Integration of High-Resolution Site Characterization Direct Sensing Tools

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Background/Objectives. Complex sites often require multiple data streams to gain a better understanding of the subsurface distribution of contaminates and the heterogeneities that often control migration. Multiple ways to combine direct sensing tools have been engineered, so that these data streams are collected in a single push at the same location. The simplest of these, which has been widely, used is the Membrane Interface / Hydraulic Profiling Tool (MiHPT) from GeoProbe. More recently, Cascade has also combined; the Waterloo Advanced Profiling System (WaterlooAPS) with Electrical Conductivity (EC), and the WaterlooAPS with Dakota Technologies' Ultra Violet Screening Tool (UVOST). Collecting multiple data streams from a single location has reduced the duration and increased the resolution of several site characterization efforts. We will provide our experience with the design and application of these technologies, including several site data sets.

Approach/Activities. The need to collect multiple data streams has become more apparent as the industry has embraced High Resolution Site Characterization (HRSC) approaches to understand contaminate distribution and small scale heterogeneity in the subsurface. These features can significantly affect the outcome of HRSC efforts and ultimately site remedial options. We will focus on the use of three tools introduced above. Including:

- Membrane Interface / Hydraulic Profiling Tool (MiHPT).
- Waterloo Advanced Profiling System (WaterlooAPS) with Electrical Conductivity (EC), and
- WaterlooAPS with Dakota Technologies' Ultra Violet Screening Tool (UVOST).

These tools have been developed for sites with specific needs, all tools provide a log of estimated hydraulic conductivity. This parameter is critical to understand how the contaminant will interact with the small scale heterogeneities at a site. Depending on the contaminant or contaminates a site the detector configuration will be determined. Cascade will present the tool selection process that we use to determine the most appropriate combinations.
In almost all cases these data are incorporated into an Earth Volumetric Studio (EVS) 3D models for the sites. Data collected from direct sensing tools are collected at high vertical densities to ensure that the entire vertical column of the subsurface is assessed. The density of data points and the multiple sensors require visual integration of the data sets so that they can be assed in near real-time efforts.

In addition the data are combined with the more quantitative data sets to provide multiple lines of evidence to support the direct sensing tools and EVS interpretation of subsurface conditions.

Results/Lessons Learned. Cascade will present the engineering design process for these tools, and the application and limitations of their use. We have utilized these tools on several sites and worked through the challenges of combining specific technologies. We will present several data sets of combined tools and how they were applied at specific sites. We are continuing to look at additional combinations and will discuss some of our efforts that are in process.