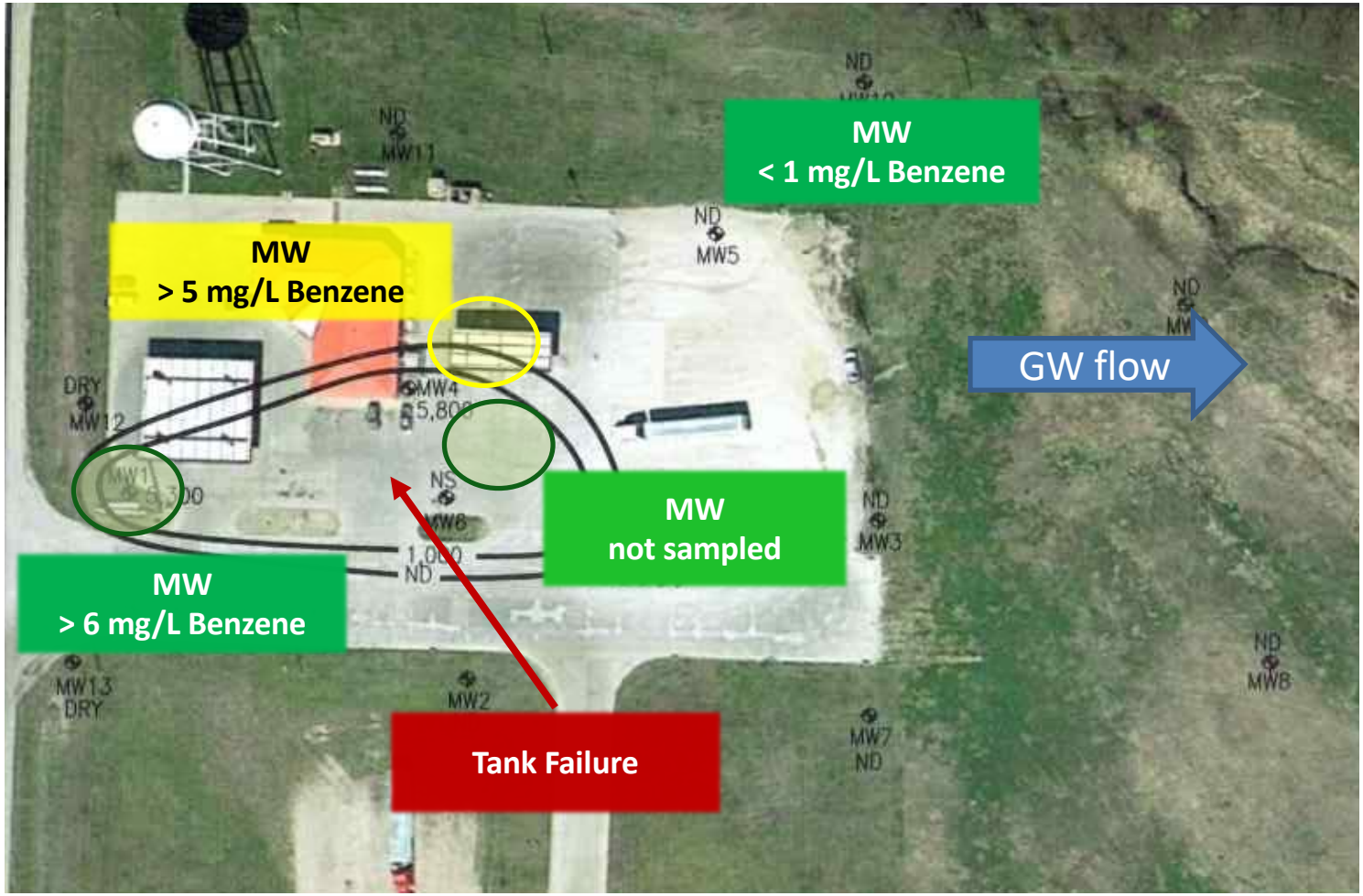
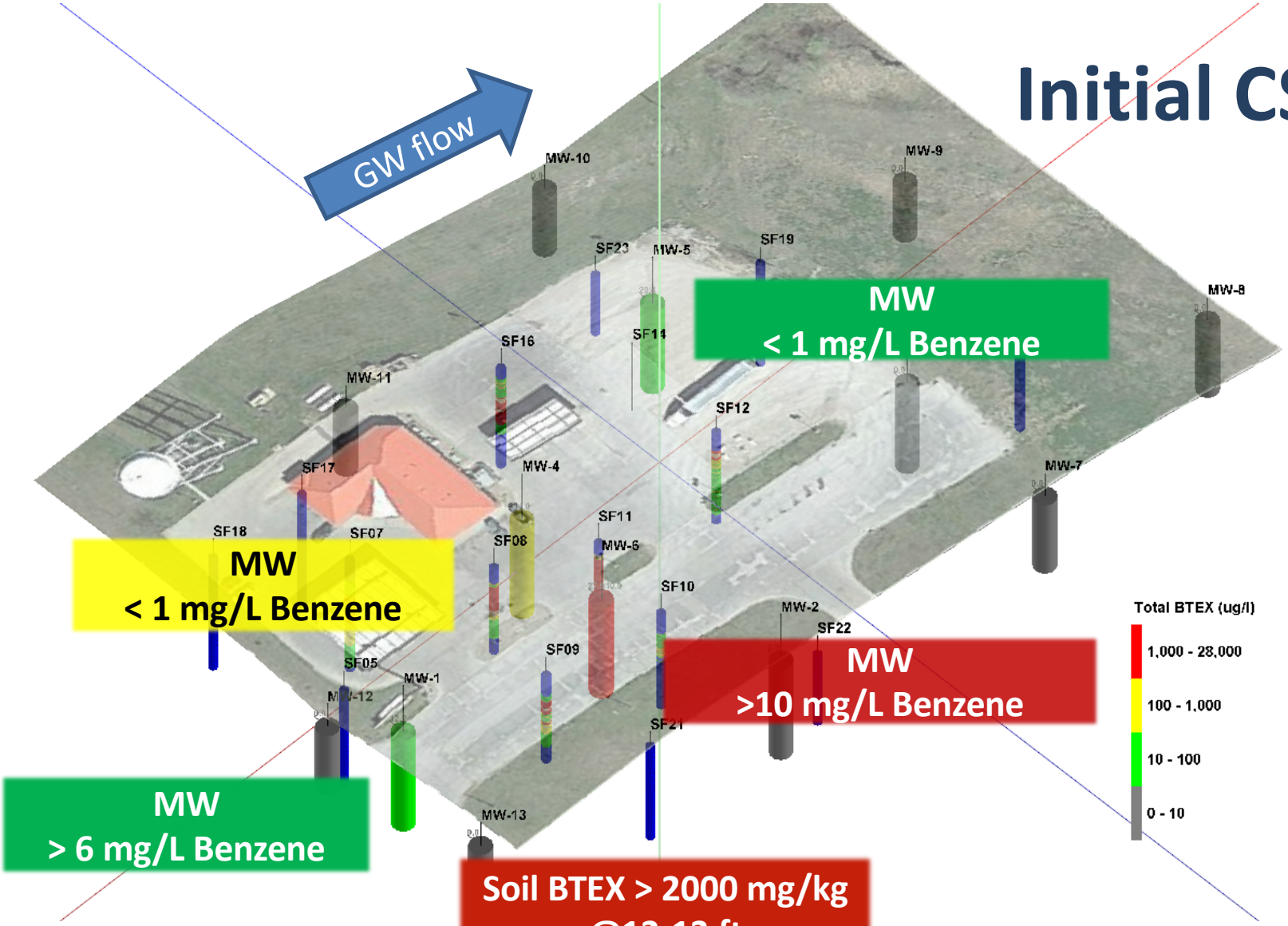
COLUMBIA TECHNOLOGIES

CASE STUDY – COMPARISON OF MULTIPLE LINES OF EVIDENCE

Initial CSM

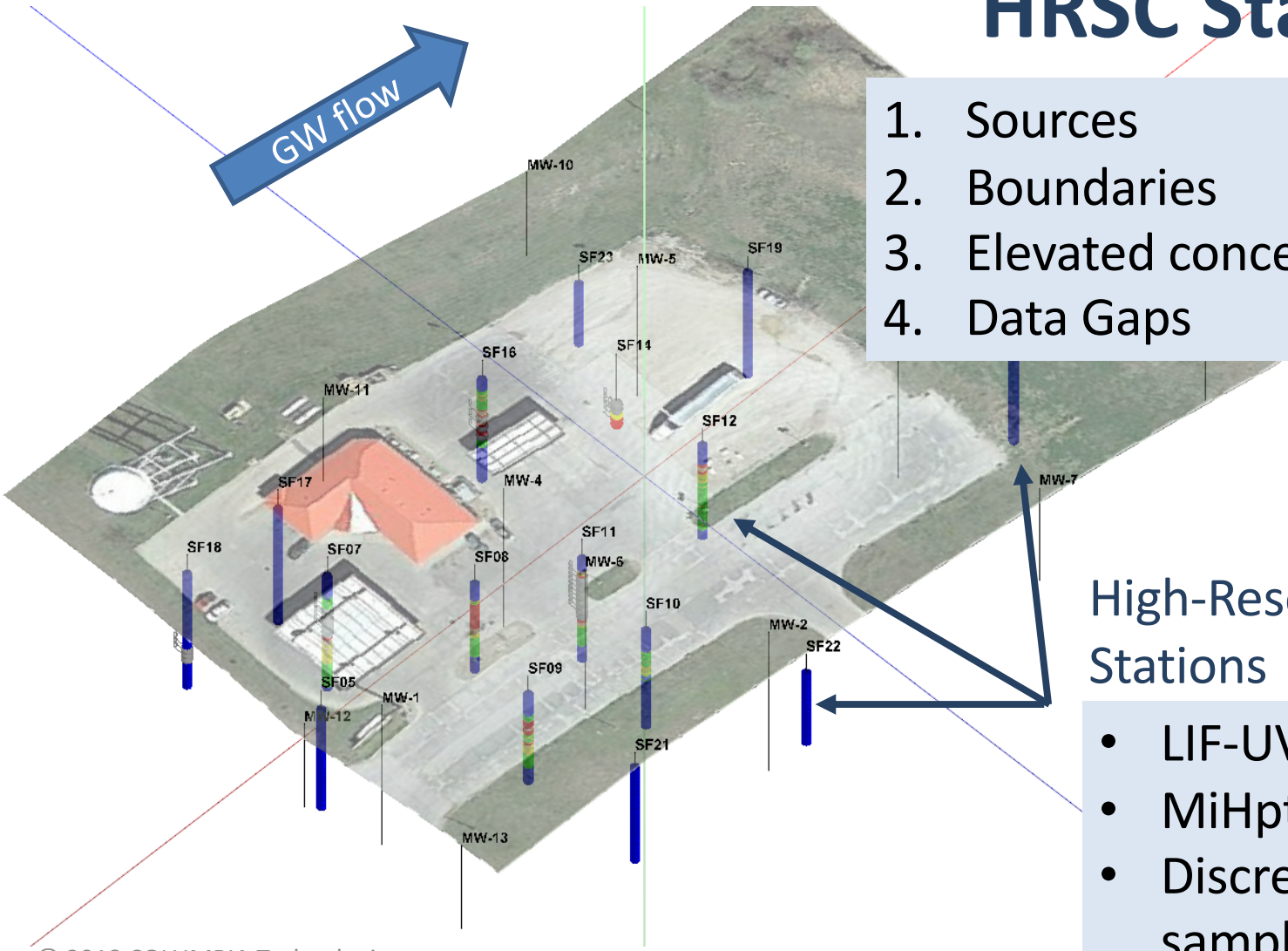


Initial CSM



HRSC Stations

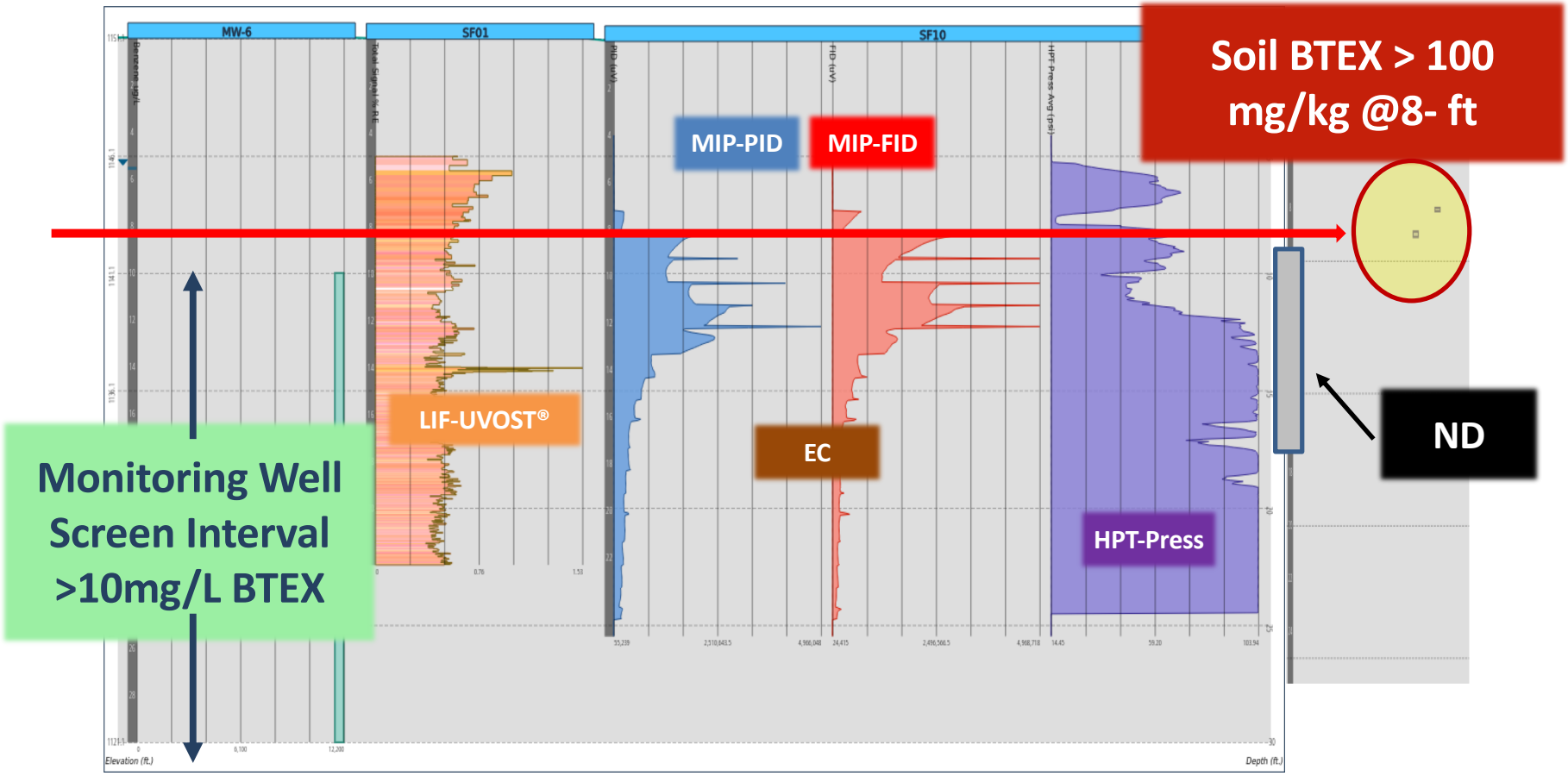
1. Sources
2. Boundaries
3. Elevated concentrations
4. Data Gaps



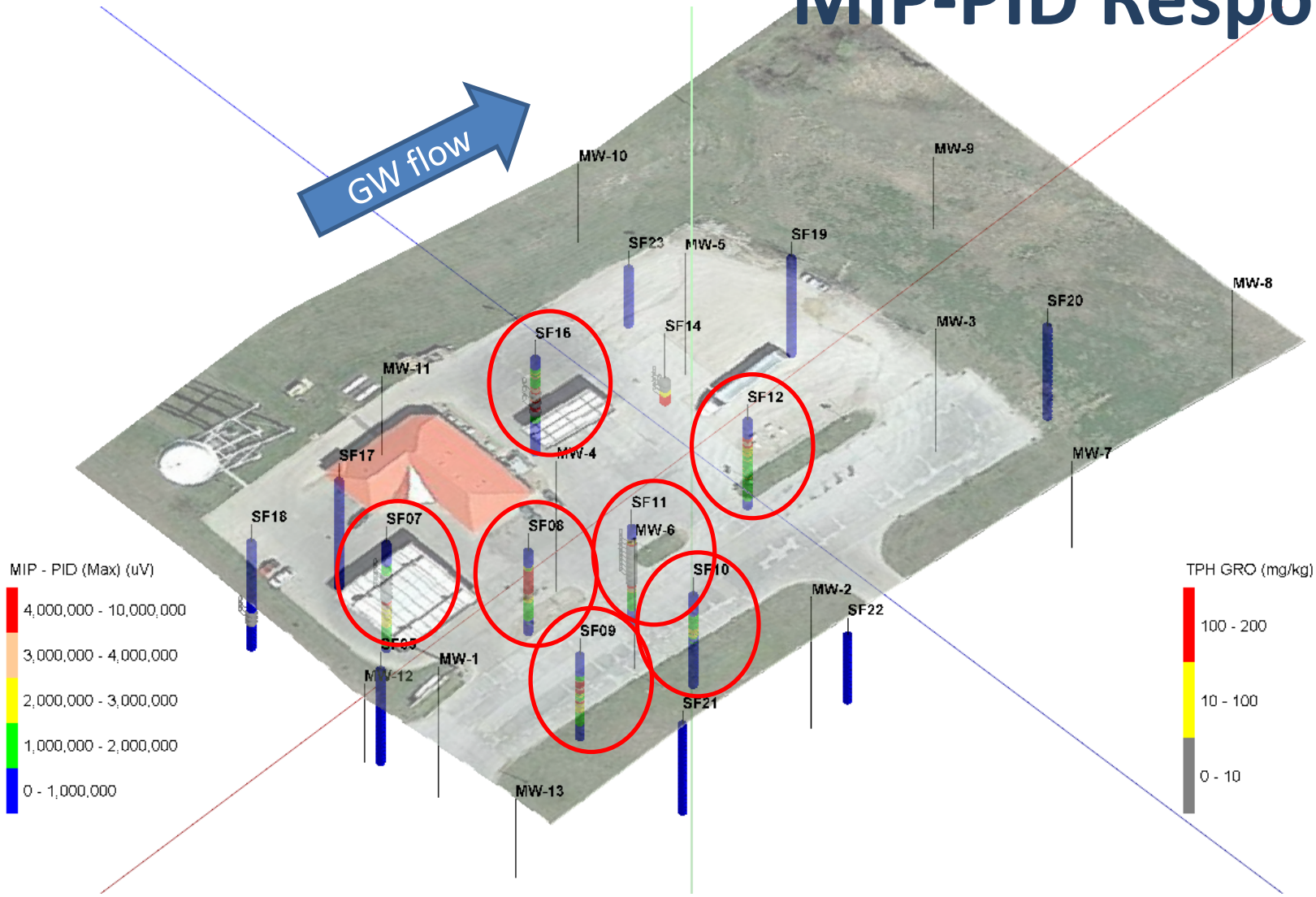
High-Resolution Stations

- LIF-UVOST®
- MiHpt
- Discrete soil sampling

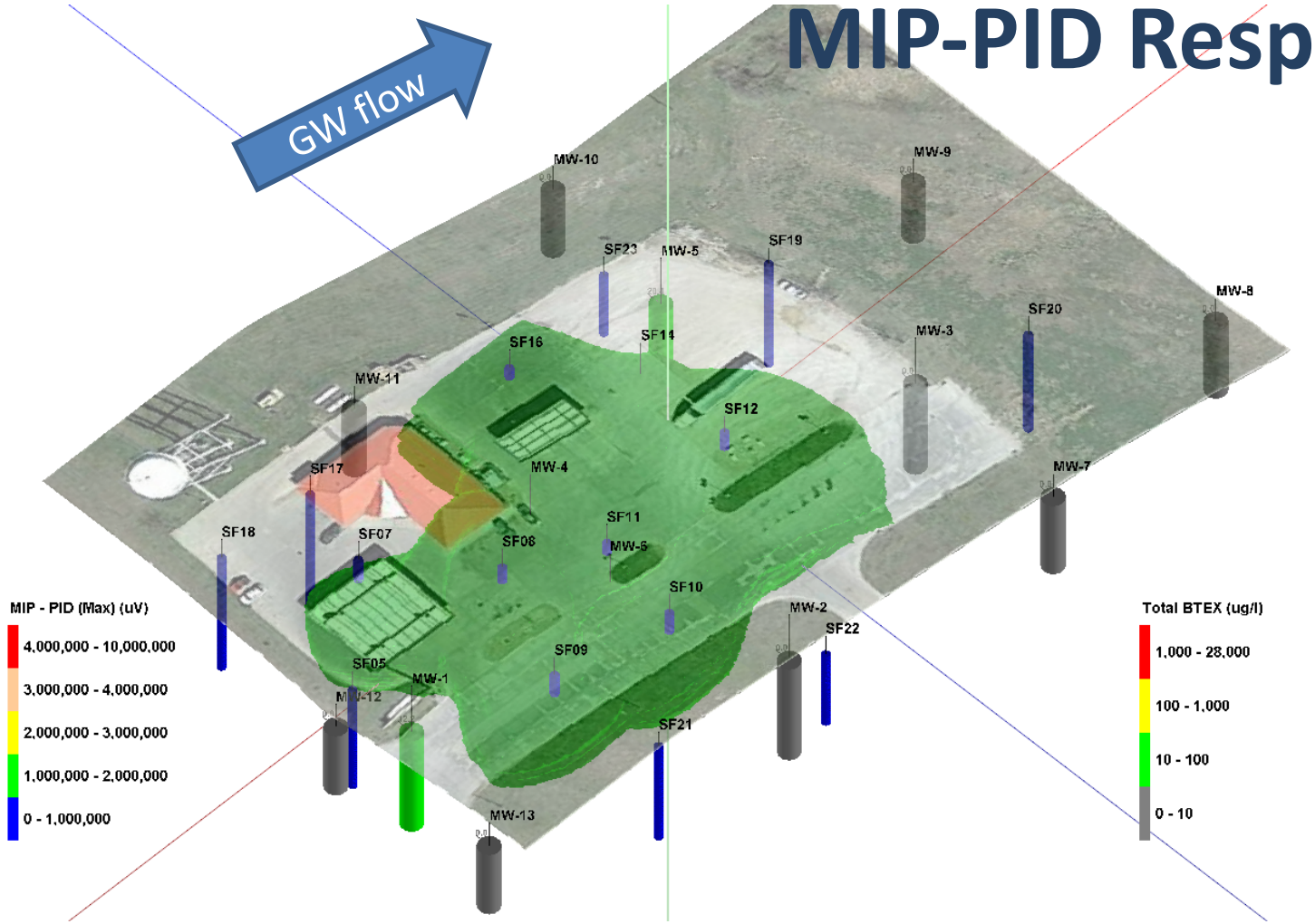
Comparing Lines of Data – Weathered Gasoline Exceeding NAPL Concentrations



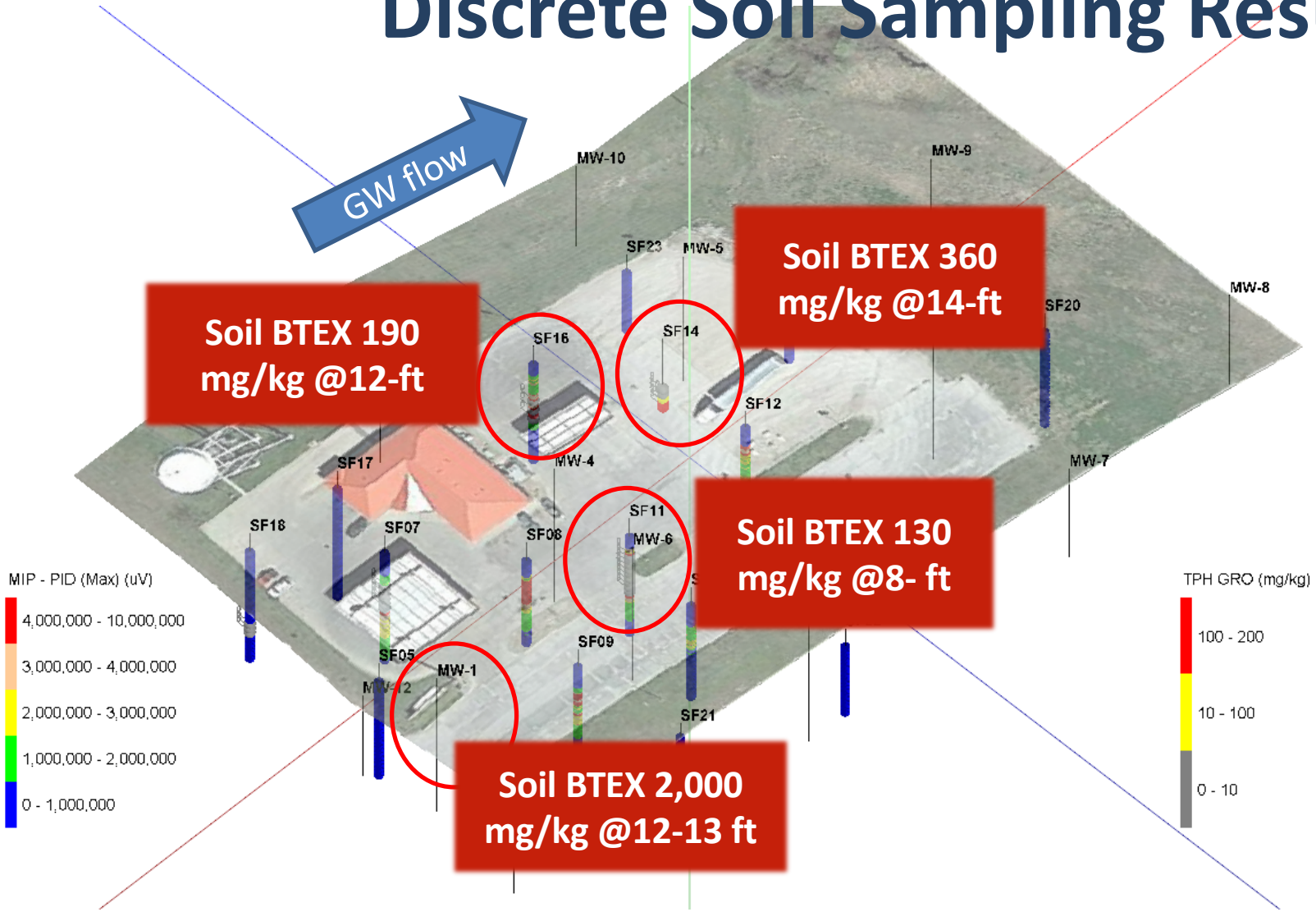
MIP-PID Response



Dissolved Phase (or greater) based on MIP-PID Response



Discrete Soil Sampling Results

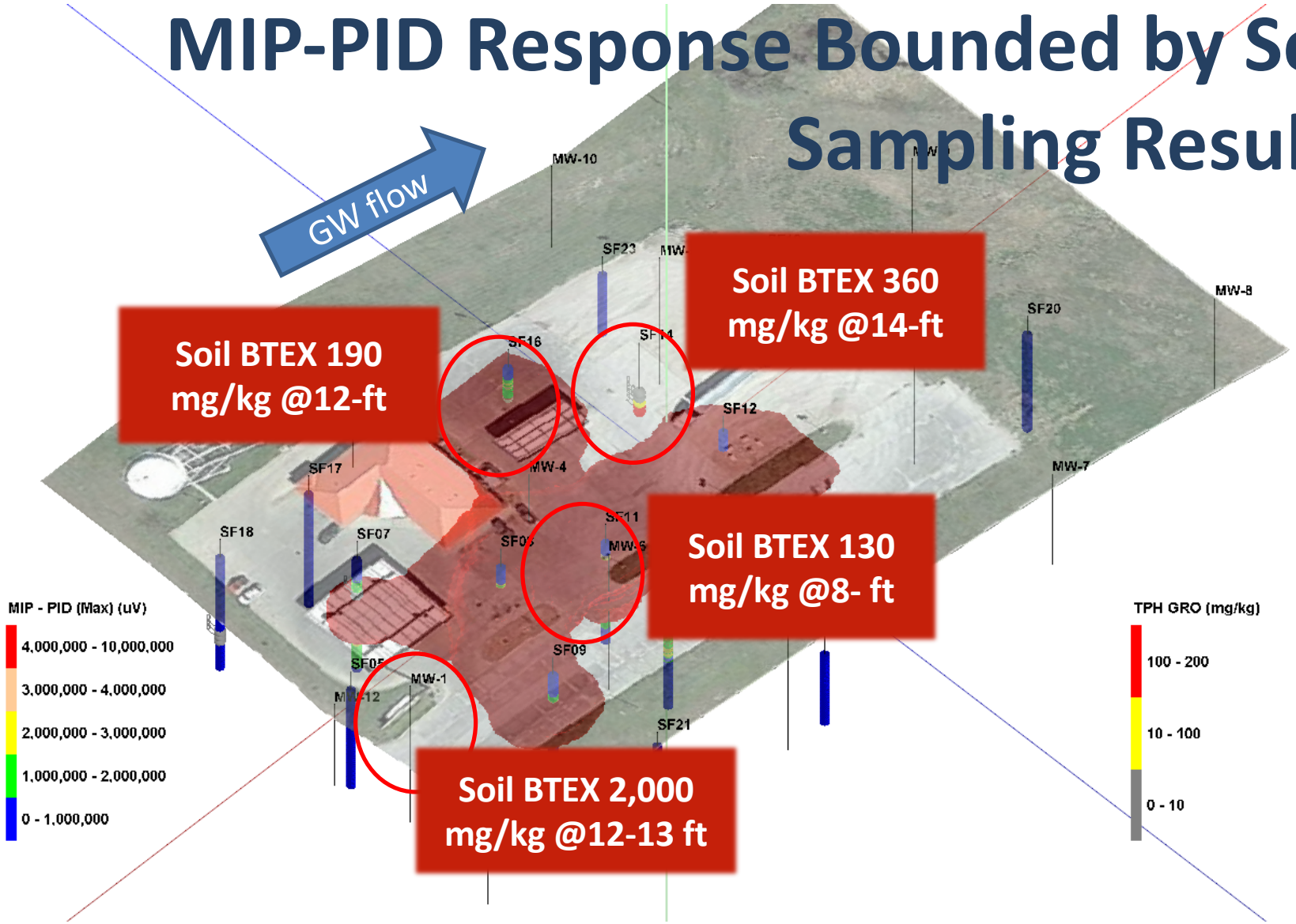


Systematic Screening

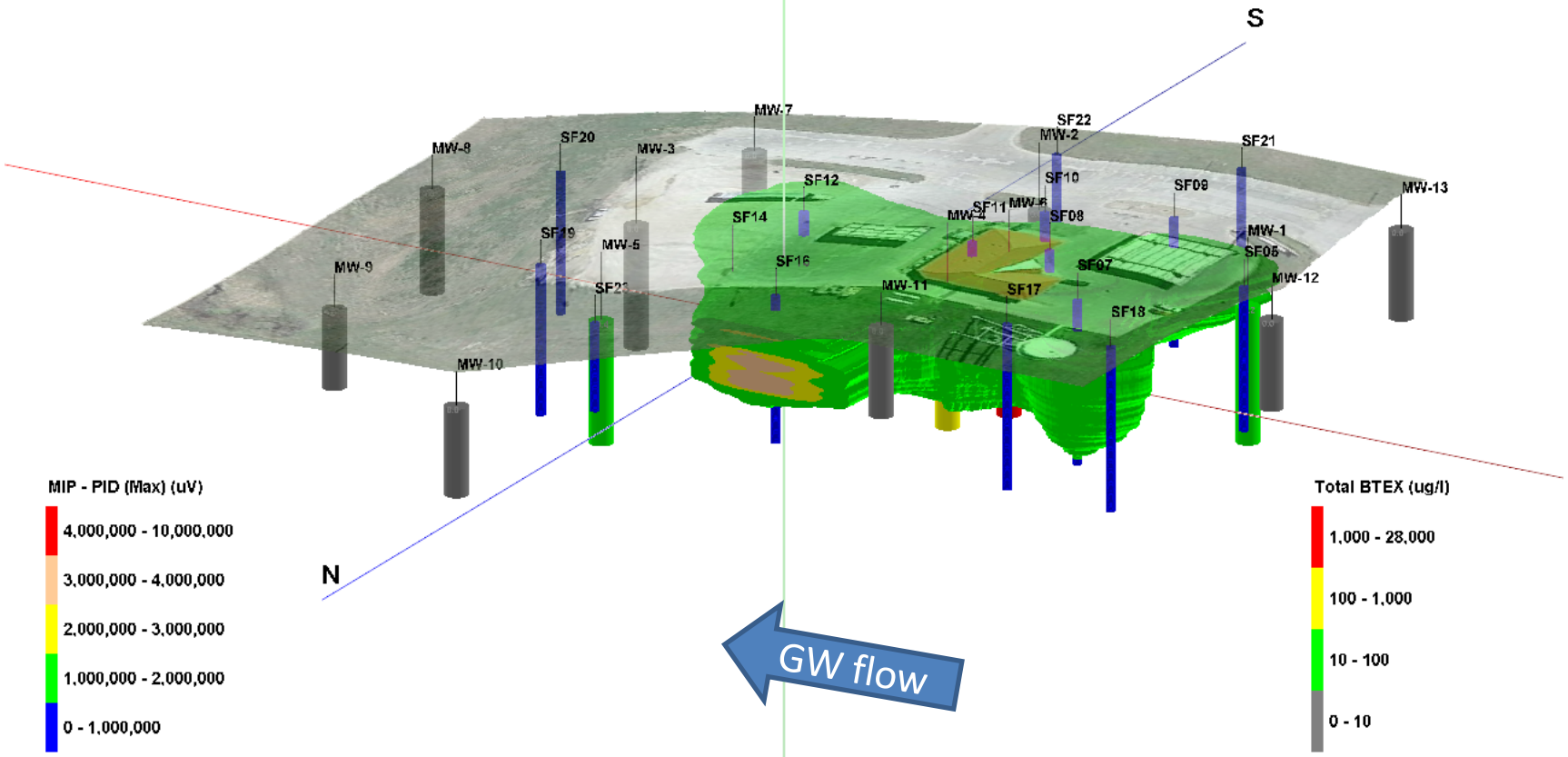
Systematic Sampling


EST. ALLIGATOR FARM 1893
Sealed & Preserved For Lab

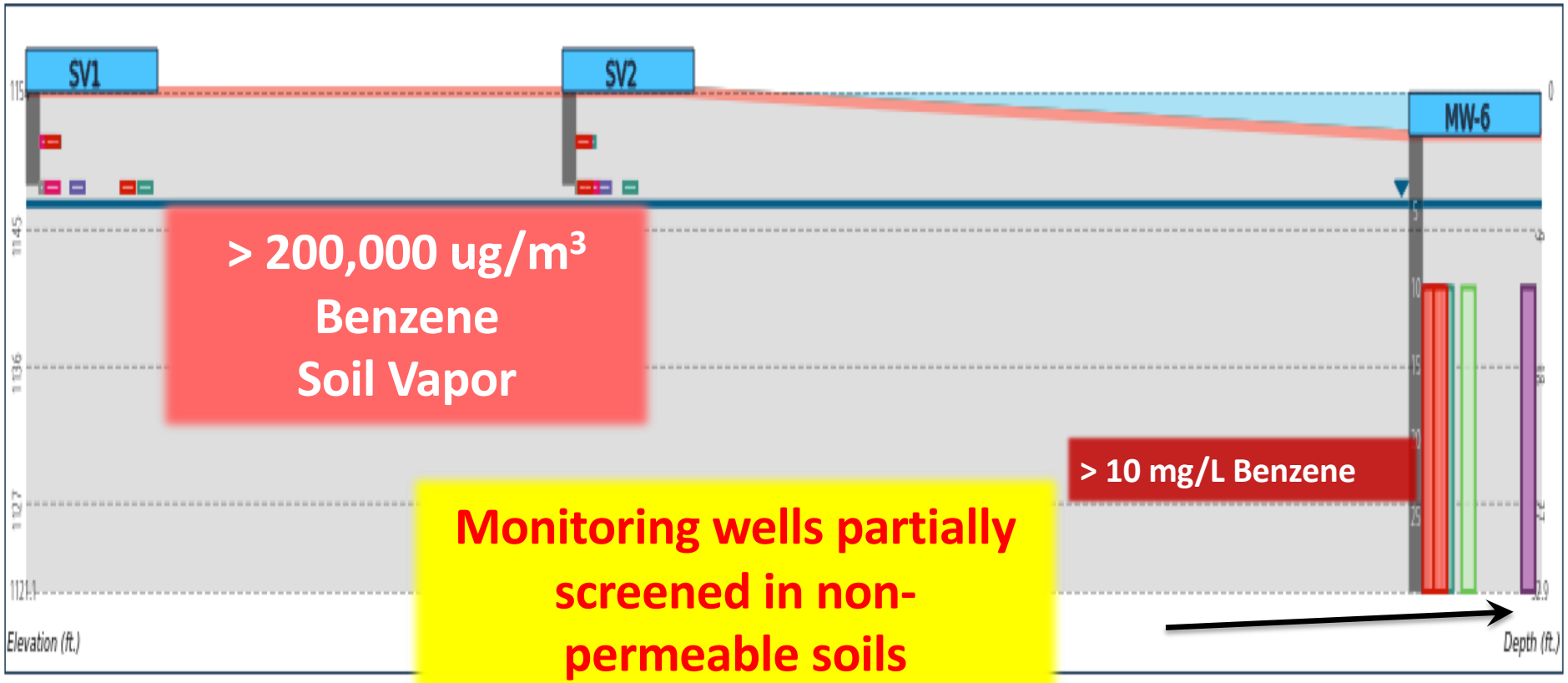
MIP-PID Response Bounded by Soil Sampling Results

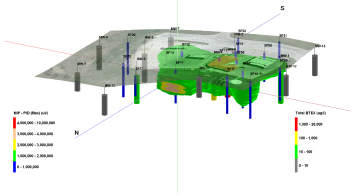


Updated LCSM



Petroleum Vapor Impact





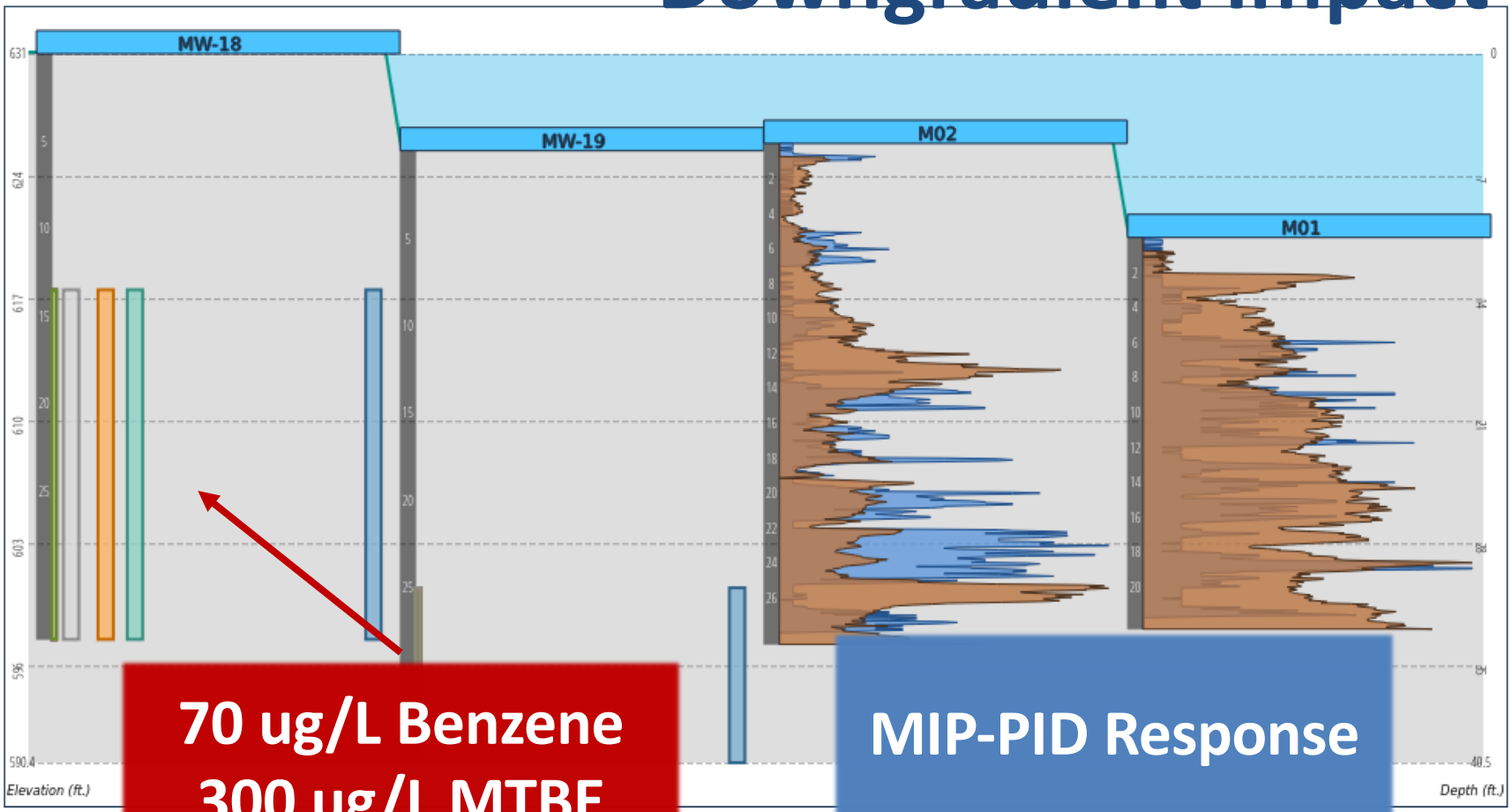
Lessons Learned

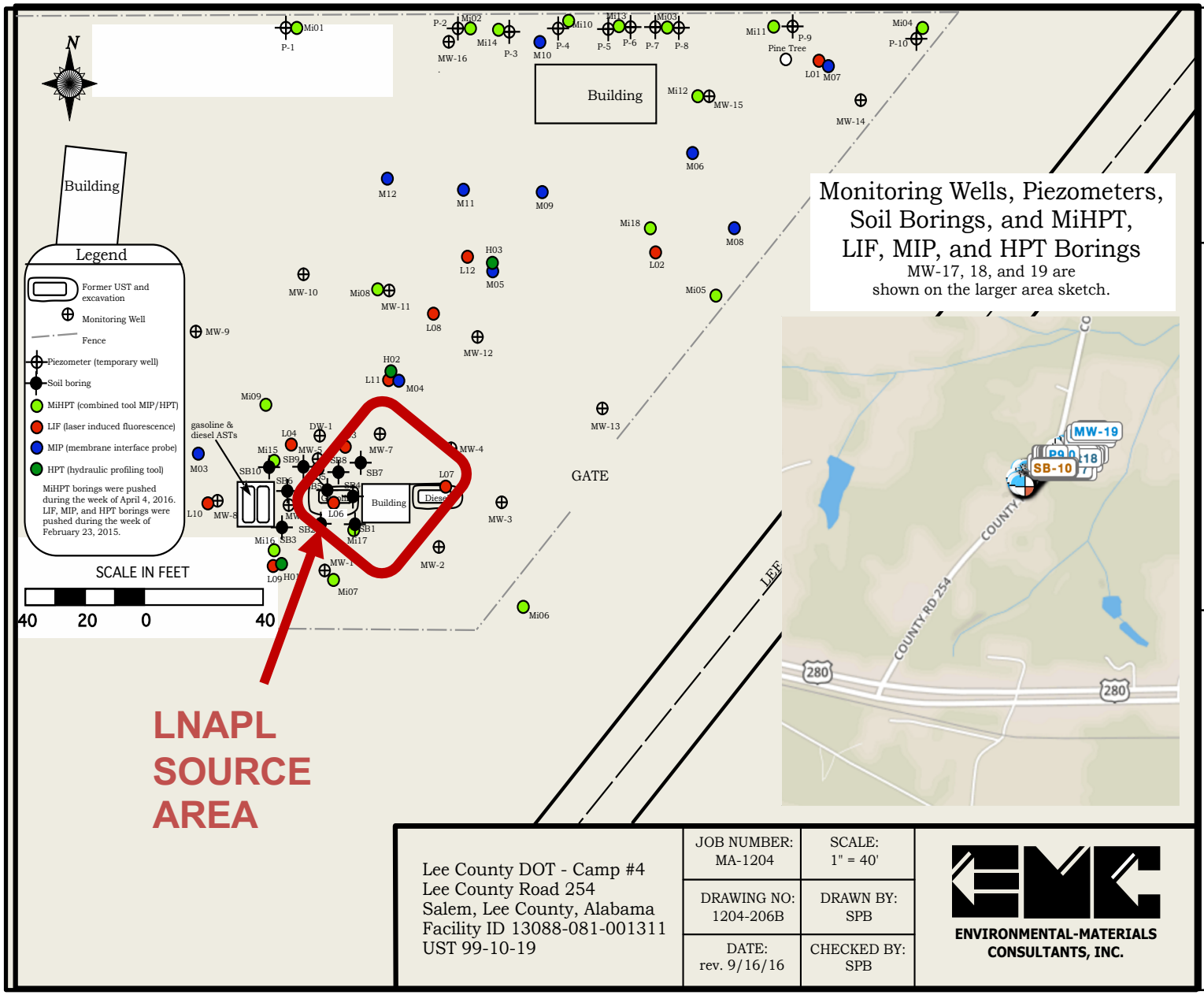
- Monitoring well results will not adequately delineate a residual LNAPL impact or mass
- Cleanup goals for groundwater are not going to be achieved if LNAPL mass remains onsite – *"if you have a water problem, you have a soil problem"*
- Petroleum vapor intrusion may pose a risk if the residual LNAPL mass is not fully characterized
- Adequate characterization of weathered gasoline LNAPL requires multiple lines of evidence

COLUMBIA TECHNOLOGIES

CASE STUDY – DISSOLVED PHASE PLUME

Downgradient Impact





Lee County DOT - Camp #4
Lee County Road 254
Salem, Lee County, Alabama
Facility ID 13088-081-001311
UST 99-10-19

JOB NUMBER: MA-1204	SCALE: 1" = 40'
DRAWING NO: 1204-206B	DRAWN BY: SPB
DATE: rev. 9/16/16	CHECKED BY: SPB

ENVIRONMENTAL-MATERIALS CONSULTANTS, INC.

Survey Locations

Lee County DOT #4
Salem, AL

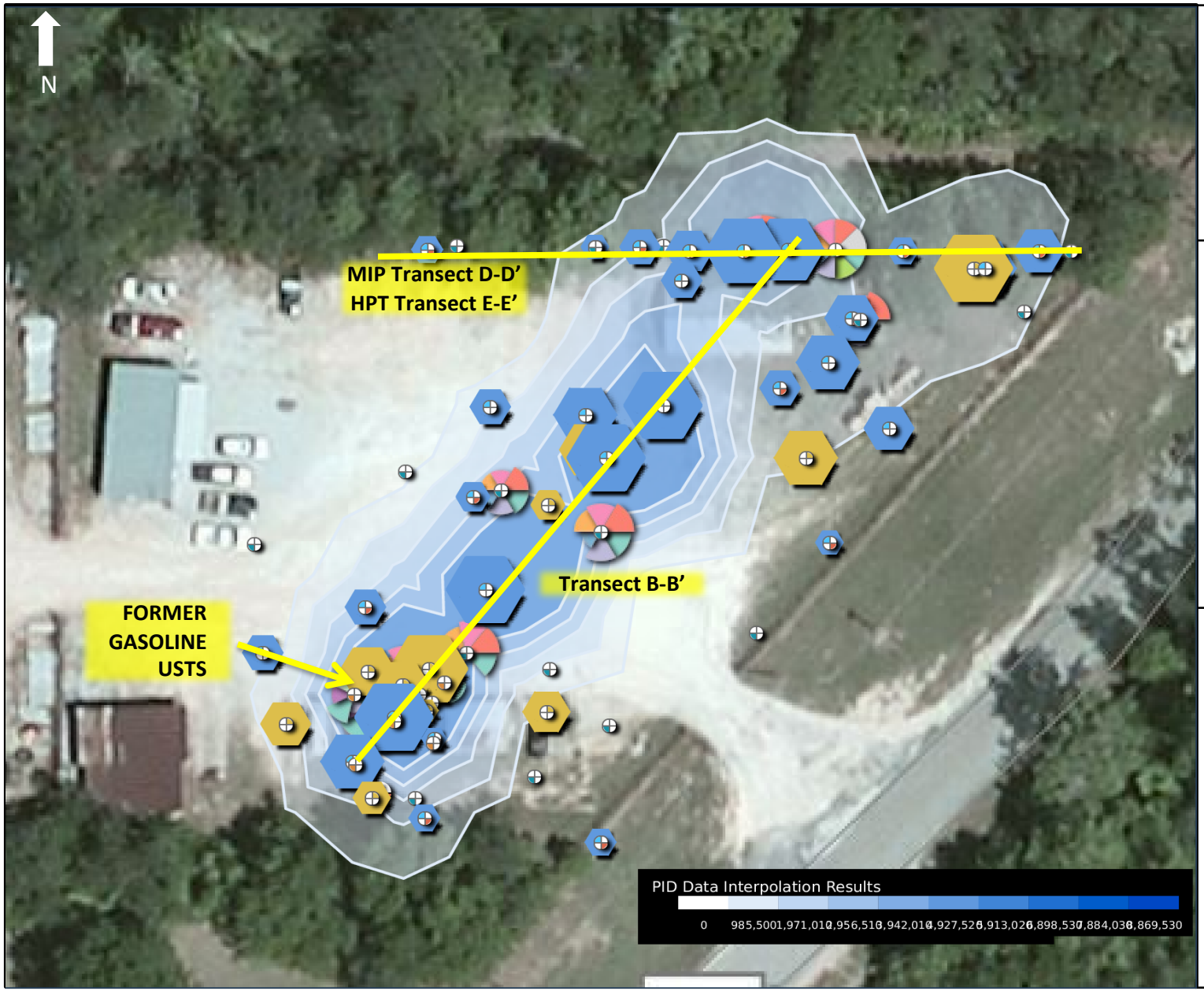
Figure 1

March 2017

High-Resolution Assessment

COLUMBIA TECHNOLOGIES

COLUMBIA TECHNOLOGIES	**Lee County DOT #4** **Salem, AL**	**Site Photo**
	High-Resolution Assessment March 2017	**Figure 3**



LNAPL Footprint

Figure 2

Lee County DOT #4
Salem, AL

March 2017

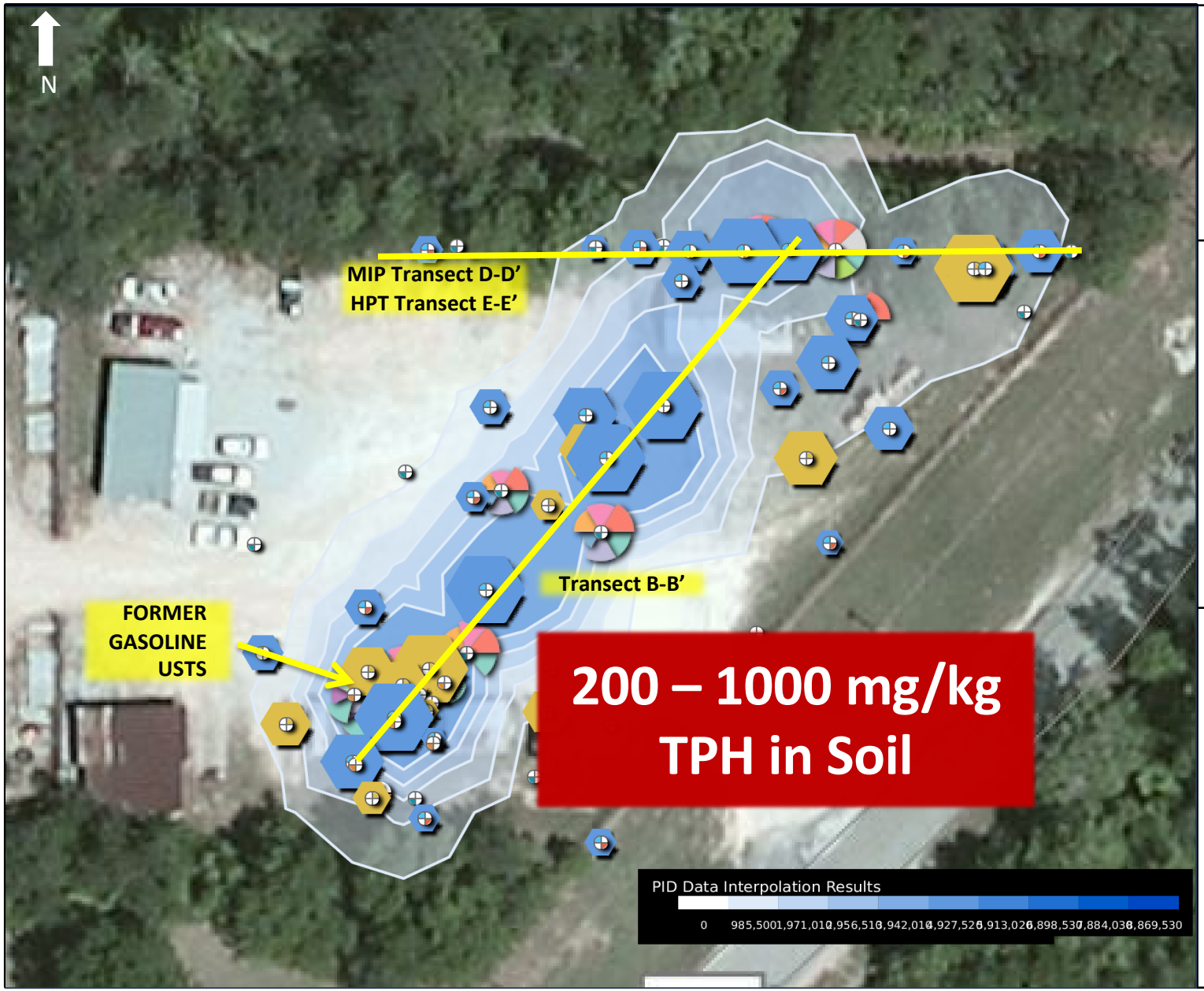
High-Resolution
Assessment

COLUMBIA TECHNOLOGIES

COLUMBIA TECHNOLOGIES	**Lee County DOT #4** **Salem, AL**		**Example EnCore Sampler**
	High-Resolution Assessment	March 2017	**Figure 5**

Lee County DOT #4 Salem, AL		Discrete Soil Sample Plug
High-Resolution Assessment	March 2017	Figure 6

COLUMBIA TECHNOLOGIES



LNAPL Footprint

Figure 2

Lee County DOT #4
Salem, AL

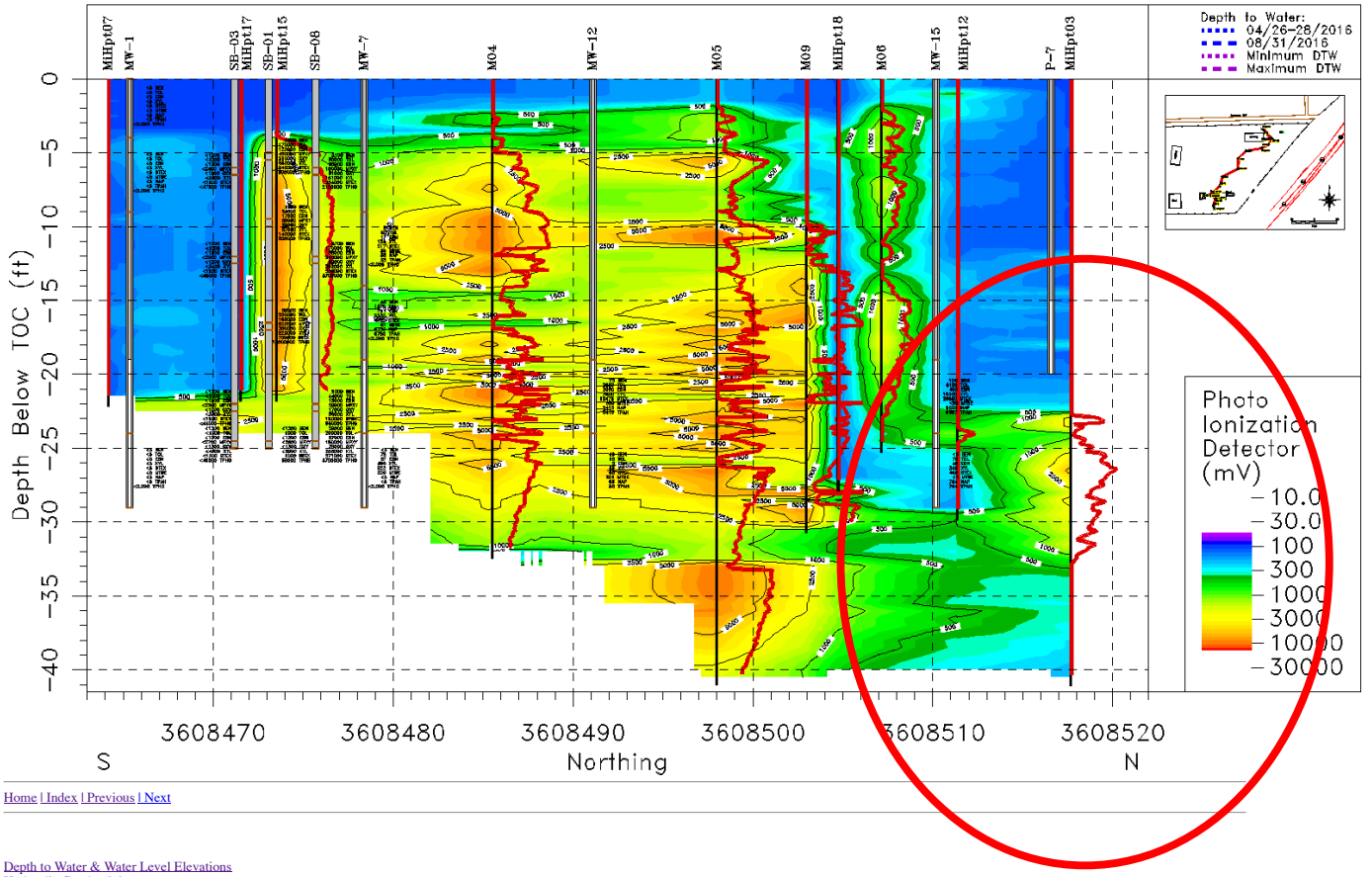
March 2017

High-Resolution Assessment

COLUMBIA TECHNOLOGIES

MIP Cross-Section B-B': PID

Lee County DOT Camp #4, 517 Lee County Road 254, Salem, Alabama



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Depth to Water & Water Level Elevations
Hydraulic Conductivity
Water Quality Concentrations
Soils Concentrations
HPT/MiHpt Evaluations (Electrical Conductivity, Injection Pressure, Flow)

MIP-PID Cross-Section B-B'

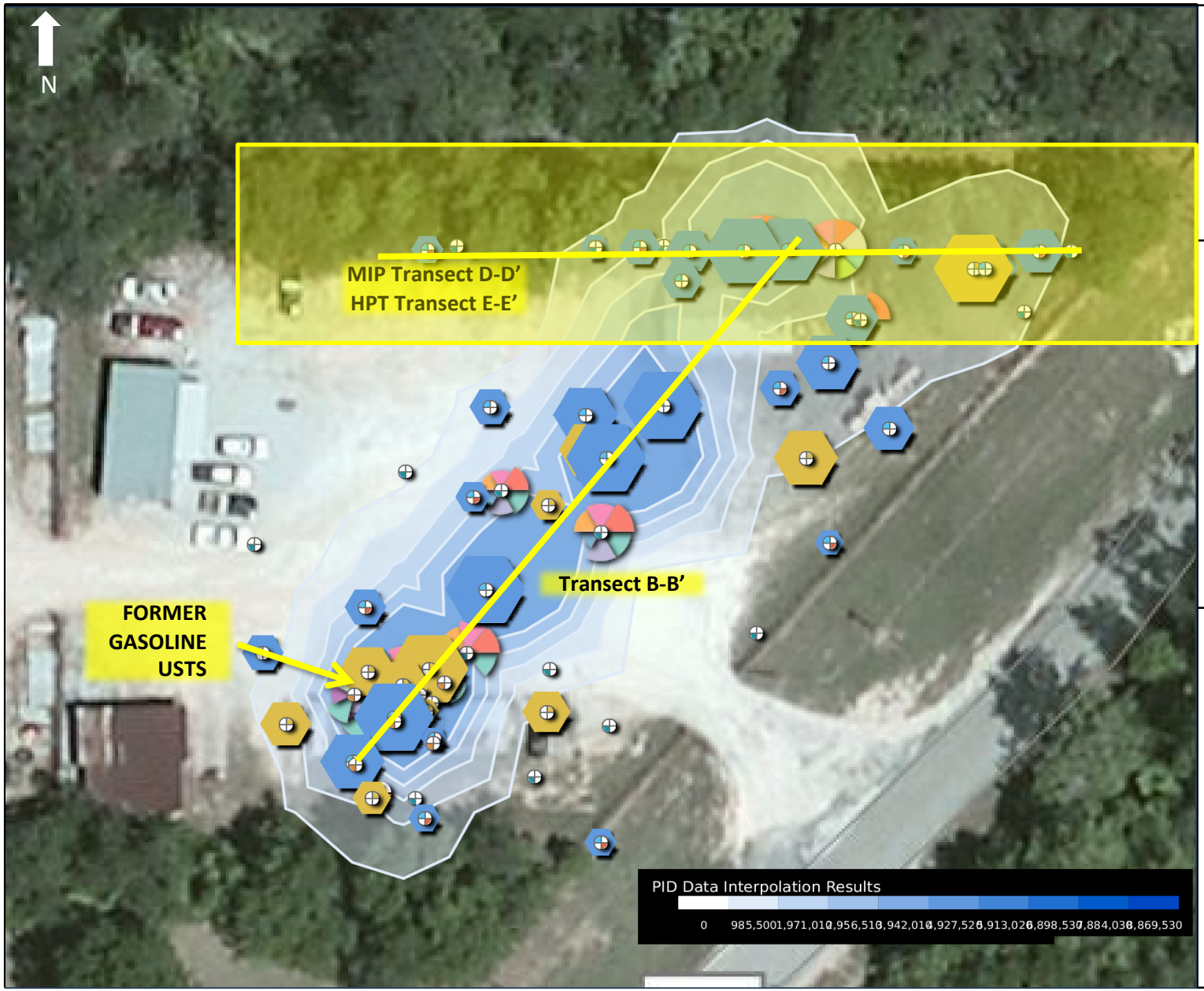
Figure 8

Lee County DOT #4
Salem, AL

March 2017

High-Resolution Assessment

COLUMBIA TECHNOLOGIES



LNAPL Footprint

Figure 2

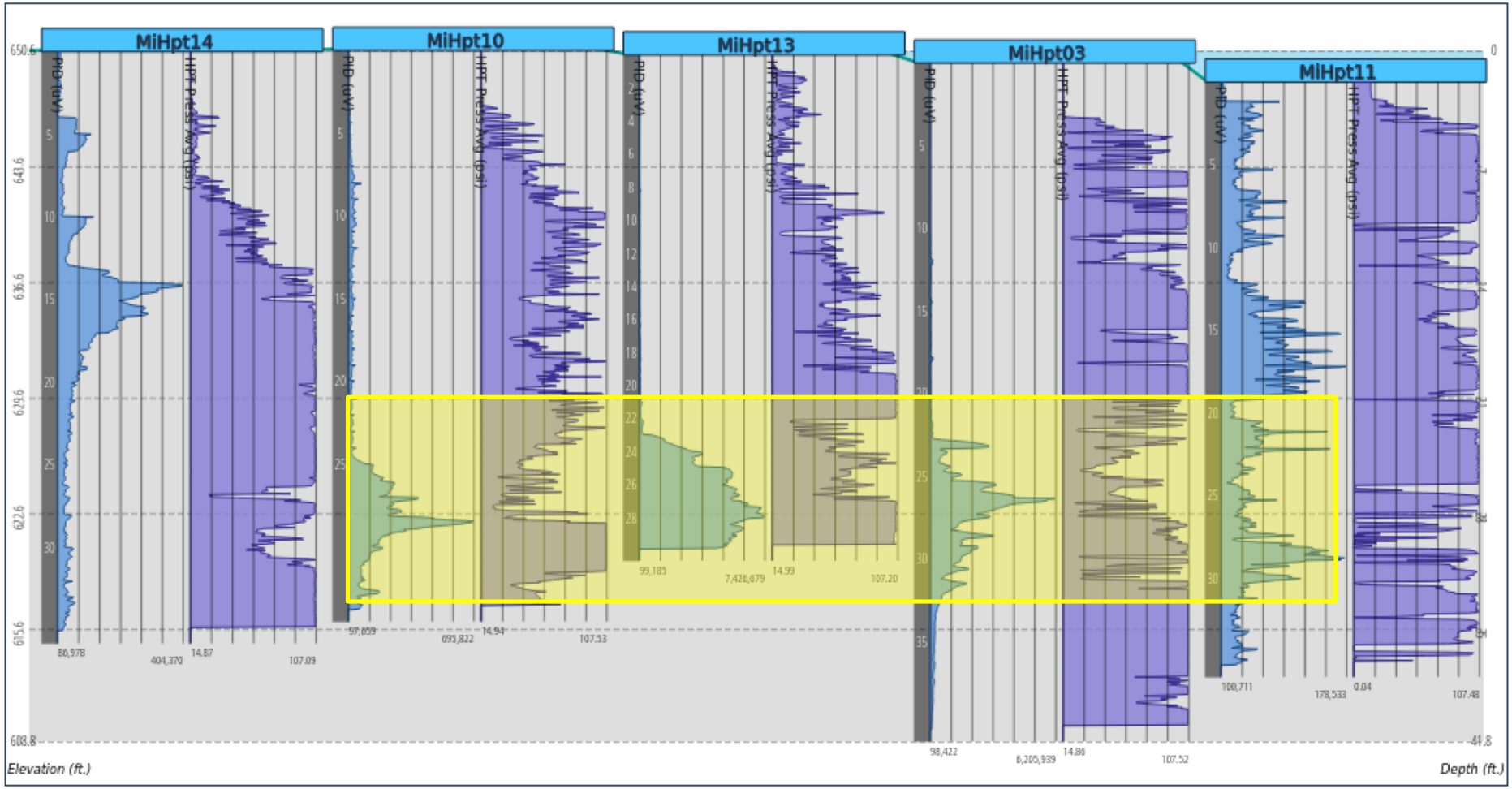
Lee County DOT #4
Salem, AL

March 2017

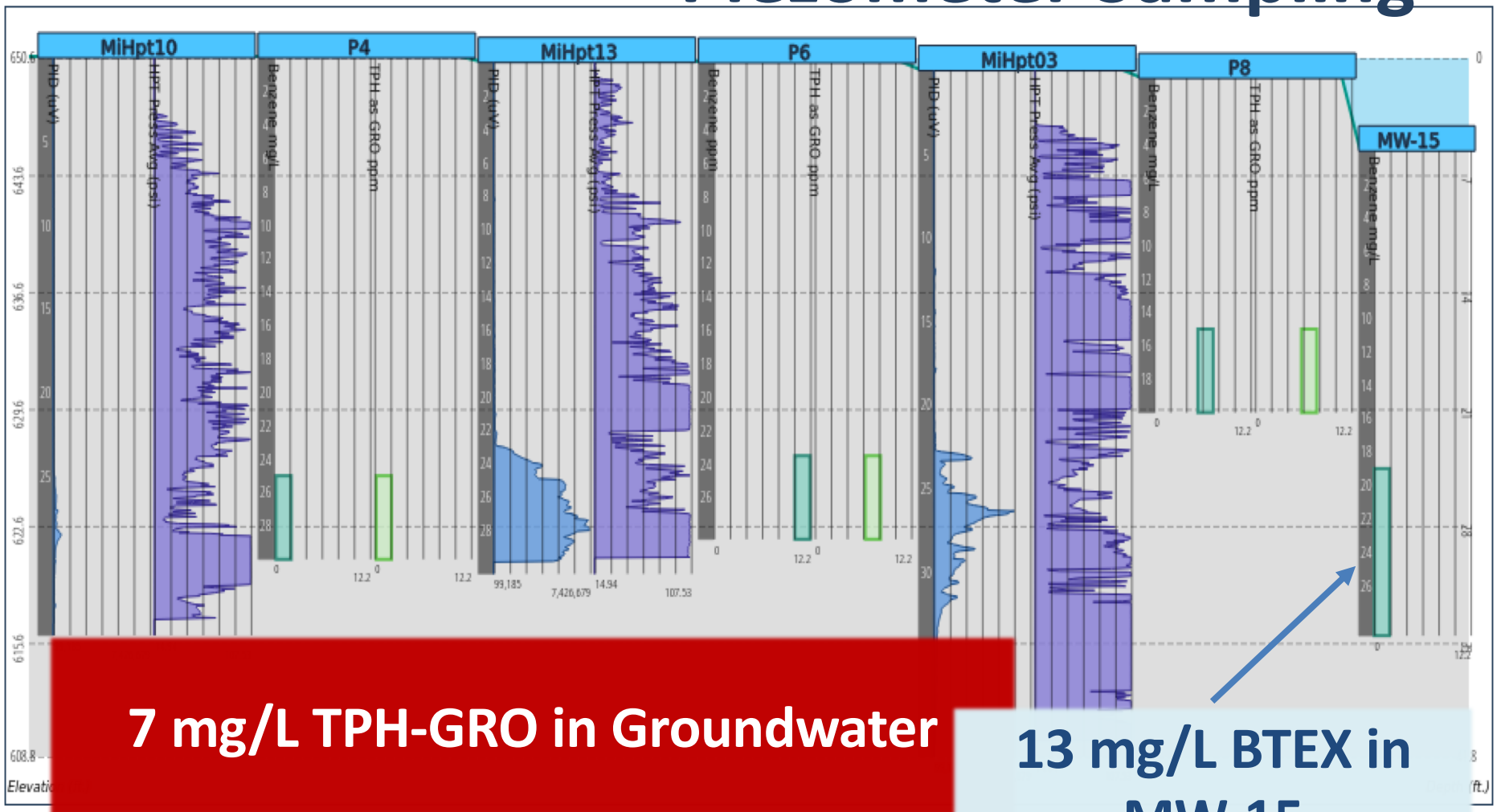
High-Resolution
Assessment

COLUMBIA TECHNOLOGIES

MiHpt Transect



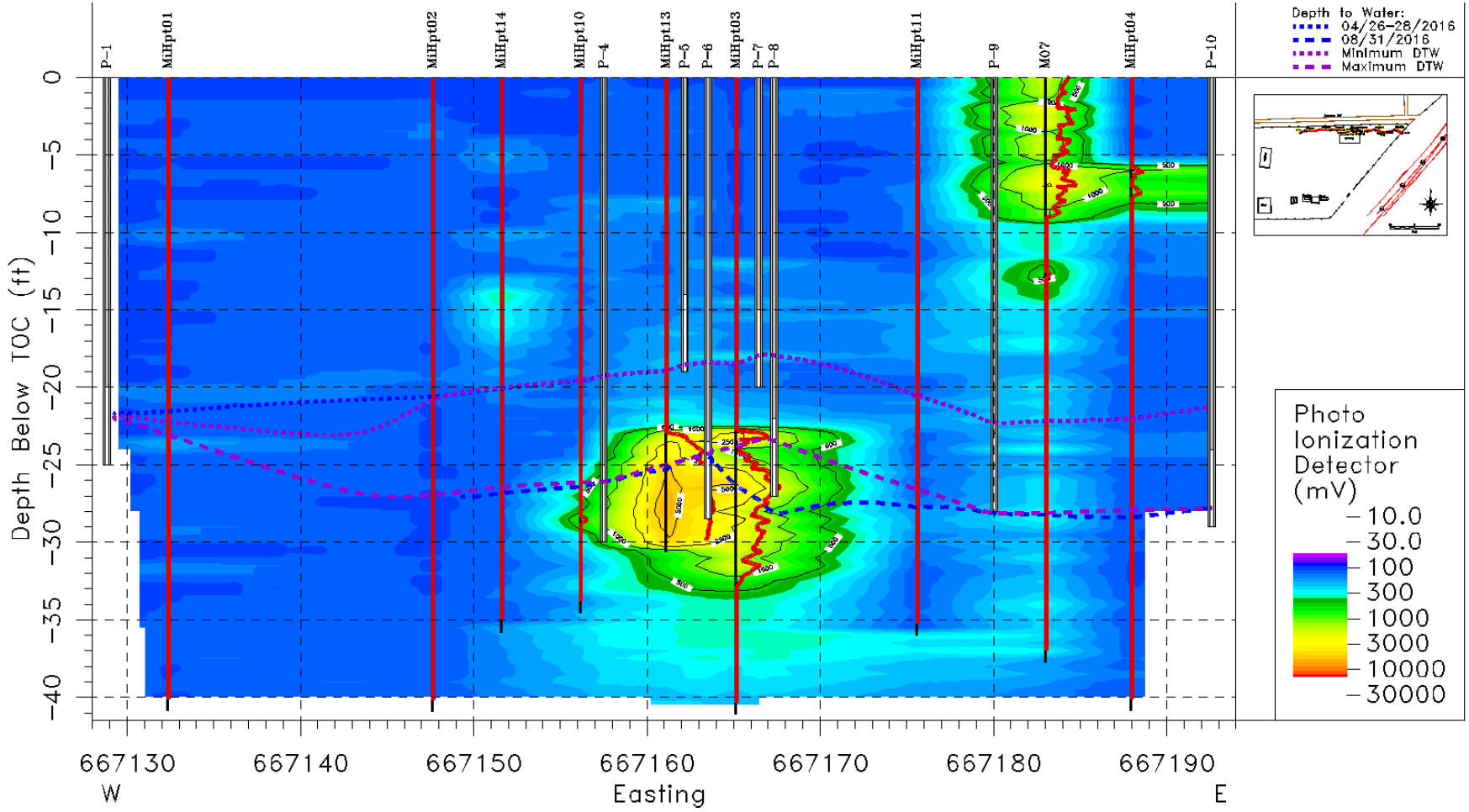
Piezometer Sampling

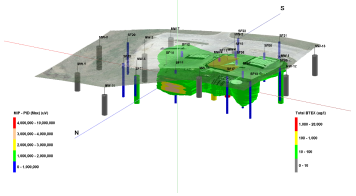


7 mg/L TPH-GRO in Groundwater

13 mg/L BTEX in MW-15

Mass Transport Diagram





Lessons Learned

- Dissolved phase contamination will result from residual LNAPL mass in saturated zone
- Cleanup goals for groundwater are not going to be achieved if LNAPL mass remains onsite – *"if you have a water problem, you have a soil problem"*
- Transport pathways will likely result in 80-90% of the dissolved phase mass moving through 10-20% of the vertical plane
- Scale appropriate measurements are need to identify the mass transport pathway