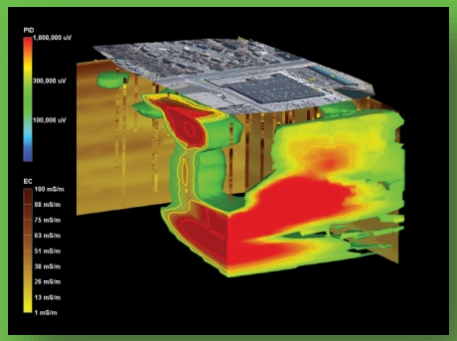
Application of High Resolution Site Characterization Tools for Source Delineation and In-Situ Thermal Treatment Design Optimization

Presented by: Michael Jordan



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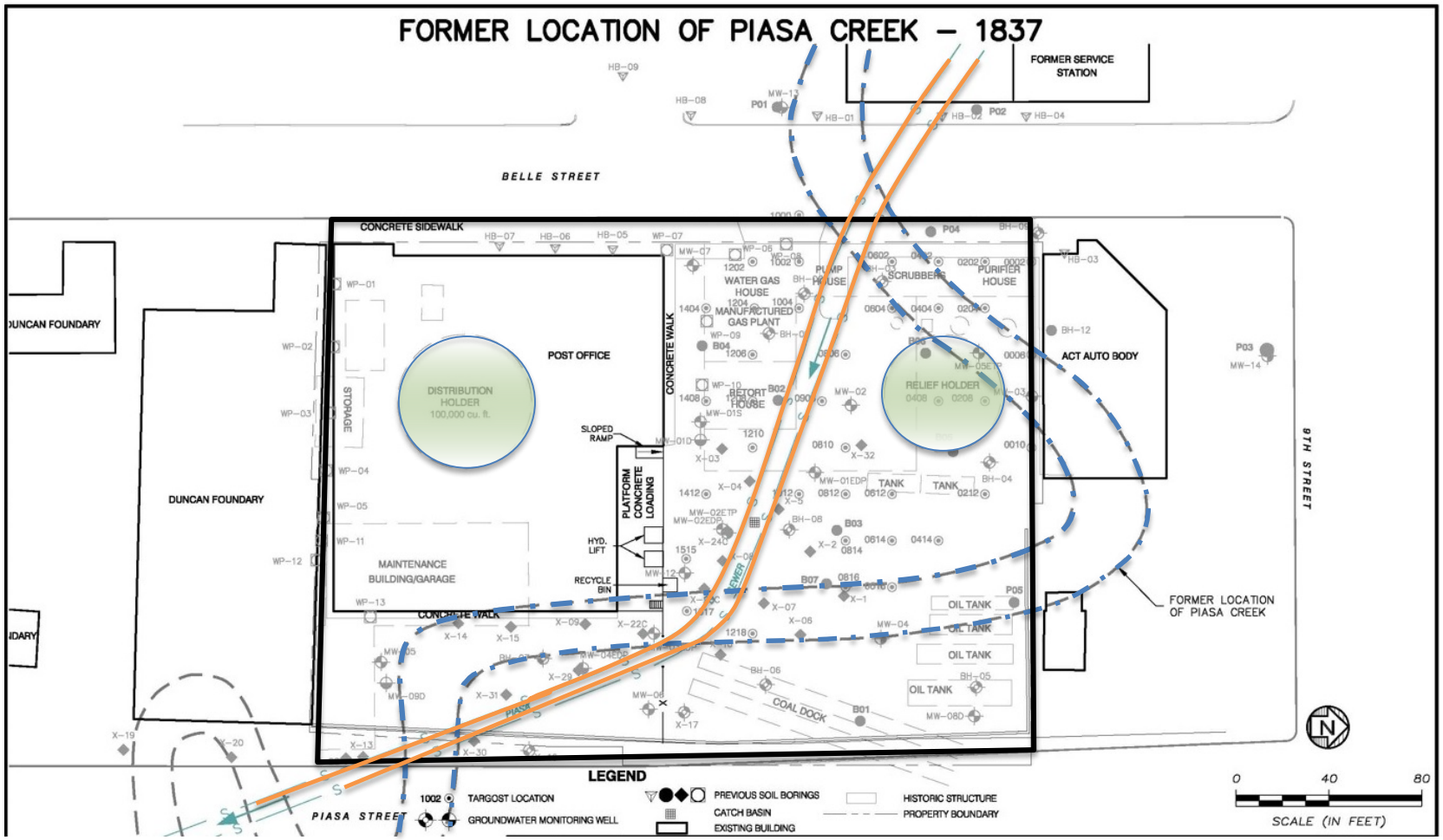
The Problem

"Most people spend more time and energy going around problems than in trying to solve them." -
Henry Ford (1863 - 1947),

- Remedial Investigations often continue for years or even decades
- Many remedies underperform or fail due to a lack of understanding of site conditions and processes (heterogeneity)
- The cost of failed/ underperforming remedies is large
- The costs of excessive long term monitoring programs related to investigating sites with monitoring wells is large
- The costs of High Resolution Site Characterization, which allows one to avoid failed remedies, is small in comparison, but requires an up front investment to result in lower life cycle costs.

Site Constraints



Data Compilation & CSM Development

- Compiled all historic data into a single web hosted database;
- Over 184,000 records were entered
- Worked with our Consultant and Client so that population and access was easily achieved.
- Utilized a collaborative approach in CSM design to compile site knowledge.

Site Data Gap Analysis

- Confirmed limited vertical or horizontal understanding of tar in the subsurface.
- Evaluation of the culvertized stream and former stream bed was incomplete
- Needed to determine impacts to bedrock
- Other source areas not investigated, UST Area, surficial inorganic contamination.

Toolbox for this Site

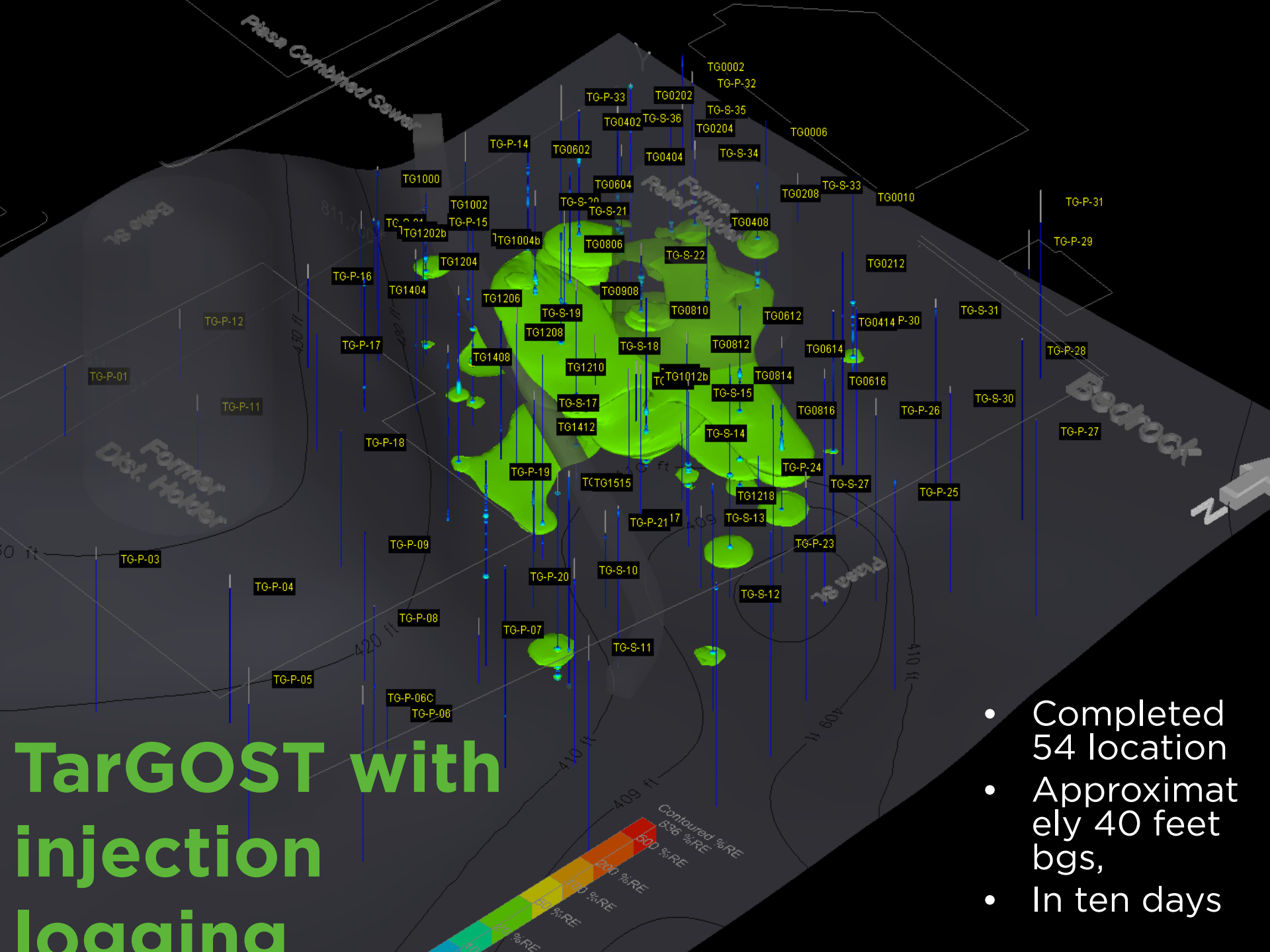
- Geophysical Clearance and Location Services
- Data Handling and Visualization
- TarGOST w/ Injection logging
- Discrete Soil Coring
- Well Installation
- Onsite and Offsite Analytical Analysis
- Hydrolgeologic Assessments

Tools and Technologies

The Right Tools for the Job

Data Handling and Visualization

- Data stream identification and formatting for rapid use within EVS
- Daily updates allowed stakeholder group to perform work in an adaptive approach.



TarGOST with injection logging

- Completed 54 location
- Approximat ely 40 feet bgs,
- In ten days

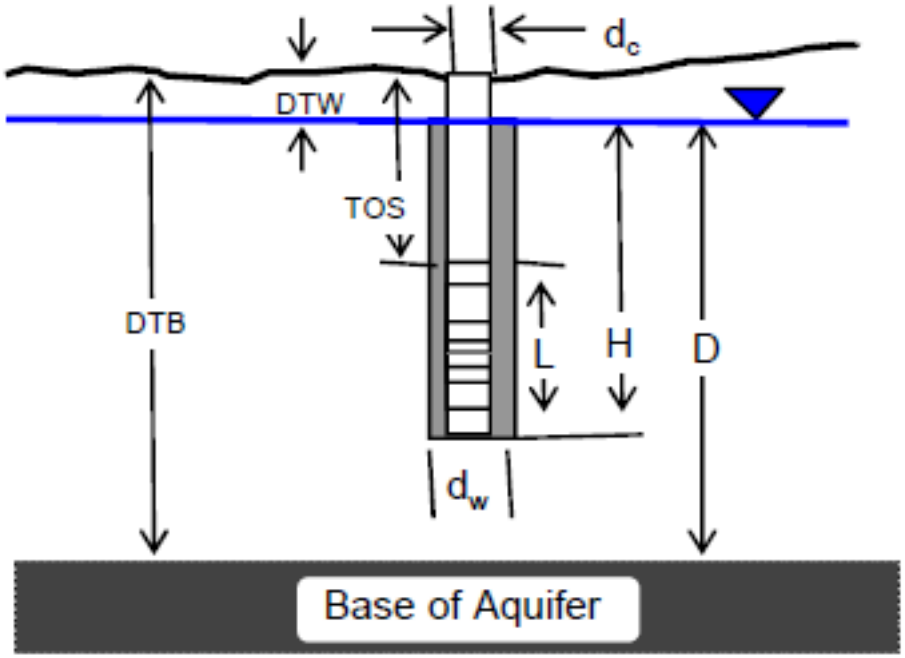
Discrete Soil Coring

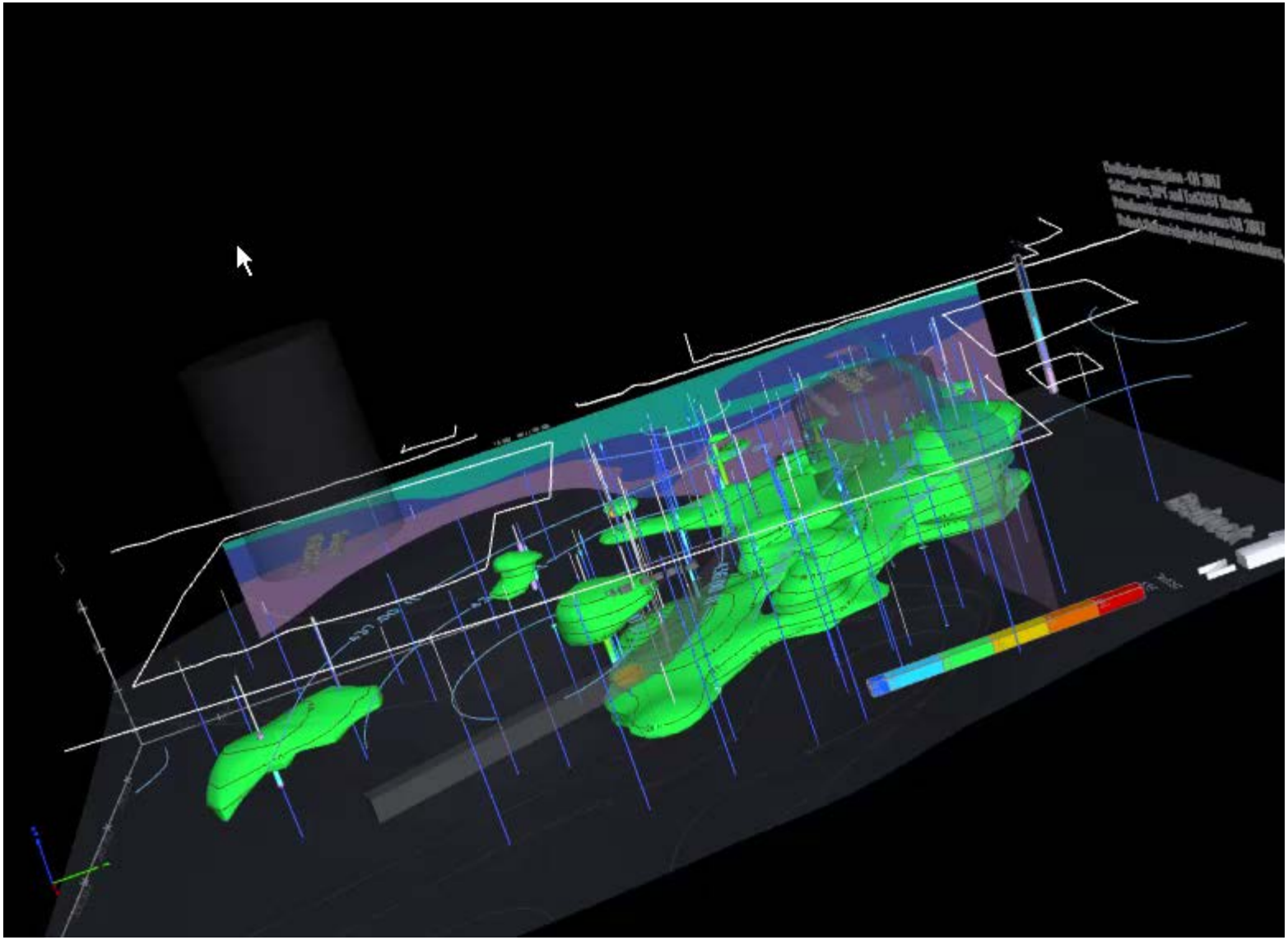
- 18 locations completed at co-located with TarGOST
- Analyzed 138 sample intervals for VOCs and SVOCs

- Onsite analytical provide results daily.
- Visual NAPL/Tar interval information logged

Hydrogeolgic Assessment

- Completed 21 slug test at 4 existing and 3 newly installed wells.
- Wells to be slug tested were located fully within specific unconsolidated units identified onsite.
- Data was used to confirm special distribution of Ik indicated by injection logging





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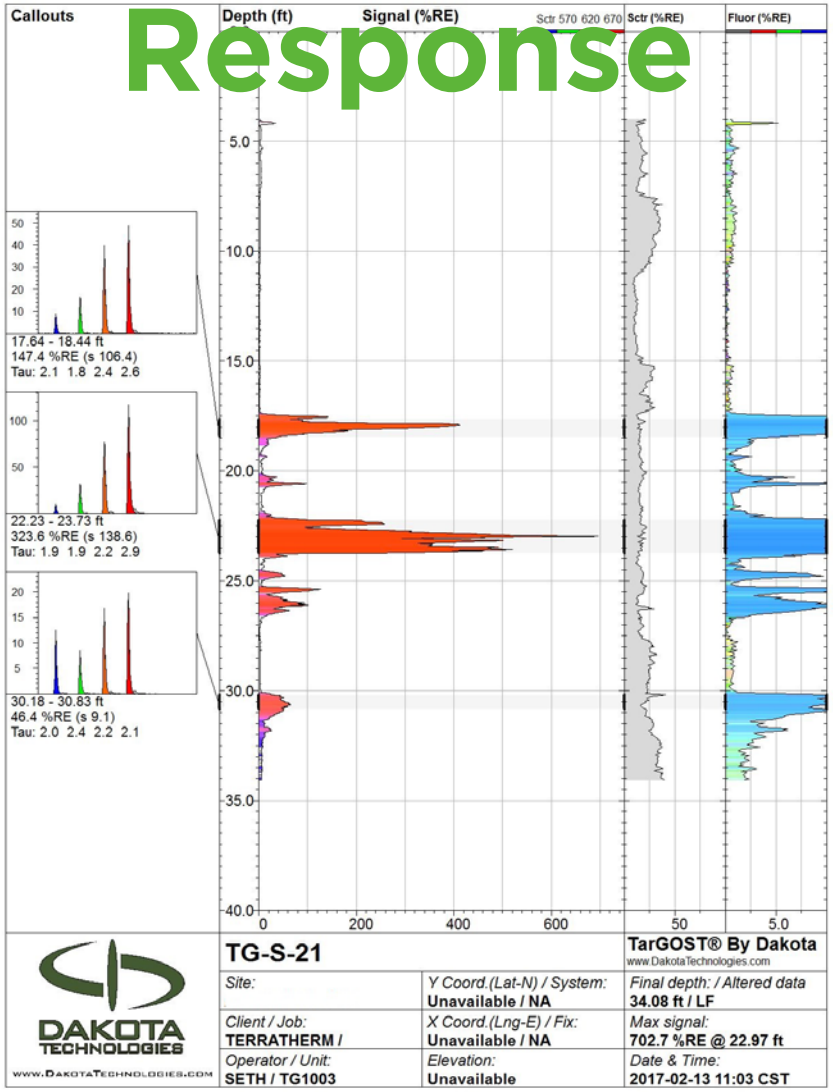
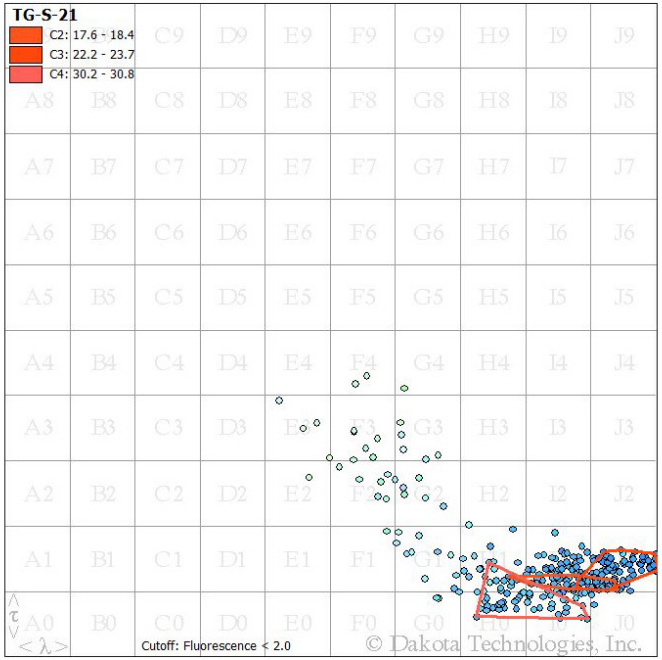
Results

Data Compilation and Analysis

- Distributed quantitative data sets were supported by qualitative data
- All data streams were combined into the Site CSM through EVS model
  - Direct sensing (%RE and Ik)
  - Soil analytical results
  - NAPL/Tar observation
  - Soil boring logs
  - Hydrogeologic assessment data

Positive Signal Response





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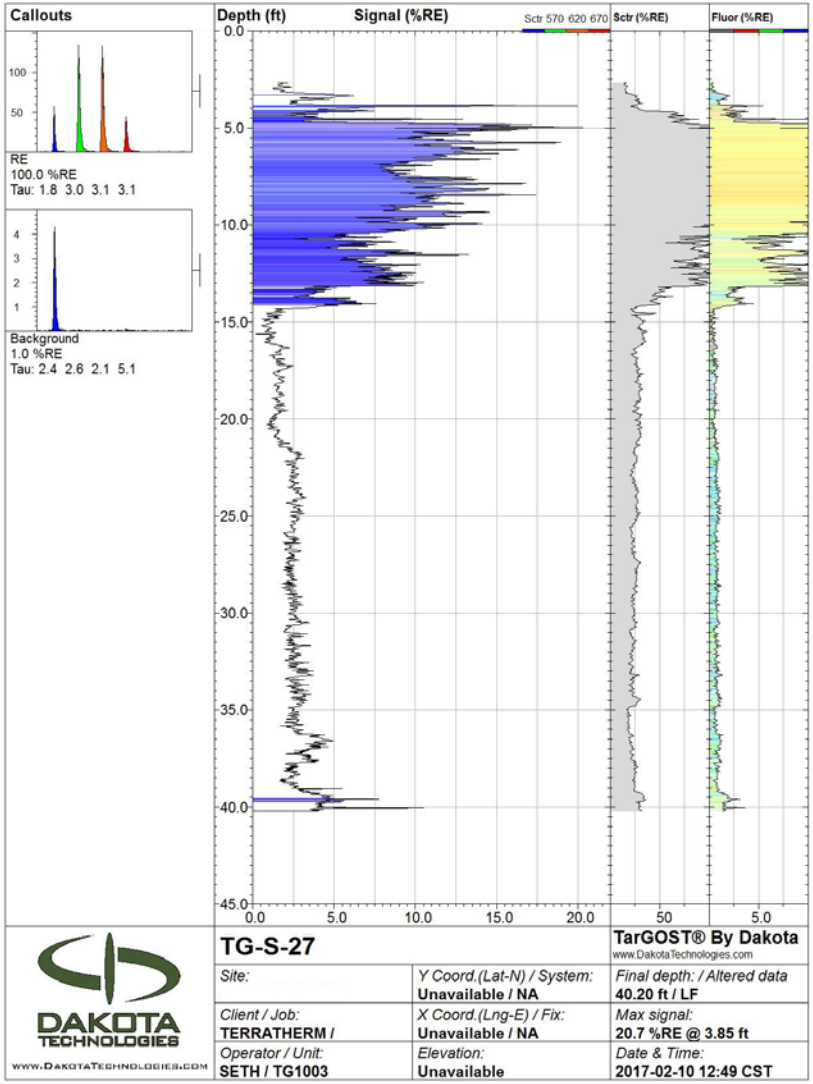
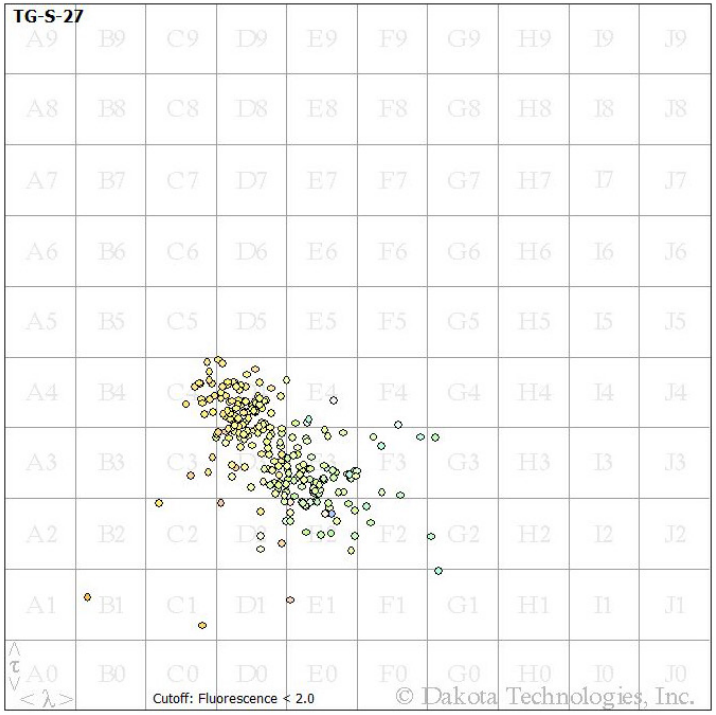
Scatter Response





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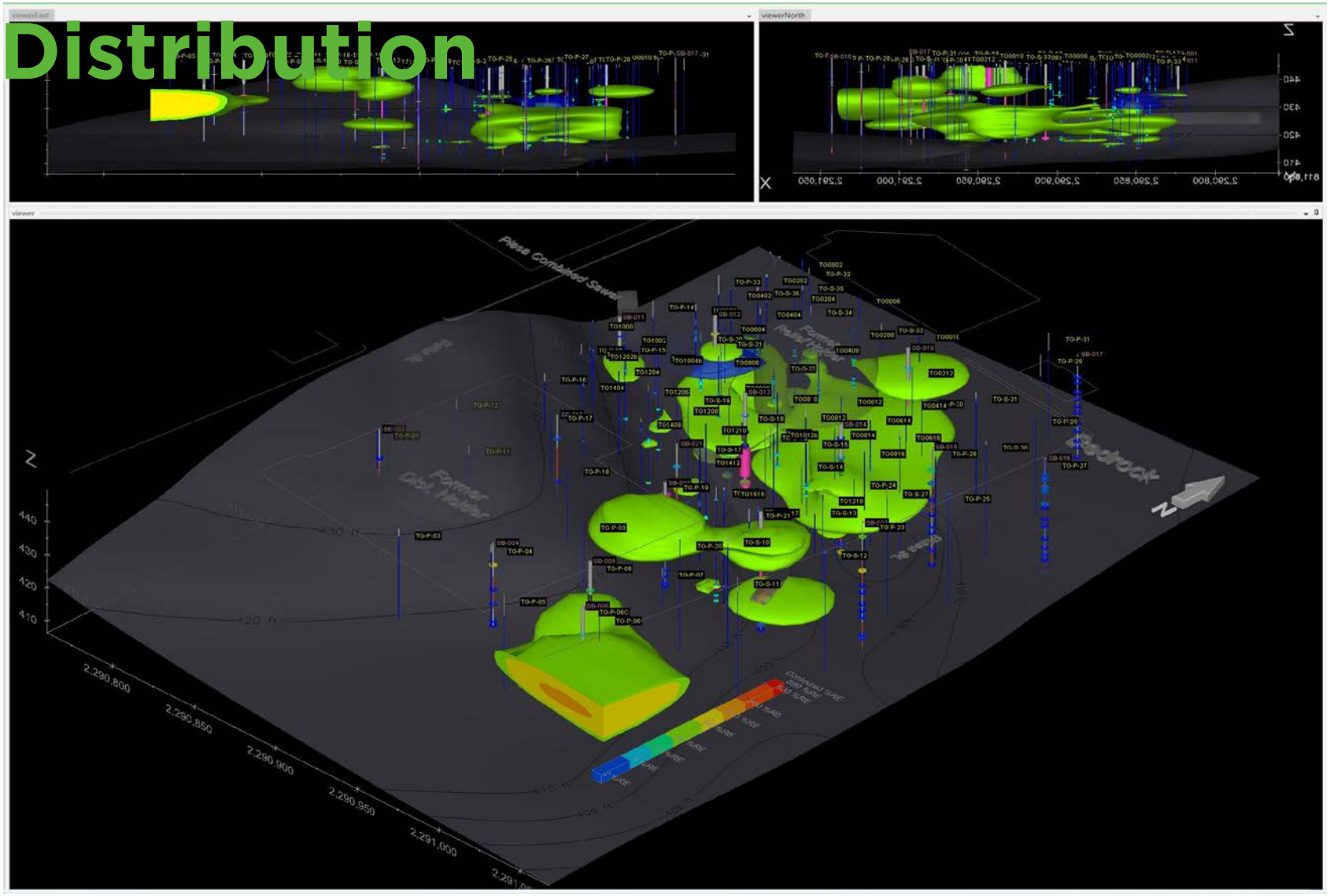
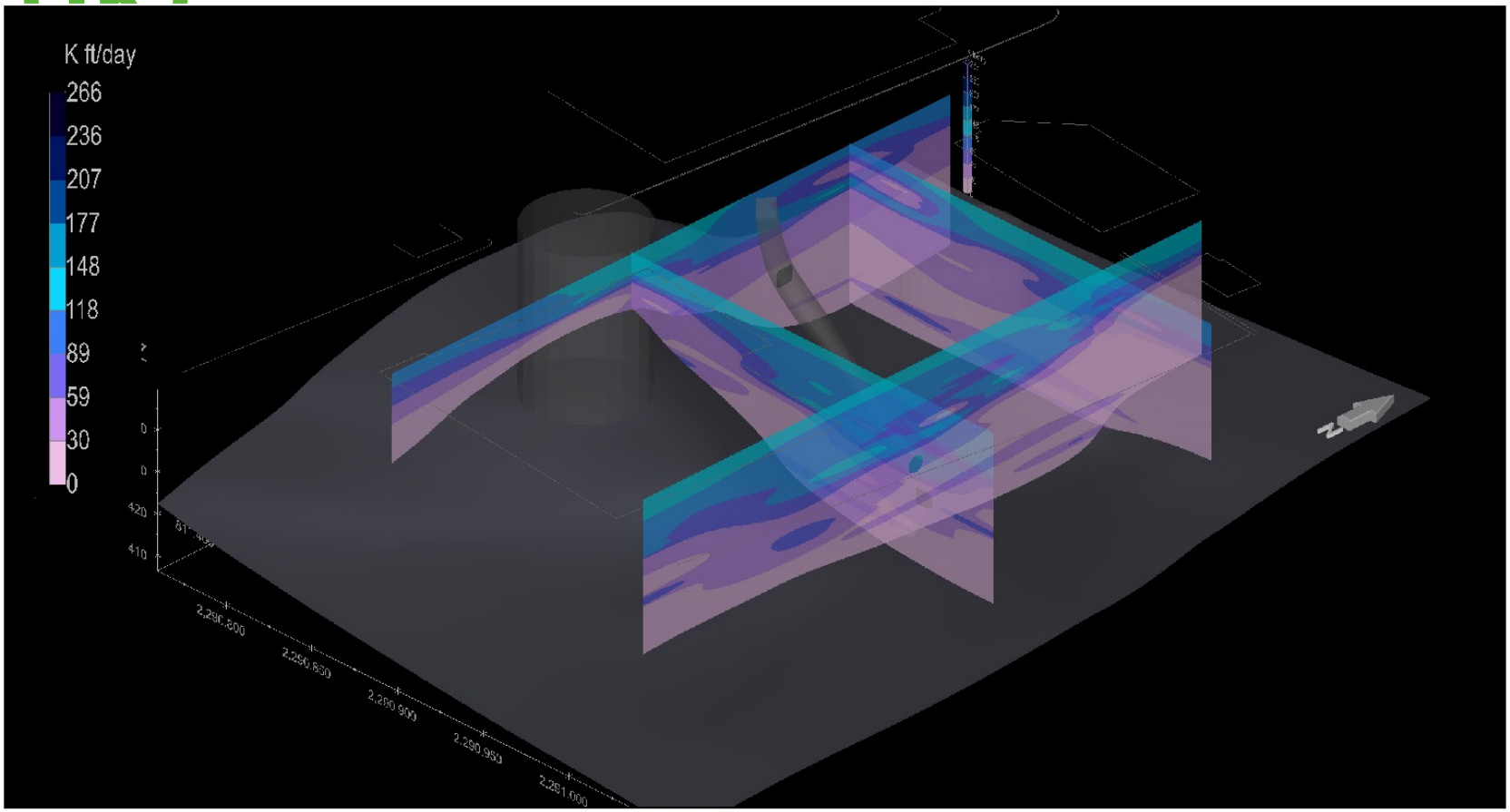
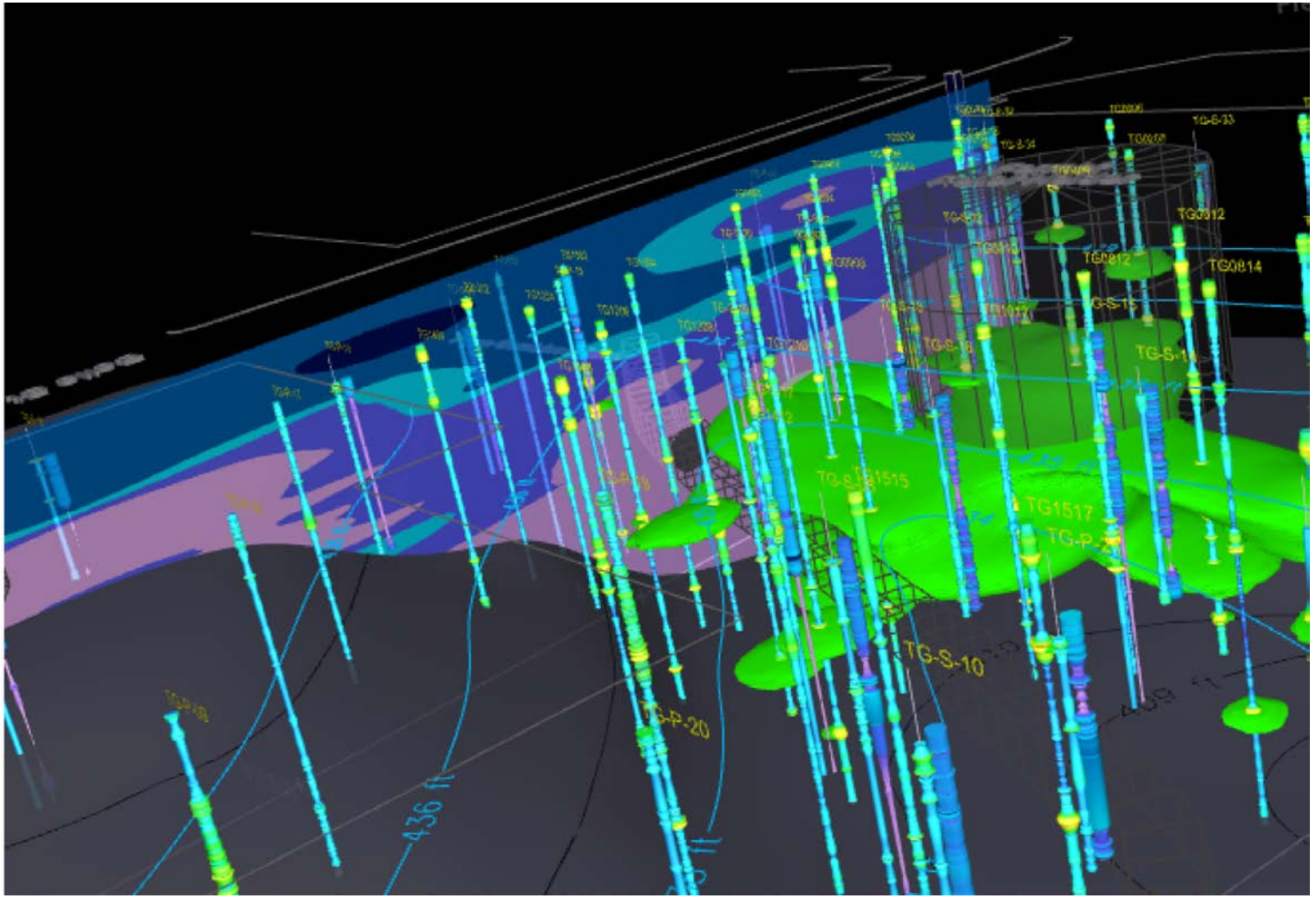
TarGOST and NAPL/Tar Distribution

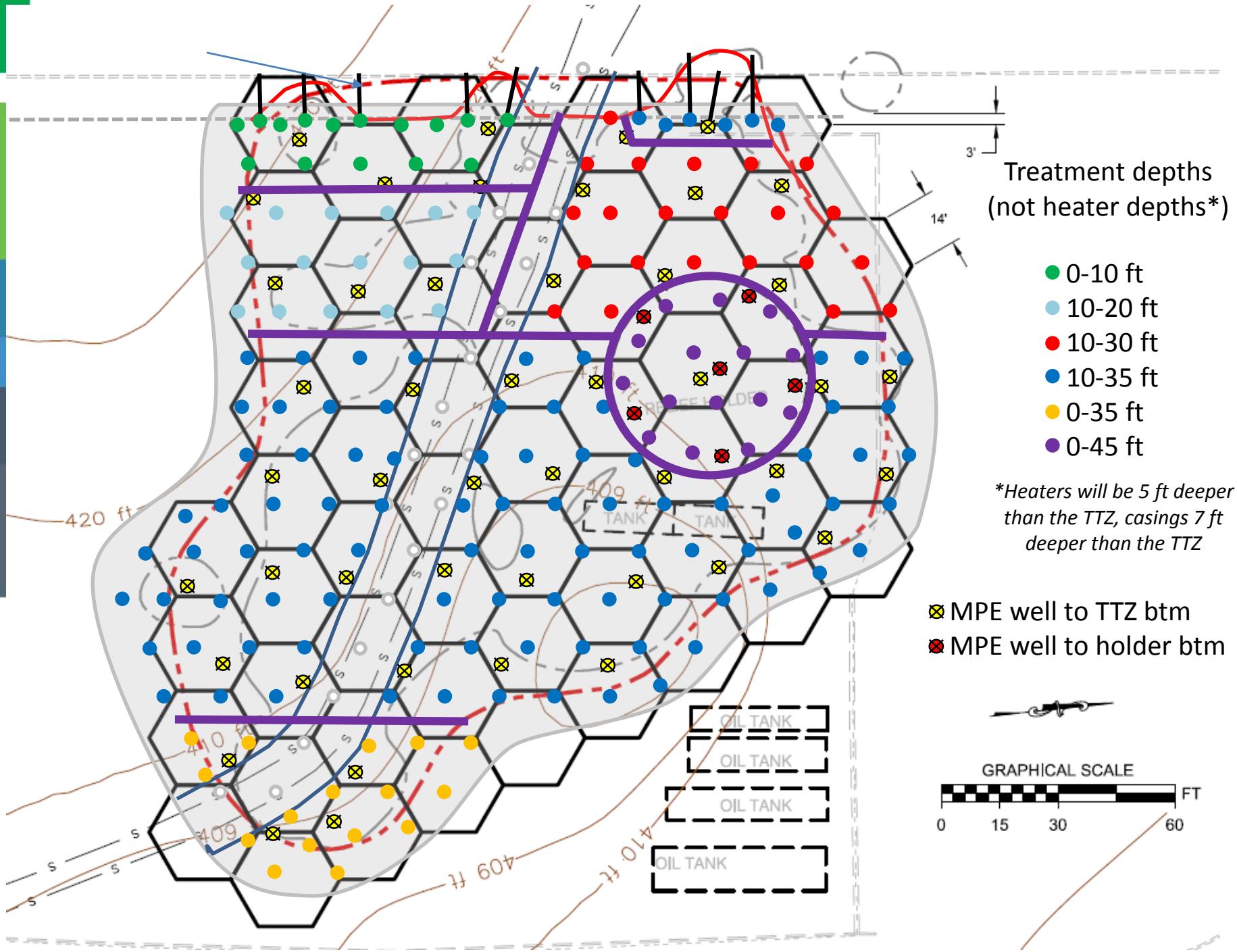


Injection Logging Results (Ik)



Data Compilation




Treatment depths
(not heater depths*)
0-10 ft
10-20 ft
10-30 ft
10-35 ft
0-35 ft
0-45 ft
*Heaters will be 5 ft deeper than the TTZ, casings 7 ft deeper than the TTZ
MPE well to TTZ btm
MPE well to holder btm
GRAPHICAL SCALE
FT
0
15
30
60
3'
14'
420 ft
410 ft
409 ft
OIL TANK
OIL TANK
OIL TANK
OIL TANK
TANK
TANK

Thank you

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