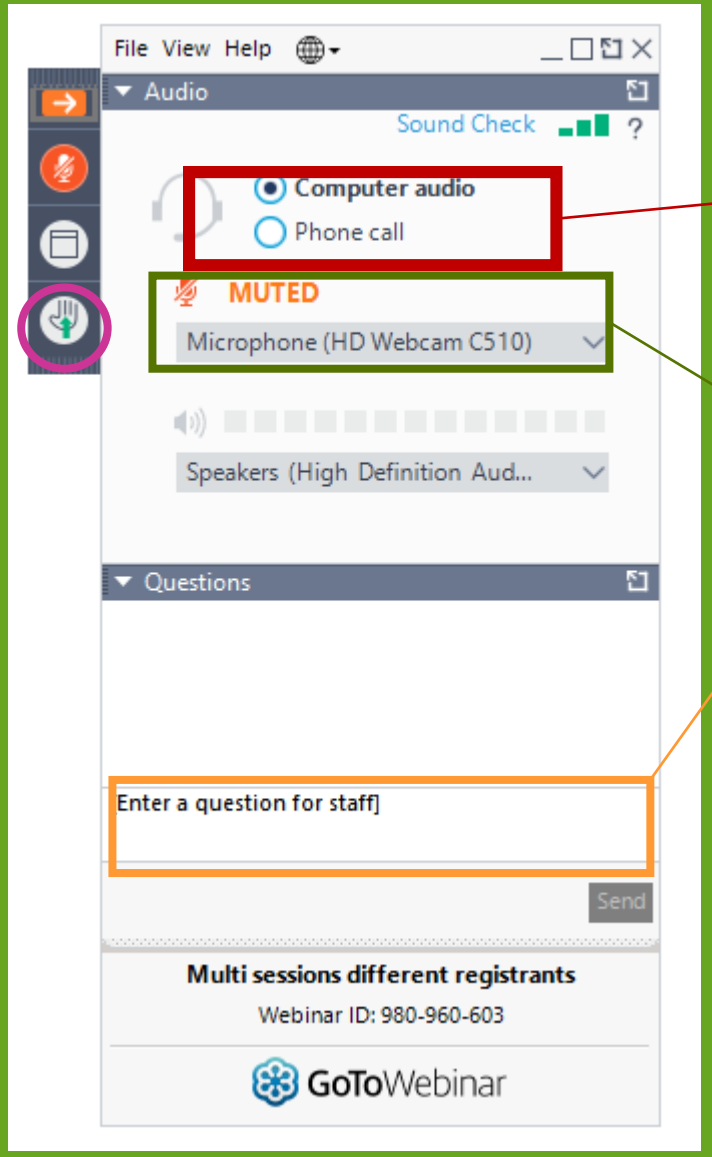
Using GoToWebinar



Two Options for Audio:
1. Use your **computer's** speakers
2. Call in by **phone** using the call-in number and access code in the Audio section of the control box.

All participants are **muted** by default.

Questions: Use the "send question" option in the chat panel to ask questions throughout the presentation.

Ask for help! Use the questions box to let us know if you have technical difficulties. You can also **raise your hand** for help.

LESSONS LEARNED FROM HRSC USED AT LUST SITES

Welcome to NEIWPCC's addition in the LUST Corrective Action Webinar Series

6/24/2020

Today's Speakers

John Sohl, President and CEO | Columbia Technologies

Dorothy Malaier, P.G. Chief, UST Corrective Action State and Federal Funds Section | *Alabama DEM*

Ashleigh Thrash, P.G. Section Manager, Assessment & Non-Permitted Petroleum Section | *South Carolina DHEC*

AGENDA

- Lessons Learned from 150 HRSC Investigations and Failed UST Remediation Sites
- High Resolution Site Characterization in Alabama- A Strategy to Advance UST Release Cleanups in Alabama
- Utilization of High-Resolution Site Characterization (HRSC) In South Carolina
- Q&A
- End

COLUMBIA TECHNOLOGIES

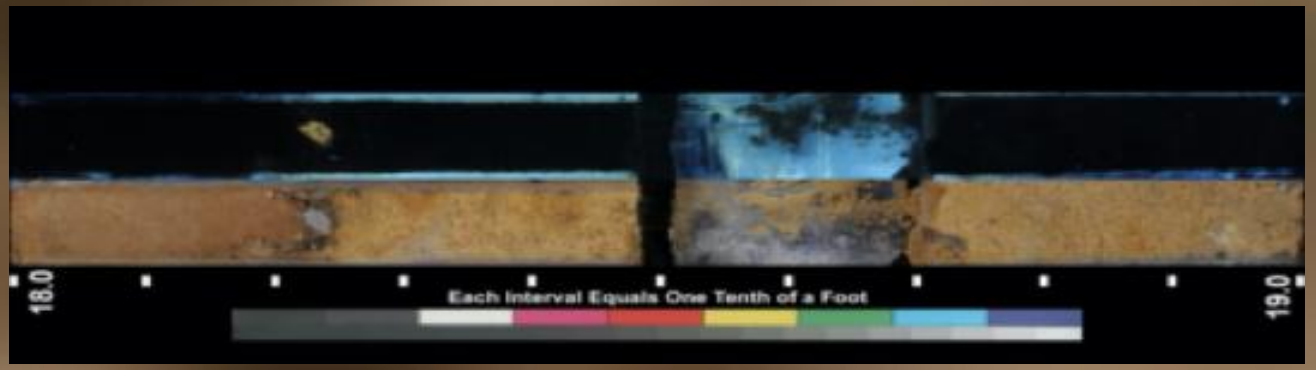
Lessons Learned from 150 HRSC Investigations and Failed UST Remediation Sites

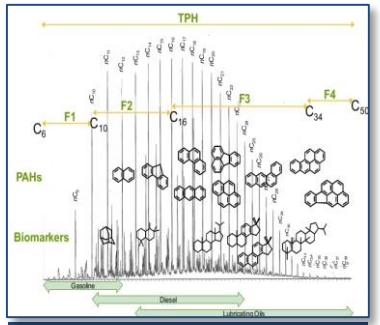
John H Sohl III
www.columbiatechnologies.com
jsohl@columbiatechnologies.com
+1-301-455-7644

Focus on Groundwater =>
Expensive & Blinding Misdirection

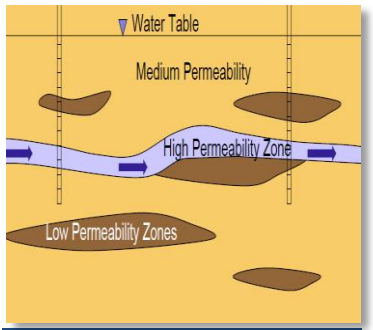
FOCUS ON
LNAPL AND SOIL

FOCUS ON
GROUNDWATER

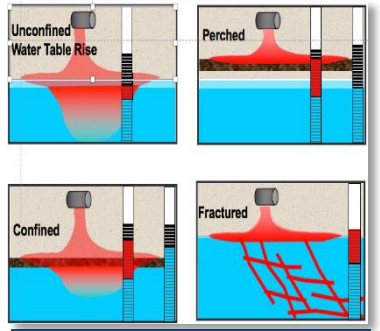




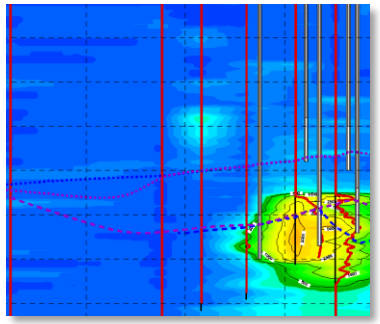
LNAPL CHEMISTRY



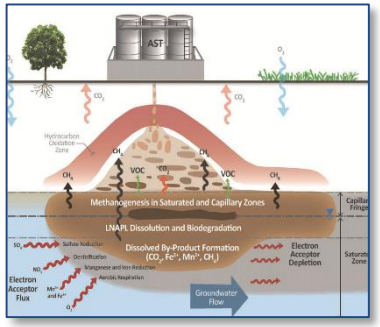
SOIL PERMEABILITY



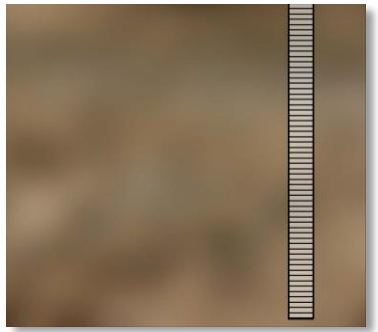
GROUND WATER



DISSOLVED PHASE



VAPOR PHASE



SPATIAL ALIGNMENT

Technical Scope of Work

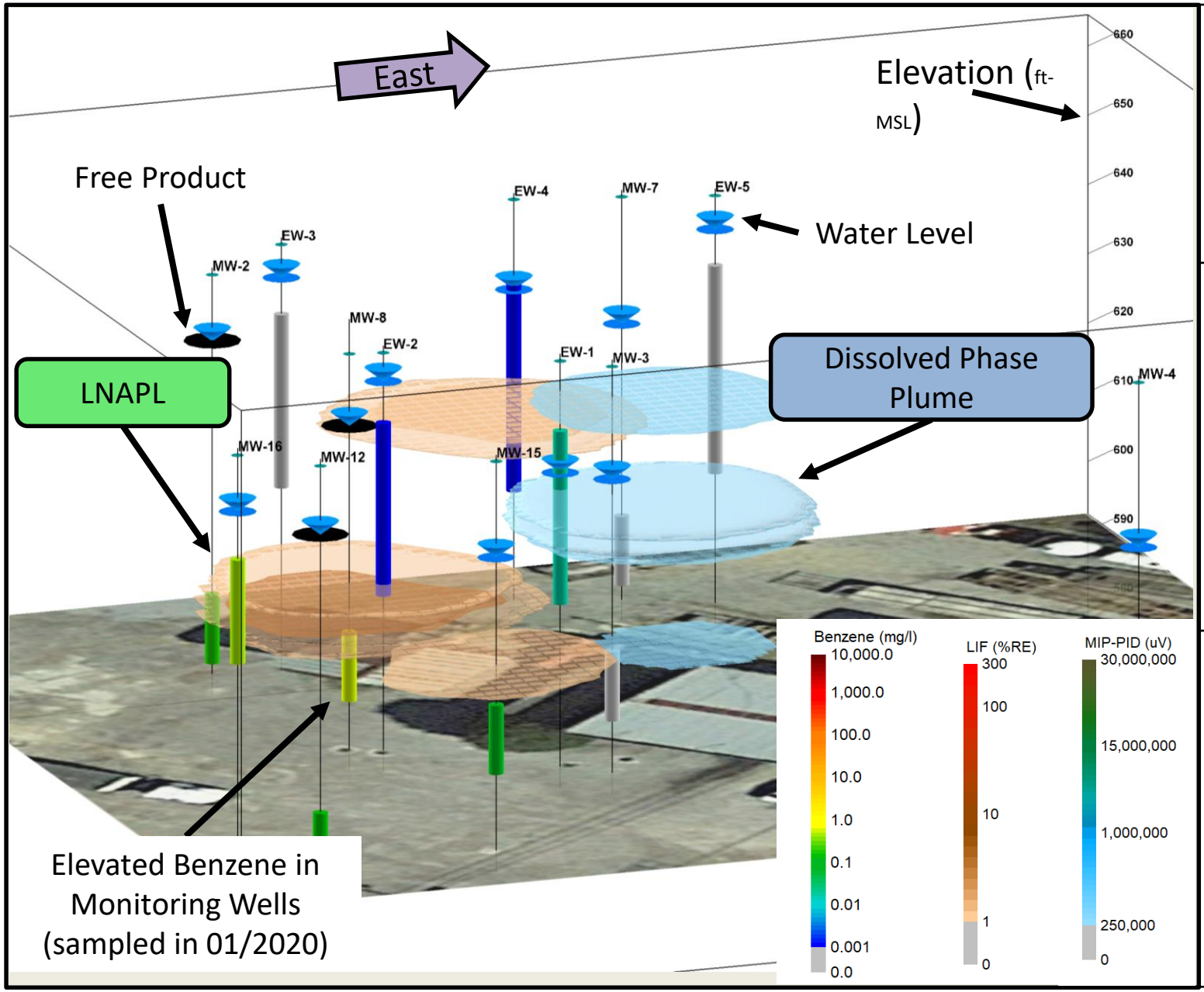
1. Review historical work plans and data to establish current CSM
2. Map residual source material and evaluate its characteristics
3. Evaluate stability of the LNAPL body
4. Evaluate impact to groundwater, dissolved phase plume, and migration path mass transport
5. Evaluate potential vapor intrusion concerns.
6. Evaluate spatial orientation of installed monitoring and recovery well screen intervals against the LNAPL location and soil permeability.
7. Evaluate potential for natural source zone depletion.
8. Revise the CSM

Preliminary Findings from 150 Investigations

Finding	Number of Sites
1. Significant gaps in the conceptual site models	145
2. Residual LNAPL	150
3. Residual LNAPL below the air-water interface	150
4. Layered site stratigraphy	140
5. The residual LNAPL is in the tighter zones	140
6. Chemical injections did not reach the tighter zones	20 of 20
7. Redistribution of the LNAPL	70
8. LNAPL redistributed by vacuum enhanced extraction	70 of 70
9. Residual LNAPL is bound to soil	140
10. Misaligned monitoring and recovery wells	50
11. Groundwater redox parameters are good indicators	2 of 2

COLUMBIA TECHNOLOGIES

CASE EXAMPLE
STEPHENS FUEL



LNAPL vs. Benzene (mg/l)

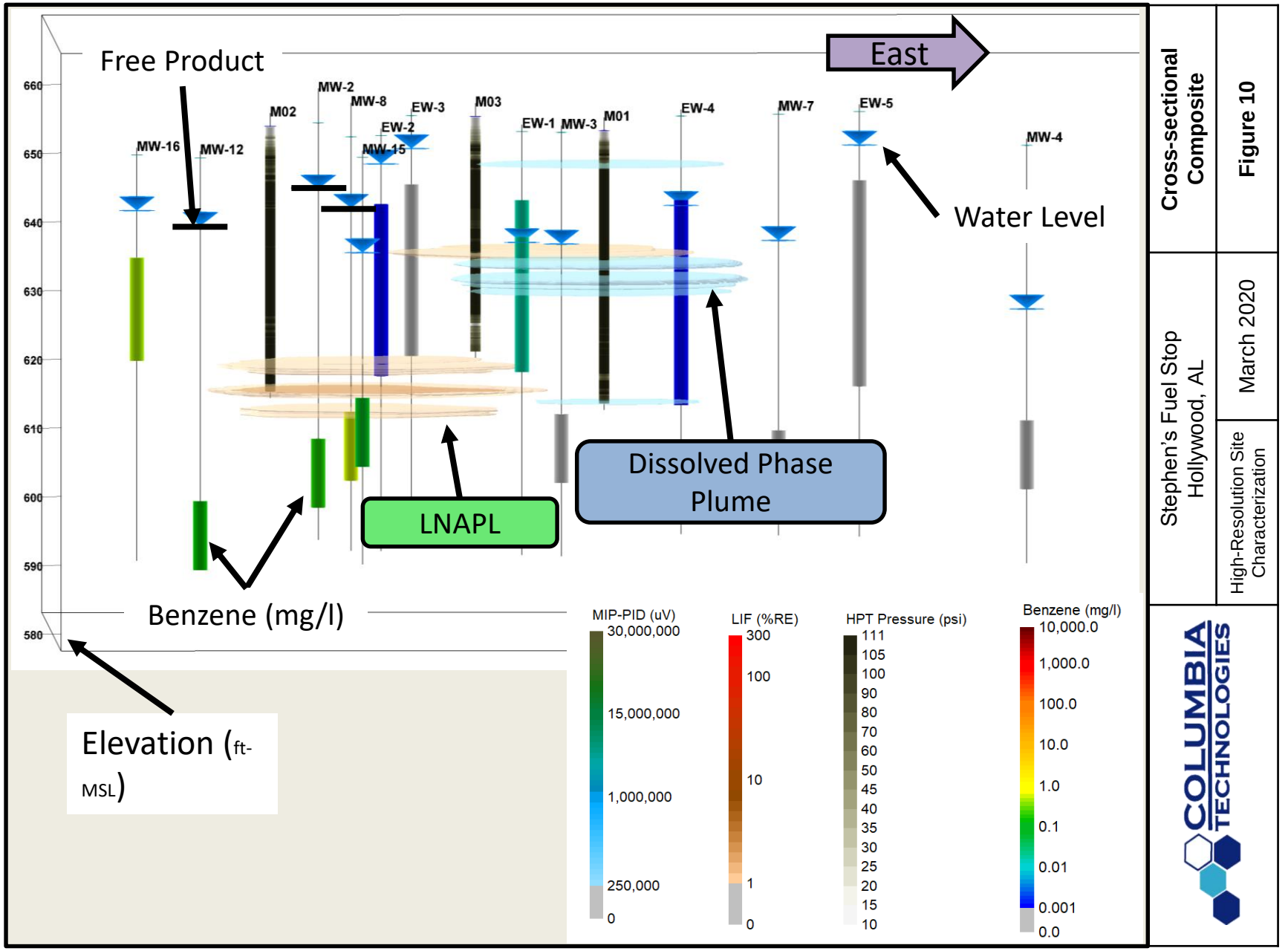
Figure 9

Stephen's Fuel Stop
Hollywood, AL

March 2020

High-Resolution Site Characterization

COLUMBIA TECHNOLOGIES



Cross-sectional Composite

Figure 10

Stephen's Fuel Stop
Hollywood, AL

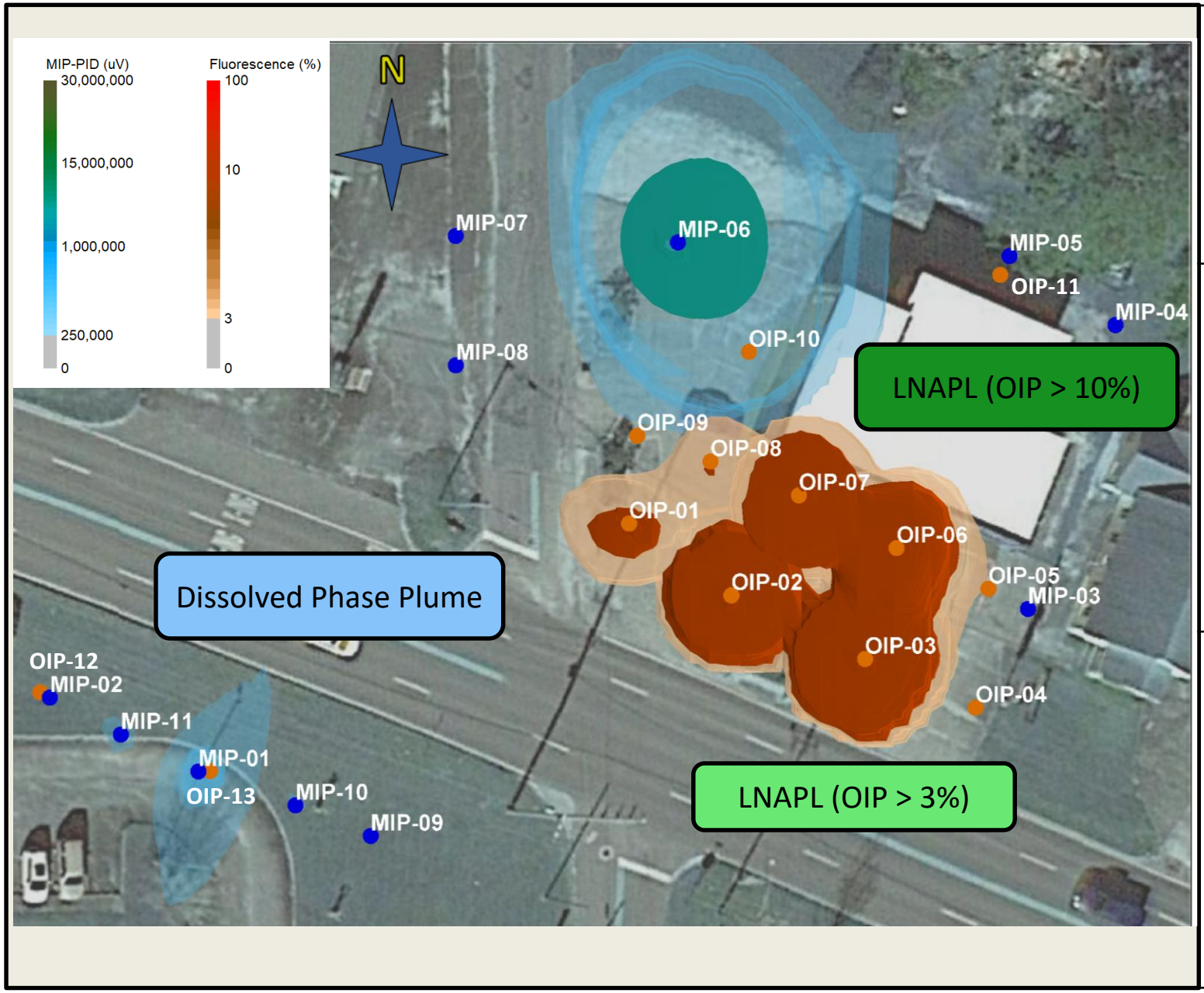
March 2020

High-Resolution Site Characterization

COLUMBIA TECHNOLOGIES

COLUMBIA TECHNOLOGIES

CASE EXAMPLE
MAPLE AVE



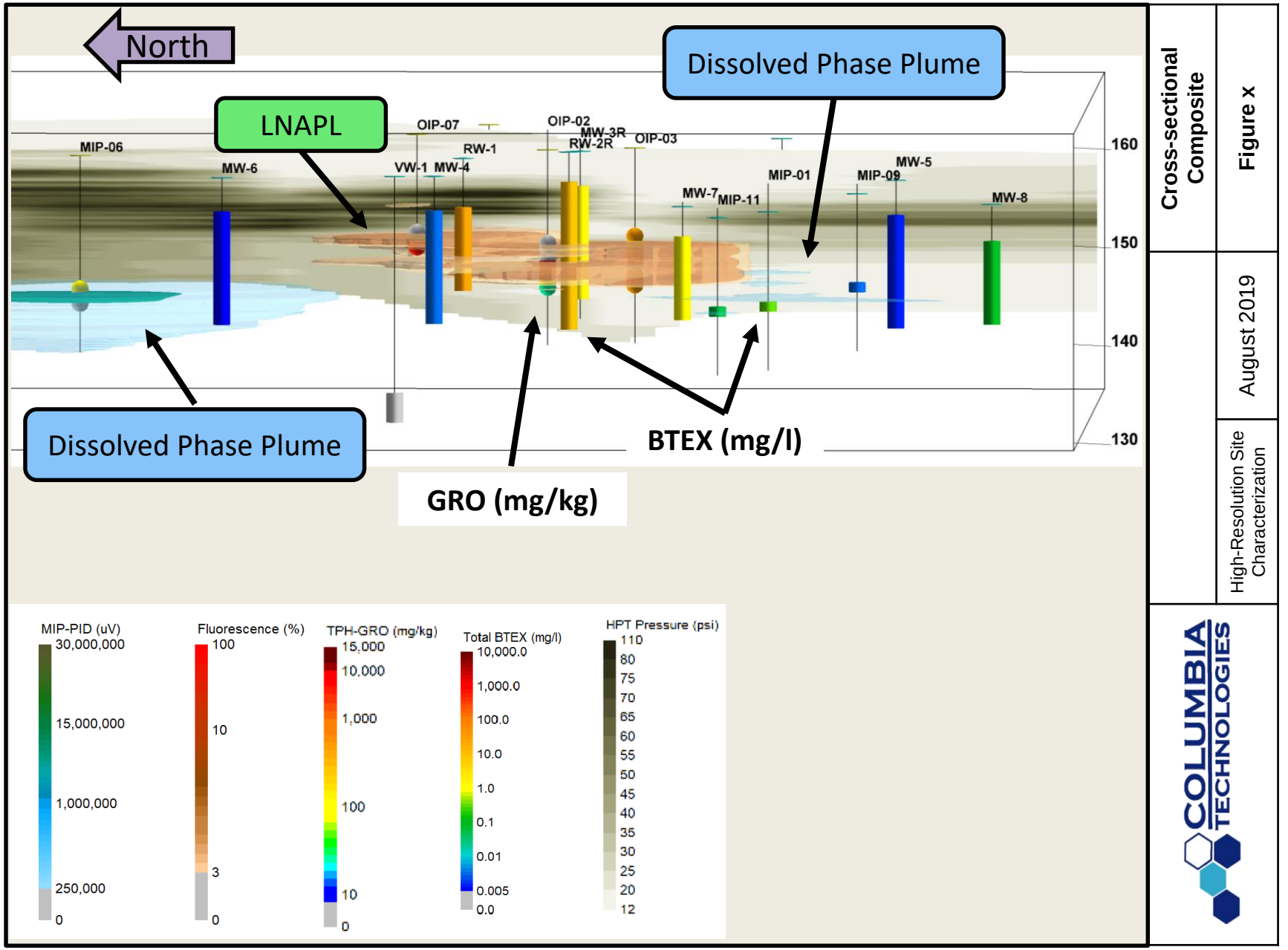
LNAPL Footprint

Figure X

August 2019

High-Resolution Site Characterization

COLUMBIA TECHNOLOGIES



Cross-sectional Composite

Figure x

August 2019

High-Resolution Site Characterization

COLUMBIA TECHNOLOGIES

COLUMBIA TECHNOLOGIES

CASE EXAMPLE
FORMER TIGER OIL

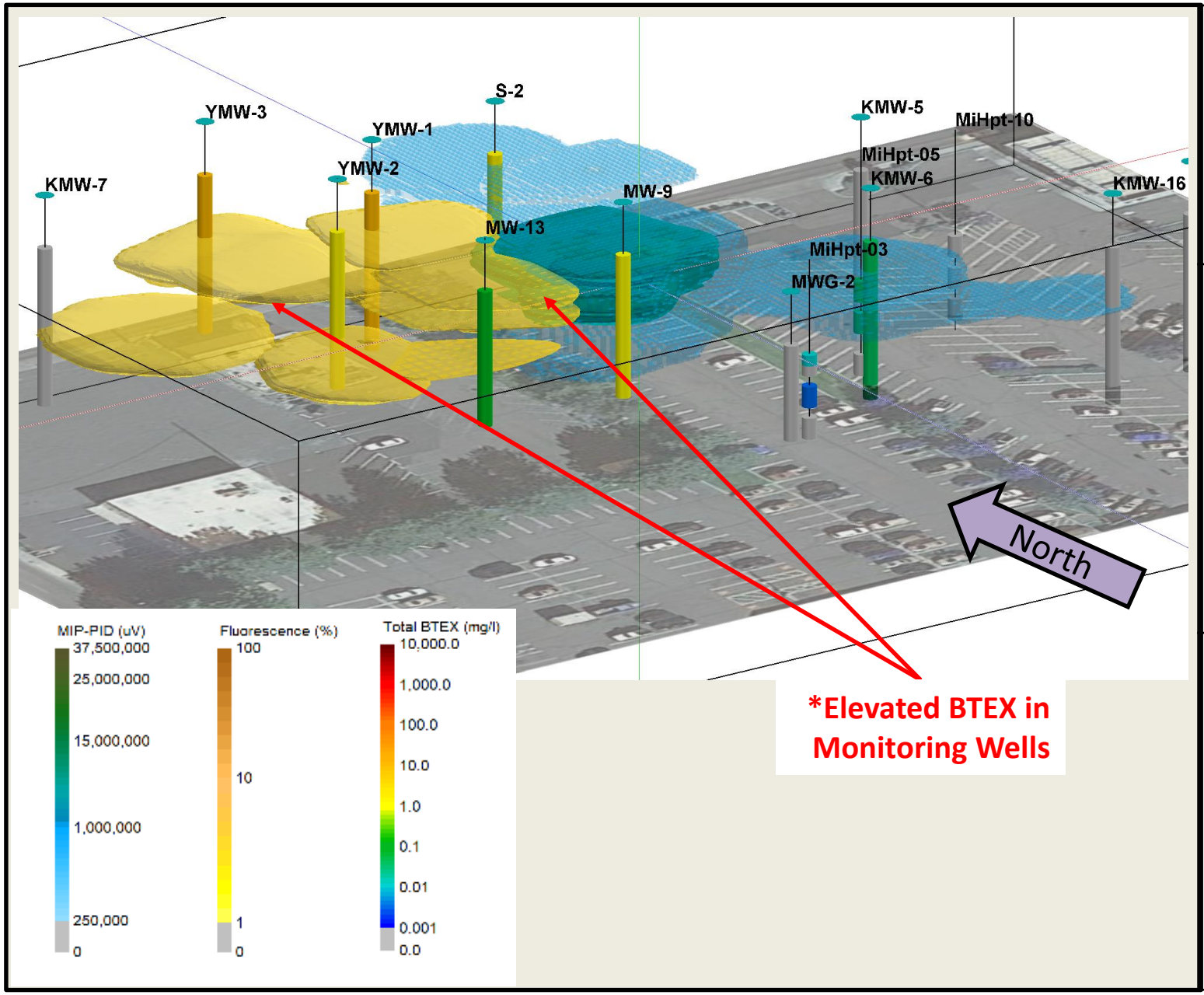
GRO Soil Samples from 2015

Figure 13

March 2019

High-Resolution Site Characterization

COLUMBIA TECHNOLOGIES



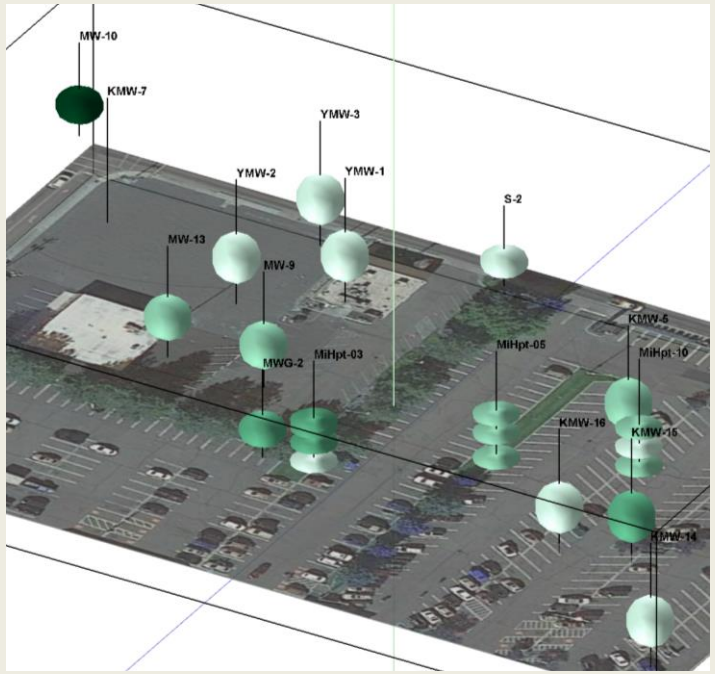
MIP-PID vs BTEX In Monitoring Wells

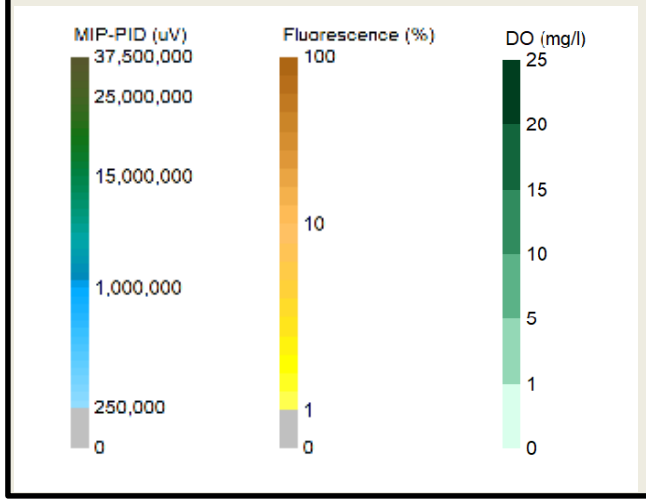
Figure 14

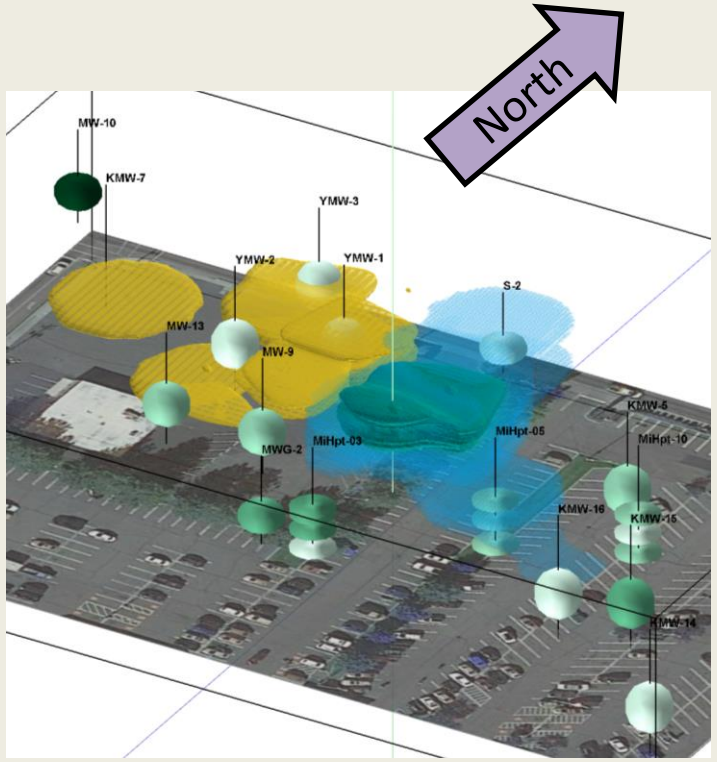
March 2019

High-Resolution Site Characterization

COLUMBIA TECHNOLOGIES







LNAPL vs DO

Figure 13

March 2019

High-Resolution Site Characterization

COLUMBIA TECHNOLOGIES

COLUMBIA TECHNOLOGIES

OIP, PID, and Co-Located Soil Samples: https://skfb.ly/6SnXM

OIP, PID, and Groundwater Samples: https://skfb.ly/6SnVU

3D IMAGERY – TIGER OIL

Contracting – State Limitations

1. The State regulators and reimbursement funds do not have a mechanism to identify stalled or failed remediation projects.

2.There is generally not a funding or reimbursement mechanism for reevaluating the conceptual site model where the remediation has failed or stalled.

3.There is generally not a funding or reimbursement mechanism for HRSC with adaptive work plan execution.

Recommendations

1. Encourage the States to upgrade the conceptual site models of failed and stalled remediation sites.
2. Implement ITRC LNAPL-3 Management guidelines.
3. Implement HRSC early, especially prior to any remedial activities that lower the groundwater or inject chemicals.
4. Incorporate saturated soil sampling into protocols and contract mechanisms.
5. Add total petroleum hydrocarbon (TPH) analyses to the soil sampling to verify stability of the LNAPL body.
6. Gather NSZD data to answer questions regarding the residual LNAPL's effect on groundwater.

Question & Answer

Please address all questions to a speaker

High Resolution Site Characterization in Alabama

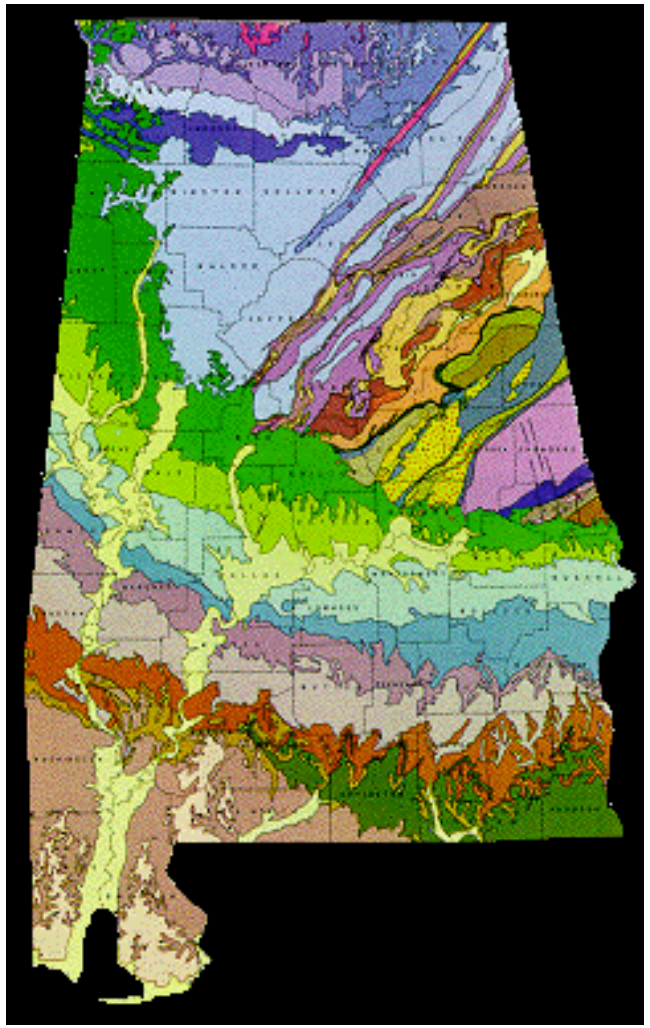
A Strategy to Advance UST Release Cleanups in Alabama

Dorothy Malaier
UST Corrective Action State and Federal Funds Section

NEIWPCC WEBINAR
June 24, 2020

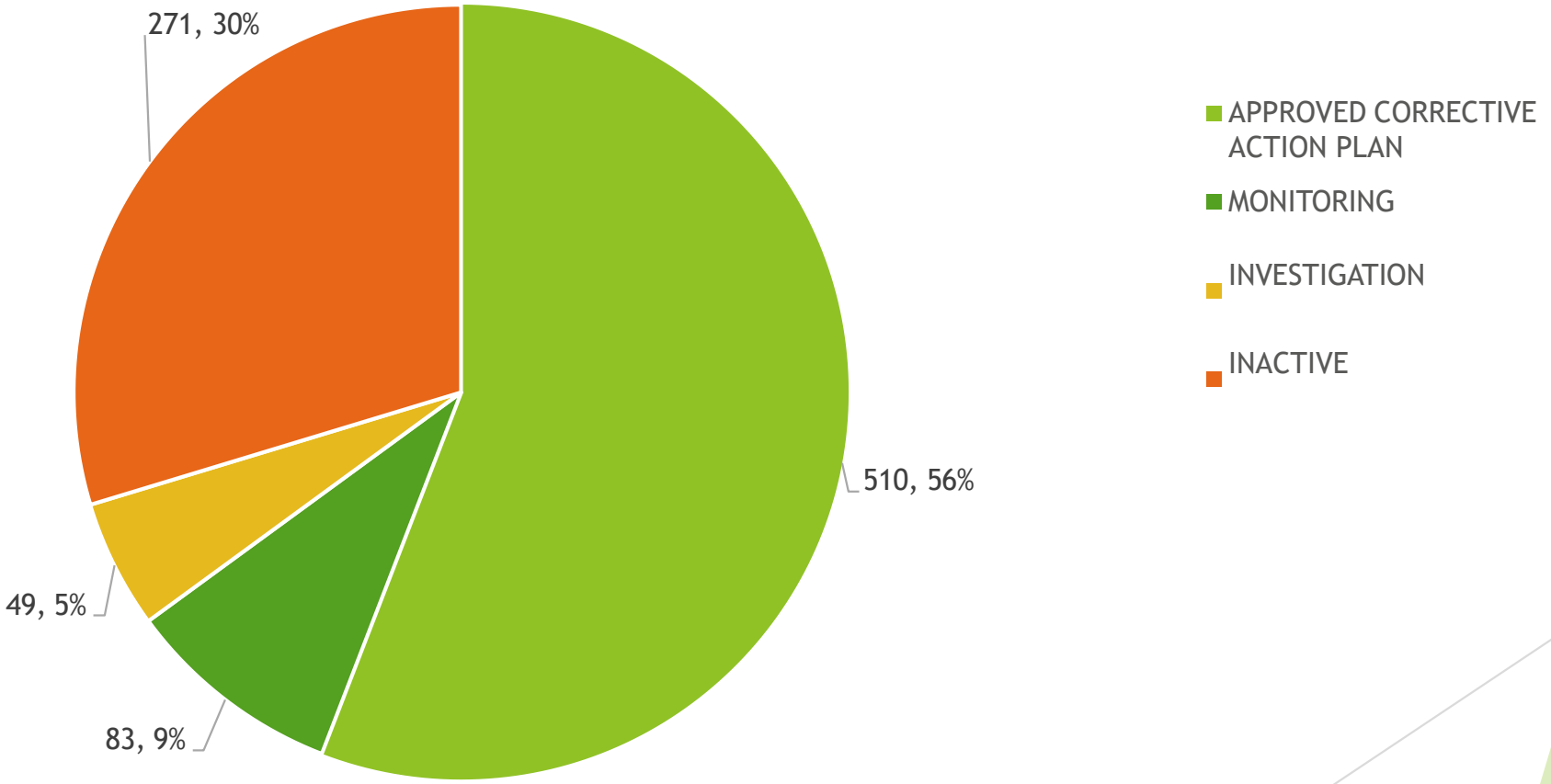
Geologic Map of Alabama

- Coastal Plain
- Piedmont
- Valley and Ridge
- Highland Rim
- Karst areas



OPEN UST RELEASE INCIDENT UNIVERSE

TOTAL NUMBER OF UST RELESE INCIDENTS = 5,249
NUMBER OF OPEN UST RELEASE INCIDENTS = 913



Advancing Cleanups…

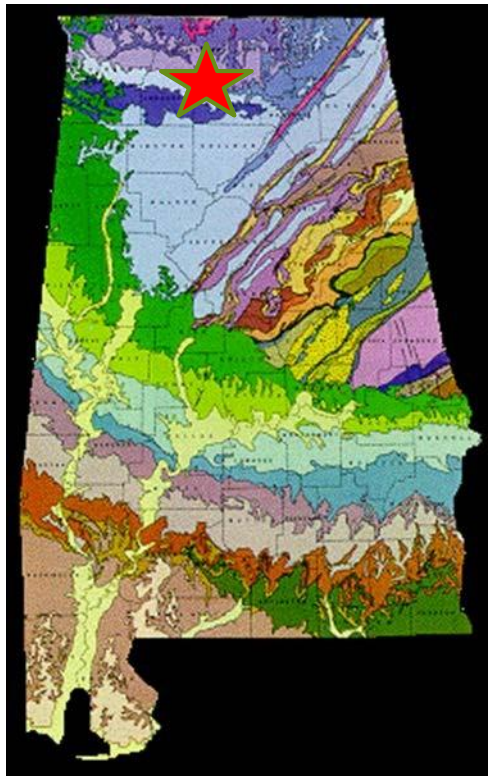
- ? How do we increase the number of cleanups?
- ? How do we decrease the cleanup time?
- ? What do we not know that we could know?

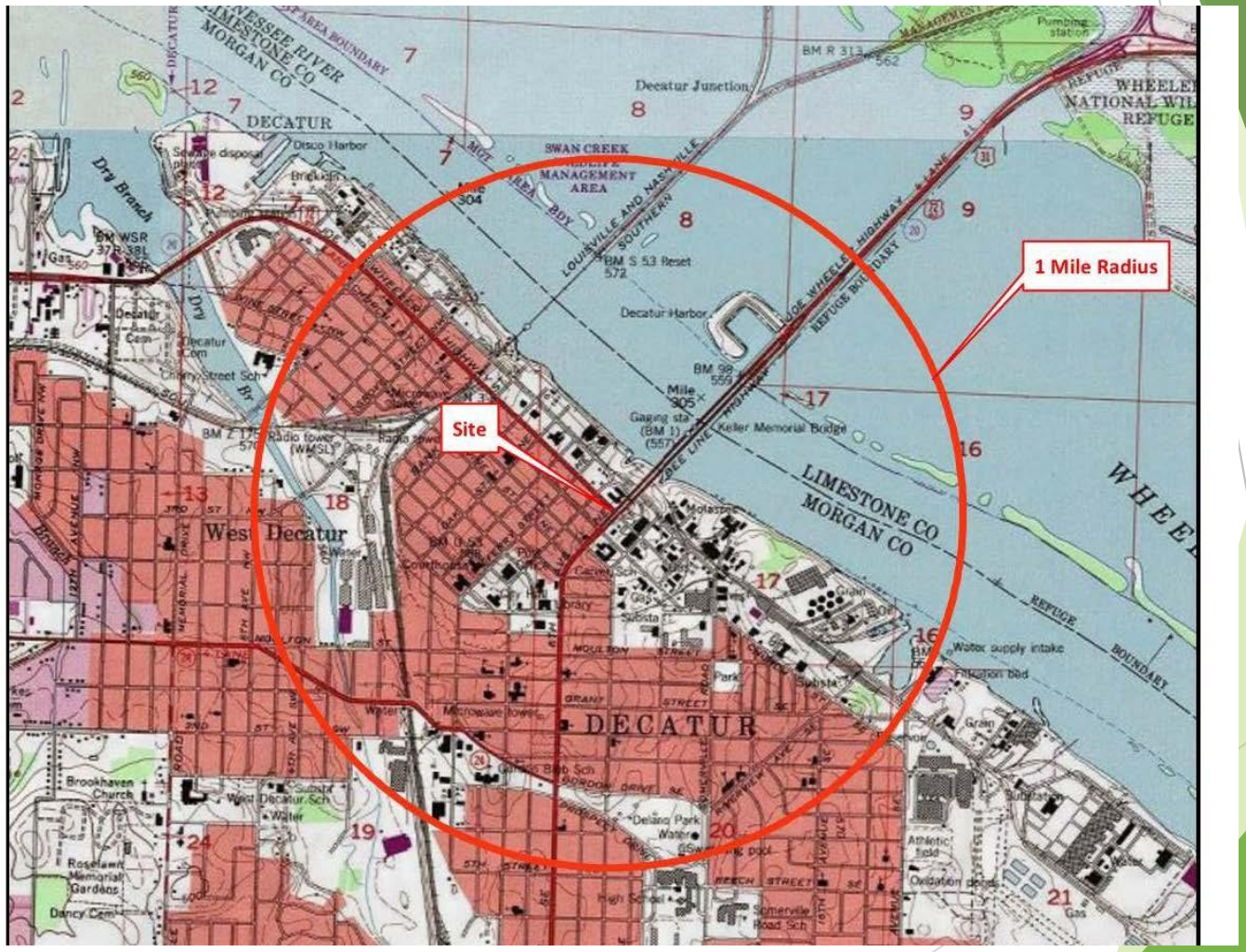
5 Experiences with High Resolution Site Characterization

- Emergency Response - Decatur
- Multiple Sources – Theodore
- Old Release– Tuscaloosa
- Vertical Extent of Contamination – Glencoe
- Large Release – Spanish Fort

Emergency Response

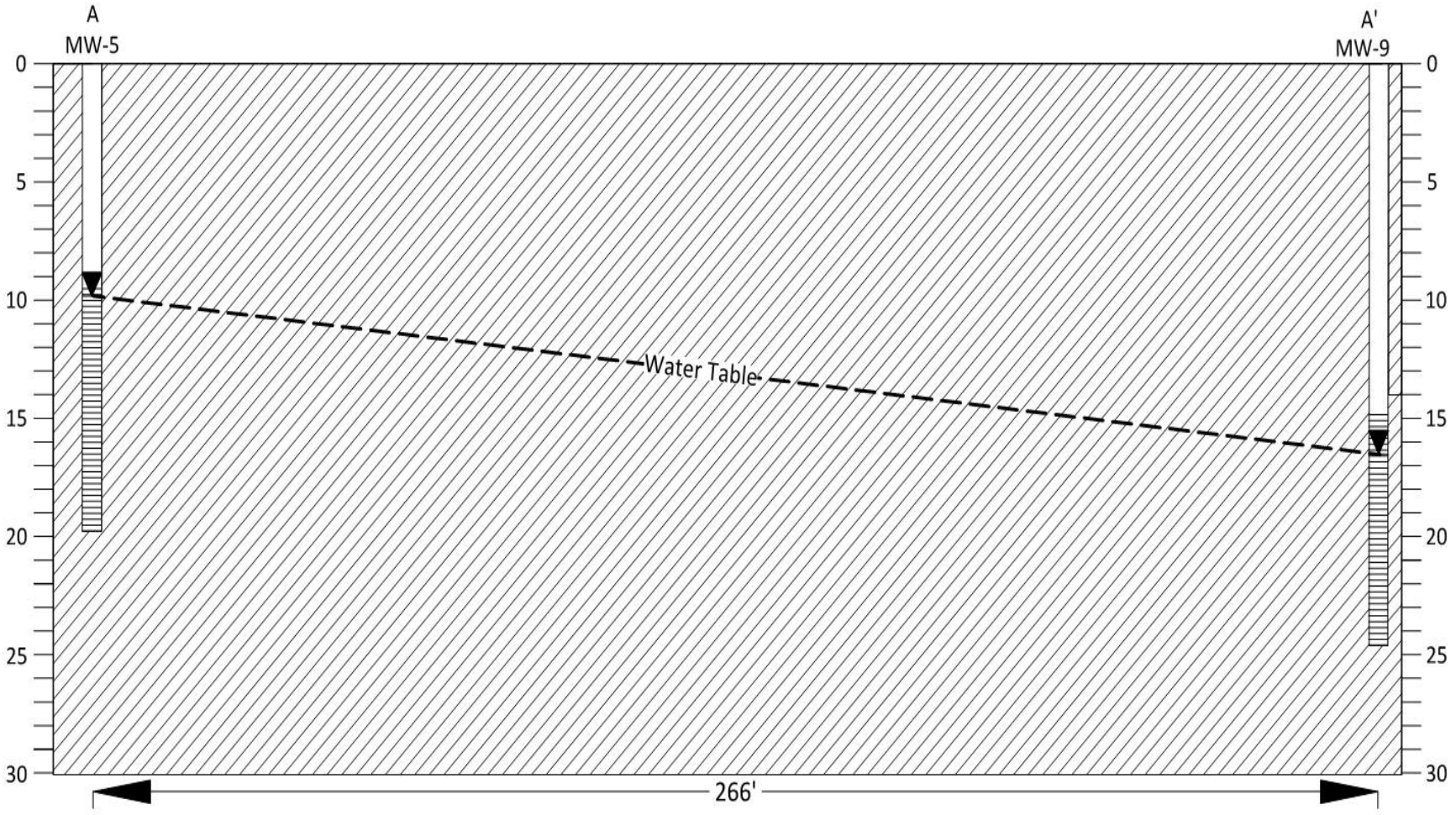
- Decatur, Alabama

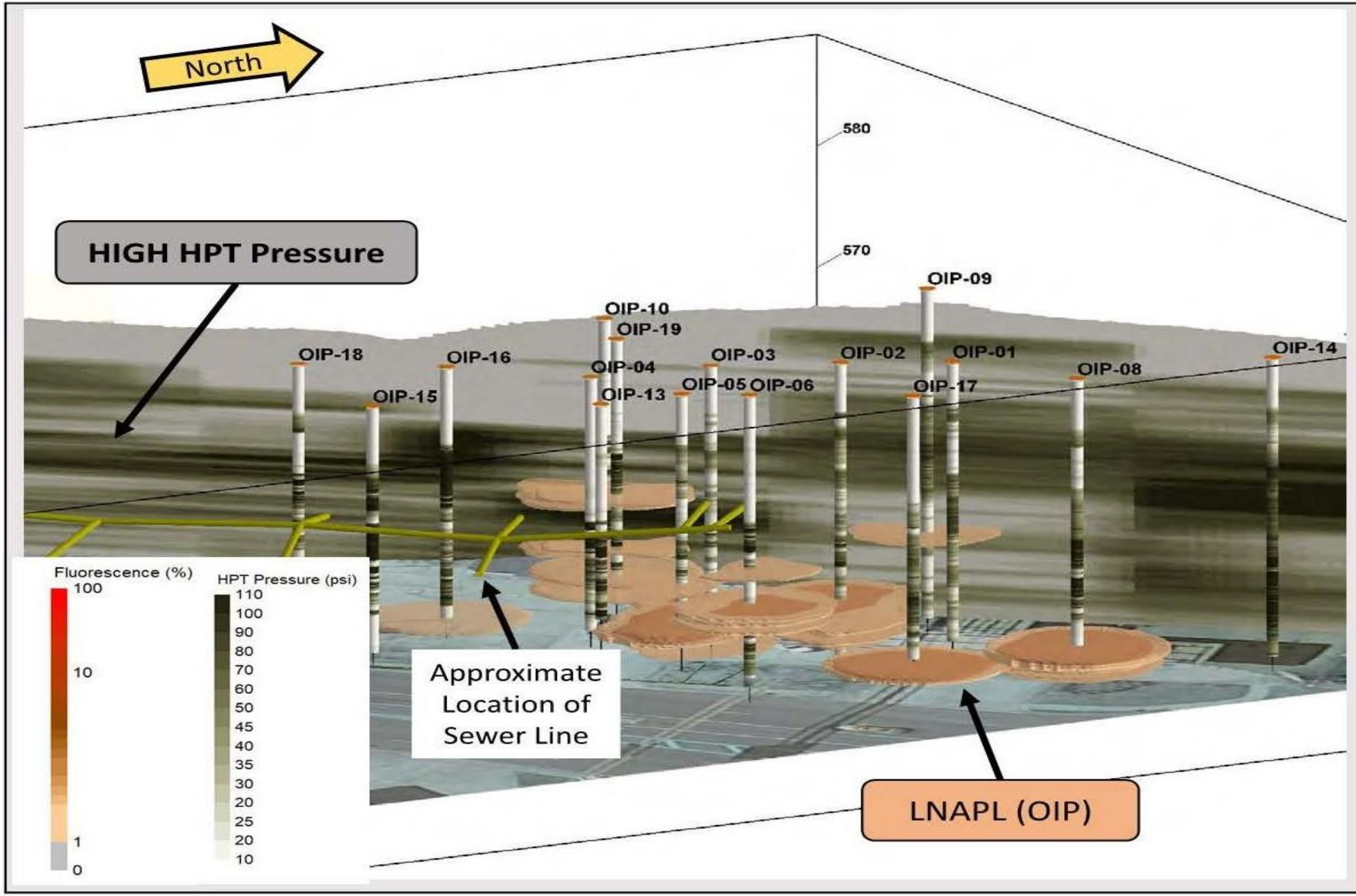




Emergency Response: HRSC's role in the emergency response

- Emergency response in January 2020
- High resolution investigation performed in early February 2020
- The purpose of the study was to accurately delineate both vertically and laterally any residual light non-aqueous phase liquid (LNAPL) at the site, to identify the soil structure in which any LNAPL resides for permeability and potential for recovery, and to identify pathways from the source area to the sanitary sewer.
- Remediation system installed in late January 2020


A
MW-5
A'
MW-9
0
5
10
15
20
25
30
Water Table
266'



HRSC Direct Sensing Results

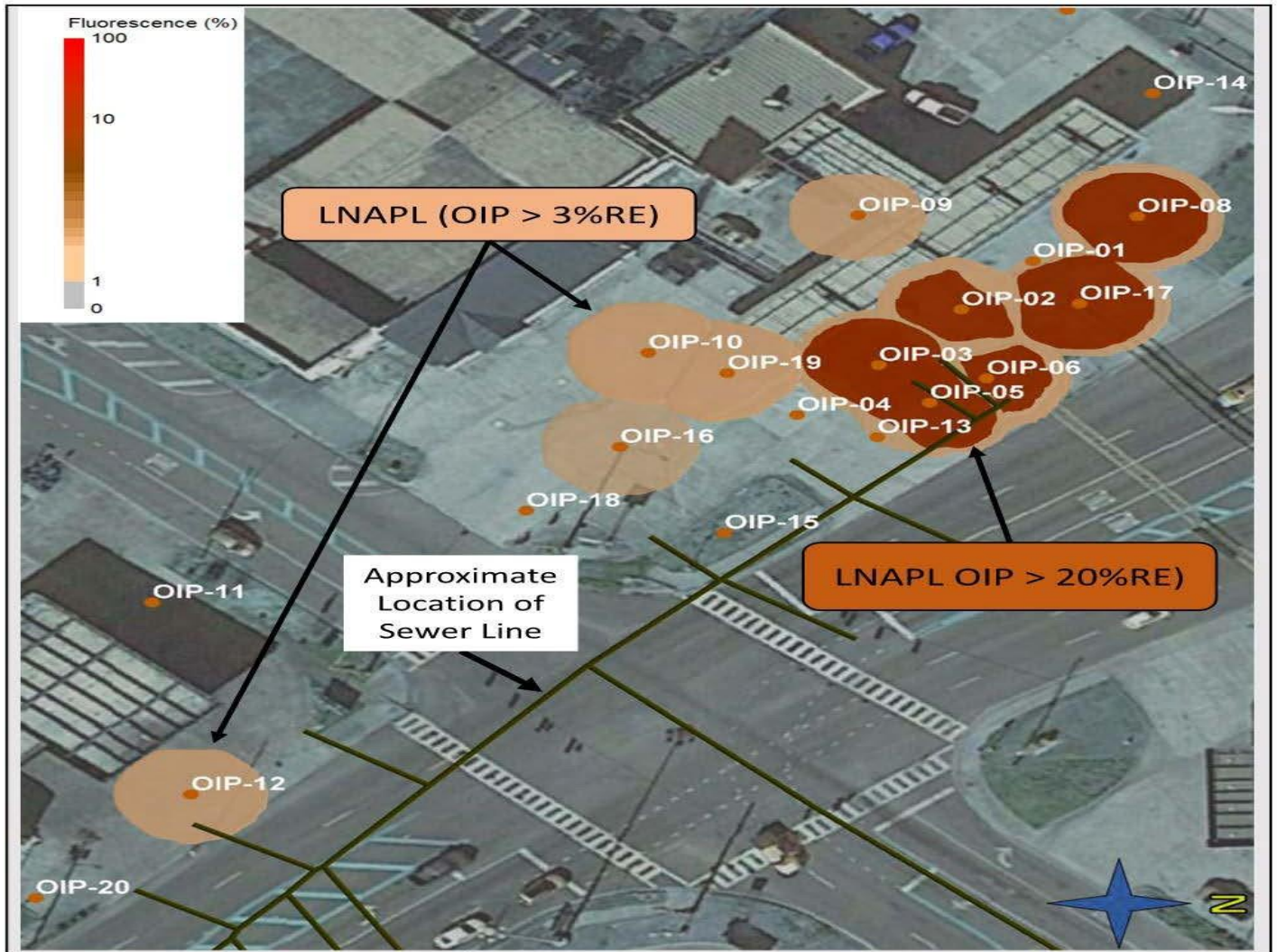
Figure 10

Riverside Shell ER
Decatur, Alabama

February 2020

High-Resolution Site Characterization

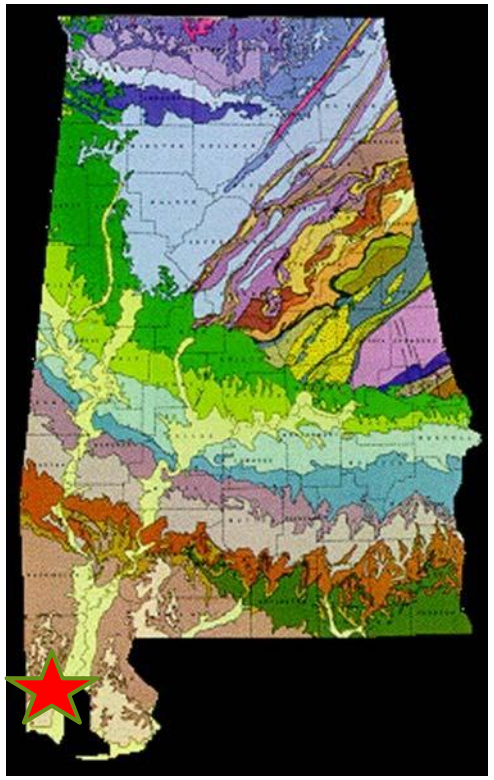
COLUMBIA TECHNOLOGIES

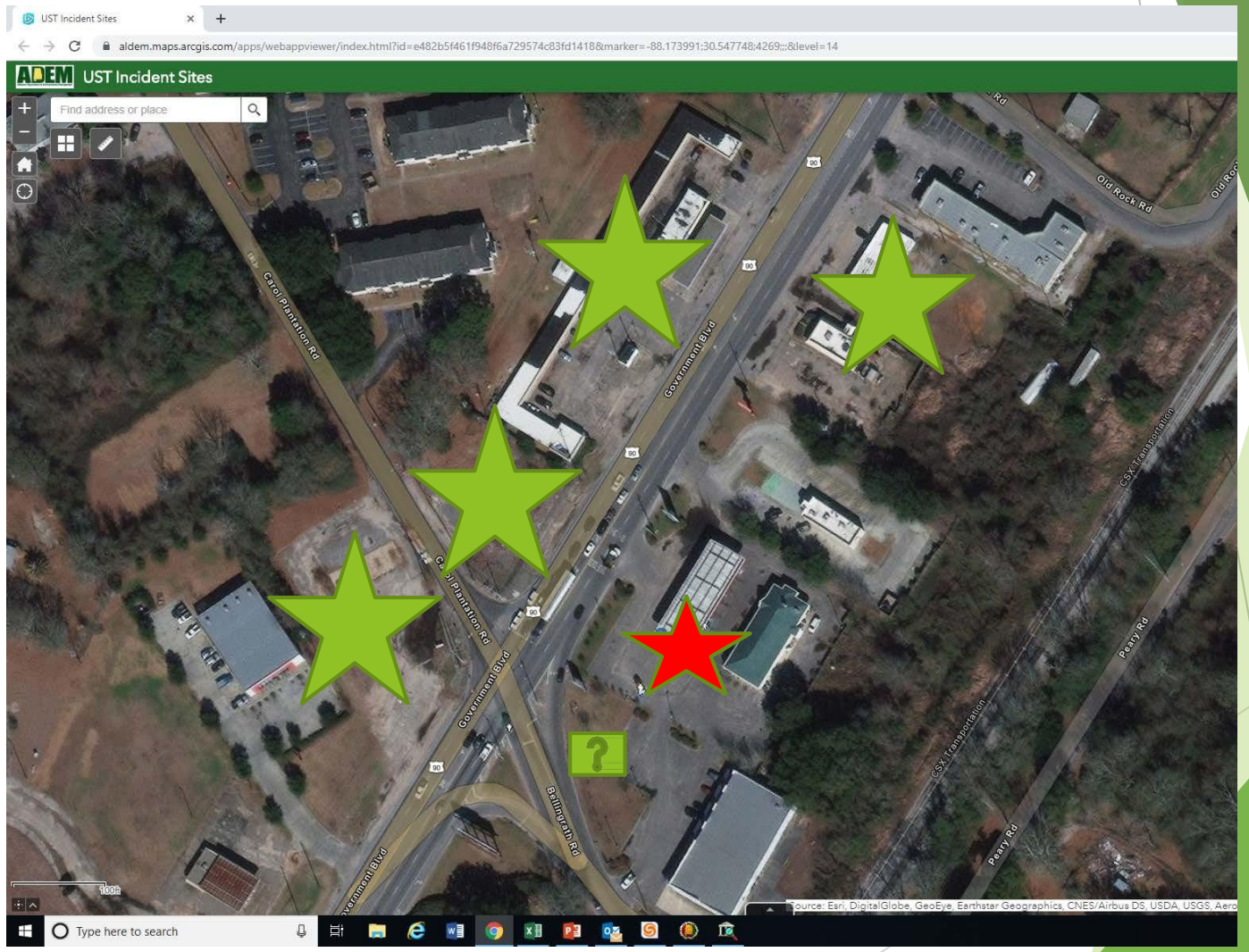


COLUMBIA TECHNOLOGIES	Riverside Shell ER Decatur, Alabama	**LNAPL Footprint**
	High-Resolution Site Characterization February 2020	**Figure 5**

Are there multiple sources?

- Theodore, Alabama





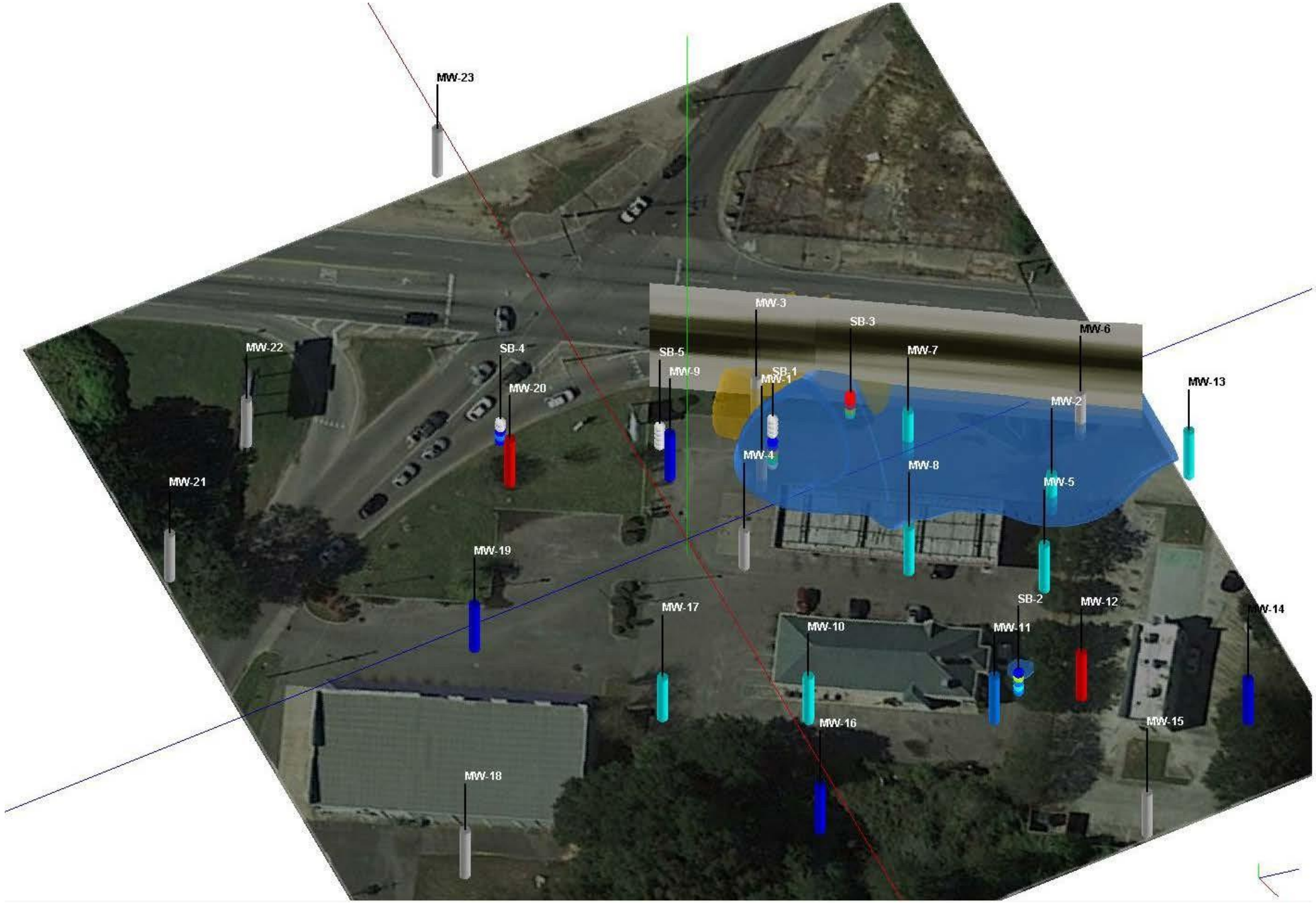

MW-23
MW-22
SB-4
MW-20
SB-5
MW-9
MW-3
SB-3
MW-6
MW-7
SB-1
MW-1
MW-13
MW-2
MW-4
MW-8
MW-5
MW-21
MW-19
MW-17
SB-2
MW-12
MW-14
MW-10
MW-11
MW-16
MW-15
MW-18

Figure 10

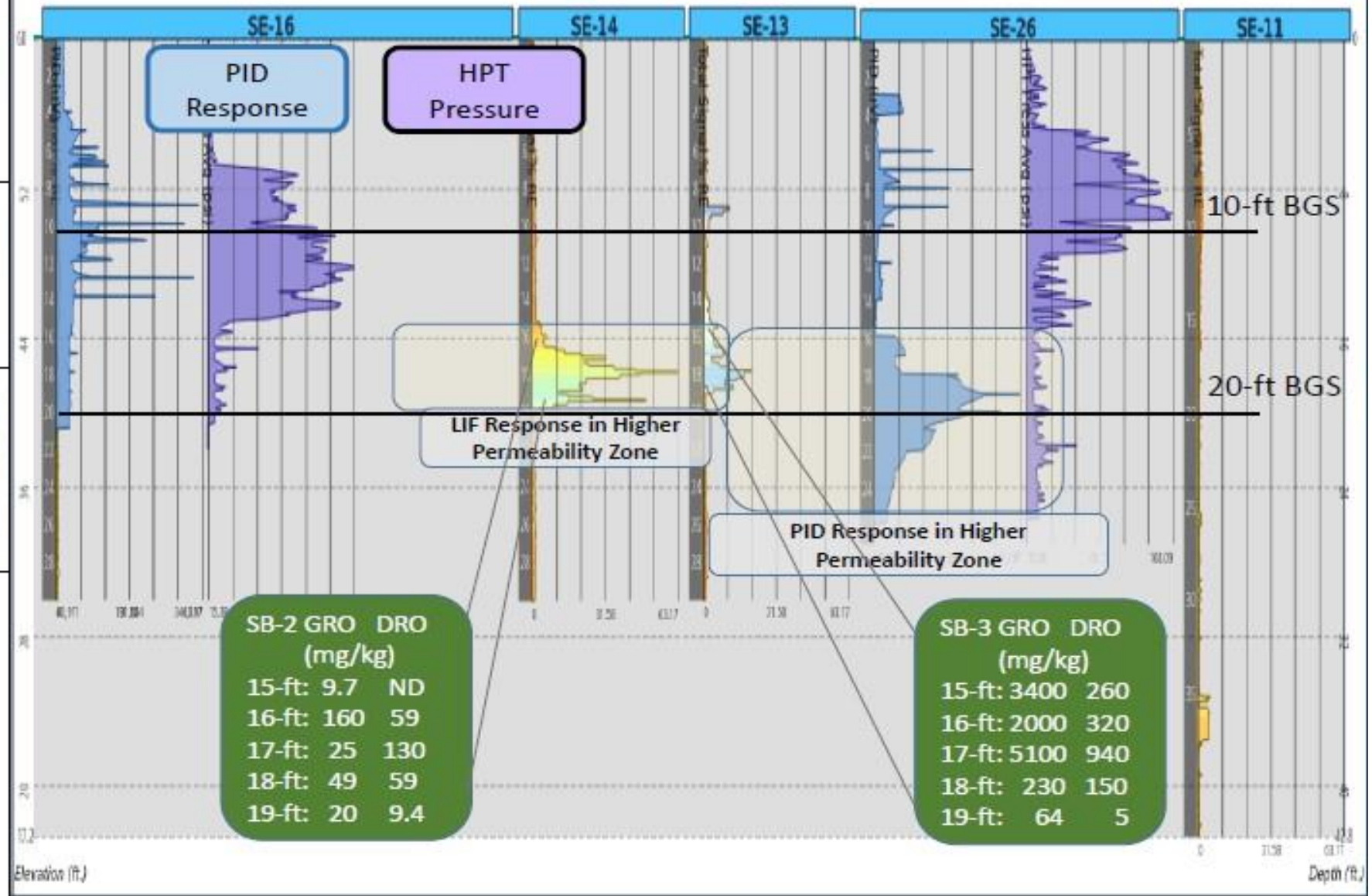
Western Boundary Transect A-A' Logs

February 2019

High-Resolution Assessment

SAI Theodore Exxon
Theodore, AL

COLUMBIA TECHNOLOGIES



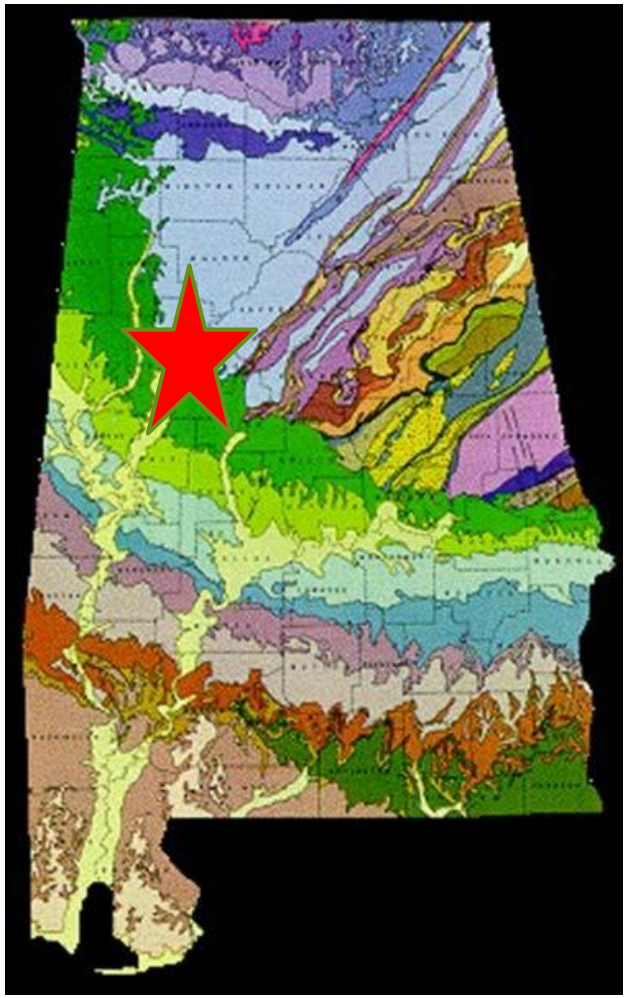
“The highest concentrations of contaminants in groundwater monitoring wells are off site both to the north (MW-12) and to the south (MW-20). These do not appear to have originated on the property itself, based on significantly lower MIP-PID responses and groundwater concentrations in monitoring wells near the tank enclosure and service island.”

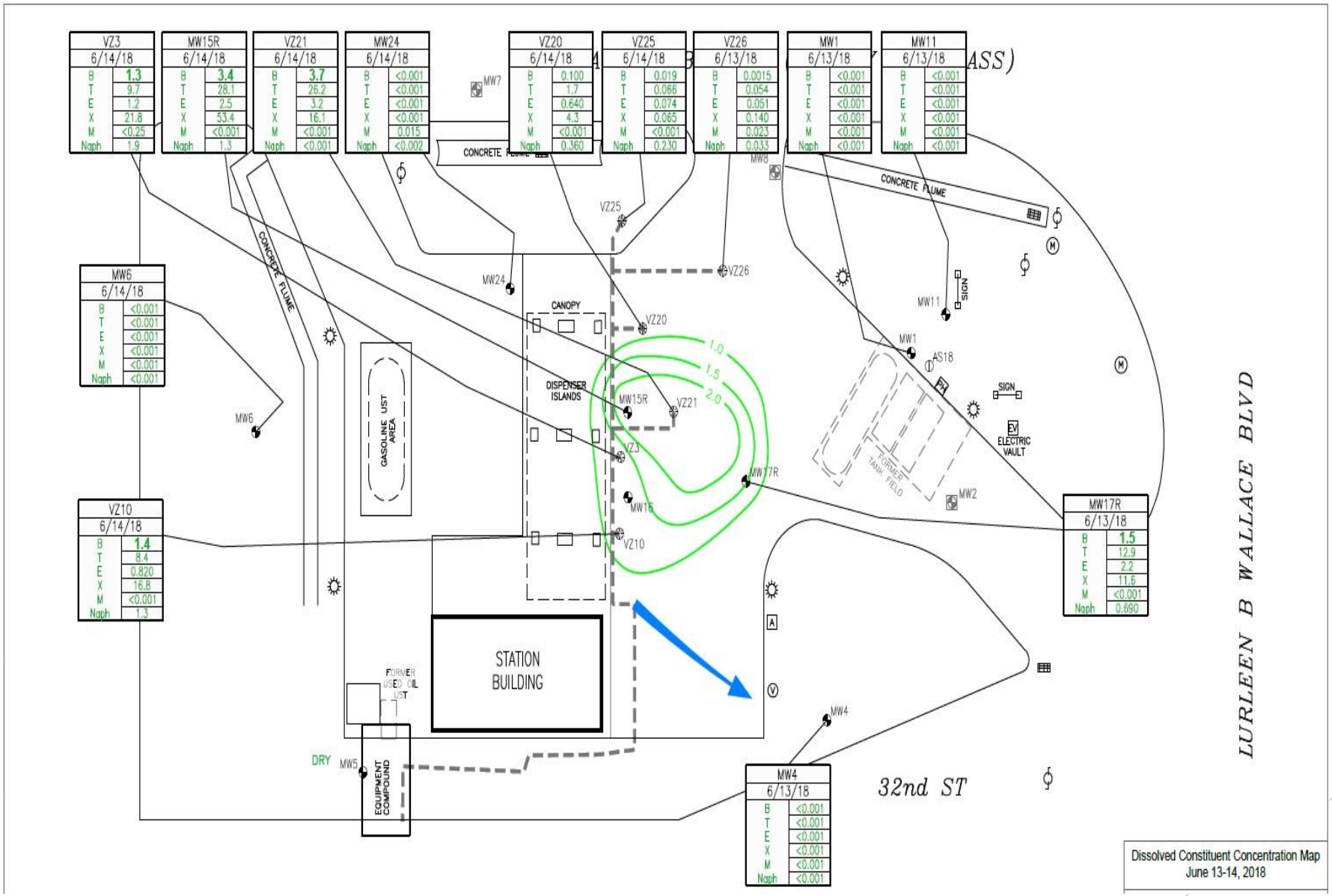
Going forward….

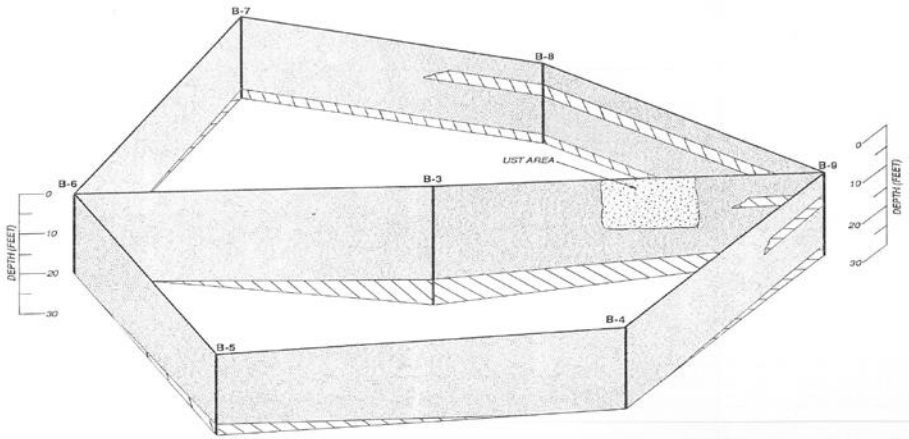
- Highest benzene concentrations continue to be in offsite wells
- Site continues in a monitoring only program
- Investigation into deed documents to determine if adjacent properties may have been used for fuel storage is underway

Old Incident (1991)

- Tuscaloosa, Alabama




VZ3
6/14/18
B 1.3
T 9.7
E 1.2
X 21.8
M <0.25
Naph 1.9
MW15R
6/14/18
B 3.4
T 28.1
E 2.5
X 53.4
M <0.001
Naph 1.3
VZ21
6/14/18
B 3.7
T 26.2
E 3.2
X 16.1
M <0.001
Naph <0.001
MW24
6/14/18
B <0.001
T <0.001
E <0.001
X <0.001
M 0.015
Naph <0.002
VZ20
6/14/18
B 0.100
T 1.7
E 0.640
X 4.3
M <0.001
Naph 0.360
VZ25
6/14/18
B 0.019
T 0.066
E 0.074
X 0.065
M <0.001
Naph 0.230
VZ26
6/13/18
B 0.0015
T 0.054
E 0.051
X 0.140
M 0.023
Naph 0.033
MW1
6/13/18
B <0.001
T <0.001
E <0.001
X <0.001
M <0.001
Naph <0.001
MW11
6/13/18
B <0.001
T <0.001
E <0.001
X <0.001
M <0.001
Naph <0.001
MW6
6/14/18
B <0.001
T <0.001
E <0.001
X <0.001
M <0.001
Naph <0.001
VZ10
6/14/18
B 1.4
T 8.4
E 0.820
X 16.8
M <0.001
Naph 1.3
MW17R
6/13/18
B 1.5
T 12.9
E 2.2
X 11.6
M <0.001
Naph 0.690
MW4
6/13/18
B <0.001
T <0.001
E <0.001
X <0.001
M <0.001
Naph <0.001
MW7
MW8
VZ25
VZ26
MW24
CANOPY
VZ20
1.0
1.5
2.0
DISPENSER ISLANDS
MW15R
VZ21
VZ3
MW17R
MW16
VZ10
MW6
GASOLINE UST AREA
CONCRETE FLUME
CONCRETE FLUME
MW11
SIGN
MW1
AS18
SIGN
EV ELECTRIC VAULT
FORMER TANK FIELD
MW2
STATION BUILDING
FORMER USED OIL UST
DRY
MW5
EQUIPMENT COMPOUND
MW4
32nd ST
LURLEEN B WALLACE BLVD
Dissolved Constituent Concentration Map
June 13-14, 2018



LEGEND

- CLAY TO SILTY CLAY
- SILTY FINE SAND TO MEDIUM SAND
- BACK FILL MATERIAL

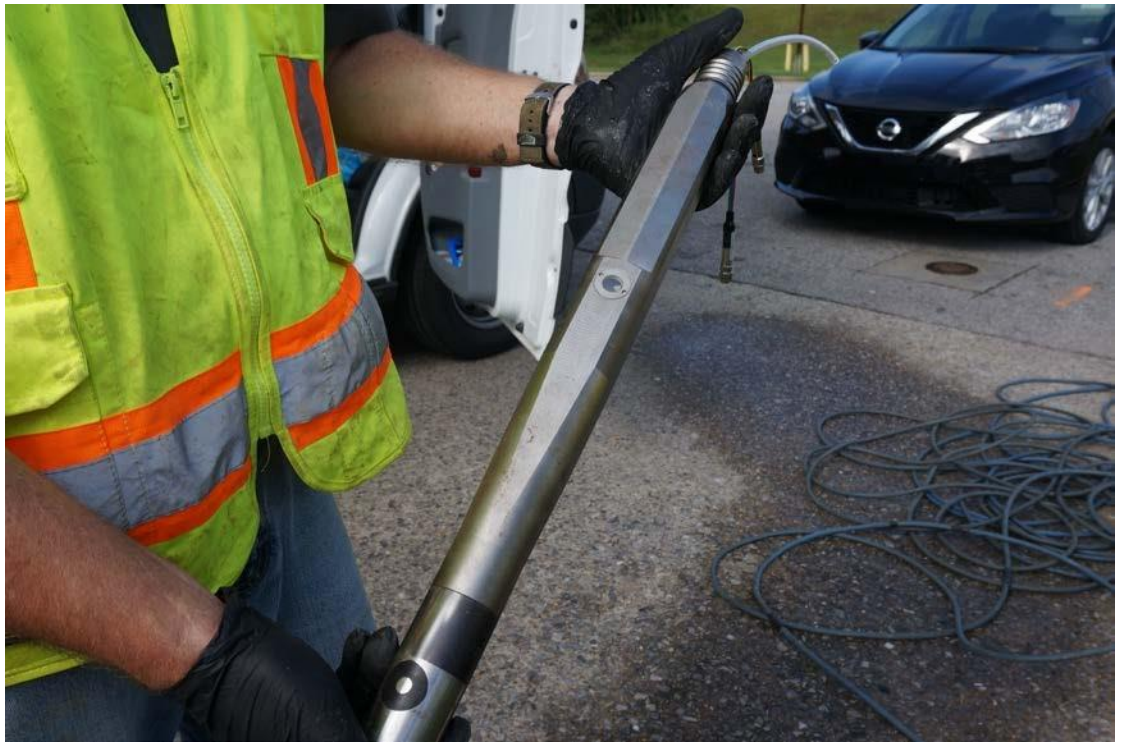
11" O.D. Hollow Stem: 4' to 20'

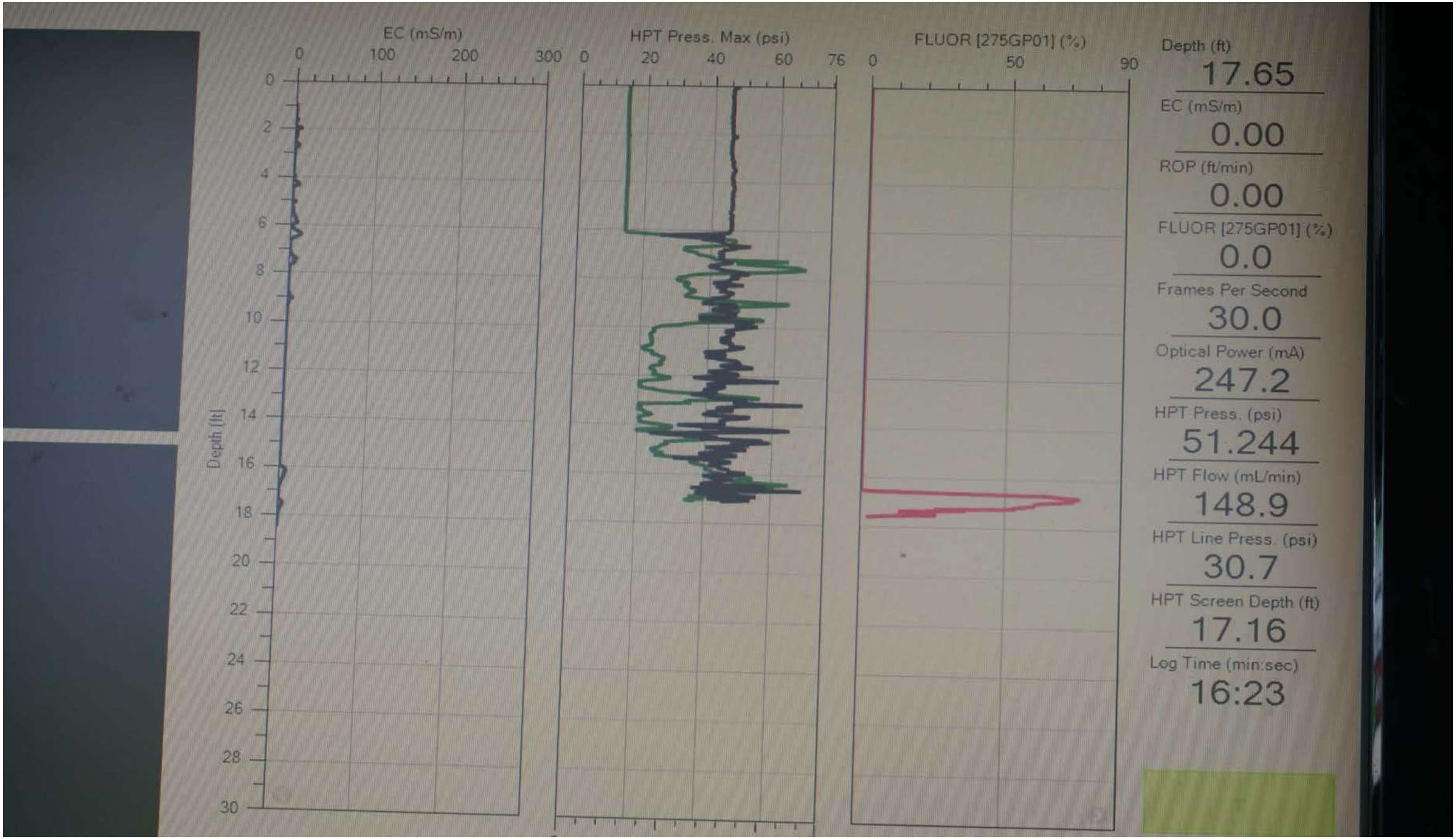
LOGGED BY : W. M. Flores

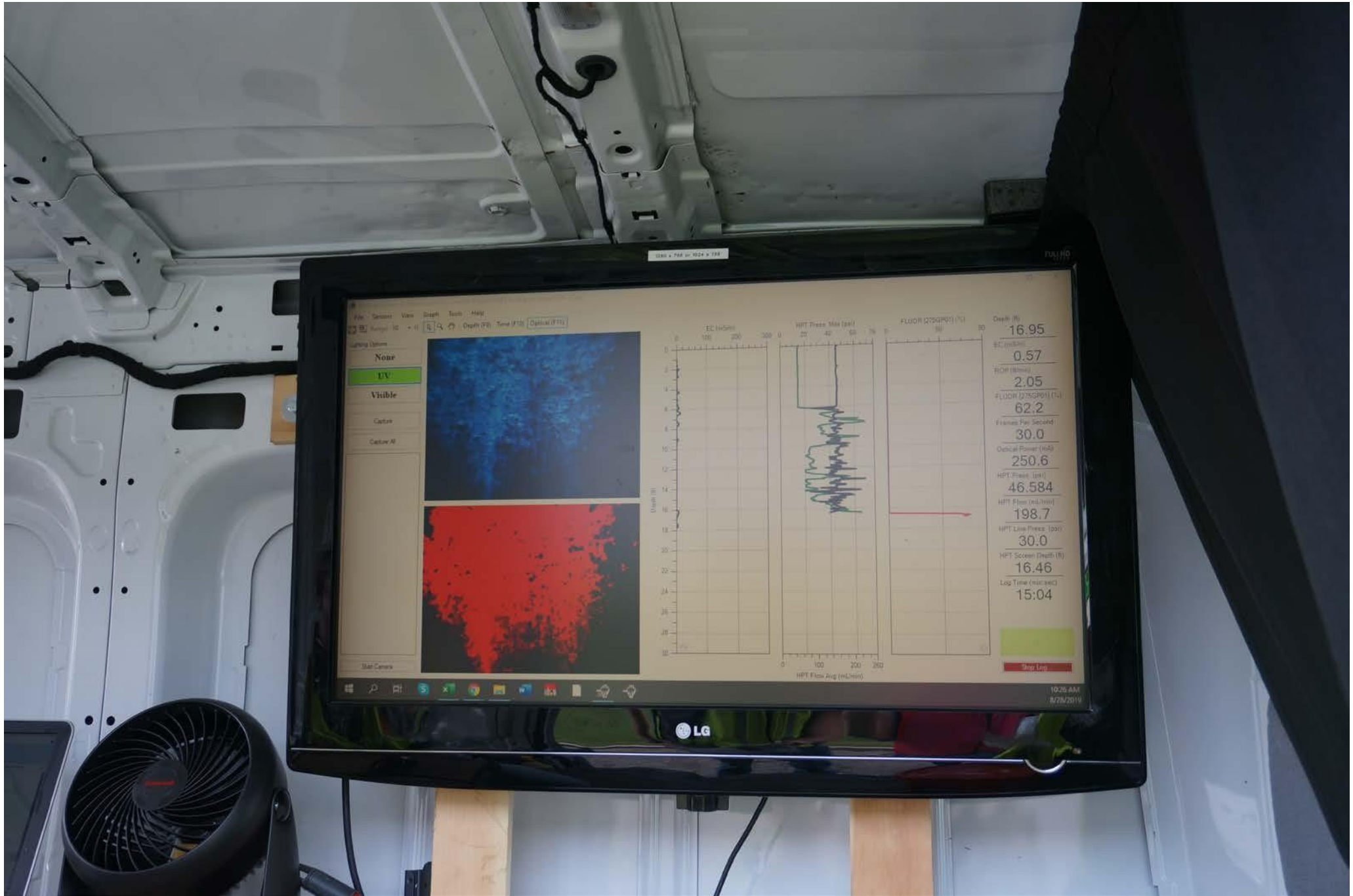
Depth (feet)	SAMPLE	WL	HNU Reading (ppm)	Std. Pen. Test (blows/ft)	Description of Material
					4" Asphalt
			50	5	Loose orange SILTY SAND (SM)
5					Dark orange SILTY CLAY (CL) w/sandy CLAY charcoal lens -- trace of sand and gravel
			100	8	Loose brown CLAYEY SAND (SC) w/gravel
10		▽			Loose dark orange coarse SAND (SP)
			100	7	
15					
			10	19	-- gray, tan and orange
20					Gray CLAYEY SAND (SC) Boring TP-1 was terminated at 20 feet.

Shelby Tube
Std. Penetration Test (Split Spoon Sample)
Auger Cuttings
No Recovery
▽ Water First Noted
▼ Static Water Level

NOTE : No geotechnical laboratory testing performed. Soil classifications are based upon visual, field observation and should be considered as such.

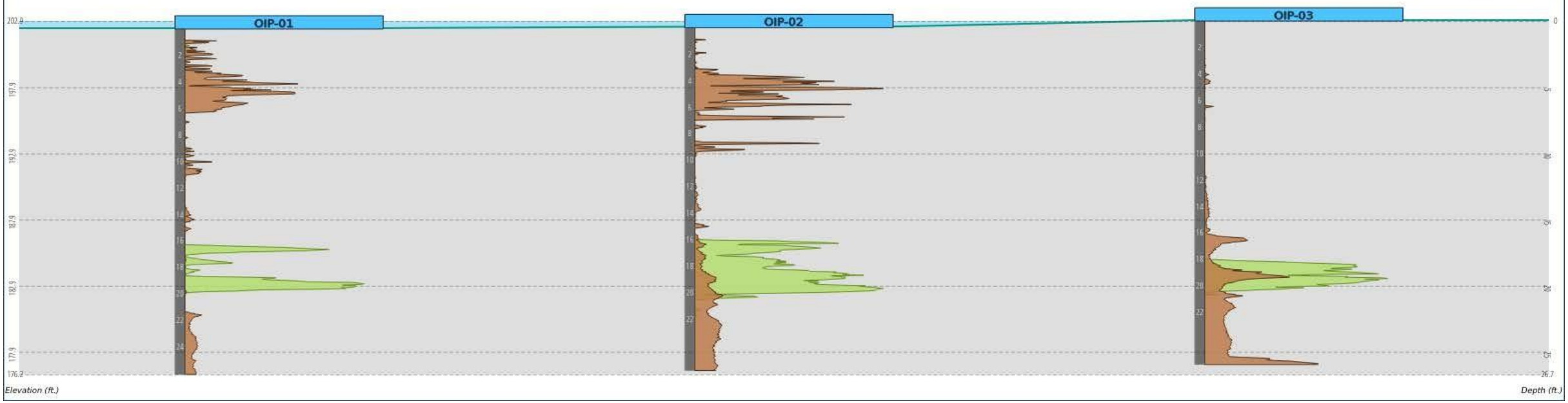


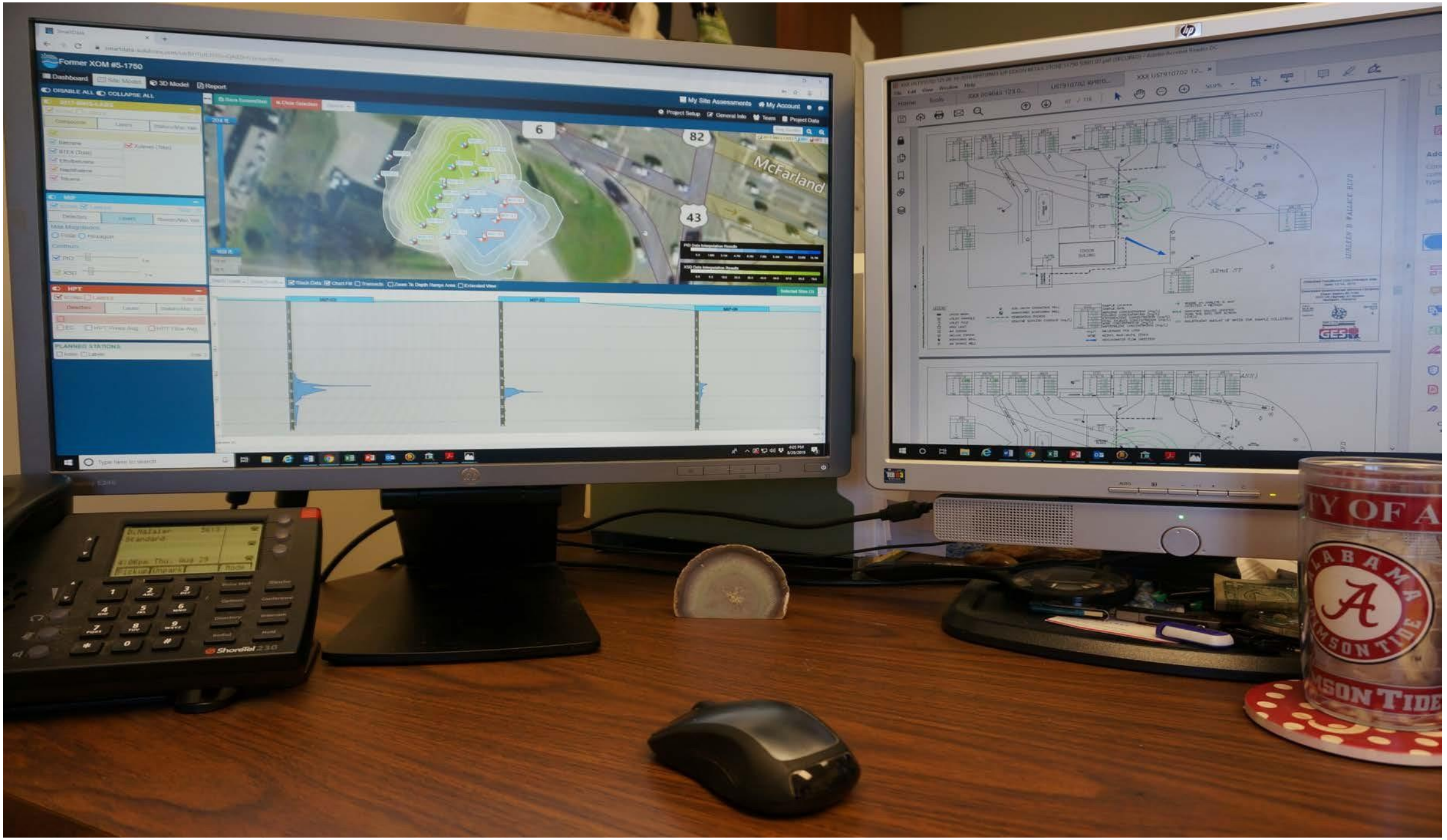

EC (mS/m)
0
100
200
300
HPT Press. Max (psi)
0
20
40
60
76
FLUOR [275GP01] (%)
0
50
90
Depth (ft)
17.65
EC (mS/m)
0.00
ROP (ft/min)
0.00
FLUOR [275GP01] (%)
0.0
Frames Per Second
30.0
Optical Power (mA)
247.2
HPT Press. (psi)
51.244
HPT Flow (mL/min)
148.9
HPT Line Press. (psi)
30.7
HPT Screen Depth (ft)
17.16
Log Time (min:sec)
16:23
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30


None
UV
Visible
Capture
Capture All
Start Camera
16.95
0.57
2.05
62.2
30.0
250.6
46.584
198.7
30.0
16.46
15:04
Stop Log
LG


6
McFarland Blvd
69
6
82
McFarland Blvd
43
32nd St
43


2017-MWS-LABS
MIP
HPT
204 ft.
169 ft.
10 m
30 ft
6
82
43
McFarland Blvd
OIP-12
OIP-14
MIP-07
OIP-06
OIP-10
OIP-11
OIP-13
OIP-07
OIP-01
OIP-02
OIP-05
MIP-06
OIP-03
OIP-08
OIP-04
MIP-03
OIP-09
MIP-04
MIP-02
MIP-01
MIP-08
MIP-05
MIP-09


OIP-01
OIP-02
OIP-03
Elevation (ft.)
Depth (ft.)

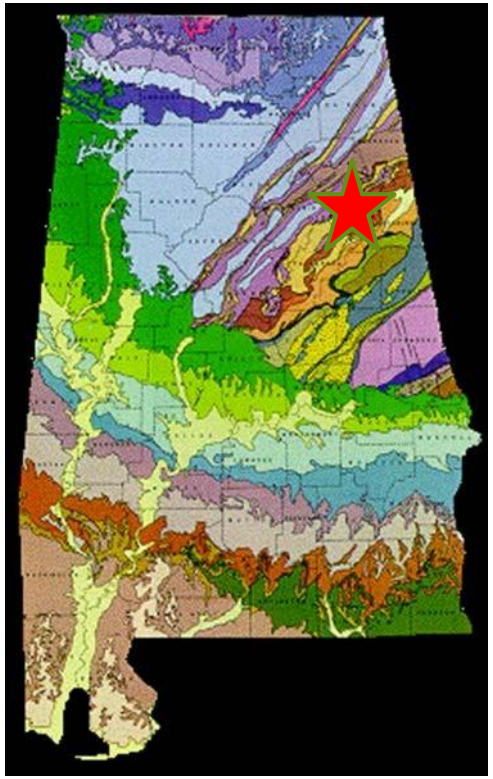

Former XOM #S-1750
Dashboard
Site Model
3D Model
Report
DISABLE ALL
COLLAPSE ALL
My Site Assessments
My Account
Project Setup
General Info
Team
Project Data
MIP
HPT
PLANNED STATIONS
6
82
43
McFarland
ShoreTel 230
ALABAMA
CRIMSON TIDE

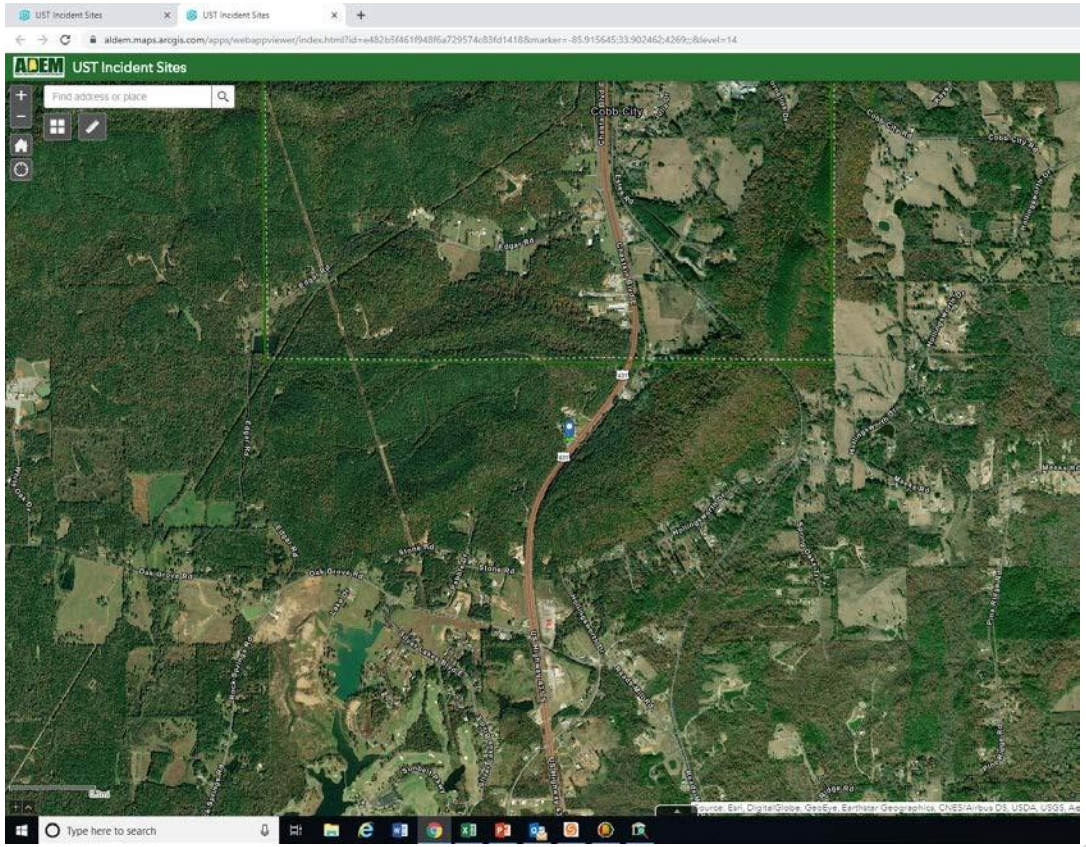
Going Forward after the HRSC…..

- The DPVE system will remain shut off
- Periodic MEME events will be performed in the vicinity of the well with the highest groundwater contamination
- Contamination is better delineated and will allow for a more focused remedial method - Injection?

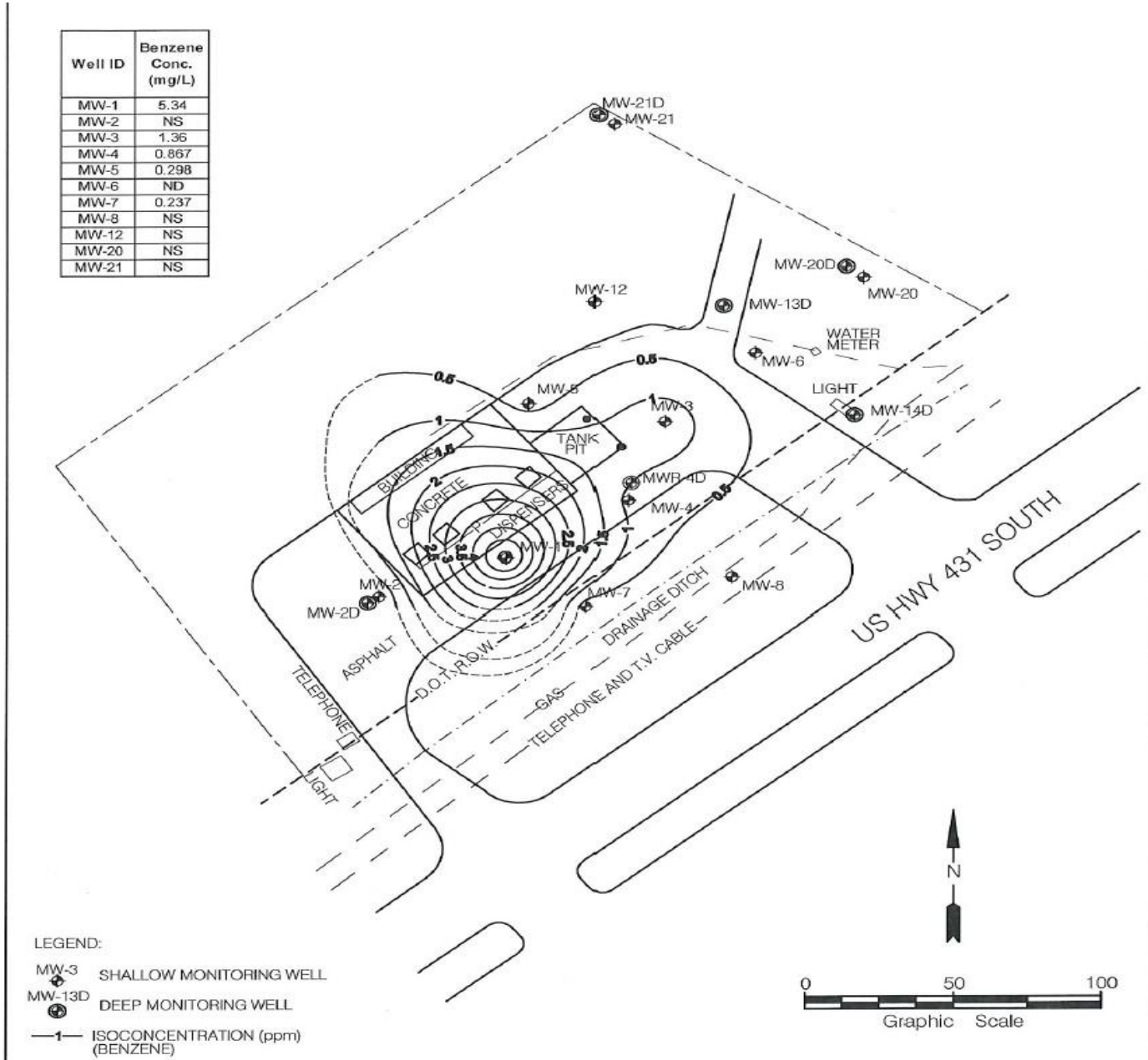
Vertical Extent of Contamination

- Glencoe, Alabama

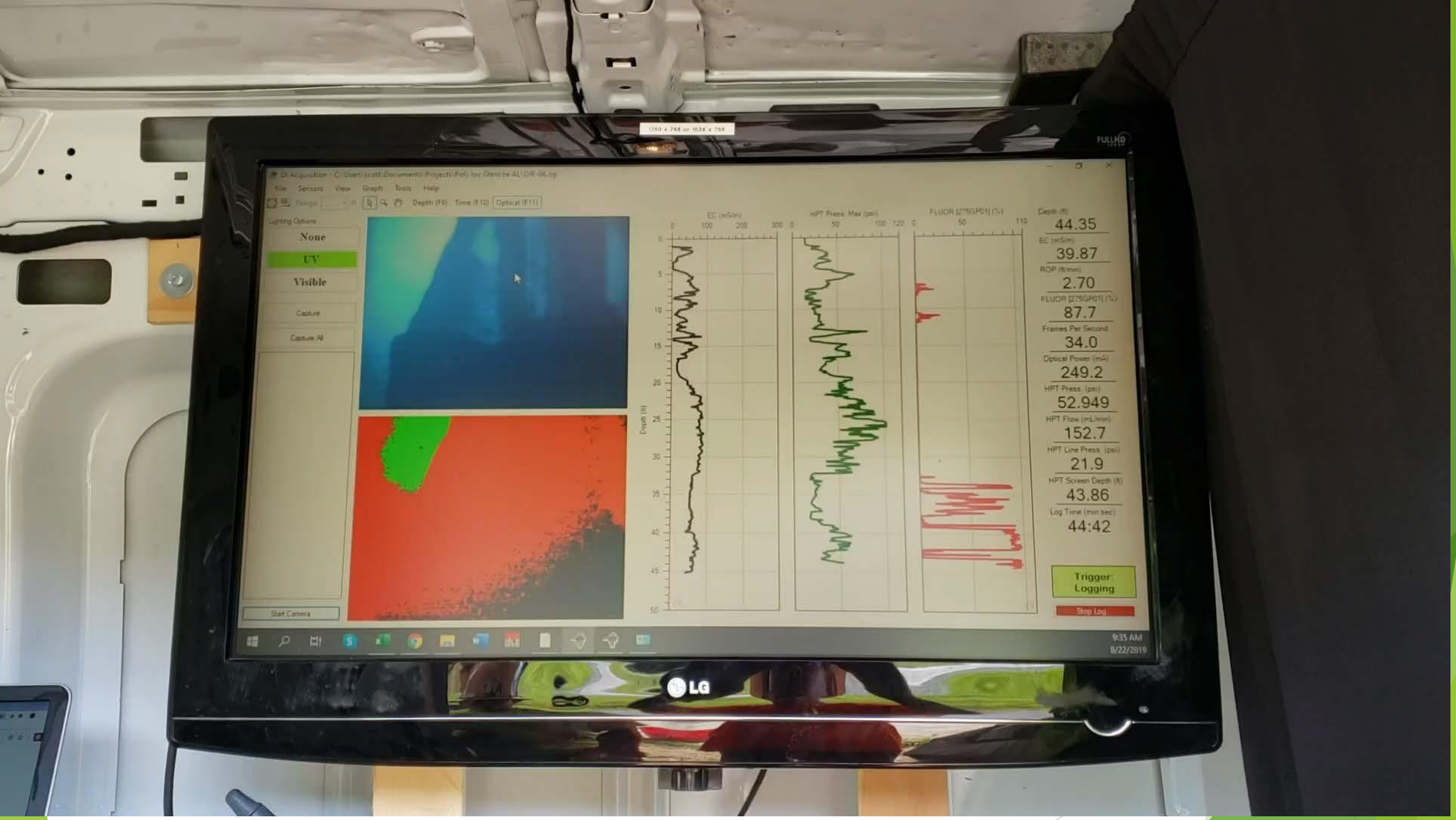


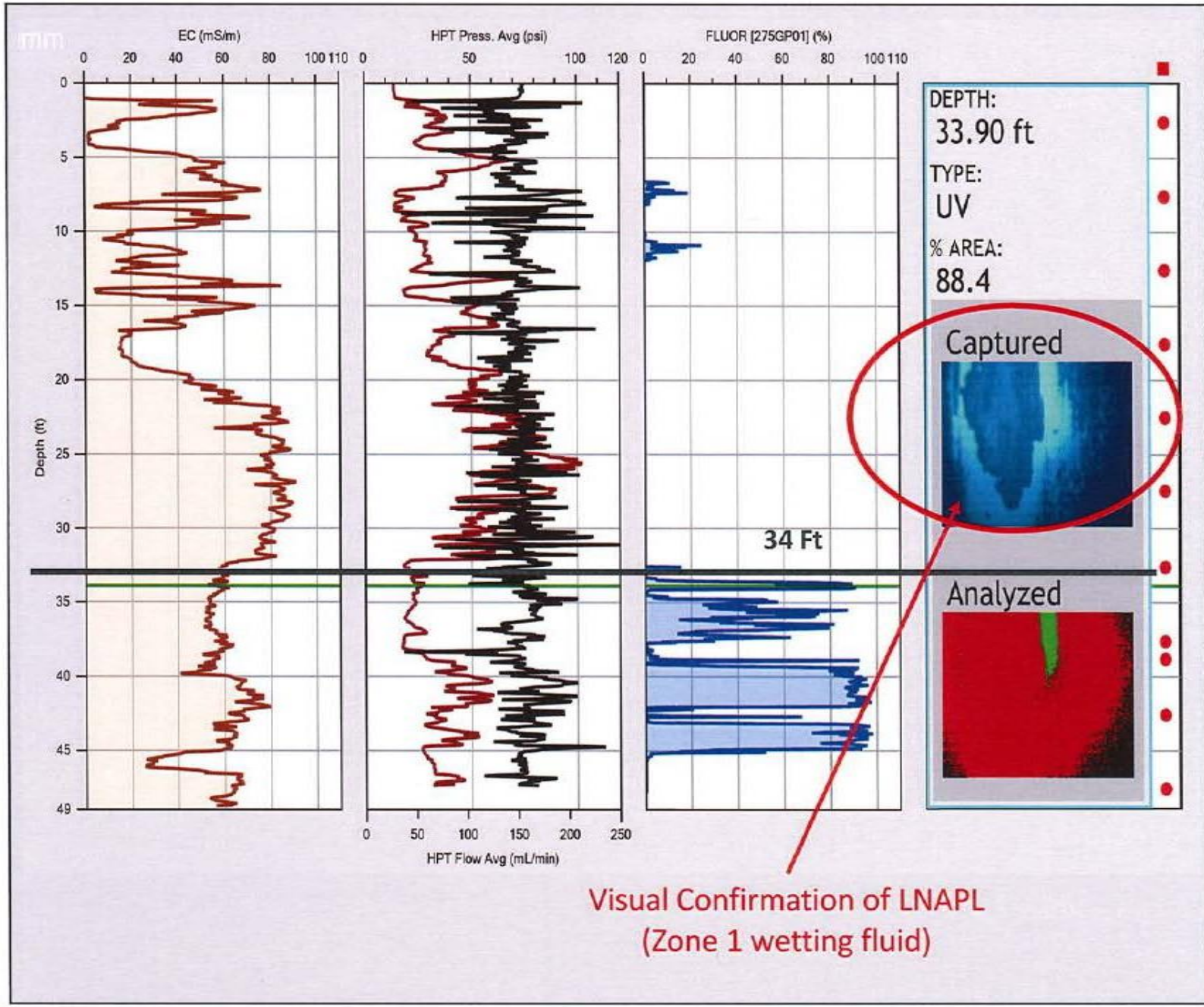


Well ID	Benzene Conc. (mg/L)
MW-1	5.34
MW-2	NS
MW-3	1.36
MW-4	0.867
MW-5	0.298
MW-6	ND
MW-7	0.237
MW-8	NS
MW-12	NS
MW-20	NS
MW-21	NS




MIP
HPT
714 ft.
647 ft.
10 m
30 ft
Depth Scale
Value Scale
Stack Data
Chart Fill
Transects
Zoom To Depth Range Area
Extended View
Selected Sites (6)
OIP-07
OIP-06
OIP-01
OIP-13
OIP-02
OIP-03


None
UV
Visible
Capture
Capture All
Start Camera
EC (mS/in)
HPT Press. Max (psi)
FLUOR [275GP01] (%)
Depth (ft)
44.35
EC (mS/in)
39.87
ROP (ft/min)
2.70
FLUOR [275GP01] (%)
87.7
Frames Per Second
34.0
Optical Power (mA)
249.2
HPT Press. (psi)
52.949
HPT Flow (mL/min)
152.7
HPT Line Press. (psi)
21.9
HPT Screen Depth (ft)
43.86
Log Time (min:sec)
44:42
Trigger: Logging
Stop Log
9:35 AM
8/22/2019
LG



Visual Confirmation of LNAPL in OIP-06

Figure 9

RJs Service Station
Glencoe, AL

August 2019

High-Resolution Site Characterization

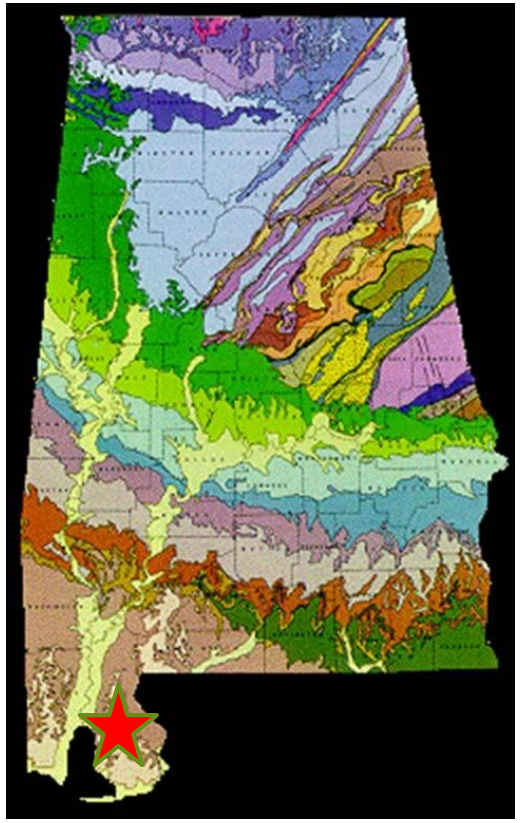
COLUMBIA TECHNOLOGIES

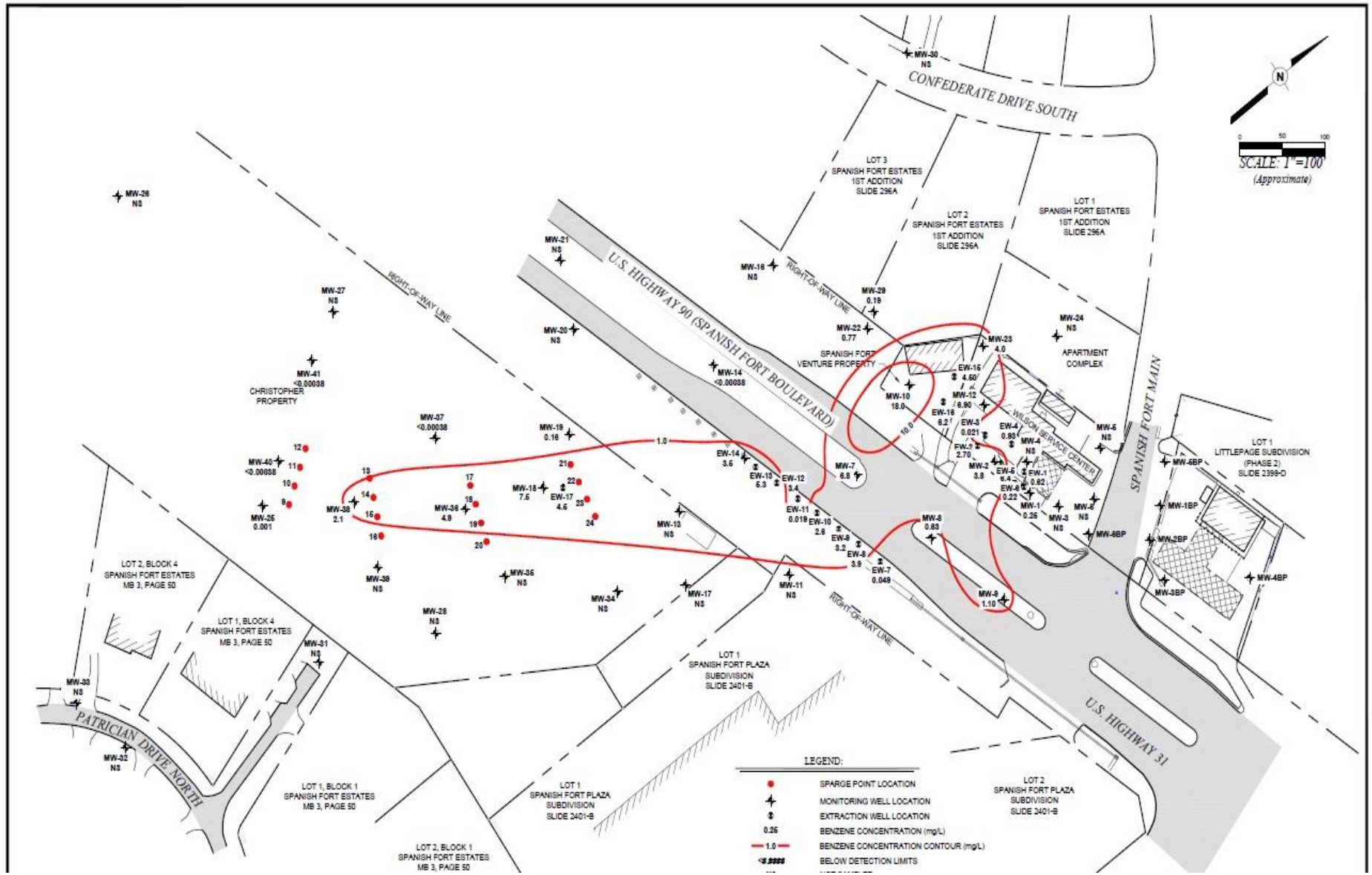
After the HSRC….

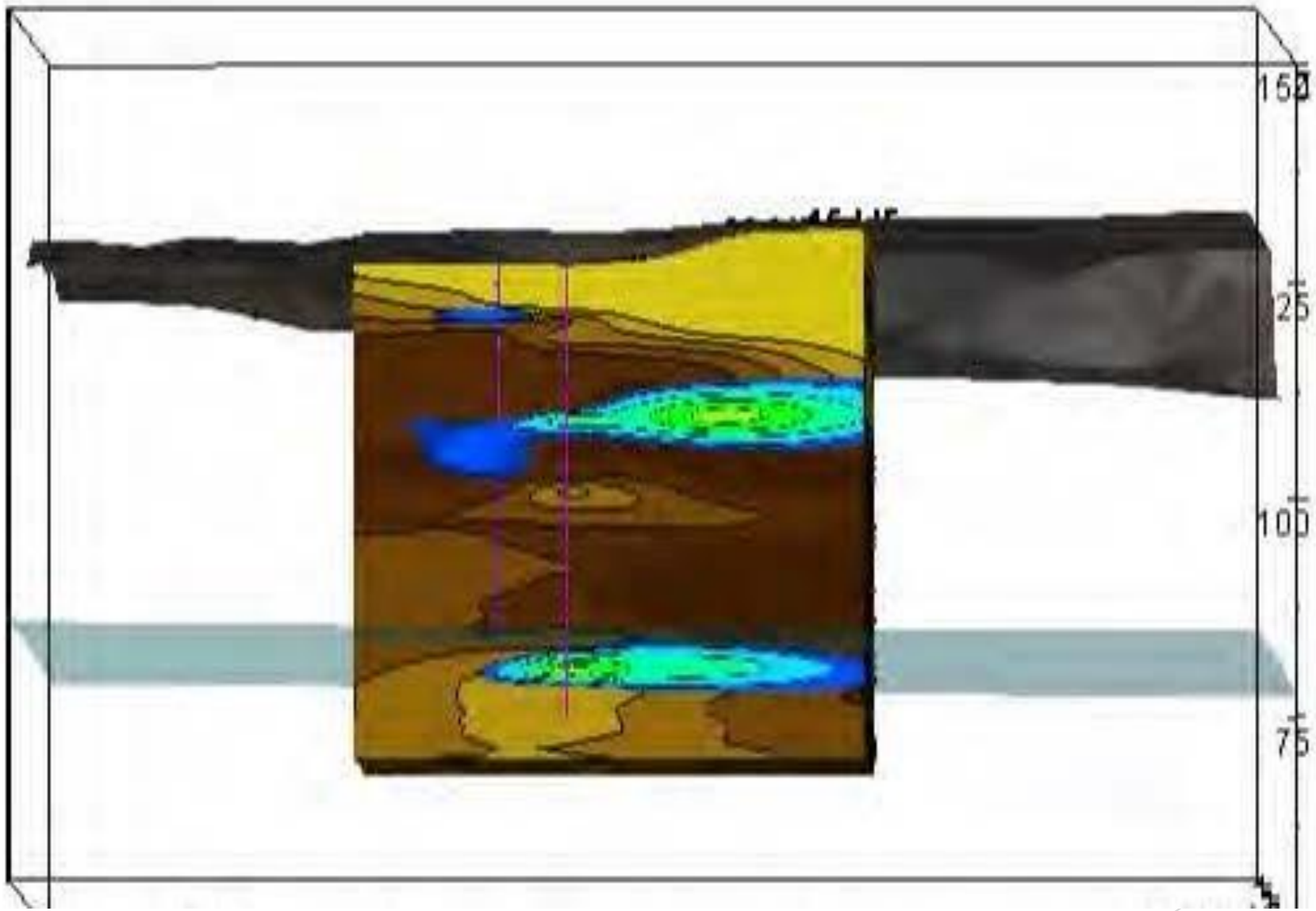
- New recovery wells were installed in the identified zones (with difficulty)
- Recently .9’ of free product observed in a site well that typically contained over 19 ppm benzene
- MEME events will be performed to reduce free product and dissolved concentrations in a more focused manner

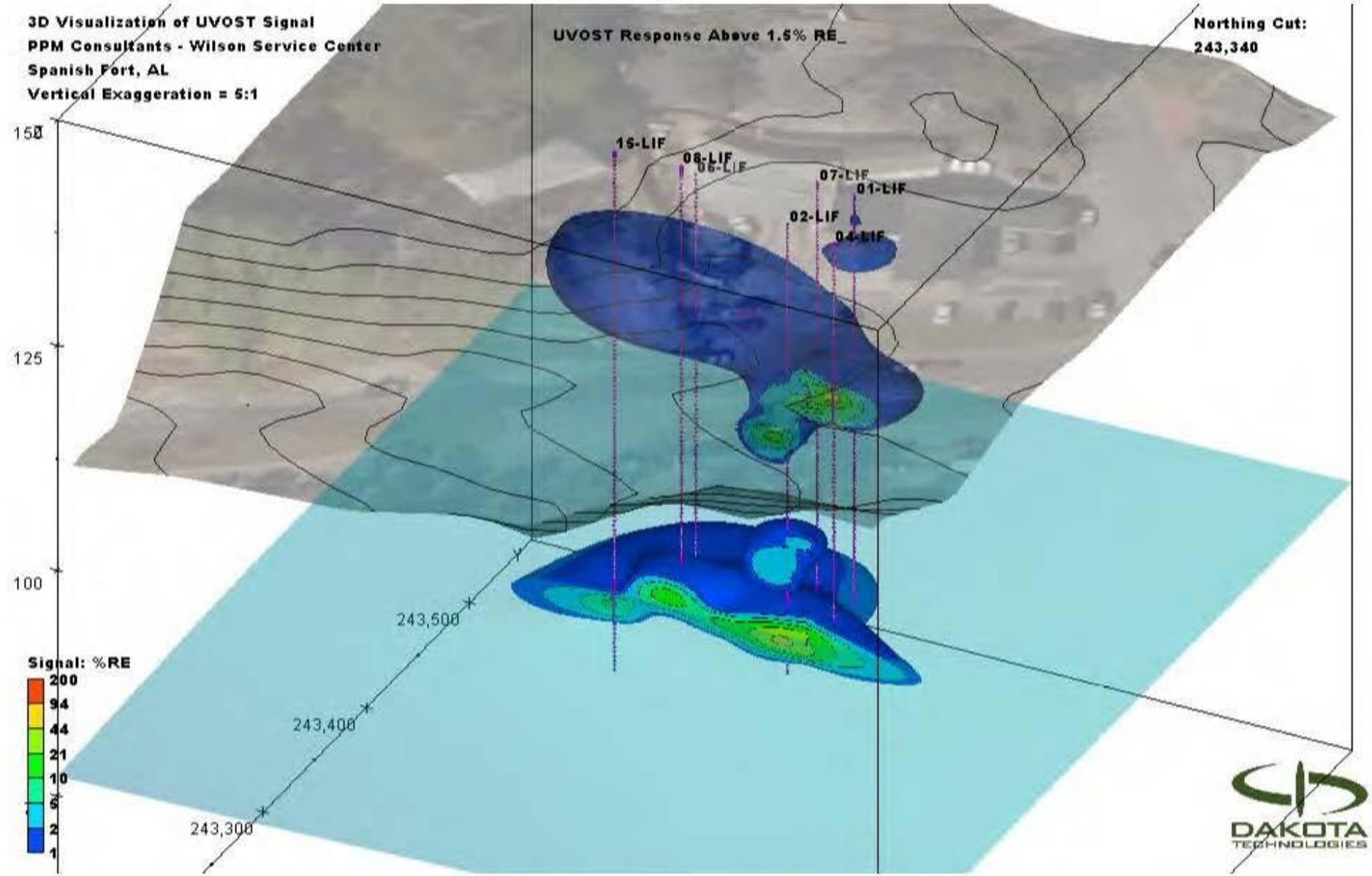
Large Release Site

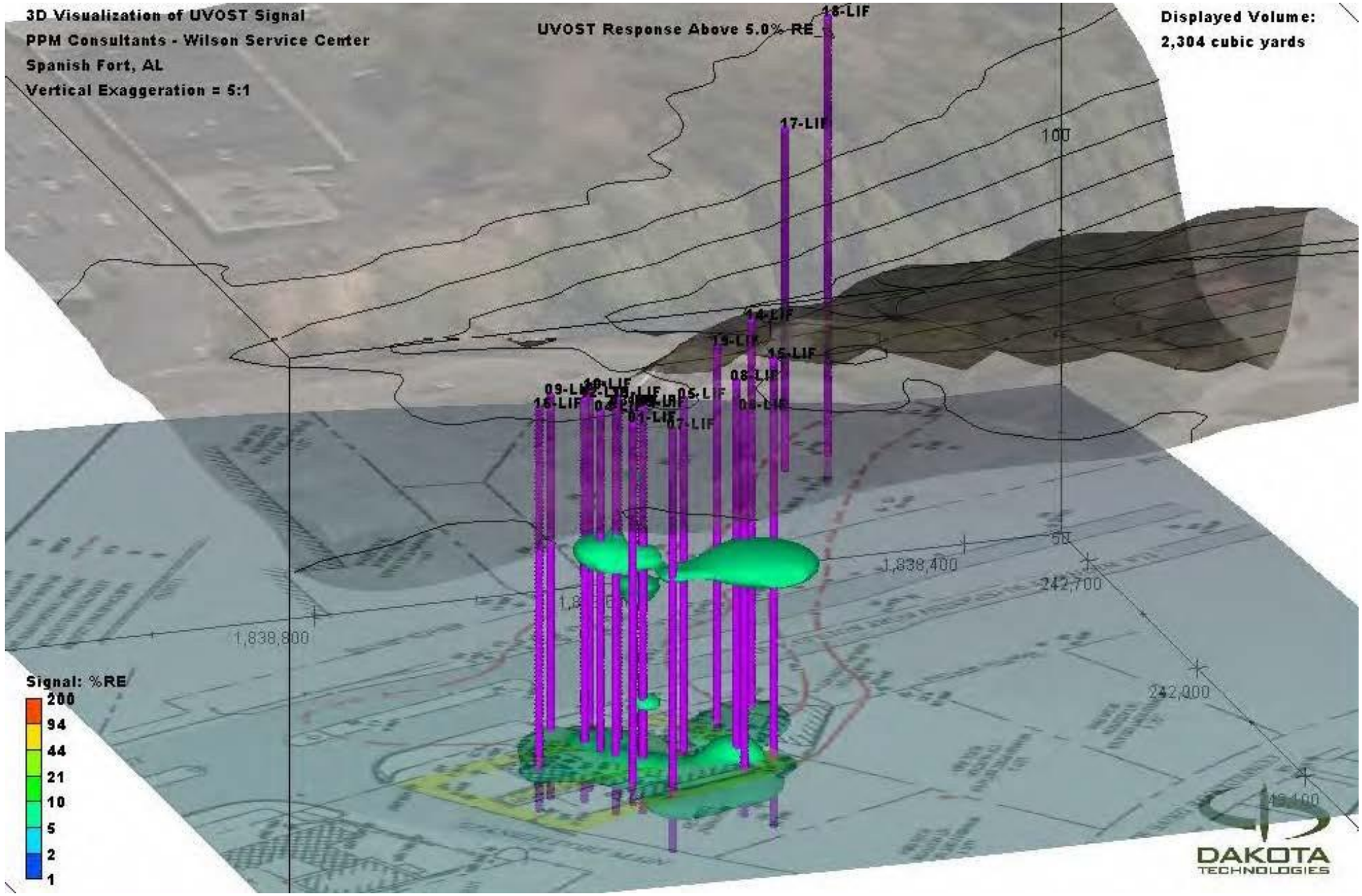
Spanish Fort, Alabama




CONFEDERATE DRIVE SOUTH
U.S. HIGHWAY 90 (SPANISH FORT BOULEVARD)
SPANISH FORT MAIN
U.S. HIGHWAY 31
PATRICIAN DRIVE NORTH
RIGHT-OF-WAY LINE
SCALE: 1"=100'
(Approximate)
LOT 3 SPANISH FORT ESTATES 1ST ADDITION SLIDE 296A
LOT 2 SPANISH FORT ESTATES 1ST ADDITION SLIDE 296A
LOT 1 SPANISH FORT ESTATES 1ST ADDITION SLIDE 296A
SPANISH FORT VENTURE PROPERTY
APARTMENT COMPLEX
WILSON SERVICE CENTER
CHRISTOPHER PROPERTY
LOT 1 LITTLEPAGE SUBDIVISION (PHASE 2) SLIDE 2398-D
LOT 2, BLOCK 4 SPANISH FORT ESTATES MB 3, PAGE 50
LOT 1, BLOCK 4 SPANISH FORT ESTATES MB 3, PAGE 50
LOT 1, BLOCK 1 SPANISH FORT ESTATES MB 3, PAGE 50
LOT 2, BLOCK 1 SPANISH FORT ESTATES MB 3, PAGE 50
LOT 1 SPANISH FORT PLAZA SUBDIVISION SLIDE 2401-B
LOT 2 SPANISH FORT PLAZA SUBDIVISION SLIDE 2401-B
LEGEND:
SPARGE POINT LOCATION
MONITORING WELL LOCATION
EXTRACTION WELL LOCATION
0.26 BENZENE CONCENTRATION (mg/L)
1.0 BENZENE CONCENTRATION CONTOUR (mg/L)
BELOW DETECTION LIMITS


150
125
100
75


3D Visualization of UVOST Signal
PPM Consultants - Wilson Service Center
Spanish Fort, AL
Vertical Exaggeration = 5:1
UVOST Response Above 1.5% RE_
Northing Cut:
243,340
150
125
100
16-LIF
08-LIF
06-LIF
07-LIF
01-LIF
02-LIF
04-LIF
243,500
243,400
243,300
Signal: %RE
200
94
44
21
10
2
1
DAKOTA
TECHNOLOGIES


3D Visualization of UVOST Signal
PPM Consultants - Wilson Service Center
Spanish Fort, AL
Vertical Exaggeration = 5:1
UVOST Response Above 5.0% RE
Displayed Volume:
2,304 cubic yards
18-LIF
17-LIF
14-LIF
19-LIF
15-LIF
08-LIF
10-LIF
09-LIF
16-LIF
05-LIF
04-LIF
01-LIF
07-LIF
100
50
1,838,400
242,700
1,838,800
242,900
Signal: %RE
200
94
44
21
10
5
2
1
DAKOTA
TECHNOLOGIES

Going Forward...

- Modified Corrective Action Plan was developed
- Horizontal wells will be installed to focus on zones under the highway
- New recovery wells to be placed on site; DPVE system has been re-installed
- SVE wells were installed to address the shallow intervals identified during the HRSC

CONSIDERATIONS AND CHALLENGES:

- Property owners may be concerned about numerous boreholes
- Select the tool suite that will provide the data you need to make future decisions
- The right of way at some sites reduces the ability to “define” the plume
- Active stations are often difficult to drill due to existing tanks, piping and dispensers

CONSIDERATIONS AND CHALLENGES:

- Utility corridors often are a barrier - the extent of plume still may not be defined
- The direct push rigs have depth limitations
- Existence of “pinnacles” and bedrock can reduce effectiveness of site investigation
- Collaboration between all parties – education is key
- Use of data by consultants
- It’s a dynamic process! Be Flexible!

HIGH RESOLUTION SITE CHARACTERIZATION

- Over 88 HRSCs have been approved/performed
- Spent over $3.5 million on this technique
- Average cost is about $42,000 per evaluation
- Information is valuable to site decision making

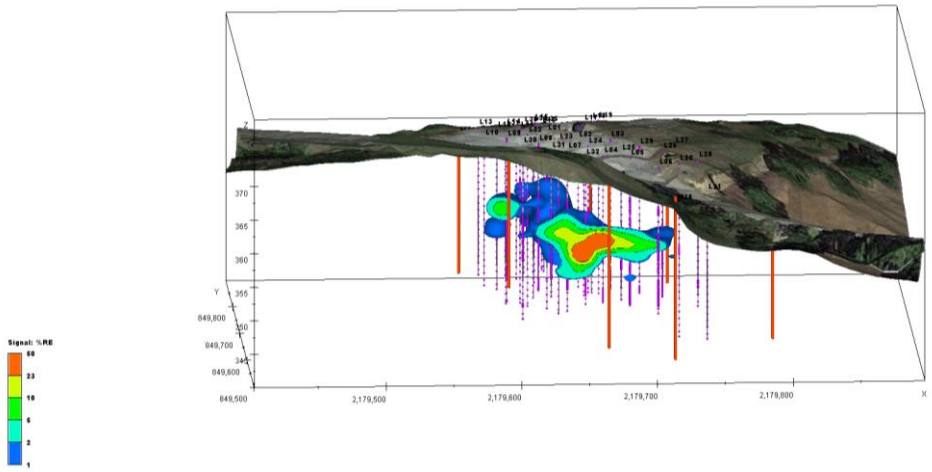
Question & Answer

Please address all questions to a speaker

South Carolina Department of Health and Environmental Control

Utilization of High-Resolution Site Characterization (HRSC) In South Carolina

Why HRSC?



- Continuous improvement
- Input from contractor community
- Utilization of newer technologies
- Data gaps?
- Improve Site Conceptual Models (SCM)
- Optimize clean-up

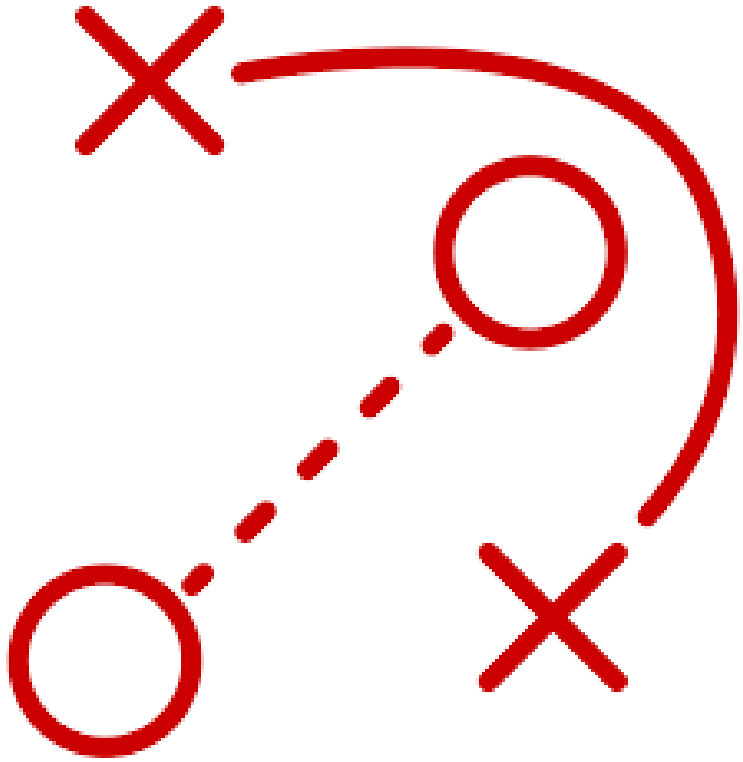
Research and Training

- Met with contractors
- EPA training & guidance
- Interstate Technology and Regulatory Counsel (ITRC)

Goals

- Learn about technology
- Explore cost vs. benefit
- Fill in data gaps
- Optimize clean-ups
- Determine limitations & best use
- POSSIBLY determine a rate structure for more widespread use

Strategy



- Pilot study
- Solicitation of bids for a collection of sites
- 2 contracts, 2 different contractors, 26 total sites throughout state
- Follow up with traditional methods

Site Selection

- Good Direct Push Technology candidates historically
- Legacy sites
- Different stages of assessment/corrective action
- Corrective action did not succeed
- Varying geology

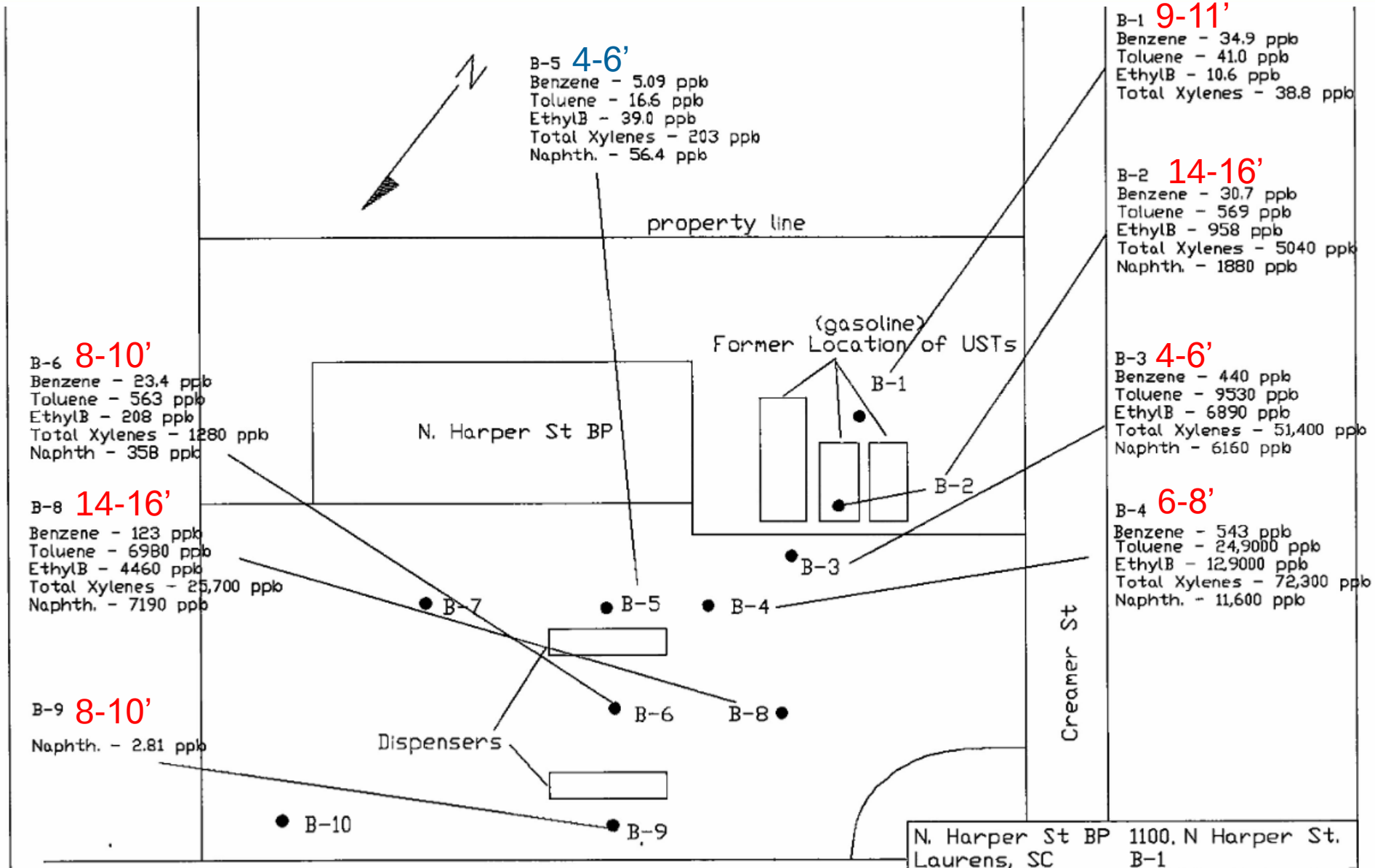
The Tools

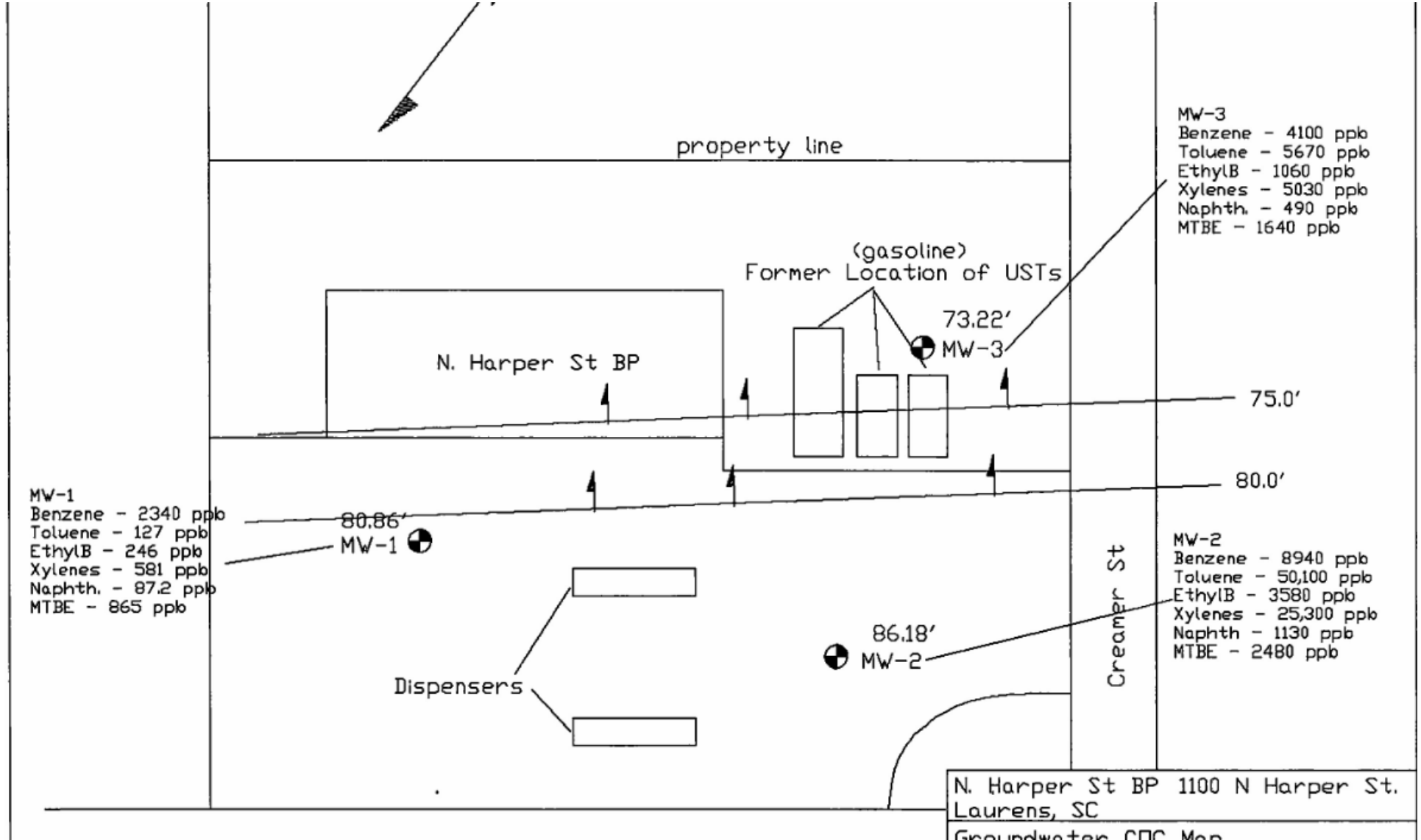
- Direct Push Technology
  - UVOST, MiHPT, OIPHPT
  - Traditional Field Screening
- Groundwater Sampling
- Soil Sampling
  - TPH
- Smartdata Solutions
- Rockworks, 4DIM

Case Study 1 – Larry's Body Shop

Standard Limited Assessment (1995)

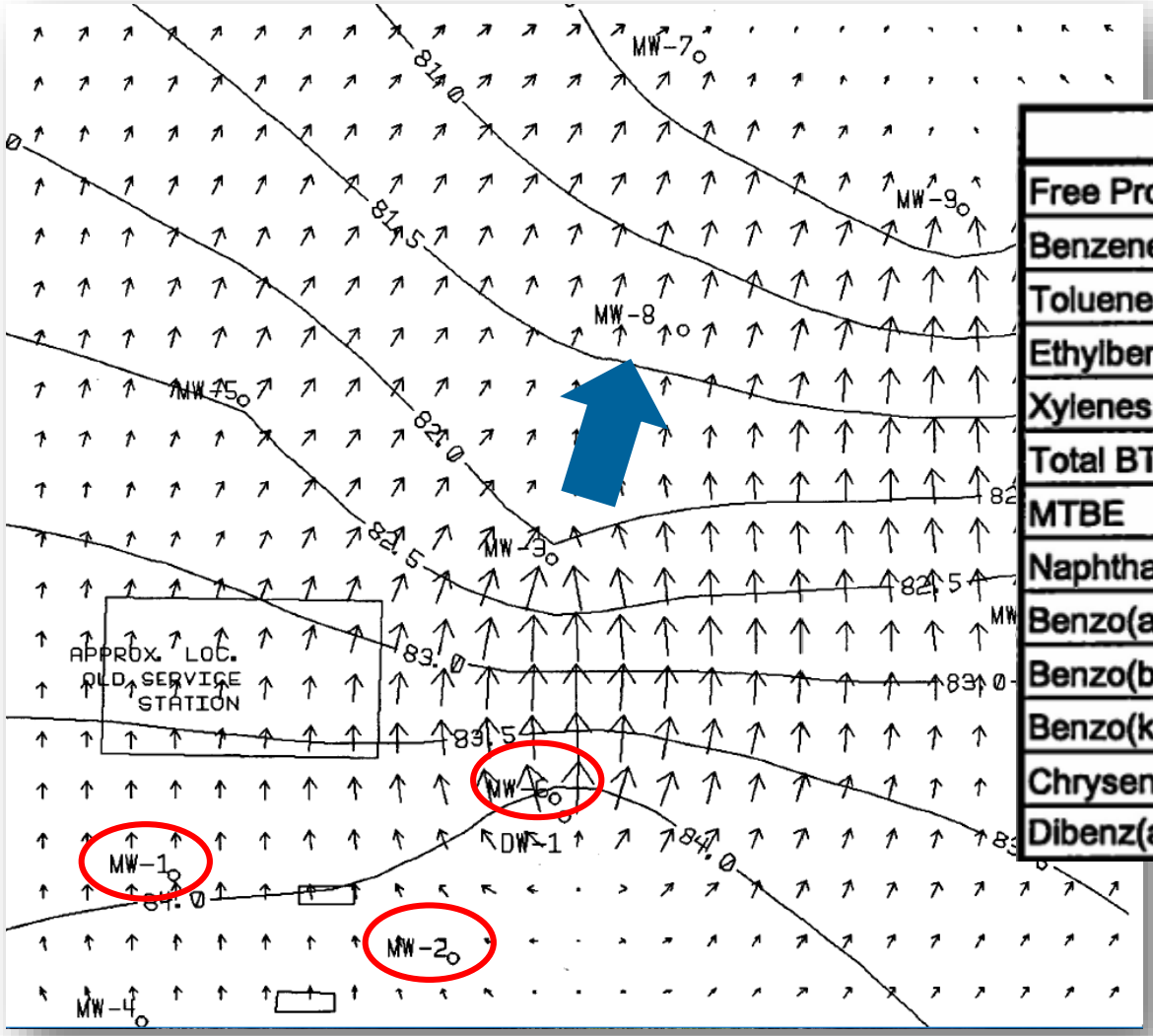
Boring Number	Sample Date	OVA Field Screening Results (ppm) 2 - 4	4 - 6	6 - 8	8 - 10	10 - 12	12 - 14	14 - 16♦
B-1	4-09-96	NS	490	NS	1975	NS	NS	1535
B-2	4-09-96	NS	126	NS	175	NS	NS	219
B-3*	4-09-96	0	>2500	>2500	>2500	NS	NS	NS
B-4	4-09-96	0	1574	>2500	>2500	NS	NS	NS
B-5	4-09-96	0	>2500	>2500	>2500	NS	NS	NS
B-6	4-09-96	0	>2500	>2500	>2500	NS	NS	NS
B-7	4-09-96	NS	804	NS	314	NS	NS	371
B-8	4-09-96	NS	443	NS	820	NS	NS	>2500
B-9	4-09-96	0	0	34	41	NS	NS	NS
B-10	4-09-96	NS	NS	NS	0	NS	NS	NS


B-5 4-6'
Benzene - 5.09 ppb
Toluene - 16.6 ppb
EthylB - 39.0 ppb
Total Xylenes - 203 ppb
Naphth. - 56.4 ppb
property line
B-1 9-11'
Benzene - 34.9 ppb
Toluene - 41.0 ppb
EthylB - 10.6 ppb
Total Xylenes - 38.8 ppb
B-2 14-16'
Benzene - 30.7 ppb
Toluene - 569 ppb
EthylB - 958 ppb
Total Xylenes - 5040 ppb
Naphth. - 1880 ppb
(gasoline)
Former Location of USTs
B-1
B-6 8-10'
Benzene - 23.4 ppb
Toluene - 563 ppb
EthylB - 208 ppb
Total Xylenes - 1280 ppb
Naphth - 358 ppb
N. Harper St BP
B-3 4-6'
Benzene - 440 ppb
Toluene - 9530 ppb
EthylB - 6890 ppb
Total Xylenes - 51,400 ppb
Naphth - 6160 ppb
B-2
B-8 14-16'
Benzene - 123 ppb
Toluene - 6980 ppb
EthylB - 4460 ppb
Total Xylenes - 25,700 ppb
Naphth. - 7190 ppb
B-3
B-4 6-8'
Benzene - 543 ppb
Toluene - 24,9000 ppb
EthylB - 12,9000 ppb
Total Xylenes - 72,300 ppb
Naphth. - 11,600 ppb
B-7
B-5
B-4
Creamer St
B-6
B-8
B-9 8-10'
Naphth. - 2.81 ppb
Dispensers
B-10
B-9
N. Harper St BP
Laurens, SC
1100. N Harper St.
B-1

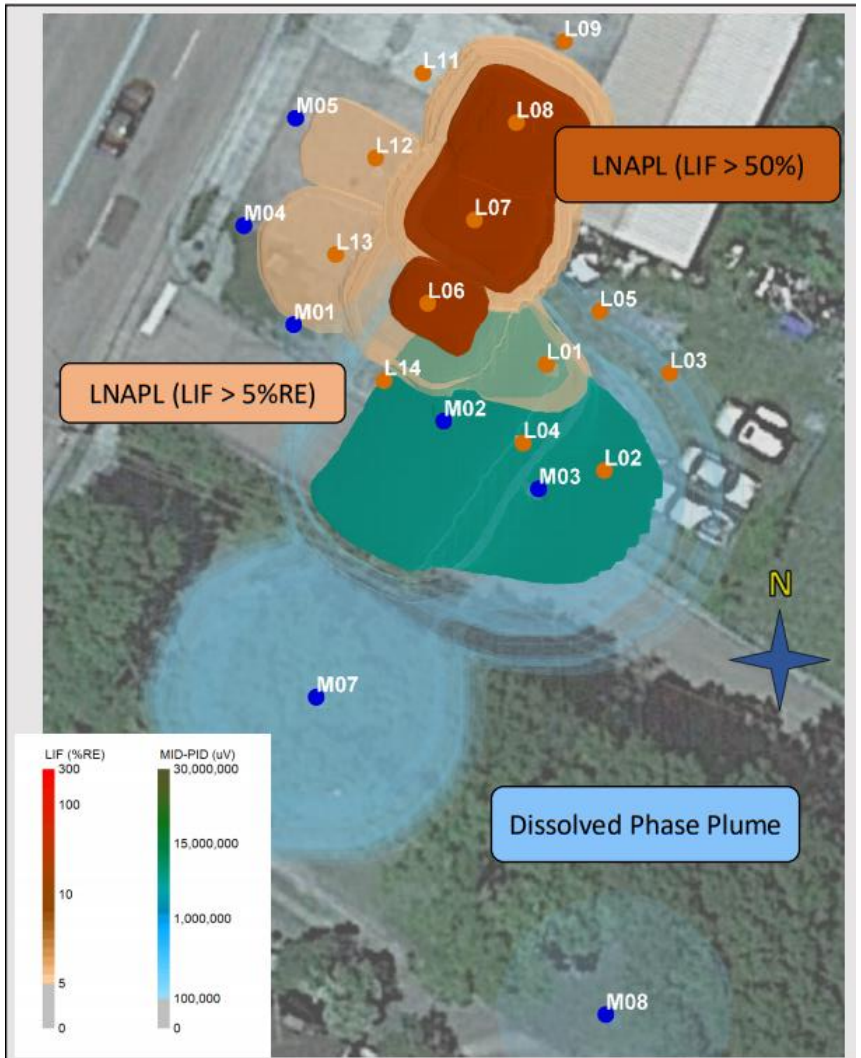

property line
MW-3
Benzene - 4100 ppb
Toluene - 5670 ppb
EthylB - 1060 ppb
Xylenes - 5030 ppb
Naphth. - 490 ppb
MTBE - 1640 ppb
(gasoline)
Former Location of USTs
73.22'
MW-3
N. Harper St BP
75.0'
80.0'
MW-1
Benzene - 2340 ppb
Toluene - 127 ppb
EthylB - 246 ppb
Xylenes - 581 ppb
Naphth. - 87.2 ppb
MTBE - 865 ppb
80.86'
MW-1
MW-2
Benzene - 8940 ppb
Toluene - 50,100 ppb
EthylB - 3580 ppb
Xylenes - 25,300 ppb
Naphth - 1130 ppb
MTBE - 2480 ppb
86.18'
MW-2
Dispensers
Creamer St
N. Harper St BP 1100 N Harper St. Laurens, SC
Groundwater COC Map

Rapid Assessment (1997)

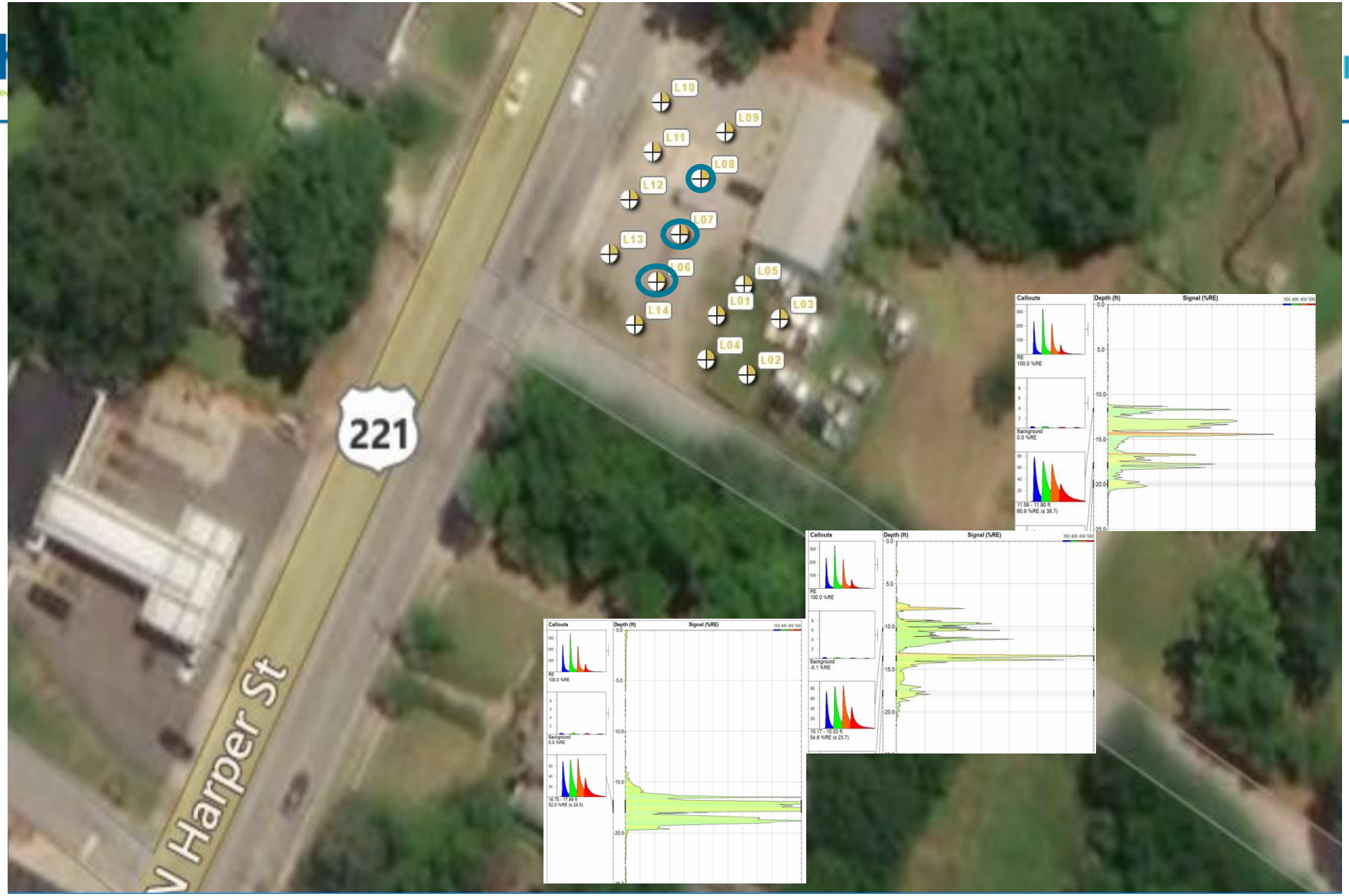
Boring Number	Sample Date	OVA Field Screening Results (ppm) 2 - 4	4 - 6	6 - 8	8 - 10	10 - 12	12 - 14	14 - 16♦
B-1	4-09-96	NS	490	NS	1975	NS	NS	1535
B-2	4-09-96	NS	126	NS	175	NS	NS	219
B-3*	4-09-96	0	>2500	>2500	>2500	NS	NS	NS
B-4	4-09-96	0	1574	>2500	>2500	NS	NS	NS
B-5	4-09-96	0	>2500	>2500	>2500	NS	NS	NS
B-6	4-09-96	0	>2500	>2500	>2500	NS	NS	NS
B-7	4-09-96	NS	804	NS	314	NS	NS	371
B-8	4-09-96	NS	443	NS	820	NS	NS	>2500
B-9	4-09-96	0	0	34	41	NS	NS	NS
B-10	4-09-96	NS	NS	NS	0	NS	NS	NS

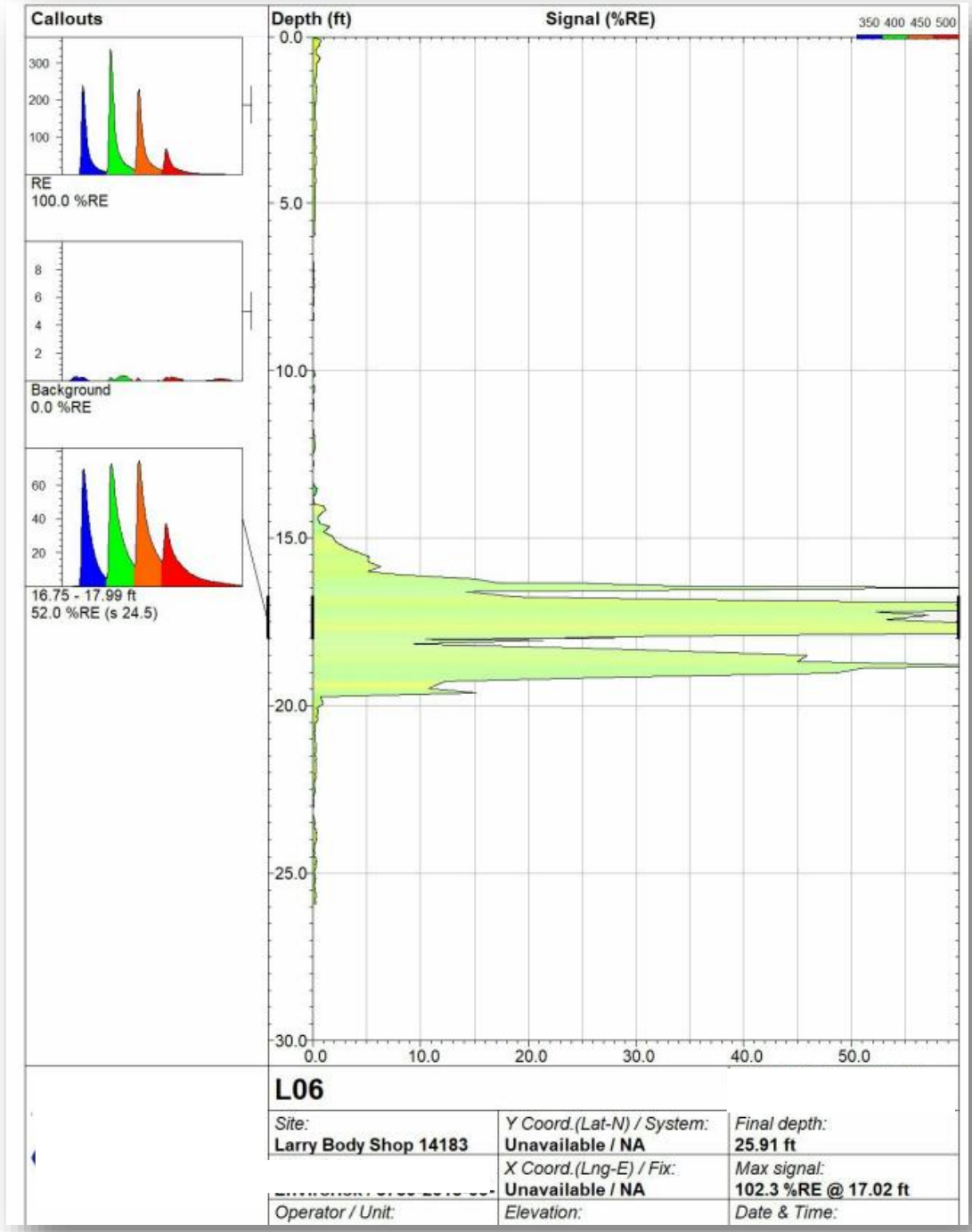


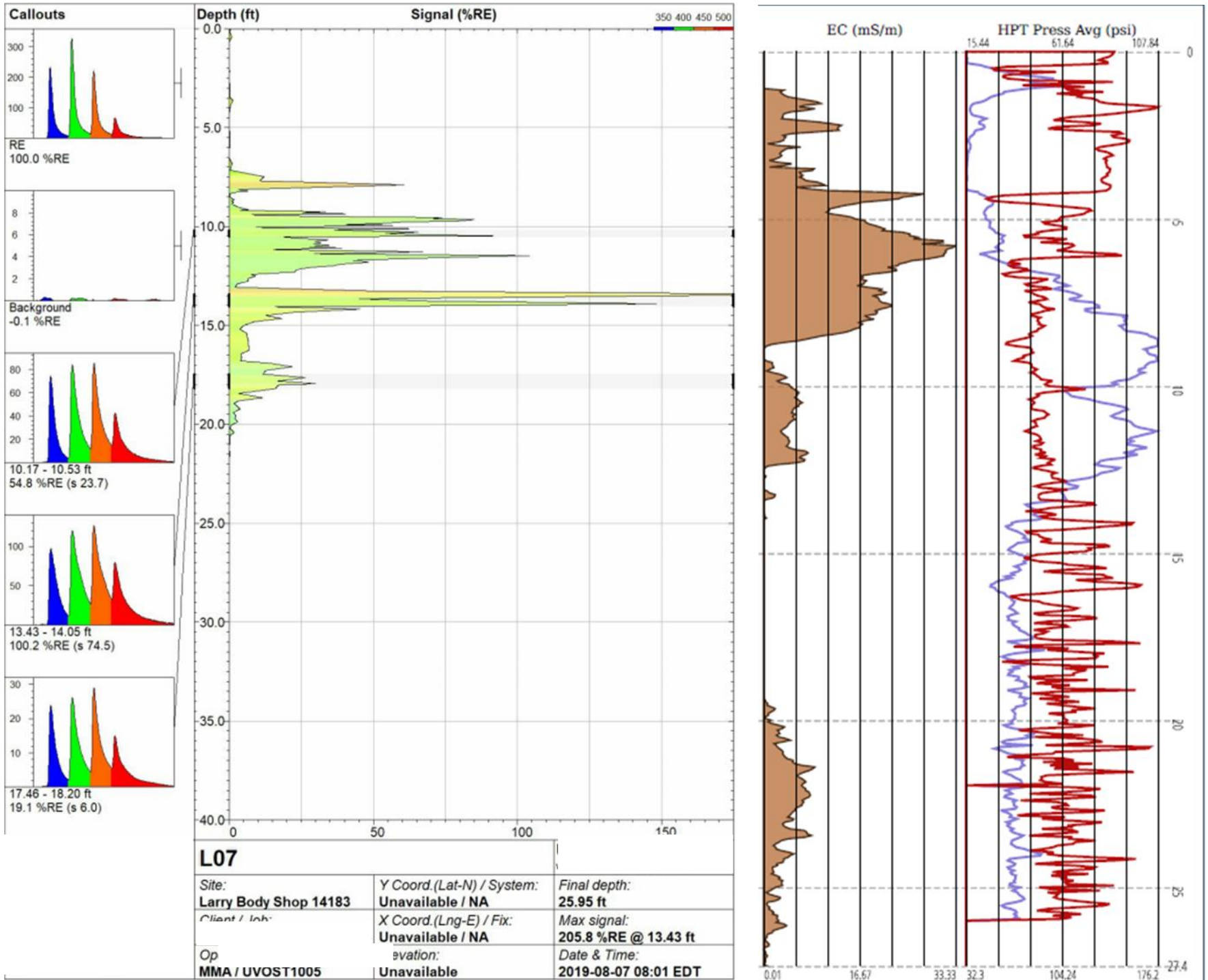
COC	MW-1	MW-2	MW-6
Free Product Thickness	None	None	None
Benzene	2,060	7,240	22,100
Toluene	ND	31,600	39,800
Ethylbenzene	39.7	3,710	3,320
Xylenes	50	21,300	16,400
Total BTEX	2,149.7	63,850	81,620
MTBE	65.6	4,650	59,500
Naphthalene	ND	630	544
Benzo(a)anthracene	ND	ND	ND
Benzo(b)flouranthene	ND	ND	ND
Benzo(k)flouranthene	ND	ND	ND
Chrysene	ND	ND	ND
Dibenz(a,h)anthracene	ND	ND	ND

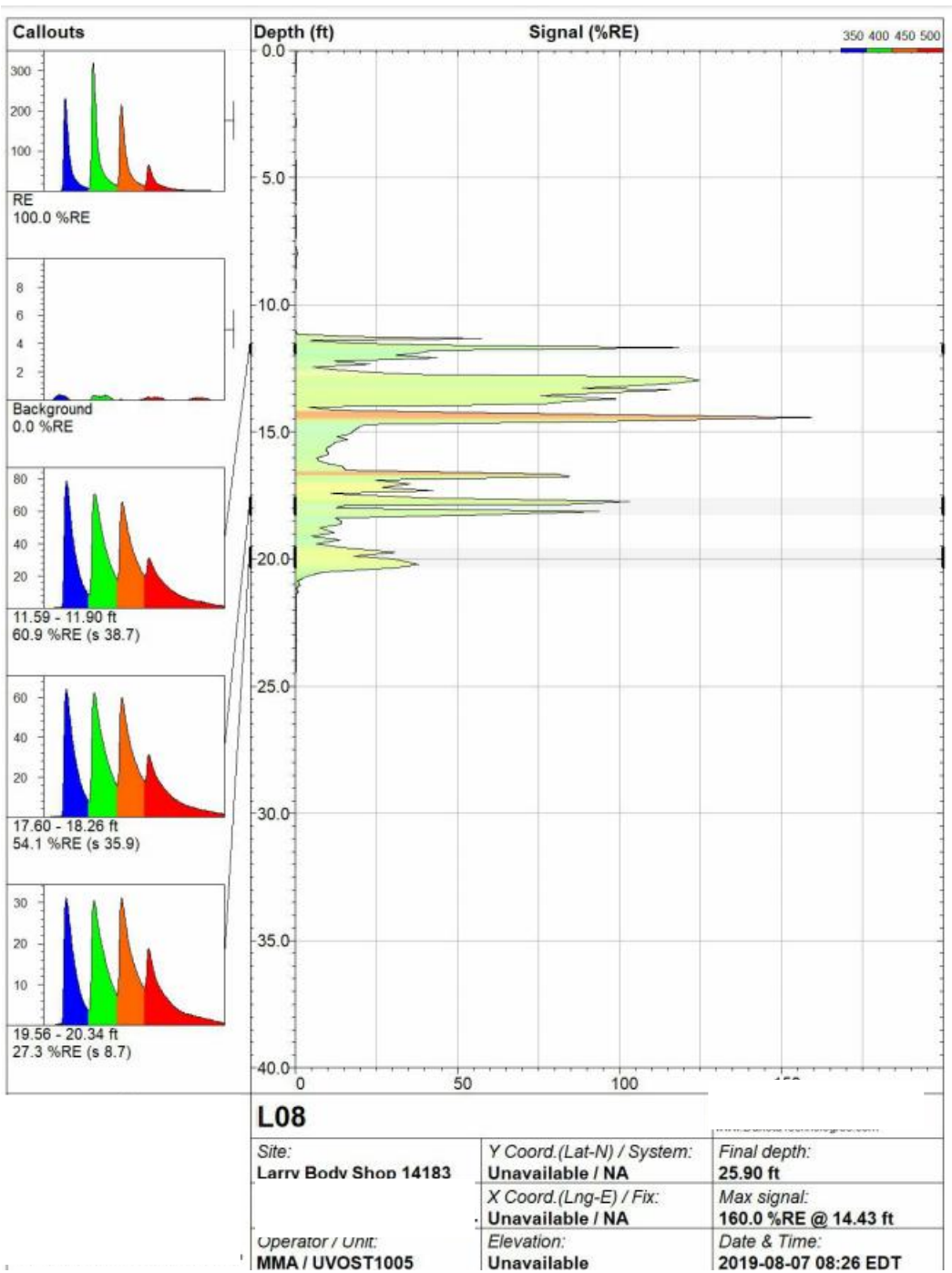


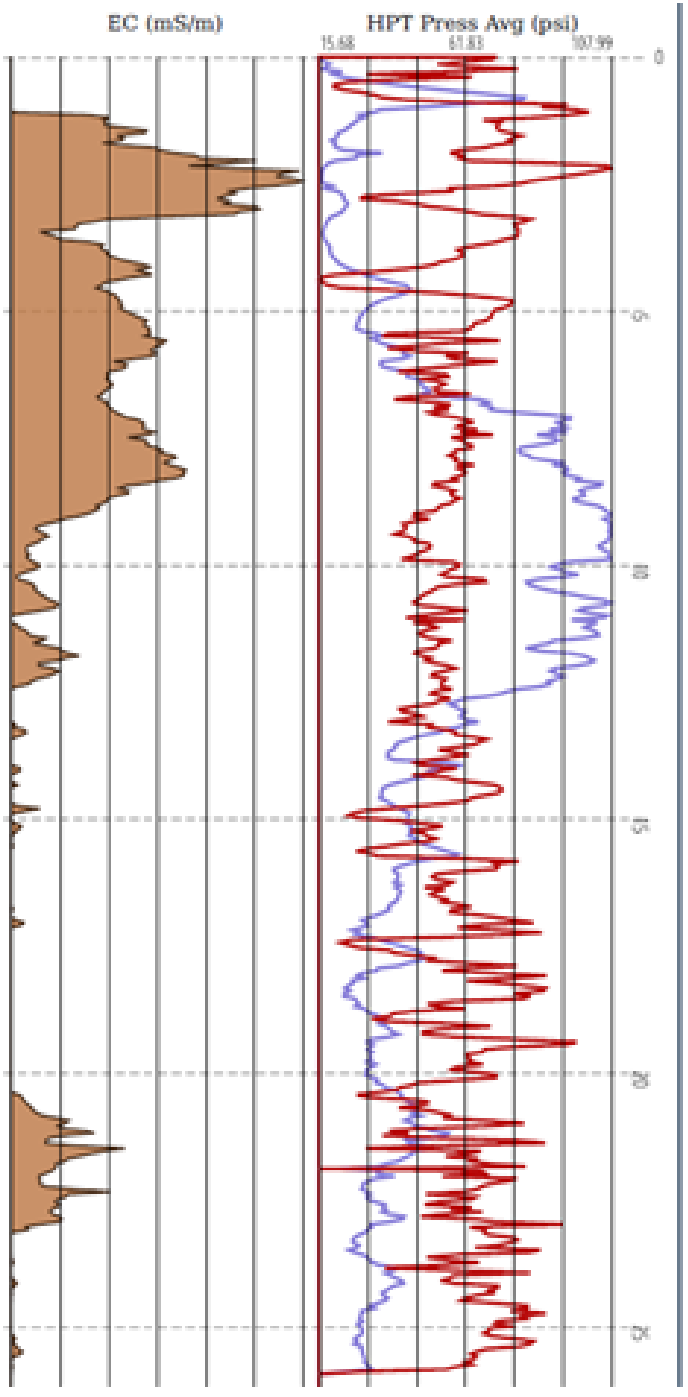
COLUMBIA TECHNOLOGIES		LNAPL Footprint
	High-Resolution Site Characterization / October 2019	Figure 4

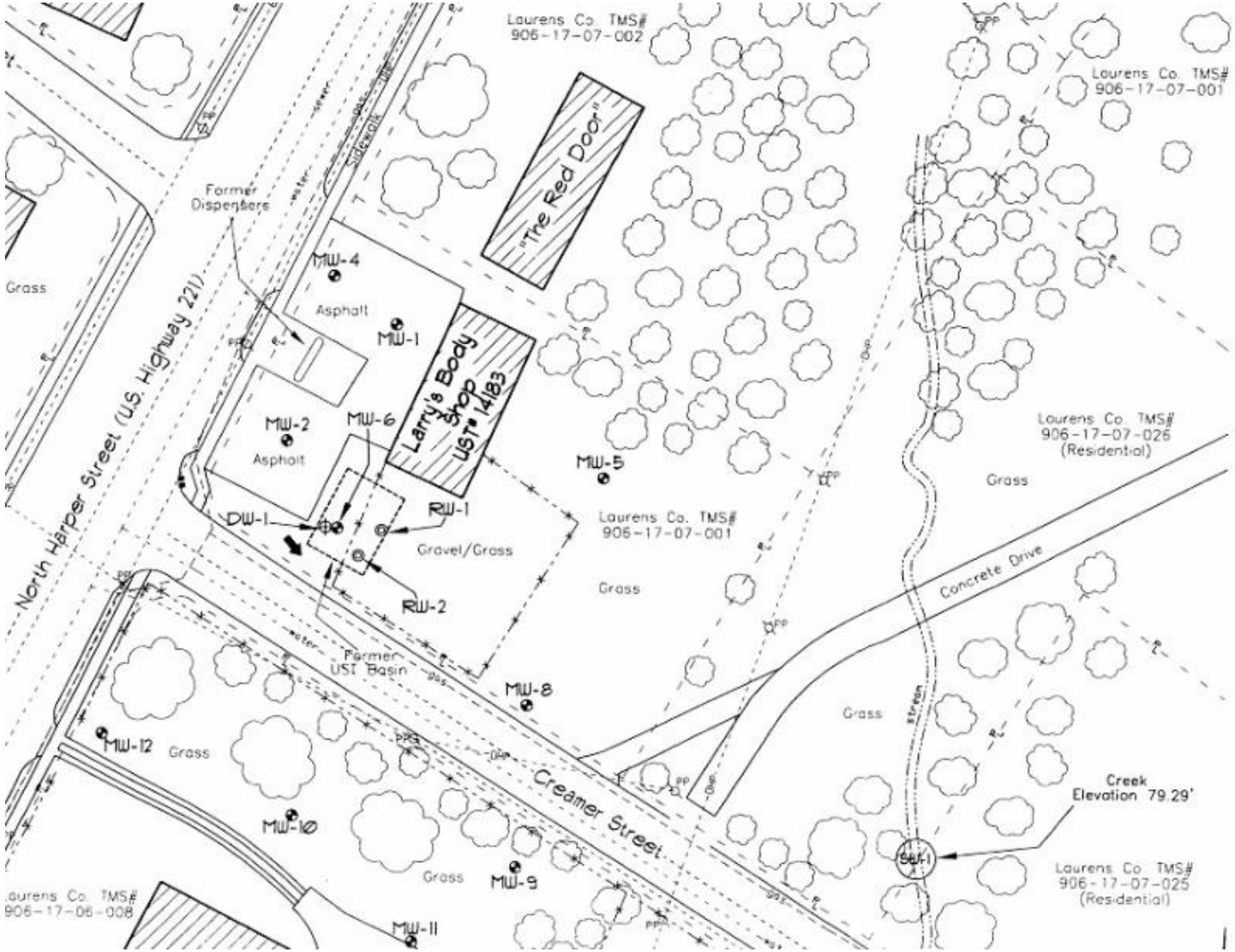

L10
L09
L11
L08
L12
L07
L13
L06
L05
L01
L03
L14
L04
L02
221
Harper St
Callouts
Depth (ft)
Signal (%RE)

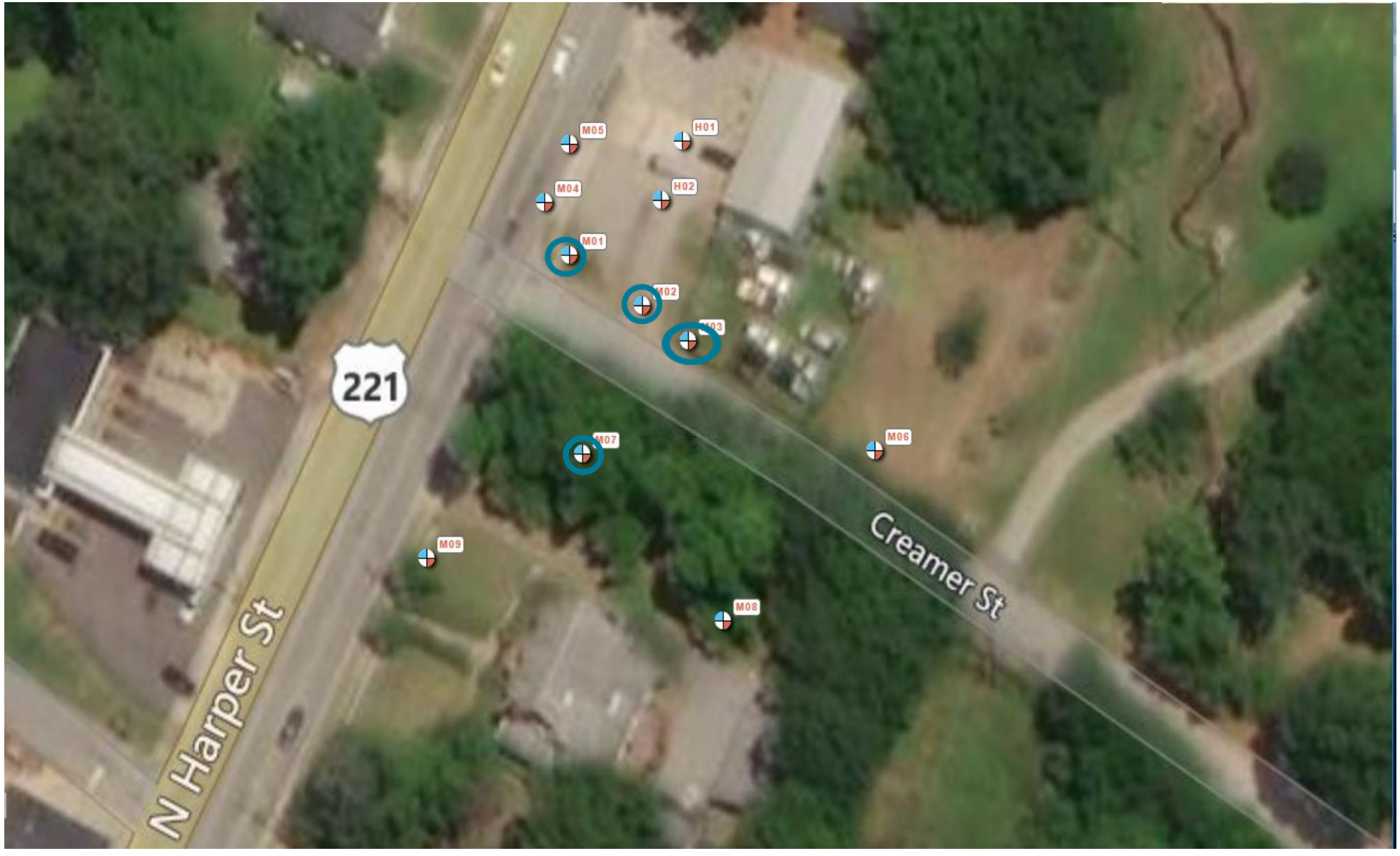

Callouts
Depth (ft)
Signal (%RE)
350 400 450 500
RE
100.0 %RE
Background
0.0 %RE
16.75 - 17.99 ft
52.0 %RE (s 24.5)
L06
Site:
Larry Body Shop 14183
Y Coord.(Lat-N) / System:
Unavailable / NA
Final depth:
25.91 ft
X Coord.(Lng-E) / Fix:
Unavailable / NA
Max signal:
102.3 %RE @ 17.02 ft
Operator / Unit:
Elevation:
Date & Time:


Callouts
Depth (ft)
Signal (%RE)
350 400 450 500
RE
100.0 %RE
Background
-0.1 %RE
10.17 - 10.53 ft
54.8 %RE (s 23.7)
13.43 - 14.05 ft
100.2 %RE (s 74.5)
17.46 - 18.20 ft
19.1 %RE (s 6.0)
L07
Site:
Larry Body Shop 14183
Y Coord.(Lat-N) / System:
Unavailable / NA
Final depth:
25.95 ft
X Coord.(Lng-E) / Fix:
Unavailable / NA
Max signal:
205.8 %RE @ 13.43 ft
Op
MMA / UVOST1005
Unavailable
Date & Time:
2019-08-07 08:01 EDT
EC (mS/m)
HPT Press Avg (psi)


Callouts
Depth (ft)
Signal (%RE)
350 400 450 500
RE
100.0 %RE
Background
0.0 %RE
11.59 - 11.90 ft
60.9 %RE (s 38.7)
17.60 - 18.26 ft
54.1 %RE (s 35.9)
19.56 - 20.34 ft
27.3 %RE (s 8.7)
L08
Site:
Larry Body Shop 14183
Y Coord.(Lat-N) / System:
Unavailable / NA
Final depth:
25.90 ft
X Coord.(Lng-E) / Fix:
Unavailable / NA
Max signal:
160.0 %RE @ 14.43 ft
Operator / Unit:
MMA / UVOST1005
Elevation:
Unavailable
Date & Time:
2019-08-07 08:26 EDT


EC (mS/m)
HPT Press Avg (psi)

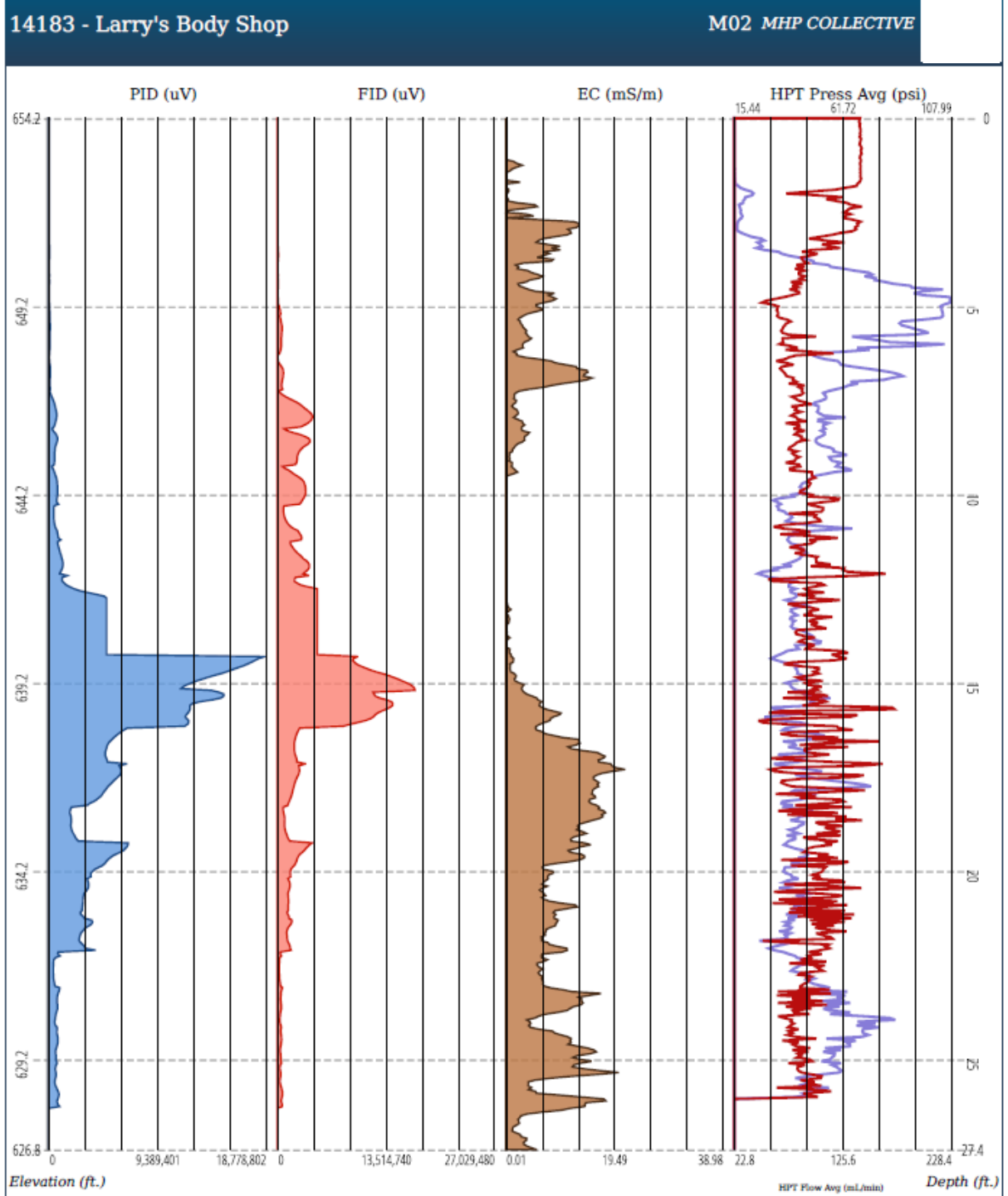

Laurens Co. TMS# 906-17-07-002
Laurens Co. TMS# 906-17-07-001
"The Red Door"
Former Dispensers
MW-4
Asphalt
MW-1
Larry's Body Shop UST# 14183
MW-2
Asphalt
MW-6
MW-5
DW-1
RW-1
RW-2
Gravel/Grass
Grass
North Harper Street (U.S. Highway 221)
Laurens Co. TMS# 906-17-07-026 (Residential)
Concrete Drive
Former UST Basin
MW-8
MW-12
Grass
MW-10
Creamer Street
MW-9
MW-11
Stream
Creek Elevation 79.29'
SW-1
Laurens Co. TMS# 906-17-06-008
Laurens Co. TMS# 906-17-07-025 (Residential)


M05
H01
M04
H02
M01
M02
M03
221
M07
M06
M09
M08
N Harper St
Creamer St

al Control

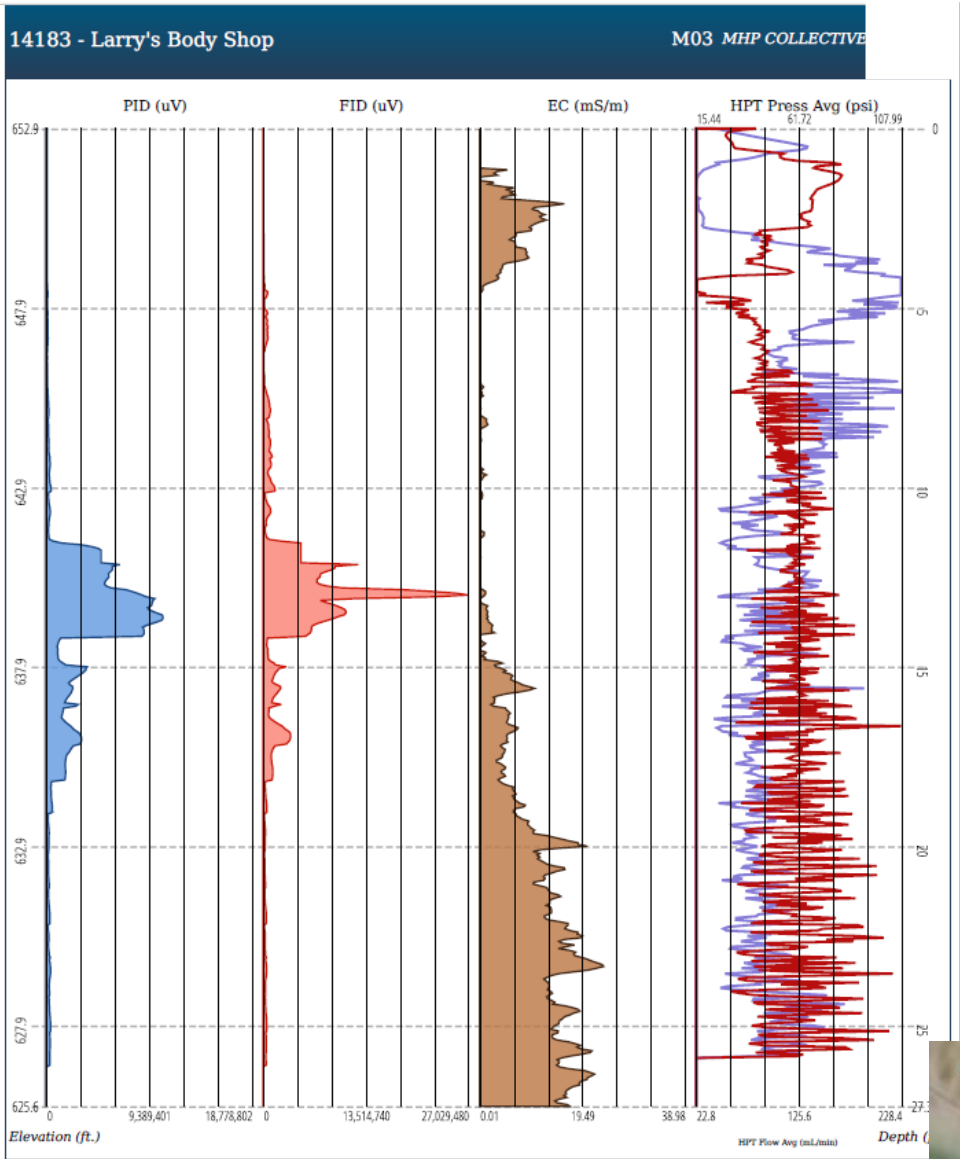
14183 - Larry's Body Shop

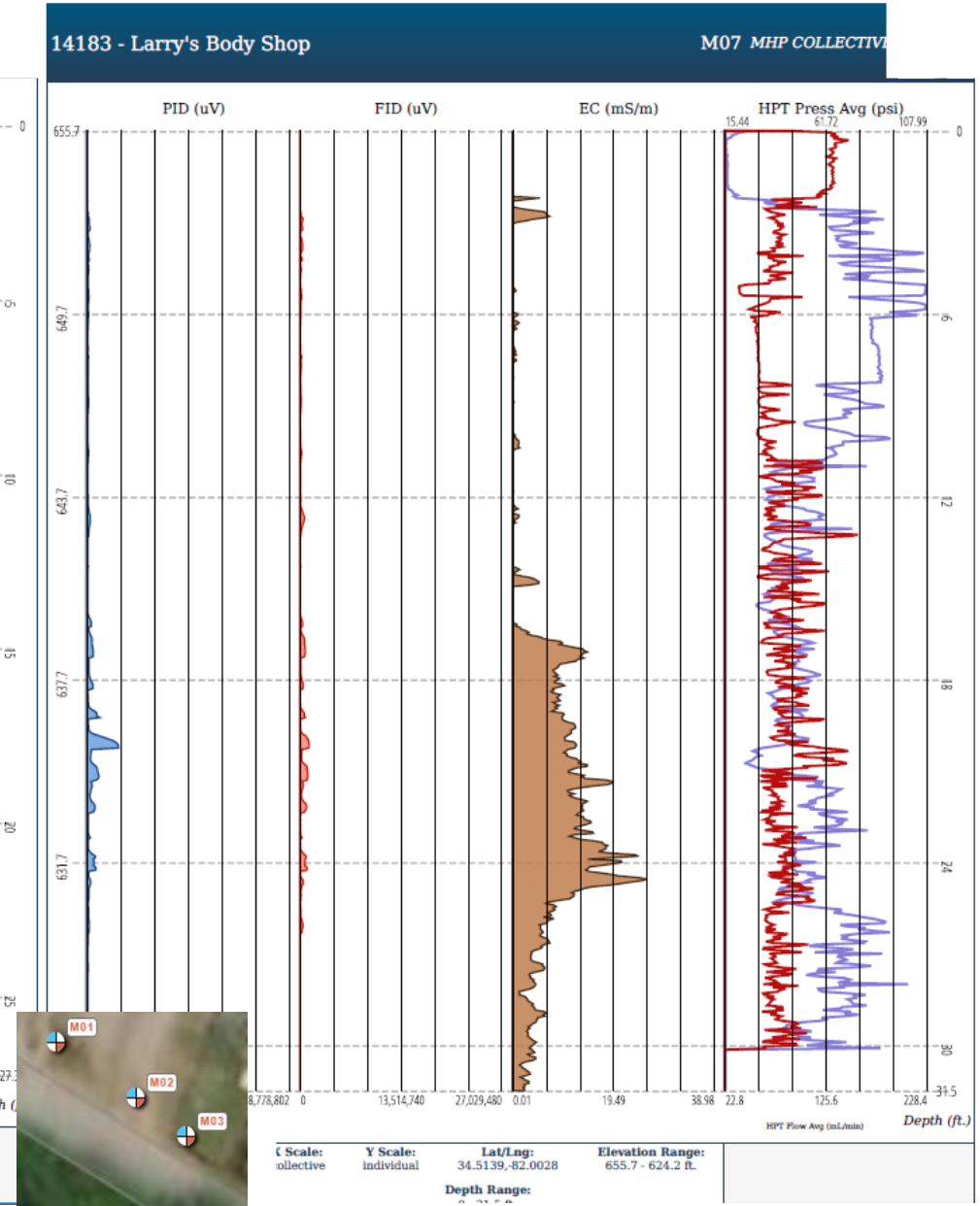
M02 *MHP COLLECTIVE*



Healthy People. He

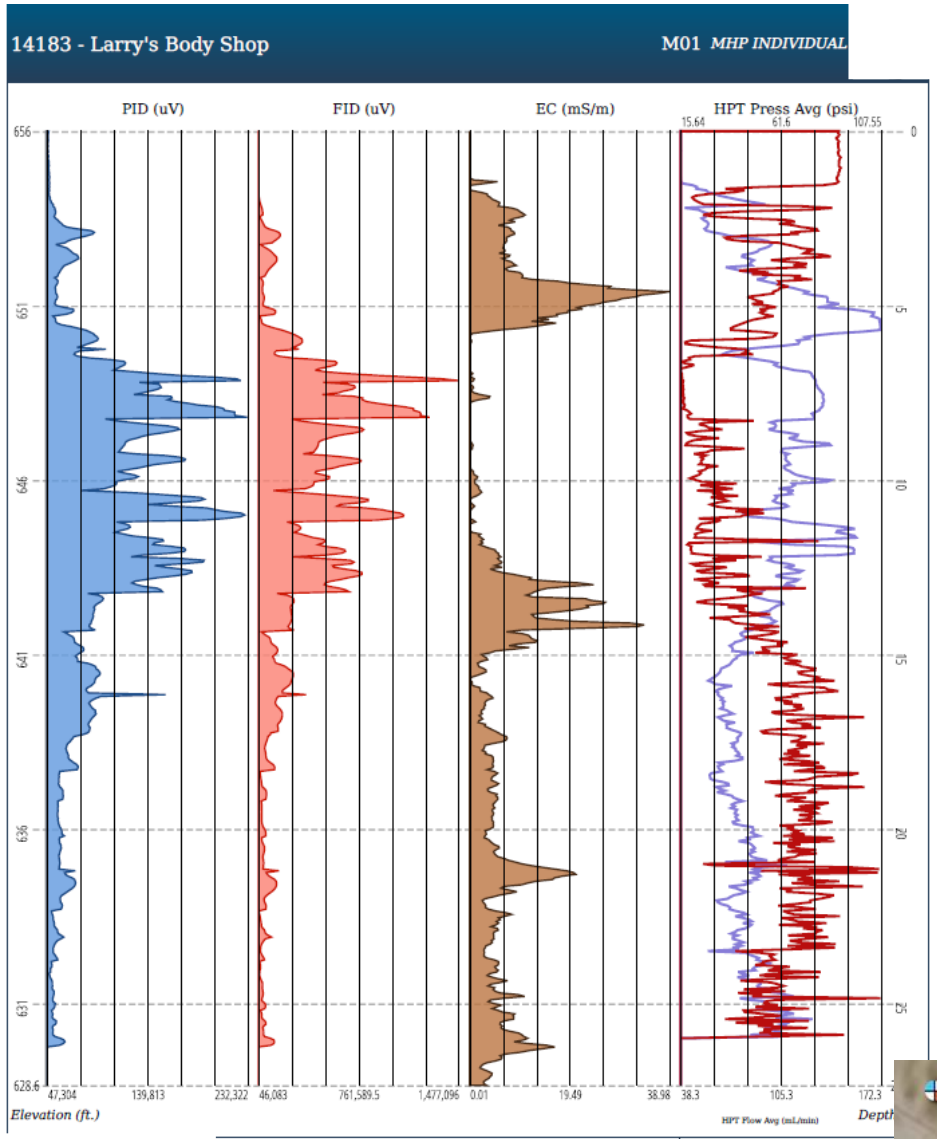
Control

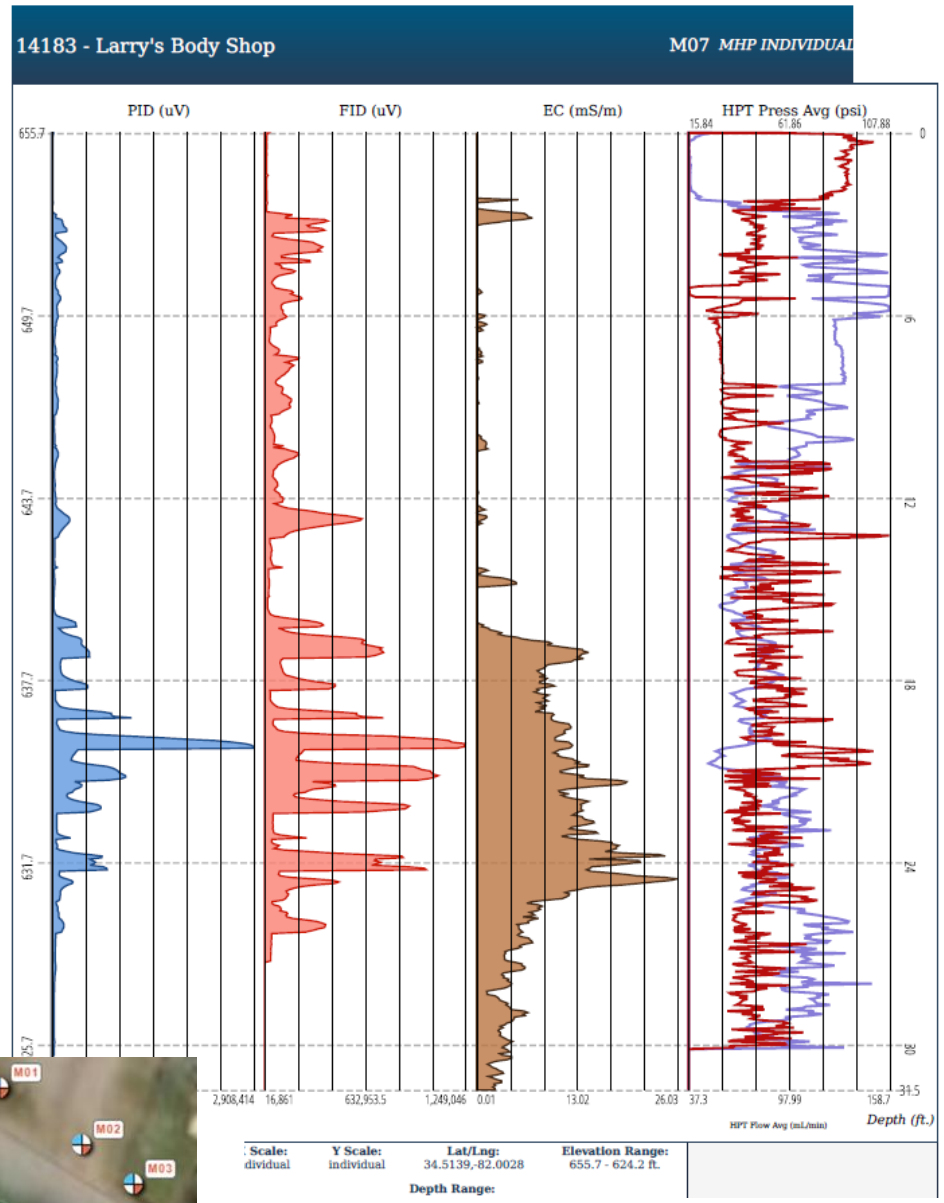


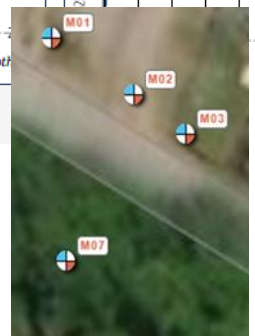


Healthy People. Healt

al Control

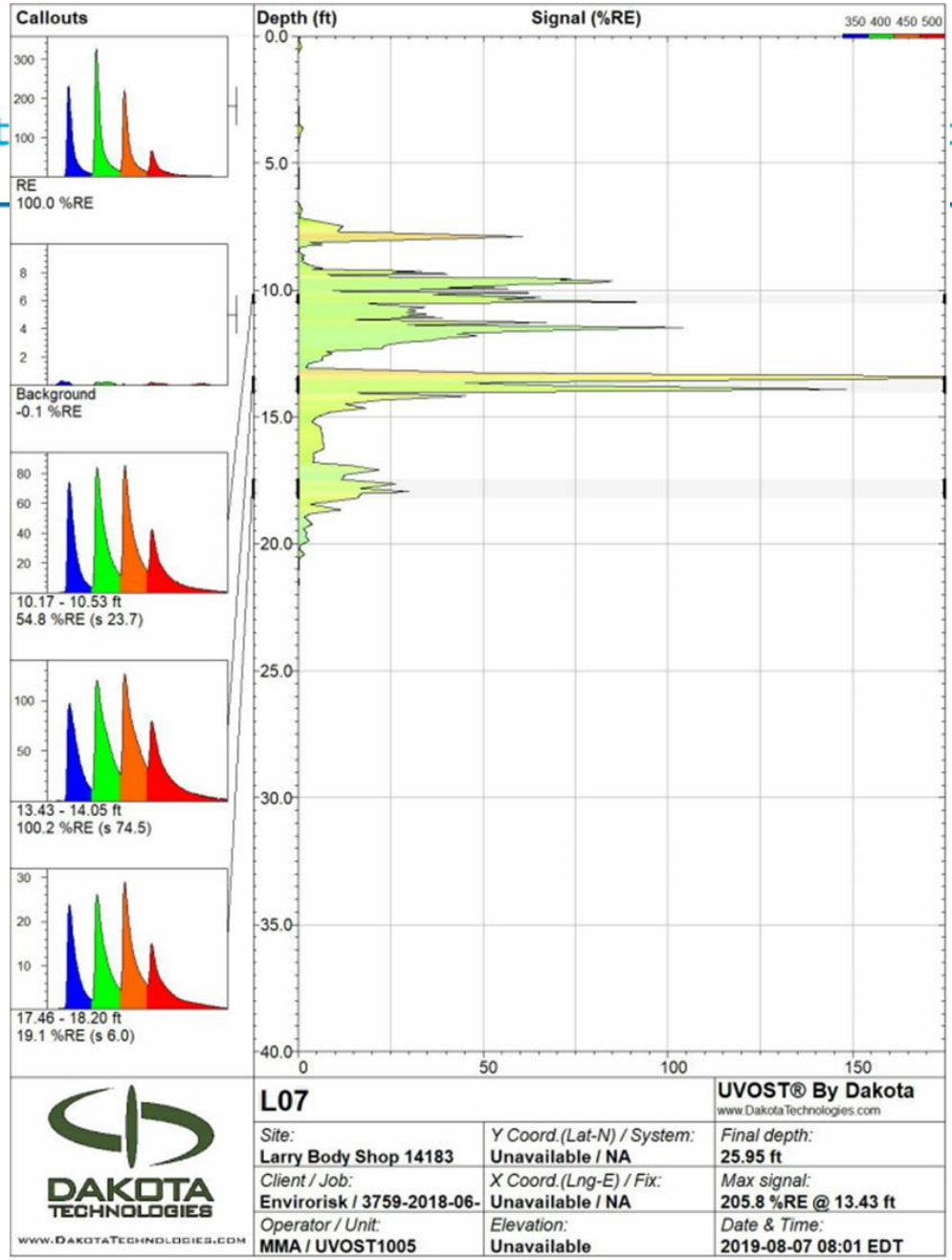




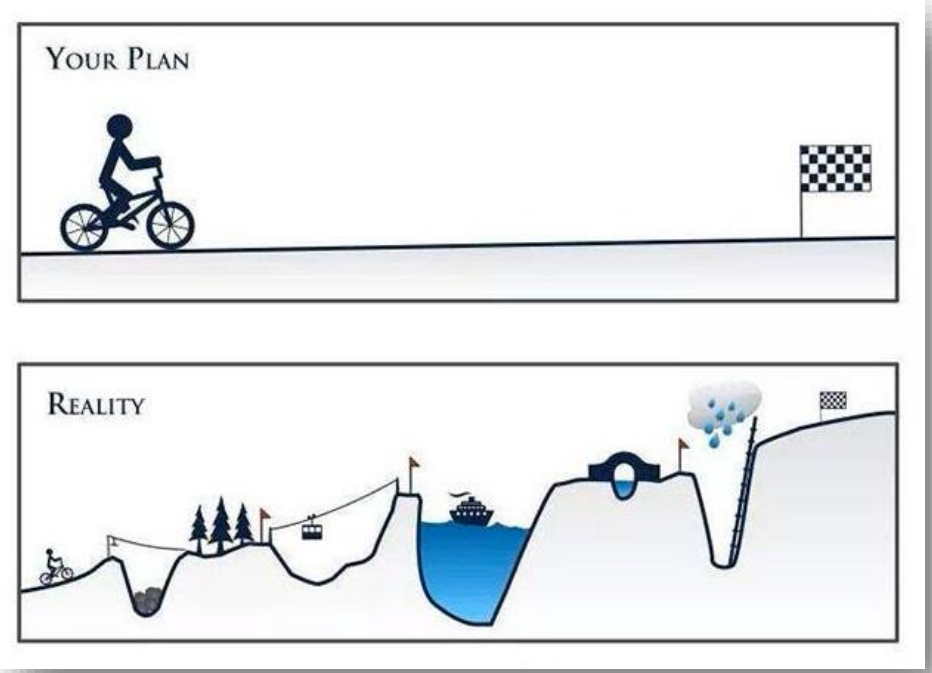


Larry's Body Shop - Results

- Identified Residual LNAPL
- Better source area characterization
- Better idea of groundwater flow and dissolved plume
- Better understanding of site geology



Lessons Learned



- Limitations/set backs
- Time commitment
- Actual Free-Phase Product (FPP) distribution
- Communication is KEY

Benefits and Results

- More accurate SCM
- Knowledge/Experience
- Outlook on future of assessments
- Gain information necessary to choose appropriate cleanup strategies
- Targeted clean-up approaches for faster and more effective clean-up

Question & Answer

Please address all questions to a speaker

Thank you for your participation

LUST Corrective Action Series: https://neiwpcc.org/our-programs/underground-storage-tanks/lust-training-resources-corrective-action/webinar-archive-corrective-action/

UST Inspector Training Series: https://neiwpcc.org/our-programs/underground-storage-tanks/ust-training-resources-inspection-leak-prevention/webinar-archive-inspector-training/

LUST Line: https://neiwpcc.org/our-programs/underground-storage-tanks/l-u-s-t-line/

THANK YOU FOR YOUR PARTICIPATION

LUST Corrective Action Webinar Series

Lessons Learned from HRSC used at LUST Sites

6/24/20

Moderated by Nick Bissonnette- Environmental Analyst, *NEIWPCC*

THANK YOU FOR YOUR PARTICIPATION