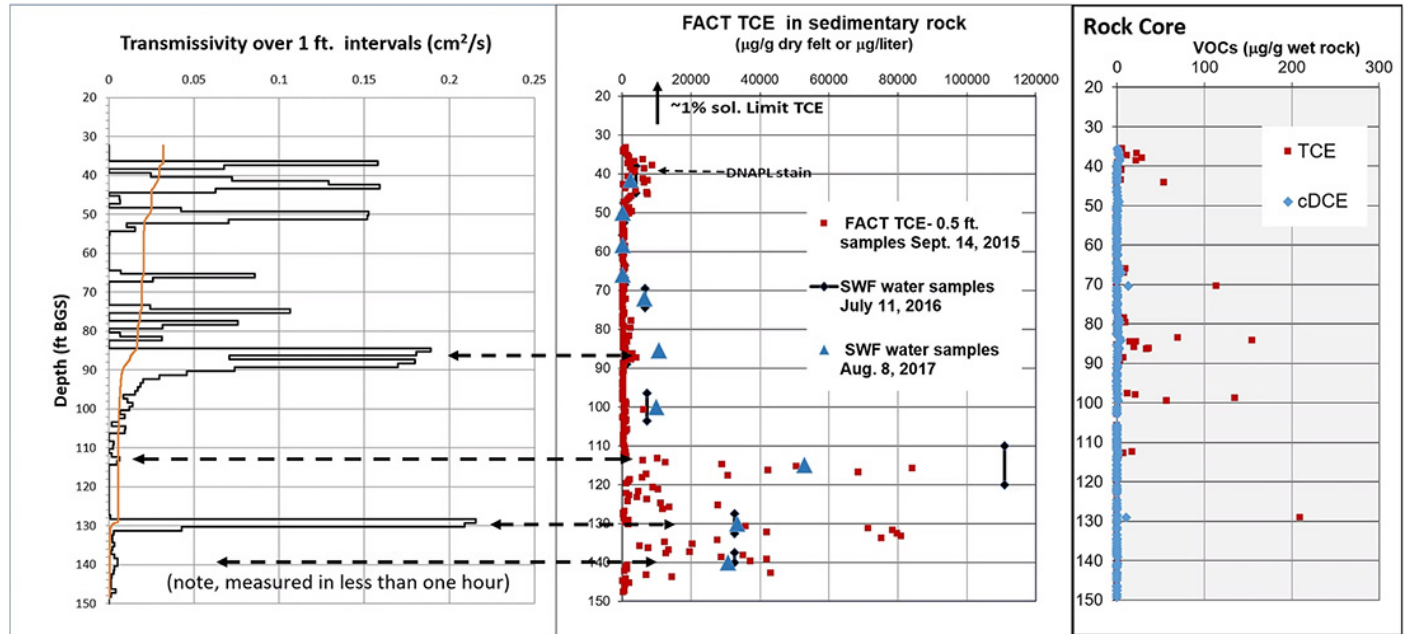
installation is removed from the well, cut into the desired sample intervals (6" to 3') and sent to the lab for analysis (EPA 8265).

The pressure exerted by the liner on the borehole wall (generally 5 to 10 feet of water pressure) creates a strong seal which prevents preferential flows from developing. Concerns of influence by contact with borehole water are put to rest from the protection provided by the hydrophobic NAPL Flute cover and very fast installation and removal procedures. This minimizes interval exposure times (a few seconds). As a precaution, the borehole water is usually pumped from the hole as the liner is everted.

## FACT Service Results

The measurements obtained by the FACT method are very representative and therefore show where the true contaminant peaks are located at depth. The replica contaminant distribution

can be used along with Flute Transmissivity Profiling data to design a multi-level groundwater sampling system and fate/transport CSM.



Transmissivity Profile and FACT data. Note the high TCE concentrations at 112' and 140' BGS in very low transmissive fractures compared to low TCE concentrations in high flowing fractures at 90' and 130'. The TCE concentrations at 140' and 112' are the same or twice as high, respectively, as the highest flowing fracture in the borehole at 130' despite the fact that they are two of the lowest flowing fractures in the borehole. This data emphasizes the need for high resolution methods rather than coarse measurements to assure that all significant contaminant source zones are properly identified during characterization. Water Samples (green diamonds), validate the FACT concentrations.

## TECHNICAL NOTES

### Installation Times

Solinst Flute liner systems should be installed as quickly as possible after the hole is drilled to minimize cross connection effects of the borehole water on the pore water in the open borehole.

### Reaction Times

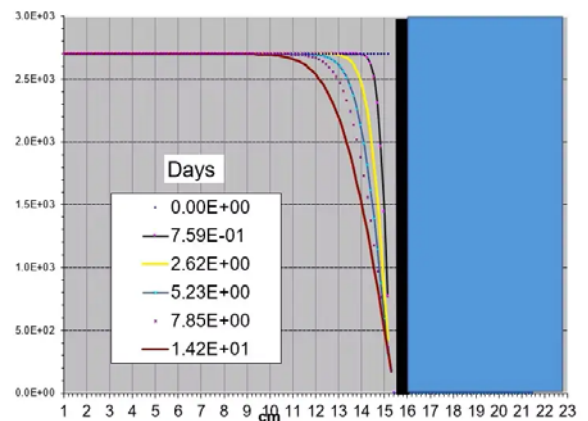
#### Vadose Zone

The FACT is typically left in place for 48 hours for a vadose zone installation to allow the diffusion process from the formation into the carbon.

#### Saturated Zone

The FACT should be left in place in the saturated zone for about two weeks due to the diffusion coefficient being much smaller in water than in air. A diffusion calculation shows that two days is long enough to "see" about 0.5cm into the borehole wall with 7% porosity. Concentration in pores is 2,700 µg/L. That improves after 2 weeks.

Diffusion of TCE at indicated days along axis in plane geom. with 7% porosity and a carbon sink at 15.15 cm



Academic Analysis of the FACT: A master's thesis is available by Monique Beyer of the Danish Technical University which is a rigorous assessment of the FACT analysis method and its use for a fractured rock site.