Making Better Decisions: Real-Time Data Collection and Interpretation

Designing the Investigation and Interpreting the Data

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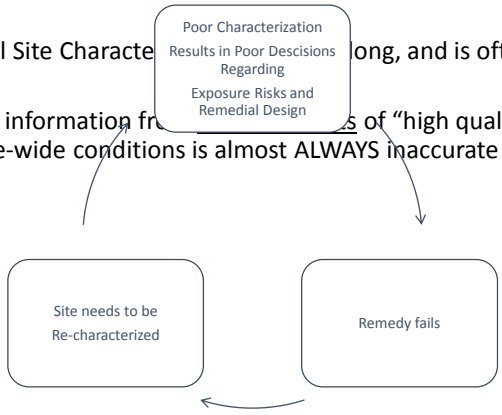
The Problem with Traditional Site Characterization Approaches

Traditional Site Characte ong, and is often incomplete

Extrapolating information fr s of "high quality" data to reflect large site-wide conditions is almost ALWAYS inaccurate & misleading



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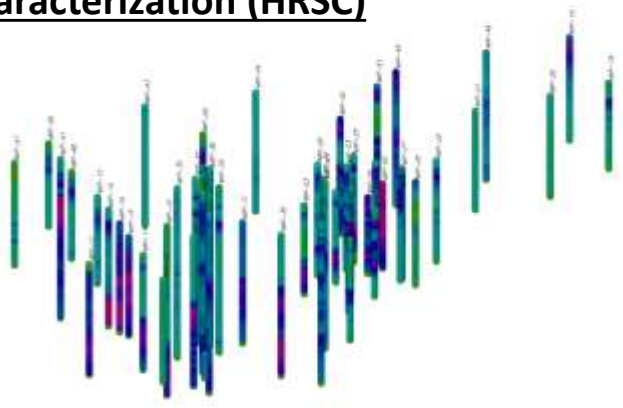
Objectives and Advantages of High Resolution Site Characterization (HRSC)

- Rapid and Complete Site Characterization
- **REDUCES UNCERTAINTY** when implementing remediation strategies
- **Cost Effective** on a program-wide perspective
- Allows for more targeted/appropriate remedial technique



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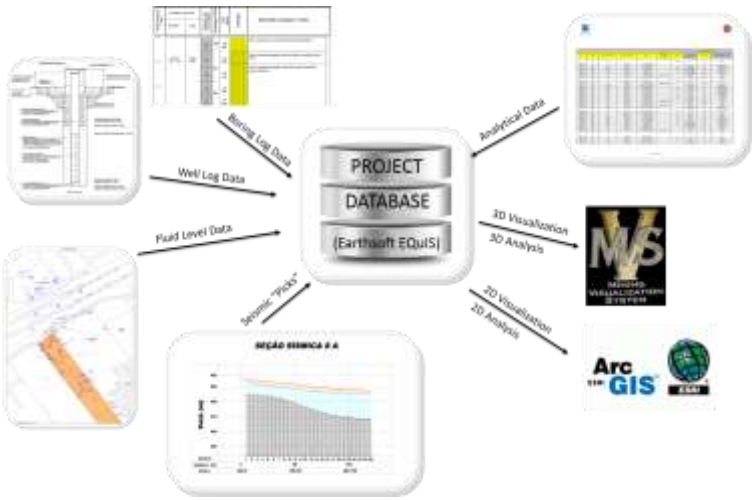
Designing the Investigation

- Evaluate Past Data Sets
  - Analytical Data
  - Geological Data
  - Aerial Photographs
  - San Born Fire Insurance Maps
  - Previous Reports



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Designing the Investigation

•Conceptual Site Model
The conceptual site model is a critical tool that should be used to identify sources, receptors and pathways associated with the area of concern and/or site. The conceptual site model should support scientific and technical decisions for the site. The conceptual site model can also assist the investigator to communicate effectively with interested parties about the critical issues, and/or processes identified at the site, and support the remedial decision making process. Development and refinement of the conceptual site model will help identify data gaps in the characterization process and can ultimately support remedial decision making.

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Designing the Investigation

- Determine the BEST tool for the job:

Maximize data density at the lowest cost per data point with data quality that satisfies data quality objectives. The selected tool(s) must also be feasible to advance based on known site conditions!

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Designing the Investigation – Best Tool For the Job

Overburden

- Membrane Interface Probe (MIP)
  - BTEX : Dissolved phase
  - CVOCs: Source Area & Dissolved
- Laser Induced Fluorescence
  - Hydrocarbons: Residual and Free Product
  - Not Dissolved phase
- Electrical Conductivity (EC), Hydraulic Profiling Tool (HPT) & Cone Penetrometer (CPT)
  - Soil Lithology
  - Historic Fill
  - Preferential Pathways/Targeting sample Intervals
- Mobile Laboratory
  - SVOC – PAHs, Pesticides, PCBs
  - VOCs Below MIP detection limits and Speciation
  - Metals – XRF
  - Test Kits – Numerous available (PCBs, Pesticides, TPH, metals)

Bedrock

- Mobile Laboratory
  - Rock Coring w/ packer testing
  - Matrix Core Analysis
- Flute Liners
- Downhole Geophysical

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Pre-Investigation Site Preparation

- A HRSC daily cost is typically more expensive than traditional sampling programs
- You know more about your site then your contractor!
- Getting a site ready prior to the contractor arriving can save time and money

- Call in you own public utility locate and/or have a professional locate done prior to contractor mobilization.
- Site access – understand access to site and access to potential locations. Inform the property owner/tenants in advance.
- Don't stop with Direct-Sensing to collect soil/groundwater samples unless absolutely necessary.

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Dynamic Work Strategies

- ***Experienced*** field team implements an ***Adaptive Sampling Program***
- ***In-Field Decision-Making*** directs subsequent data collection activities as the ***Conceptual Site Model*** is refined
- ***Iterative*** process continues **In The Field** until sufficient characterization is achieved
- Direct-sensing data provides incredibly dense vertical data sets. **However, it does nothing for horizontal data density!**

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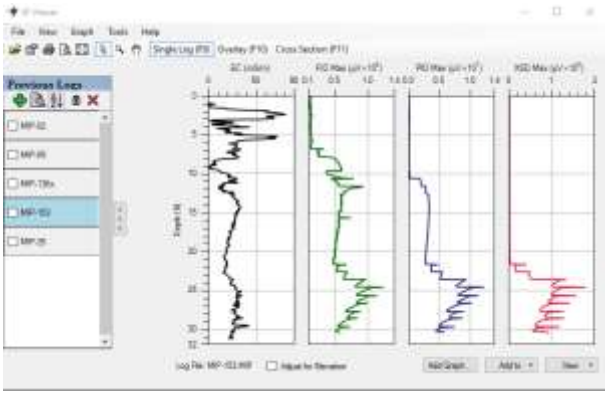
Interpreting HRSC Data

- HRSC programs generate a tremendous amount of data. It is critical to have a way to visualize the data
  - Basemap and plotting of results in the field
  - Computer based visualization in the field or off-site
  - Good survey information is critical (GPS, auto-leveling, traditional surveying)
- Geoprobe provides free software for viewing their Direct-Sensing Logs
  - http://geoprobe.com/downloads/direct-image-viewer-20



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Interpreting HRSC Data

- Geologic Data – "Making Picks"
  - Looking for patterns
    - EC data shows changes in electrical conductivity typically related to grain-size changes
    - HPT data shows pressure response in the subsurface to the injection of water
    - CPT data shows tip and sleeve pressure
- Direct Sensing Detector Data – "Evaluating Response"
  - Direct-Sensing data provides an electrical response from a detector not a concentration.
  - Must understand limitations of detectors – FID, PID, XSD, UVOST/FFD ….
  - Must understand response tests!

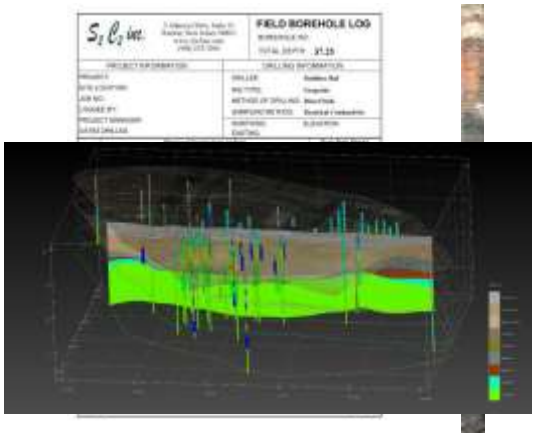
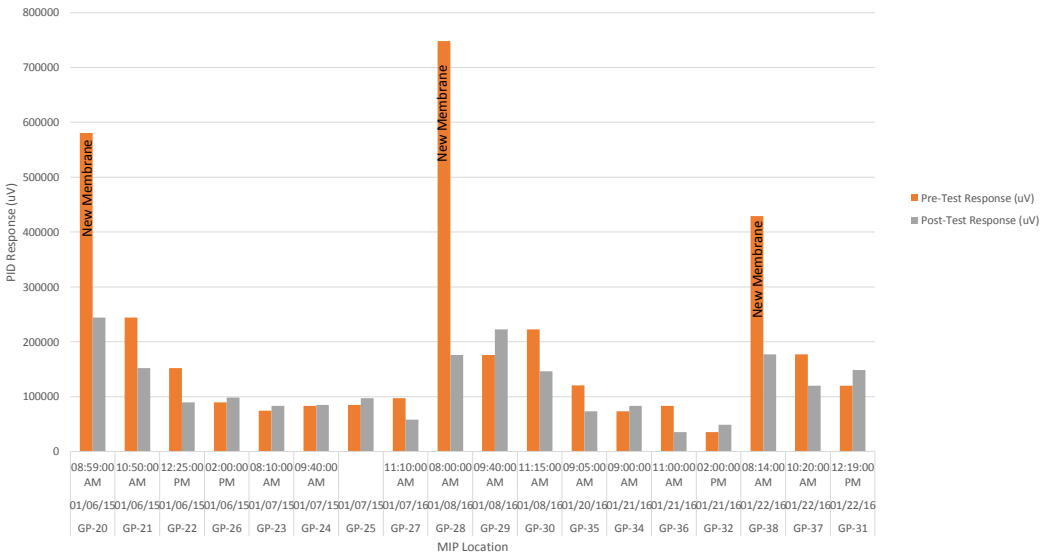
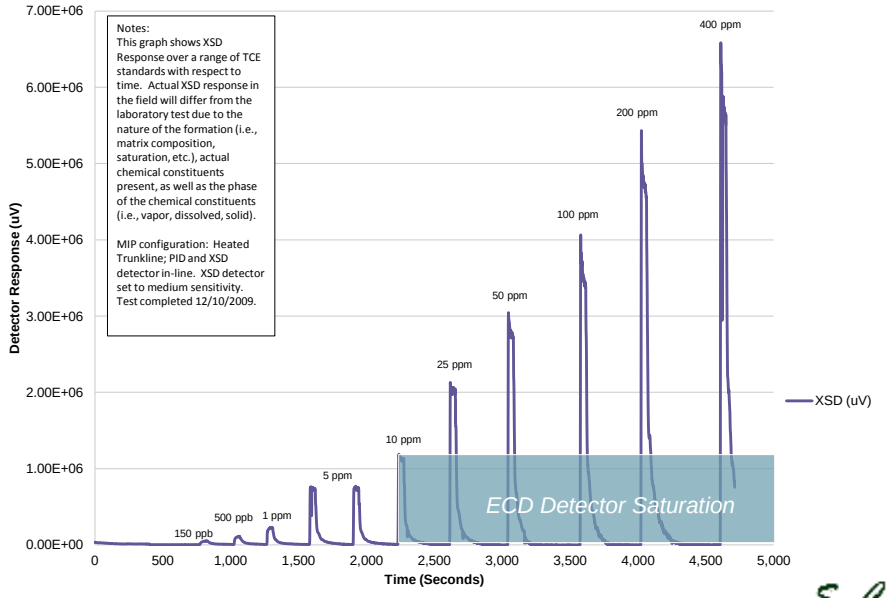
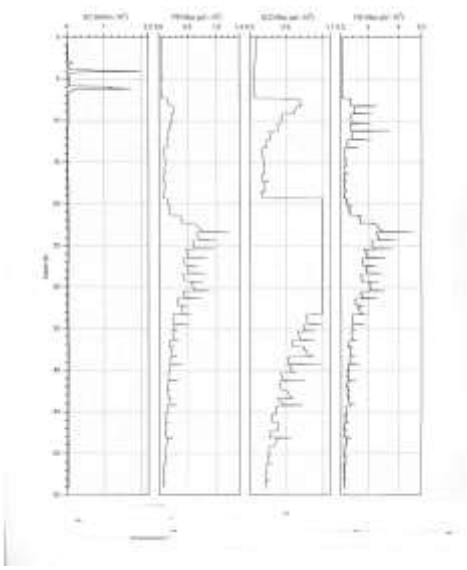


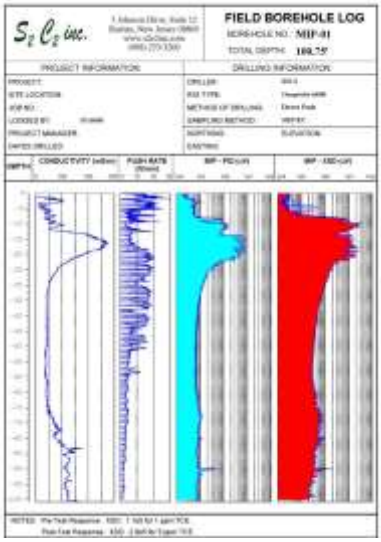
Figure 2: Pre and Post-Test Response Test Histogram
5 ppm Benzene - PID Detector





Example MIP Logs

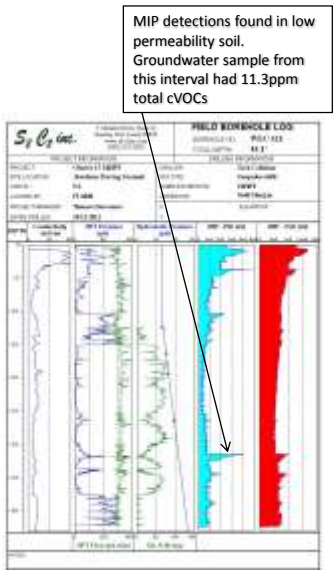




Collaborative Data Sets

- What are Collaborative Data Sets
- Very powerful in 3D-Visualization

THIS IS IMPORTANT!!! – All data points must be located in space correctly or nothing works.



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How do we incorporate sound interpretations into 3D visualization software?

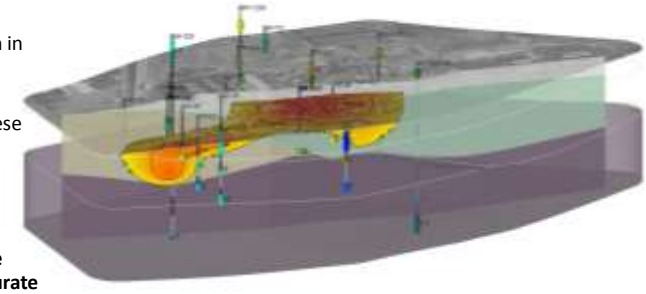
3D Data visualization is increasingly becoming more common in data evaluation.

Overall, this is a good trend; however, it is important that these interpretations be accurate!

3D Data Visualization is only as good as the data!

If the density of data collected is sufficient to manage the uncertainties inherent in a heterogeneous subsurface an accurate interpretation is possible.

Key to good 3D interpretations is good data and experienced professionals interpreting the data!



3D HRSC Animation – CVOC Site

3D HRSC Animation - Arsenic & CVOCs

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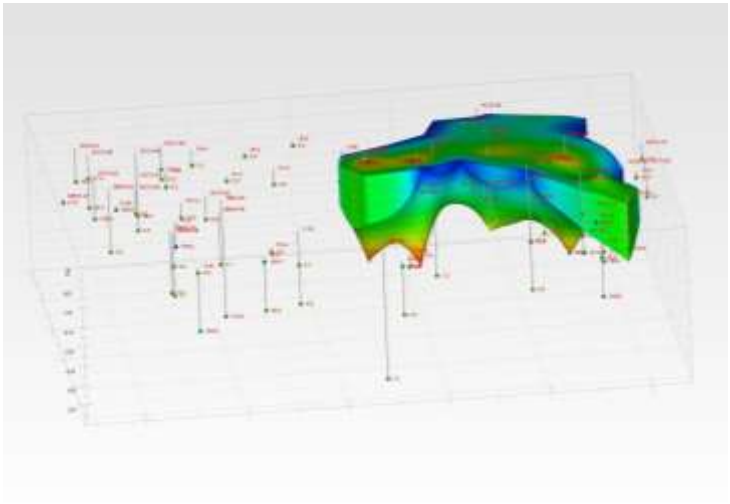
HRSC Data/3D Visualizations and Remediation

Use 3D Visualization to Evaluate Remedial Options

- Injection design
- Volume and Mass of source zones
- Vertical and Horizontal Contaminant Distribution

- Use 3D analysis to evaluate performance as well



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