

Welcome



Environmental Advisory Board (EAB) Meeting

**Robins Air Force Base
August 3, 2023**



Welcome and Program Introduction

**Ms. Shan Williams
EAB Installation Co-chair**



Acronyms and Abbreviations

- AO – Alternate Objective
- AS – Air Sparge
- ASC – Advanced Site Characterization
- CAP – Corrective Action Plan
- COC – Contaminant of Concern
- CSM – Conceptual Site Model
- CVOC – Chlorinated Volatile Organic Compound
- EA – Exploratory Area
- EAB – Environmental Advisory Board
- ERD – Enhanced Reductive Dechlorination
- EVO – Emulsified Vegetable Oil
- FID – Flame Ionization Detector
- ft – feet
- ft bgs – feet below ground surface
- ft above MSL – feet above Mean Sea Level



Acronyms and Abbreviations

- iSOC - In-situ Oxygen Curtain
- GW - Groundwater
- HPT - Hydraulic Profiling Tool
- HRSC - High Resolution Site Characterization
- LF003 - Landfill No. 3
- MCL - Maximum Contaminant Level
- MDT - Matrix Diffusion Toolkit
- MiHpt - Membrane Interface Probe with Hydraulic Profiling Tool
- MIP - Membrane Interface Probe
- $\mu\text{g/kg}$ - microgram per kilogram
- $\mu\text{g/L}$ - microgram per liter
- mL/min - milliliters per minute
- mS/m - milli siemens per meter
- μV - millivolts
- NS - Not Sampled



Acronyms and Abbreviations

- O&M – Operations and Maintenance
- PID – Photo Ionization Detector
- psi – pounds per square inch
- RL – Remediation Level
- SSI – Supplemental Site Investigation
- SVE – Soil Vapor Extraction
- SWMU – Solid Waste Management Unit
- TCE – Trichloroethene
- XSD – Halogenated Compounds Detector



Environmental Advisory Board



**Supplementary Site
Investigation (SSI) at
Solid Waste Management Unit
(SWMU) 36
(DC034) (Horse Pasture)
Robins AFB, Georgia**

**Justin Knight, PE
Principal
Geosyntec Consultants, Inc.**

August 3, 2023



Overview

- **Alternate Objective (AO) site overview**
- **SWMU 36 background**
- **SSI overview**
- **SSI field activities**
- **Exploratory Area (EA) 1**
- **EA 2**
- **EA 3**
- **Proposed path forward**



AO Site Overview

- Sites with *“complex attributes that have, to date, inhibited progress toward the achievement of RC [Response Complete].”*
- AO sites generally have incomplete conceptual site model (CSM) and are expected to require longer than 30 years to achieve Response Complete under current remedial approach



AO Site Overview

■ AO Site Activities

- **Advanced Site Characterization (ASC)/High-Resolution Site Characterization (HRSC)**
 - SSI
 - Revised Conceptual Site Model (CSM)
 - Updated groundwater monitoring program
- **Remedy Evaluation and Recommendation**
 - Pilot Studies/Treatability Tests, as applicable
- **Decision Document amendment, as applicable**
- **Remedial system operation**
 - Annual groundwater sampling

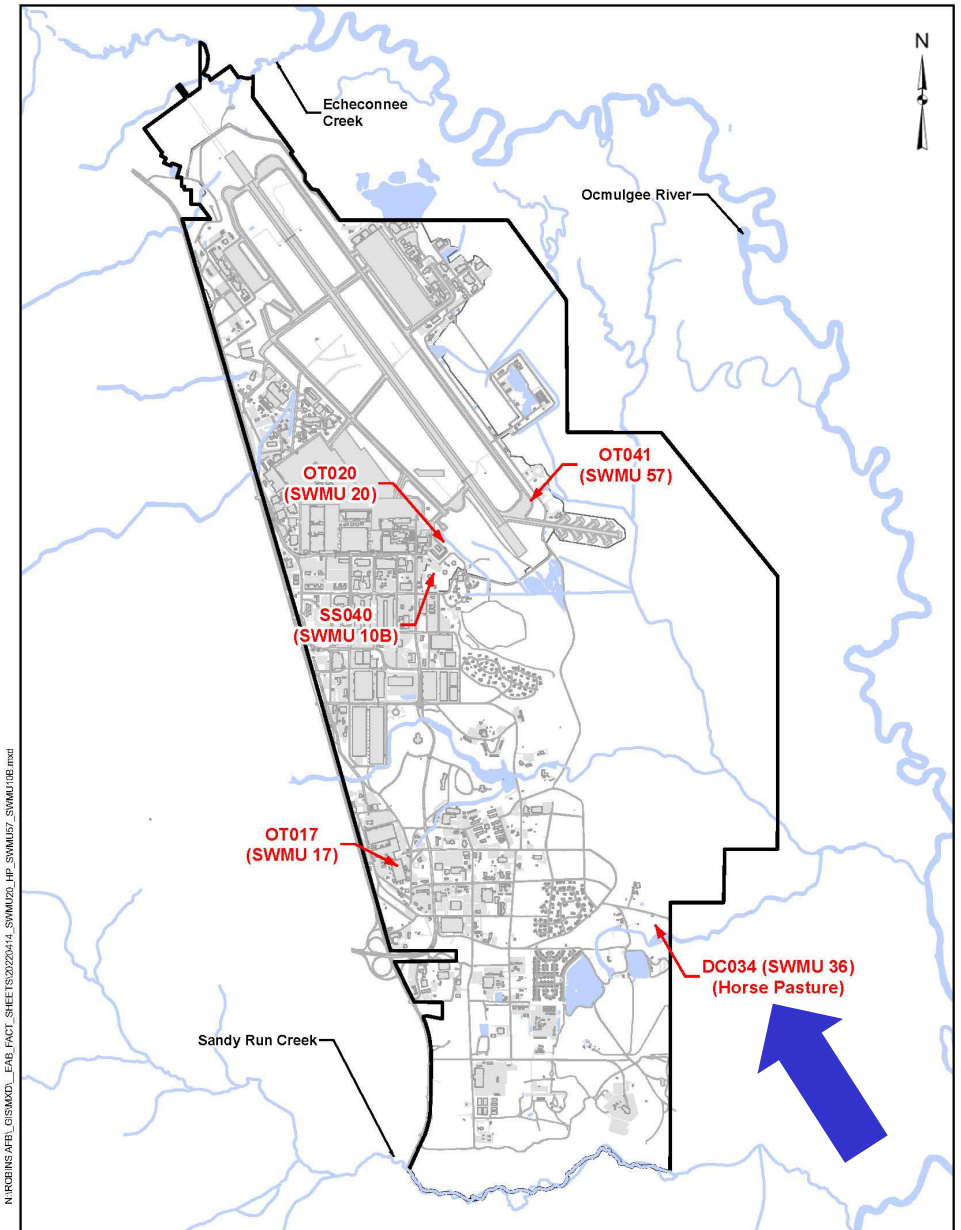
} Implementation of these tasks based on outcome of site investigations



AO Site Overview

■ Robins AFB AO sites

- SWMU 36
(DC034) (*Horse Pasture*)
- SWMU 17
- SWMU 20
- SWMU 57
- SWMU 10B





SWMU 36 Background

■ Current Corrective Action Plan (CAP) objectives

- Reduce contaminants of concern (COCs) in groundwater to below remediation levels (RLs)
- Limit further off-site migration of groundwater COCs

■ Selected remedies

- Air Sparge/Soil Vapor Extraction (AS/SVE) curtain
- Enhanced Reductive Dechlorination (ERD)
- In-Situ Oxygen Curtain (iSOC®)

SWMU 36 Groundwater COCs

Constituent	RL	Units
Acetone	1,558 ⁽¹⁾	µg/L
Benzene	5 ⁽²⁾	µg/L
Chlorobenzene (CB)	100 ⁽²⁾	µg/L
1,3-Dichlorobenzene (1,3-DCB)	9.5 ⁽¹⁾	µg/L
1,4-Dichlorobenzene (1,4-DCB)	75 ⁽²⁾	µg/L
1,2-Dichloroethane (1,2-DCA)	5 ⁽²⁾	µg/L
cis-1,2-Dichloroethene (cis-1,2-DCE)	70 ⁽²⁾	µg/L
Tetrachloroethene (PCE)	5 ⁽²⁾	µg/L
Trichloroethene (TCE)	5 ⁽²⁾	µg/L
Vinyl chloride (VC)	2 ⁽²⁾	µg/L

Notes:

(1) RL is based on site-specific risk-based values.

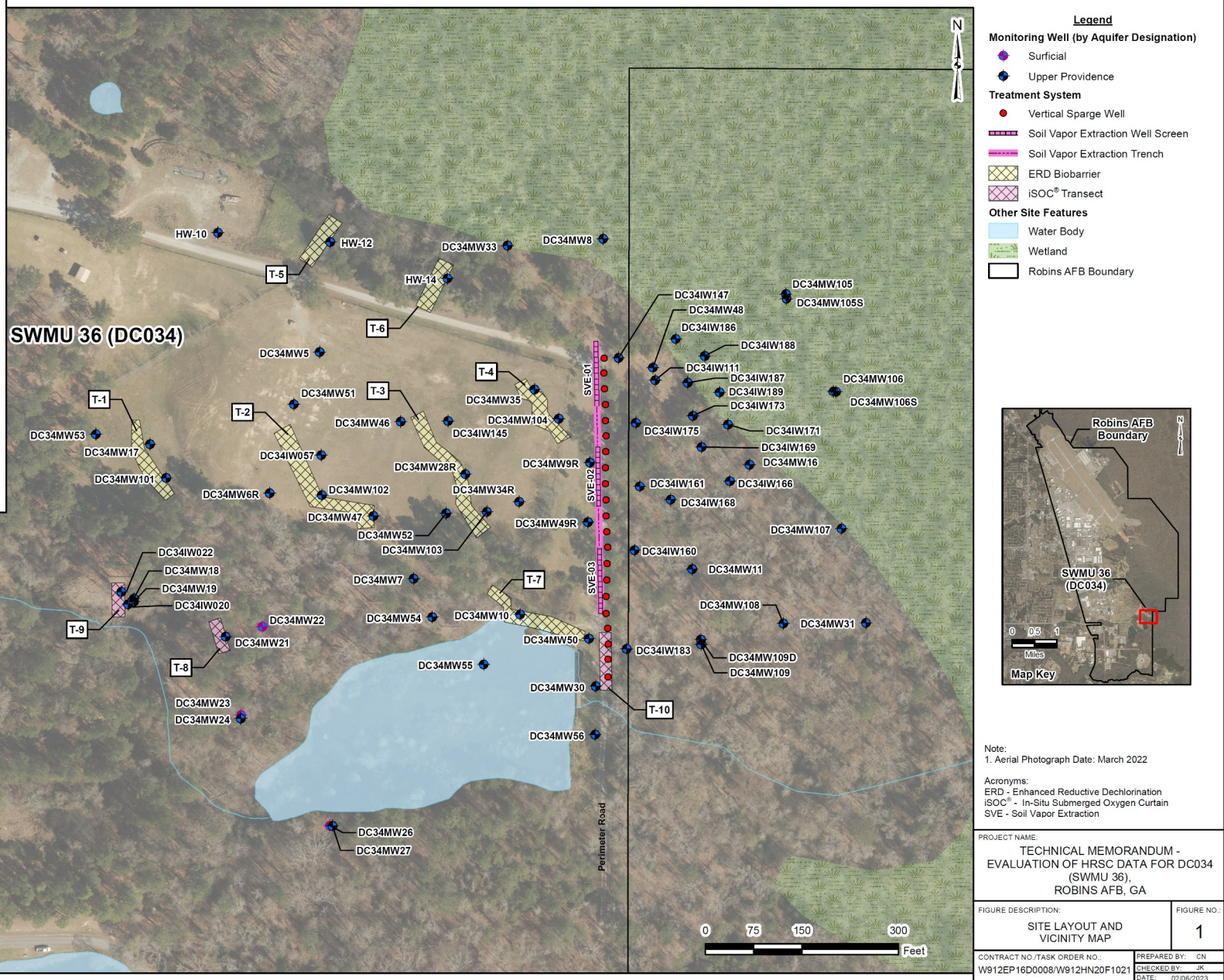
(2) RL is based on Federal Primary Drinking Water Standards, Maximum Contaminant Levels (MCLs).

Source: Corrective Action Plan (CAP) [Jacobs, 2014]



SWMU 36 Background

- **AS/SVE curtain**
 - 18 vertical AS wells
 - 3 horizontal SVE wells
- **ERD**
 - 51 injection wells/7 transects
- **iSOC®**
 - 12 infusion wells/3 transects





SWMU 36 Background

- **Most of site is underlain by massive kaolinic clay unit, which acts as an aquitard above upper Providence aquifer**
 - Data have shown that clay unit is fractured with evidence of percolation of water through clay
- **On southwest side of site near Rebecca Creek, kaolinitic clay transitions to interbedded layers of clay and sand**
- **Upper Providence is comprised of cross-bedded, fine to coarse, sand and clayey sands interbedded with lenses of kaolinitic clay in deeper portions of aquifer**
- **Groundwater flow is generally toward east/northeast**

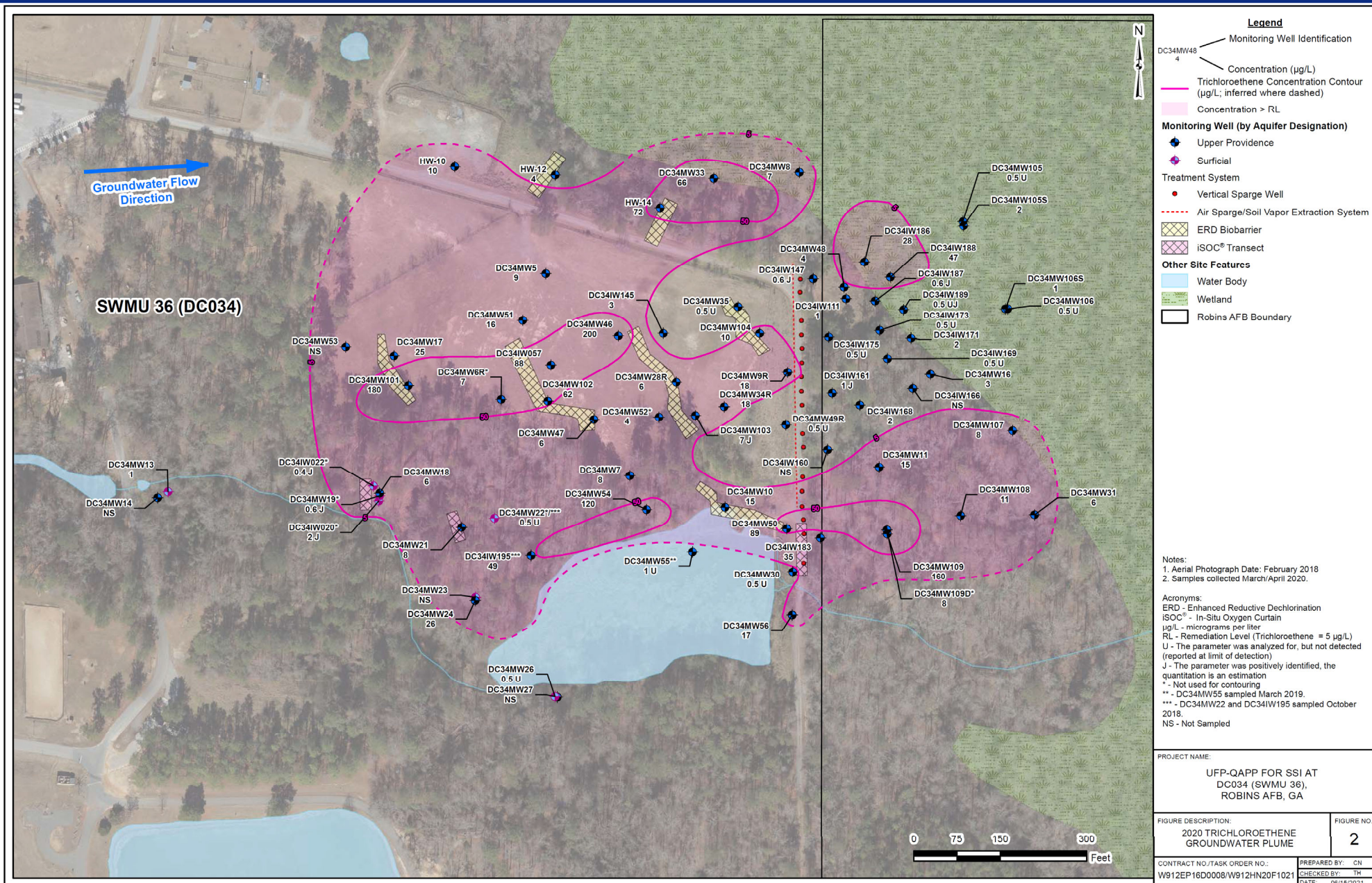


SWMU 36 Background



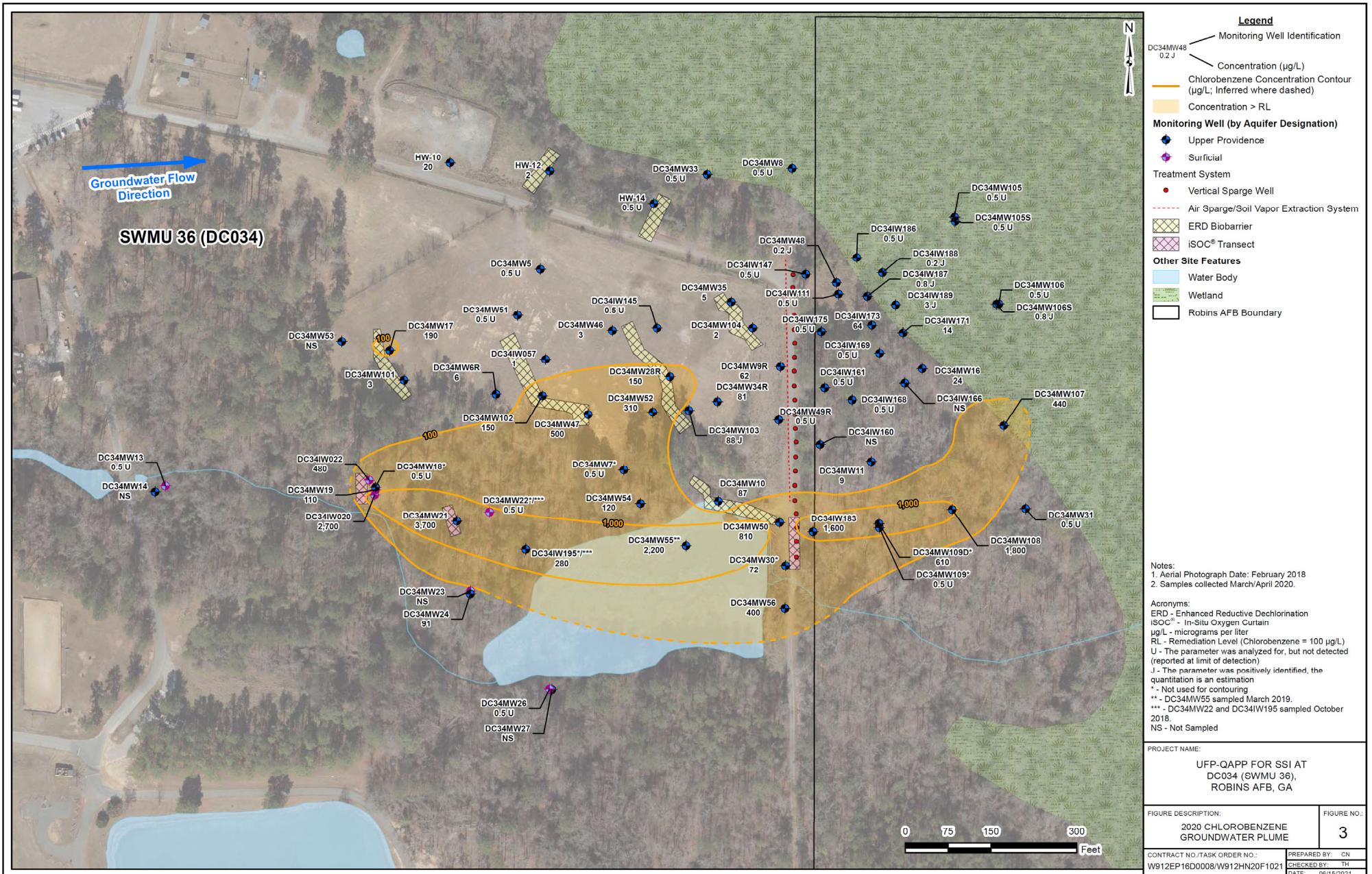


SWMU 36 Background



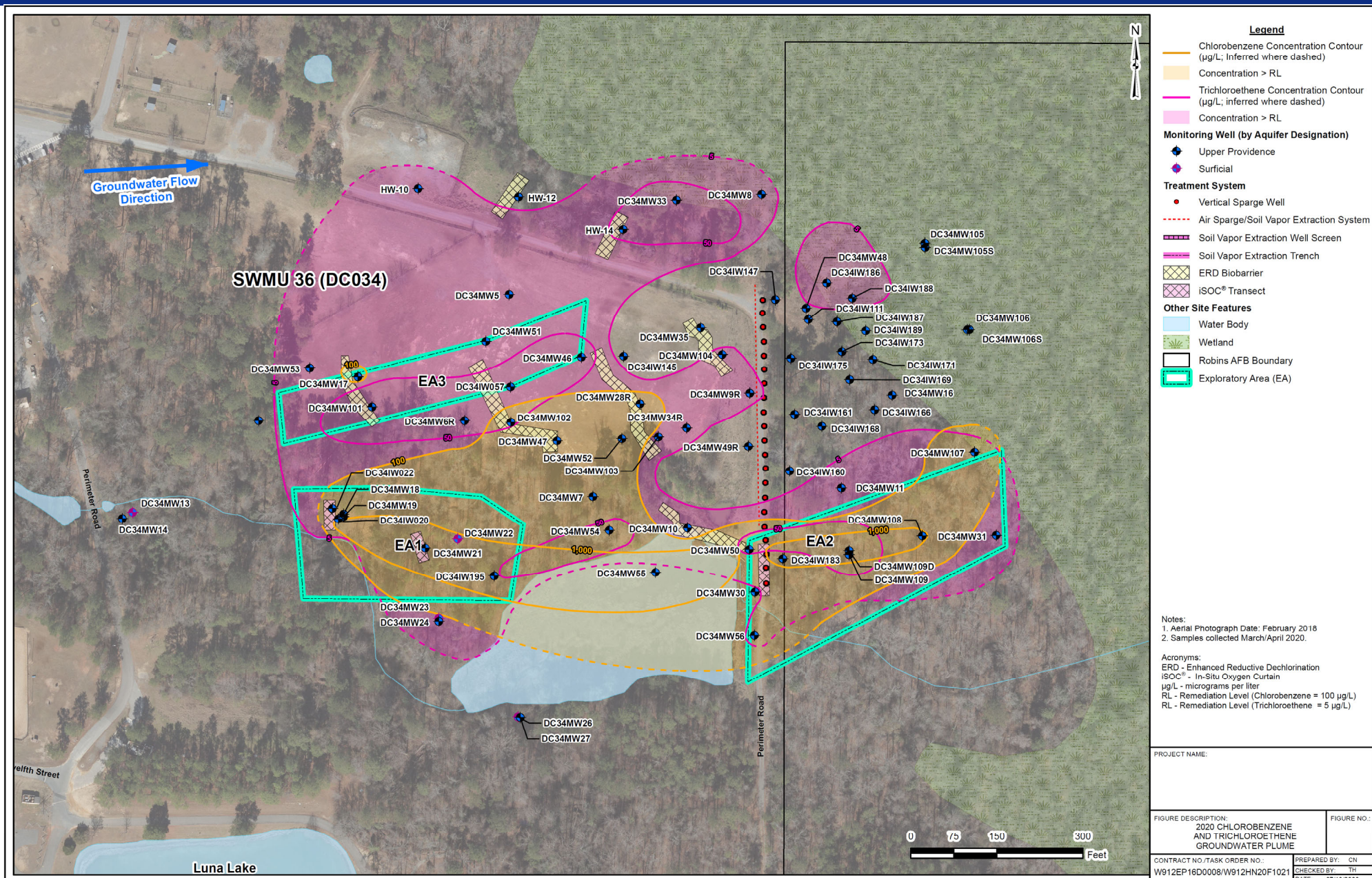


SWMU 36 Background





SSI Overview





SSI Overview

■ CSM data gaps

• EA 1

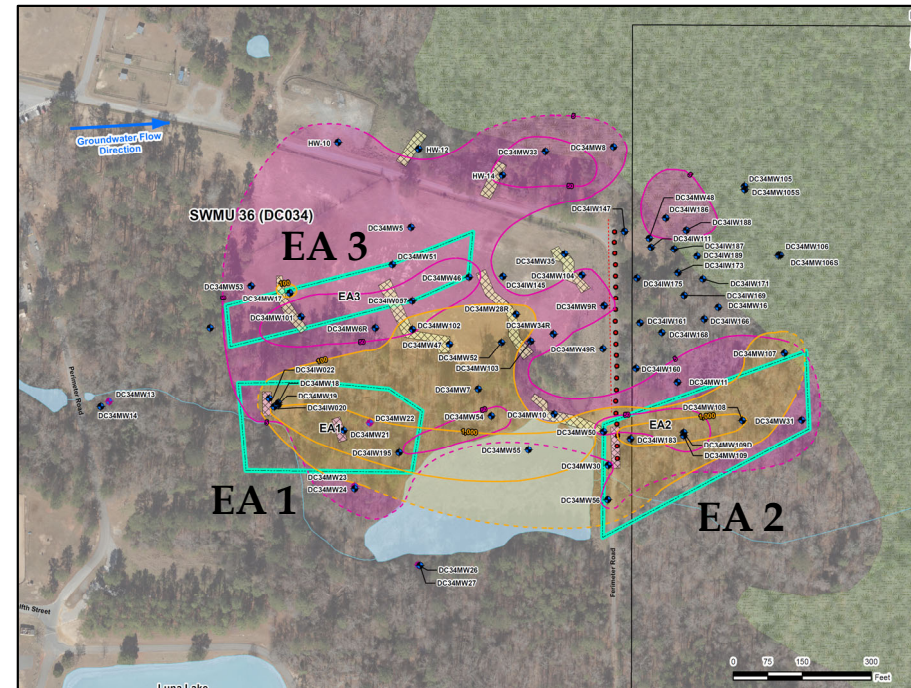
- Does chlorobenzene plume extend upgradient of DC34IW020, DC34IW022, and DC34MW19?
- How deep is chlorobenzene plume near DC34MW21 and downgradient?

• EA 2

- Where is plume migrating off-site south of AS/SVE barrier?
- How deep are chlorinated benzene and chlorinated ethene plumes at property boundary?

• EA 3

- Is residual source material present in bottom depths of clay unit?





SSI Activities

■ Phase 01

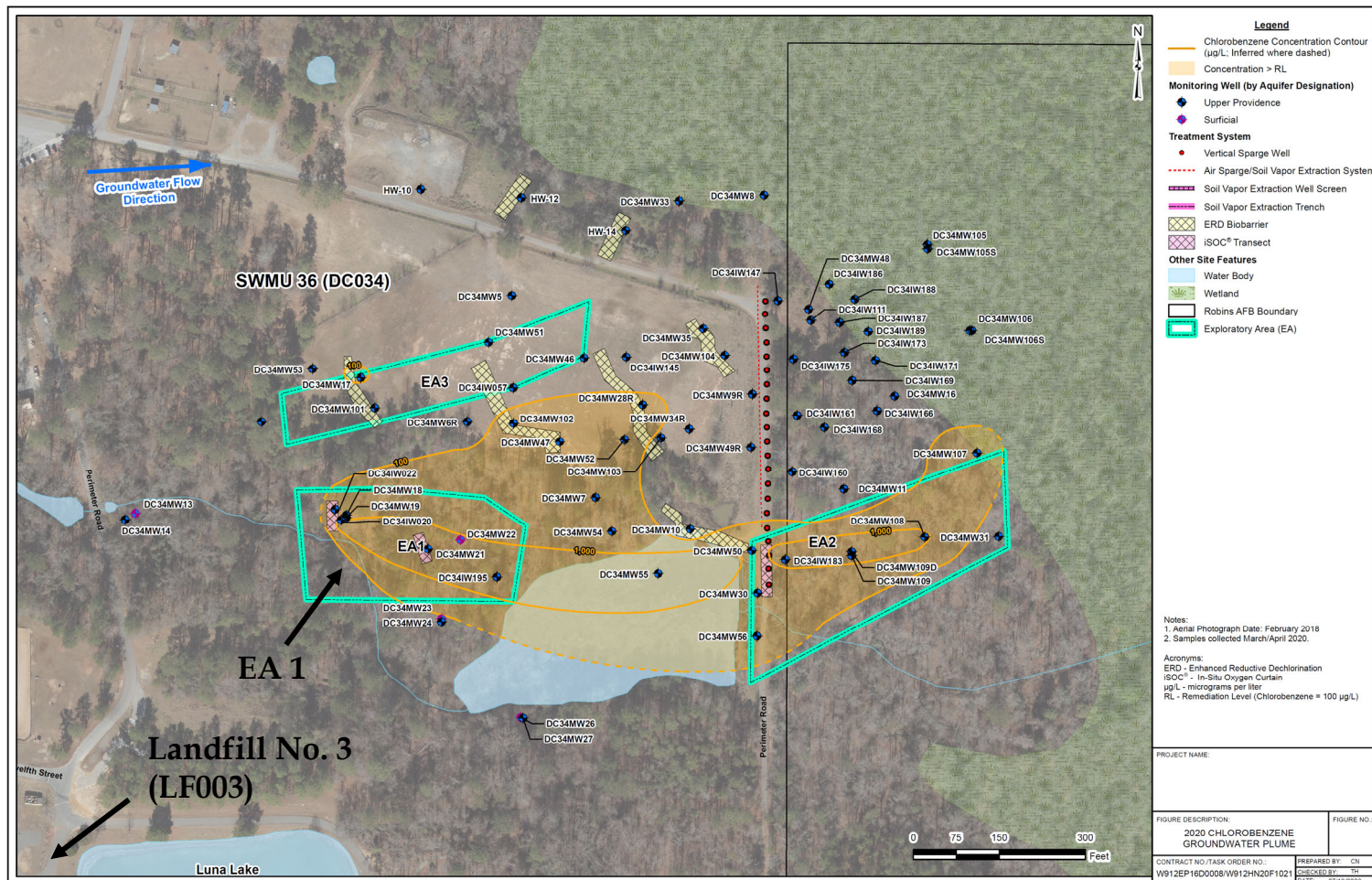
- Membrane Interface Probe (MIP) / Hydraulic Profiling Tool (HPT) (MiHpt)
- Discrete Soil and Groundwater Sampling

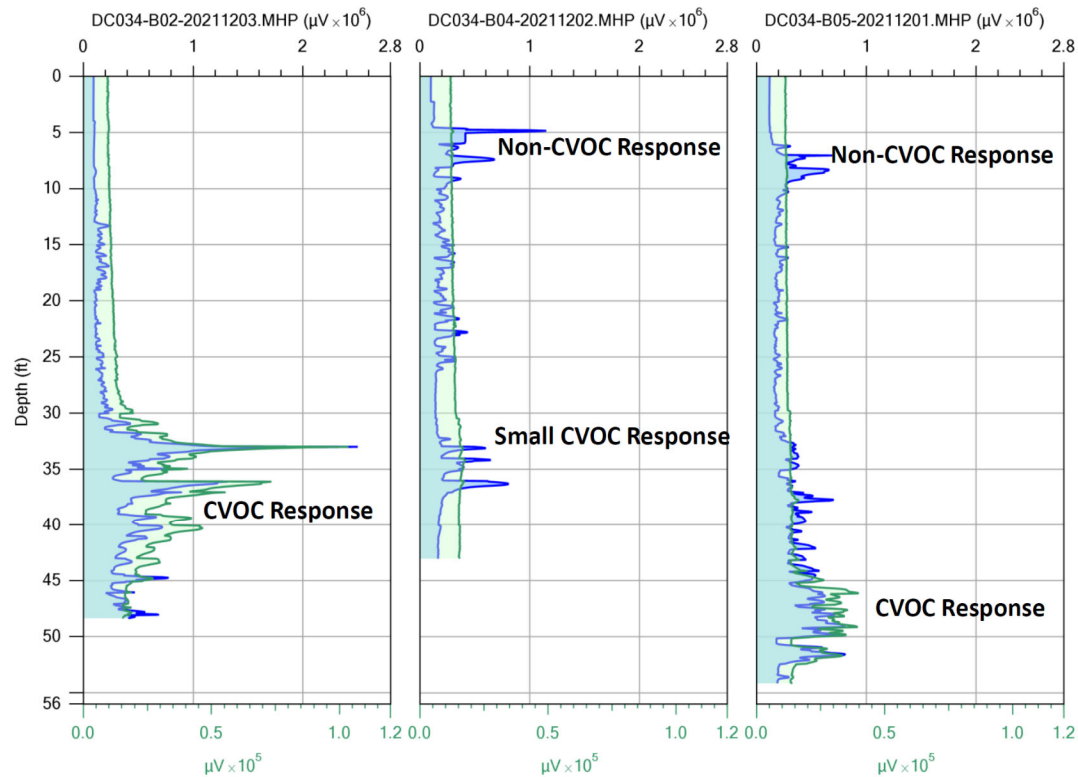




EA 1 Overview

- Focused on chlorobenzene plume
- Previous contractors have speculated LF003 as an upgradient source

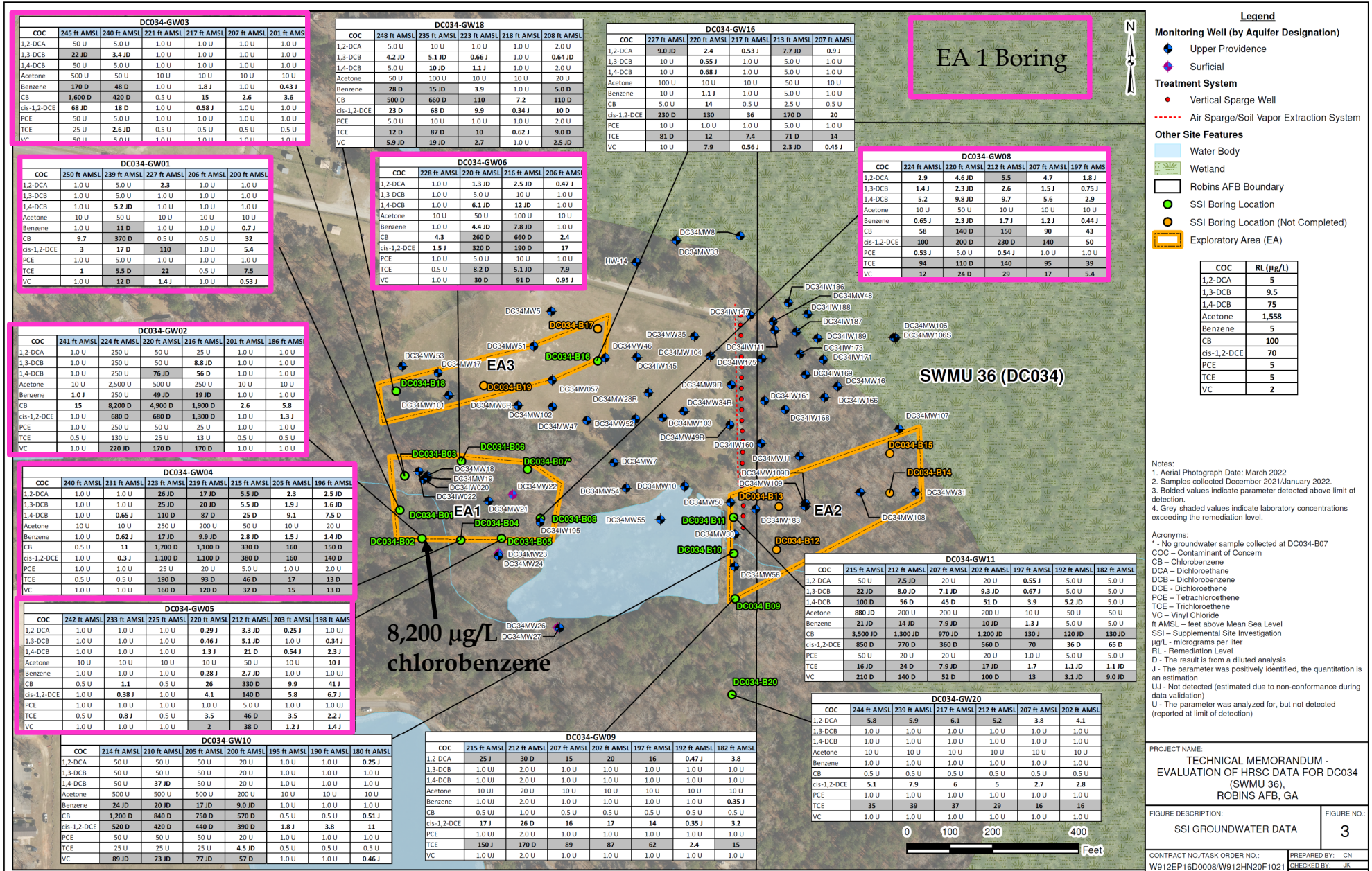


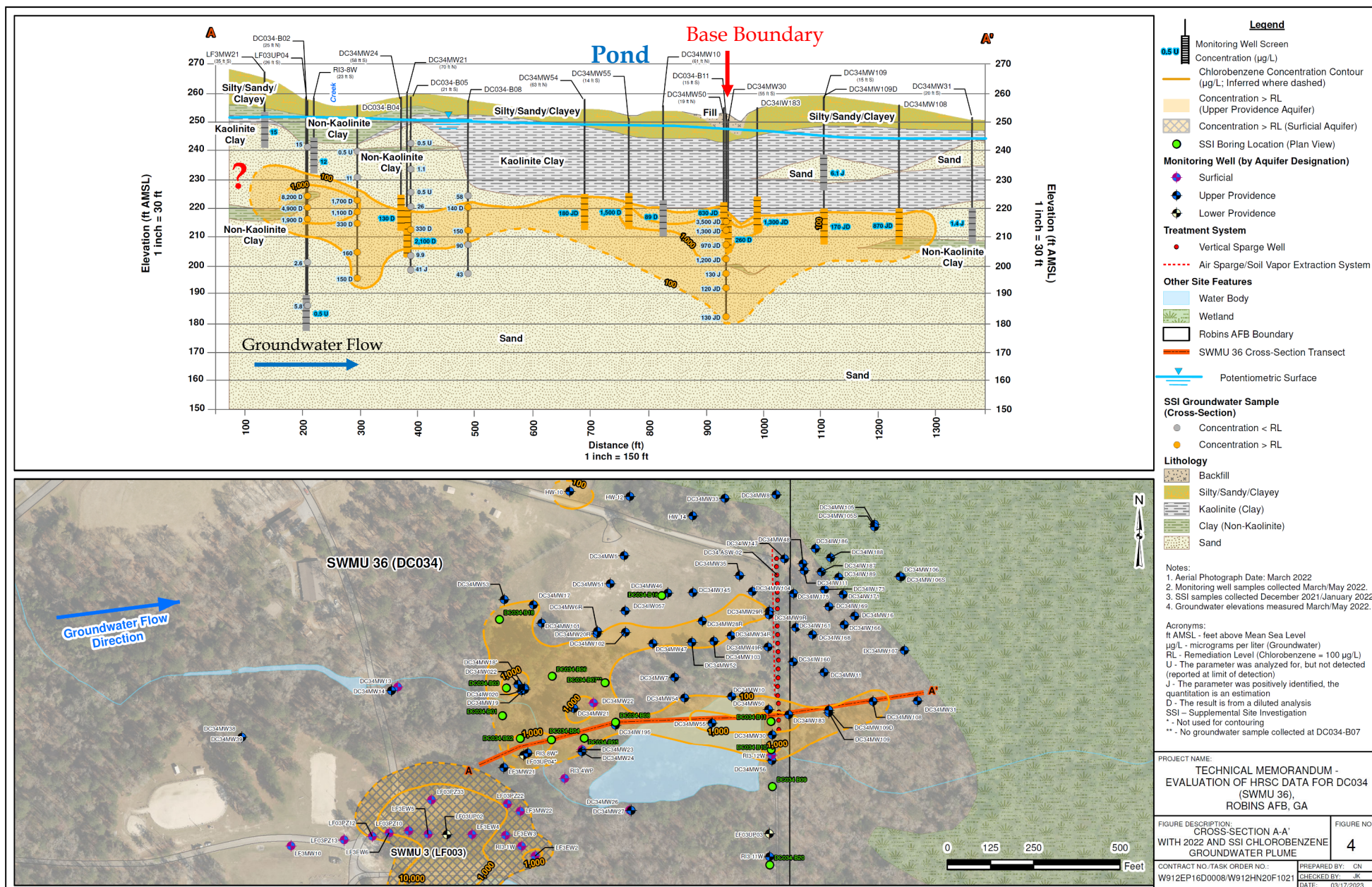


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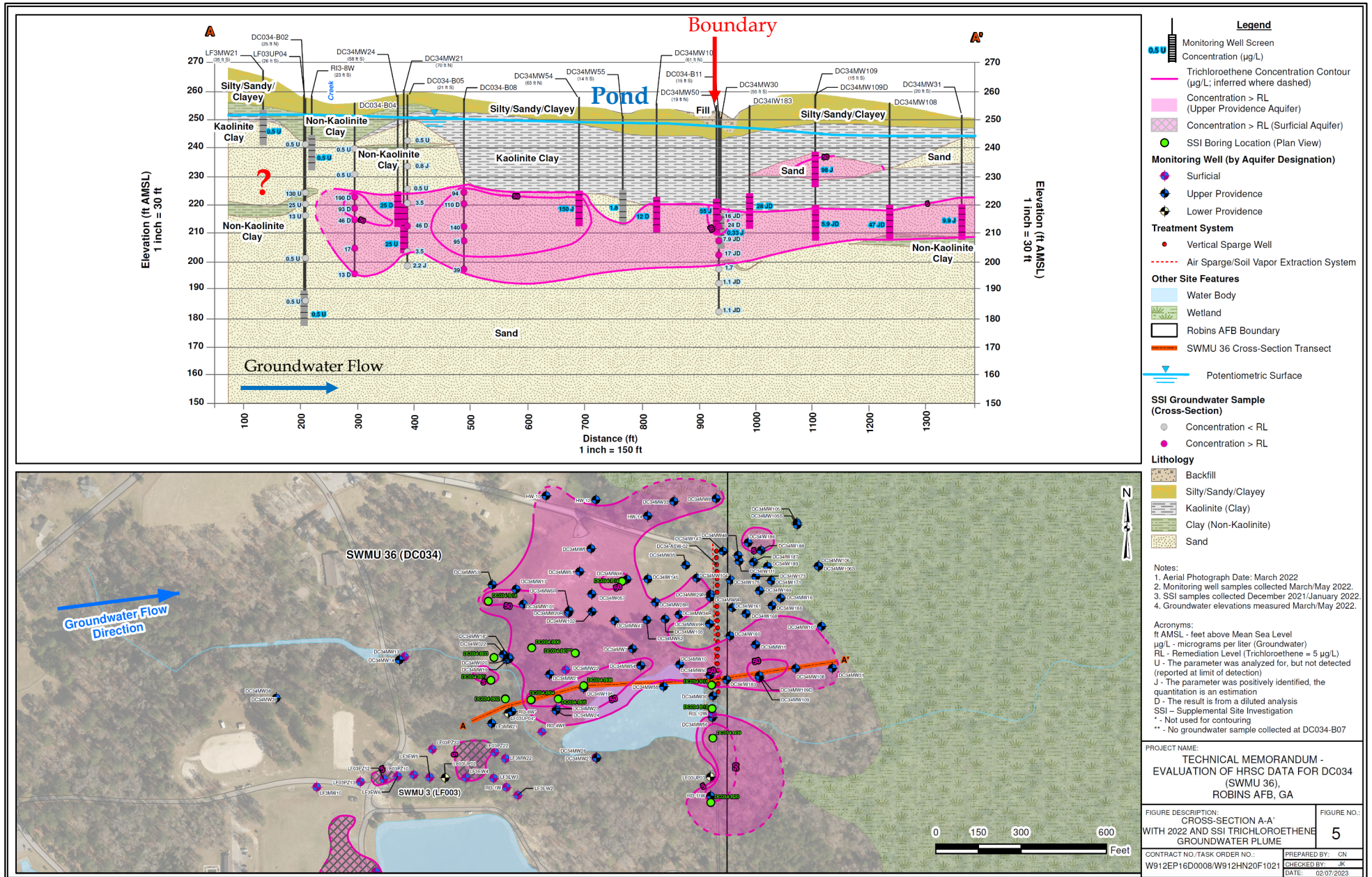
EA 1 Results







EA 1 Results



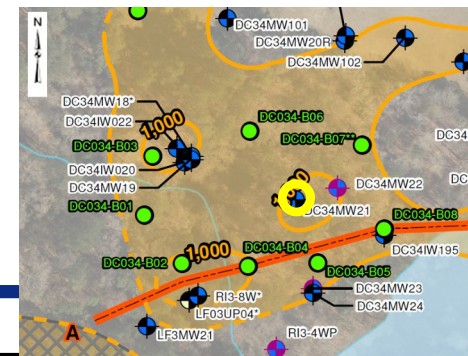


Figure 1 is a line graph showing the concentration of various contaminants in groundwater from 1995 to 2022. The Y-axis is logarithmic, representing Concentration (µg/L) from 0.01 to 10,000. The X-axis is linear, representing Year from 1995 to 2022. Five data series are plotted: CB (blue diamonds), cis-1,2-DCE (green squares), TCE (magenta triangles), VC (red circles), and an unlabeled orange line with circles. Several vertical dashed lines indicate regulatory limits (RL) for different contaminants: CB (100 µg/L), cis-1,2-DCE (70 µg/L), TCE (5 µg/L), and VC (2 µg/L). A yellow box highlights a peak concentration of 1,210 µg/L for the orange line in 2009. The graph shows significant fluctuations in concentrations over time, with a general trend of decreasing concentrations for most contaminants after 2000.

1,210

2,100

- Chlorobenzene
- Cis-1,2-Dichloroethene
- ▲ Trichloroethene
- Vinyl Chloride
- EVO and Buffer Solution Injection at all ERD Transects
- AS/SVE System Started
- iSOC® Transects 8 and 9 Started
- EVO and Buffer Solution Injection at all ERD Transects
- EVO and Buffer Solution Injection at all ERD Transects
- iSOC® Transect 10 Started
- KB-1 Injection at Transects 3, 4, and 7
- EVO Solution Injection at Transects 2, 3, and 7

Definitions:
ERD - Enhanced Reductive Dechlorination
ISOC® - In-Situ Submerged Oxygen Curtain
EVO - Emulsified Vegetable Oil
µg/L - micrograms per liter
RL - Remediation Level
ft bgs - feet below ground surface.
ft above MSL - feet above Mean Sea Level.

Notes:

1. Open symbols are not detected (reported at limit of detection).
2. Dashed line represents the RL for its color coded constituent.

Hydrogeologic Unit: Upper Providence
Screen Interval (ft bgs): 41 - 56
Screen Interval (ft above MSL): 219 - 204

VOC Trends at DC34MW21

Horse Pasture Site



Figure

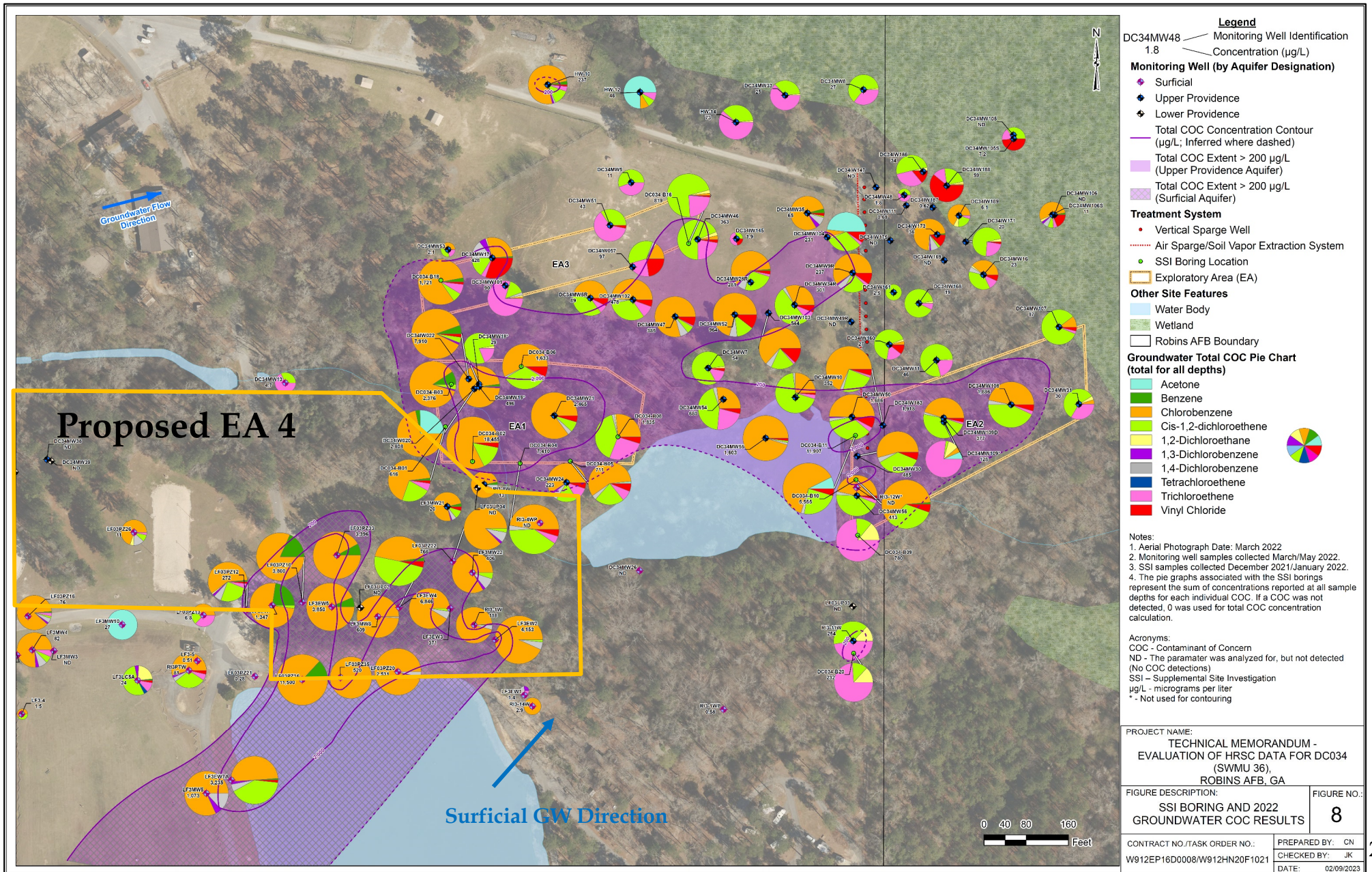
42

Kennesaw, GA

19-Oct-2022



EA 1 Results





EA 1

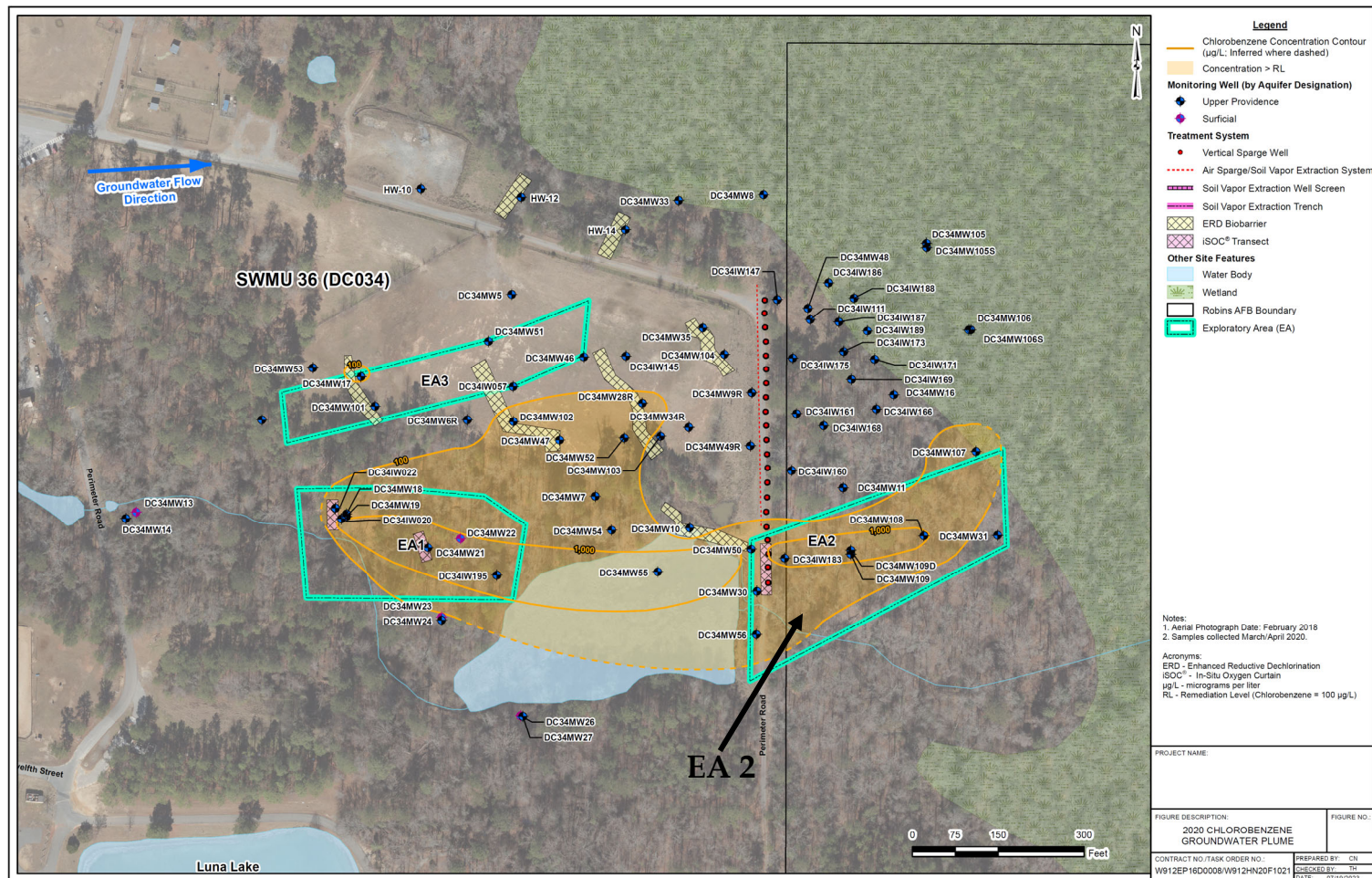
Proposed Path Forward

- Investigate LF003 area as potential upgradient source of SWMU 36 chlorobenzene groundwater plume
 - Utilize discrete sampling and/or new monitoring wells



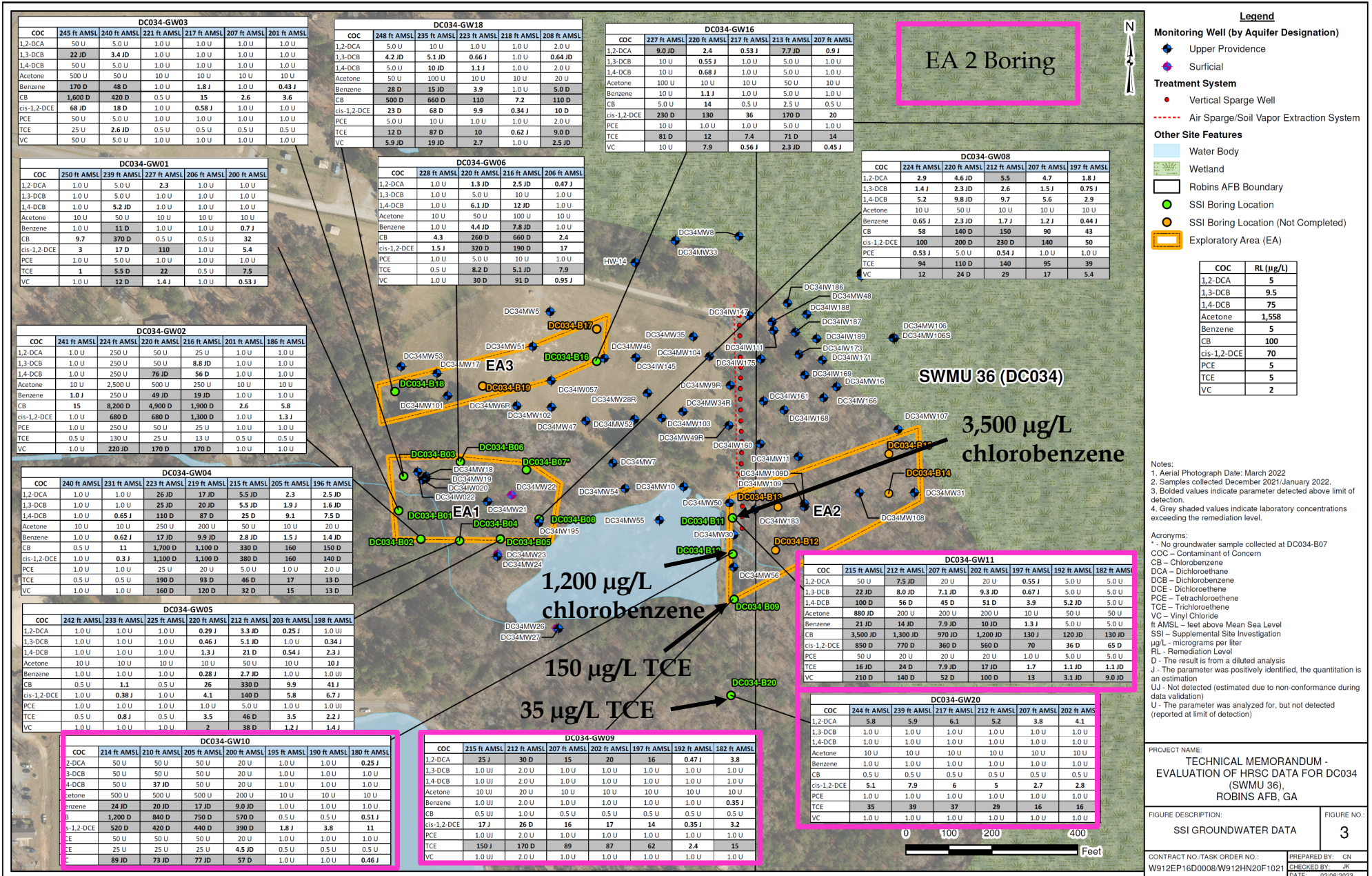
EA 2 Overview

- Off-base borings inaccessible during initial fieldwork
- Focused on eastern boundary plume south of AS/SVE



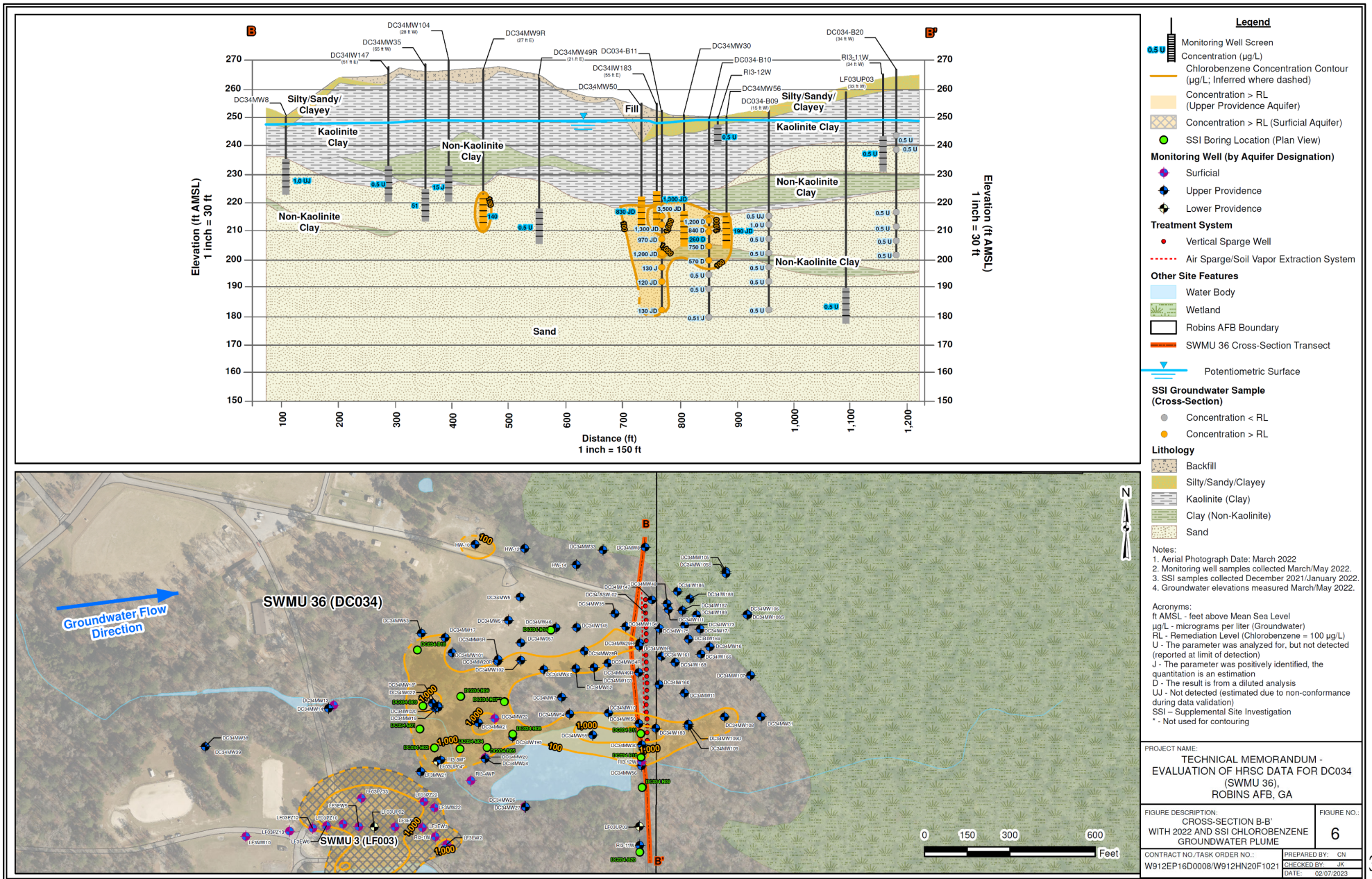


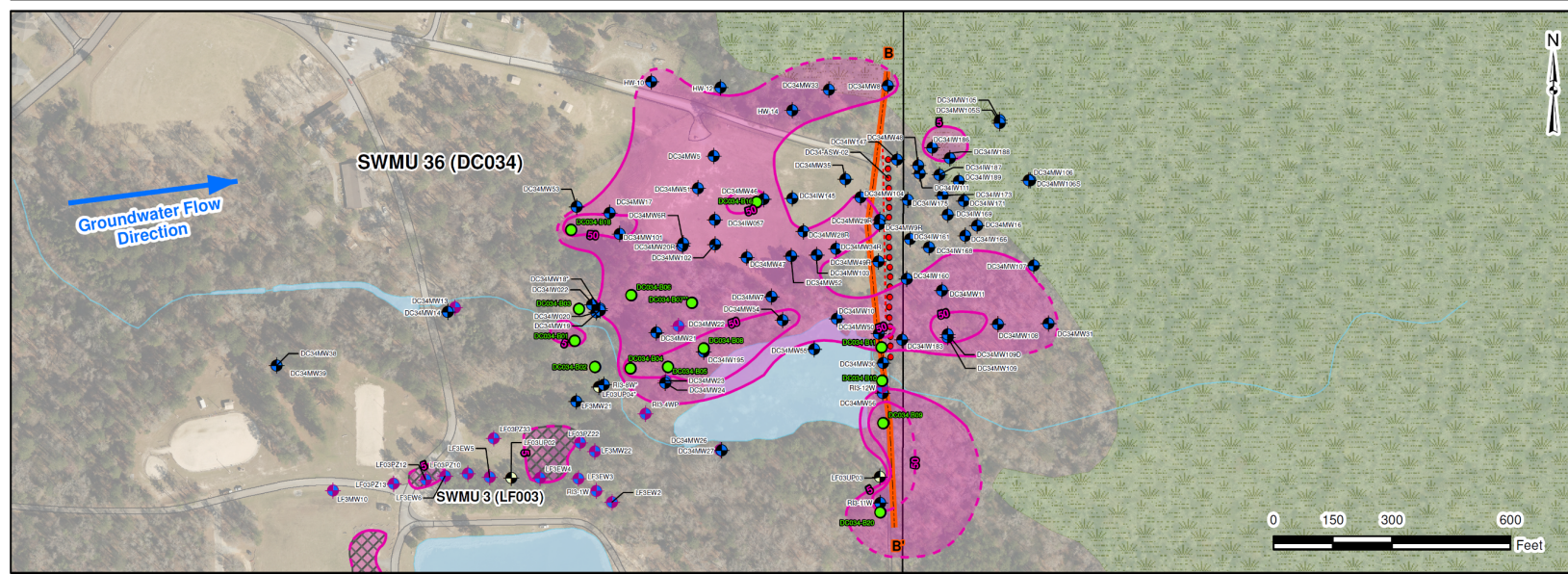
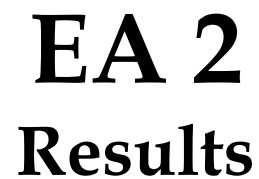
EA 2 Results





EA 2 Results

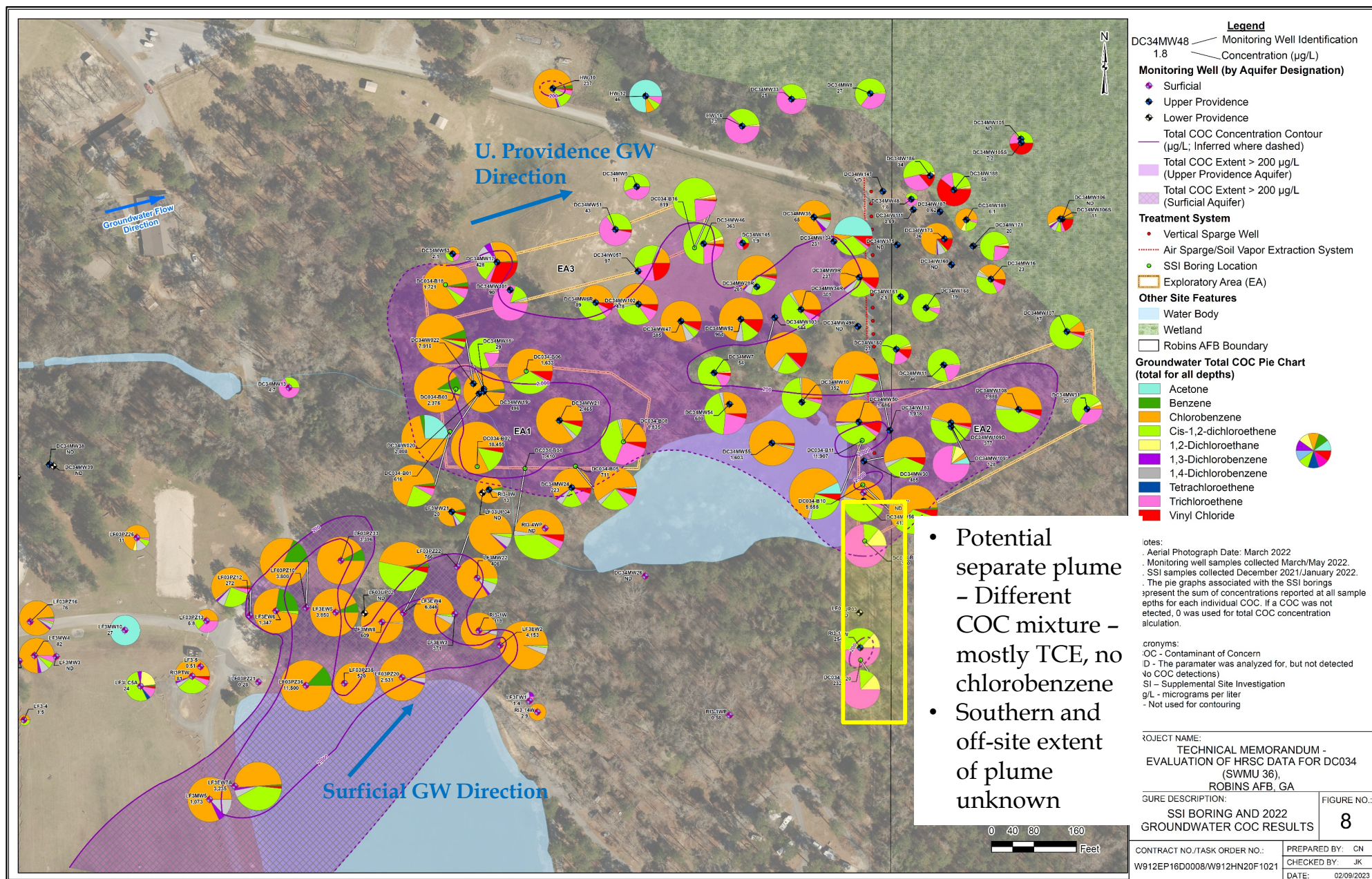




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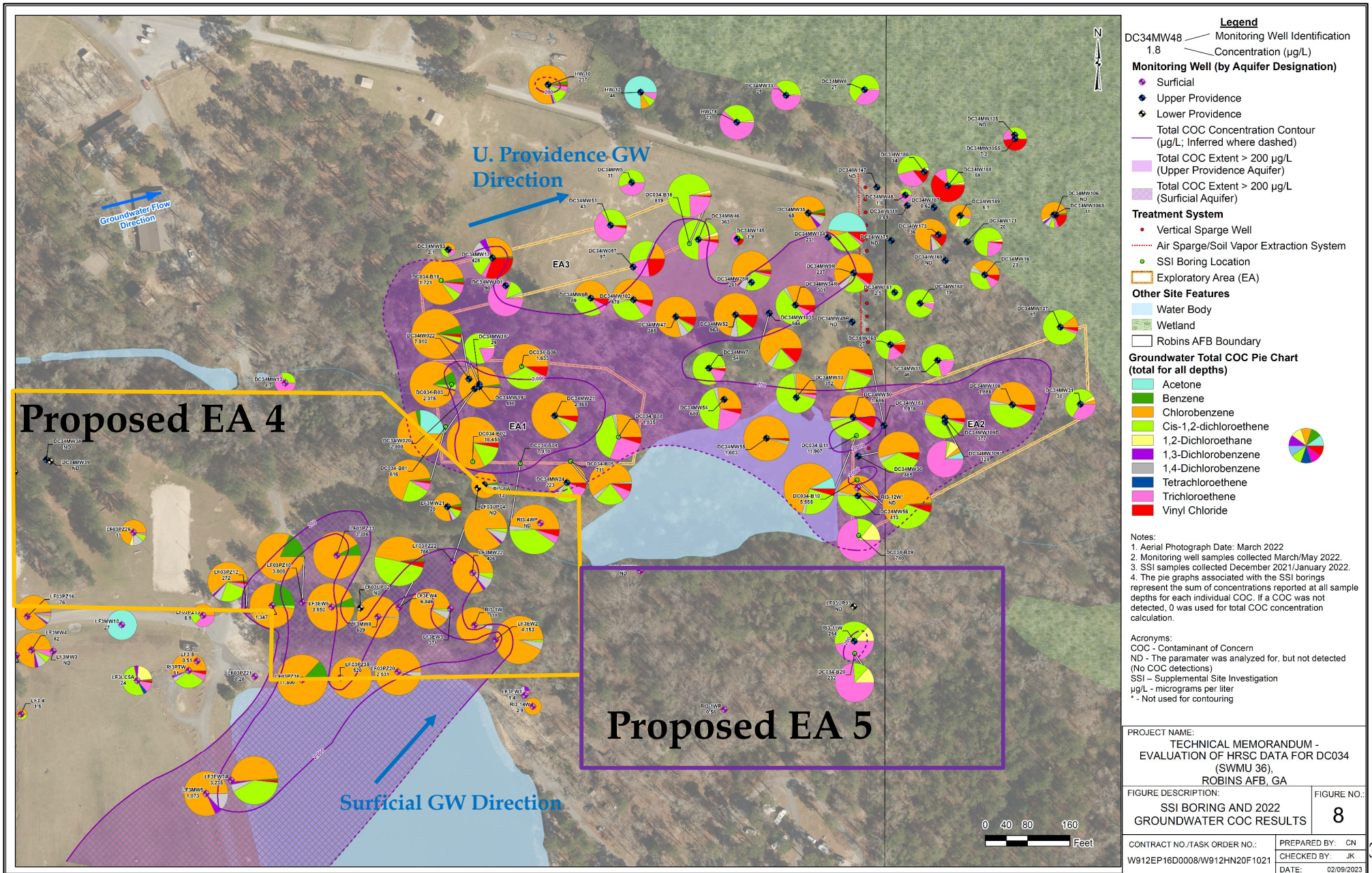
EA 2 Results



- Potential separate plume - Different COC mixture - mostly TCE, no chlorobenzene
- Southern and off-site extent of plume unknown



EA 2 Results





EA 2

Proposed Path Forward

- **Off-Base:** Discrete sampling to gather data to better understand geometry of off-base plume
- **Eastern Boundary:** Discrete sampling to further understand geometry of dissolved plume along eastern boundary (south of DC034-B20)
- **Upgradient:** Investigate LF003 area as possible source of southern TCE groundwater plume

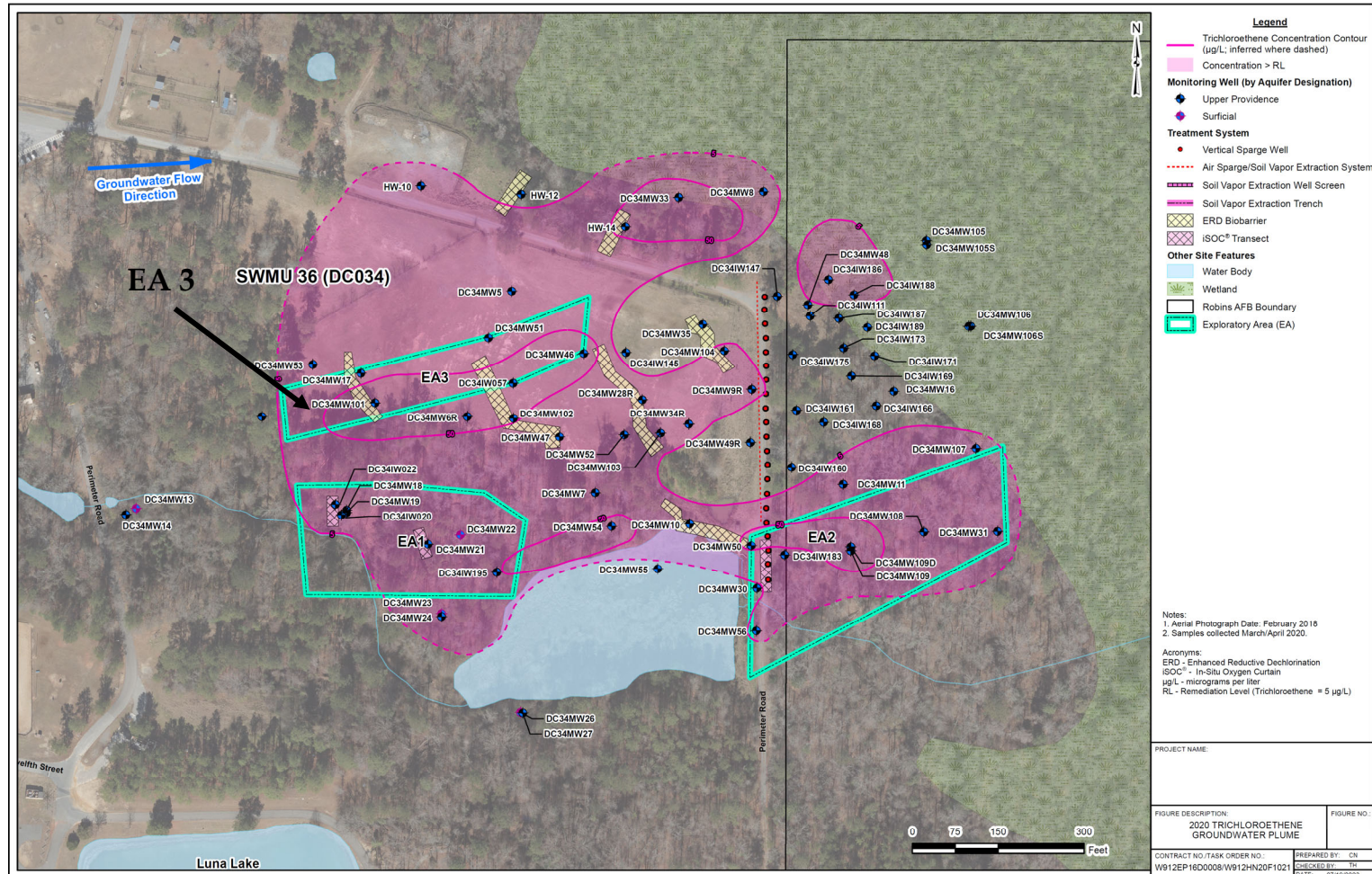


EA 3 Overview

- Focused on TCE “hot-spot” at DC34MW46 and upgradient location

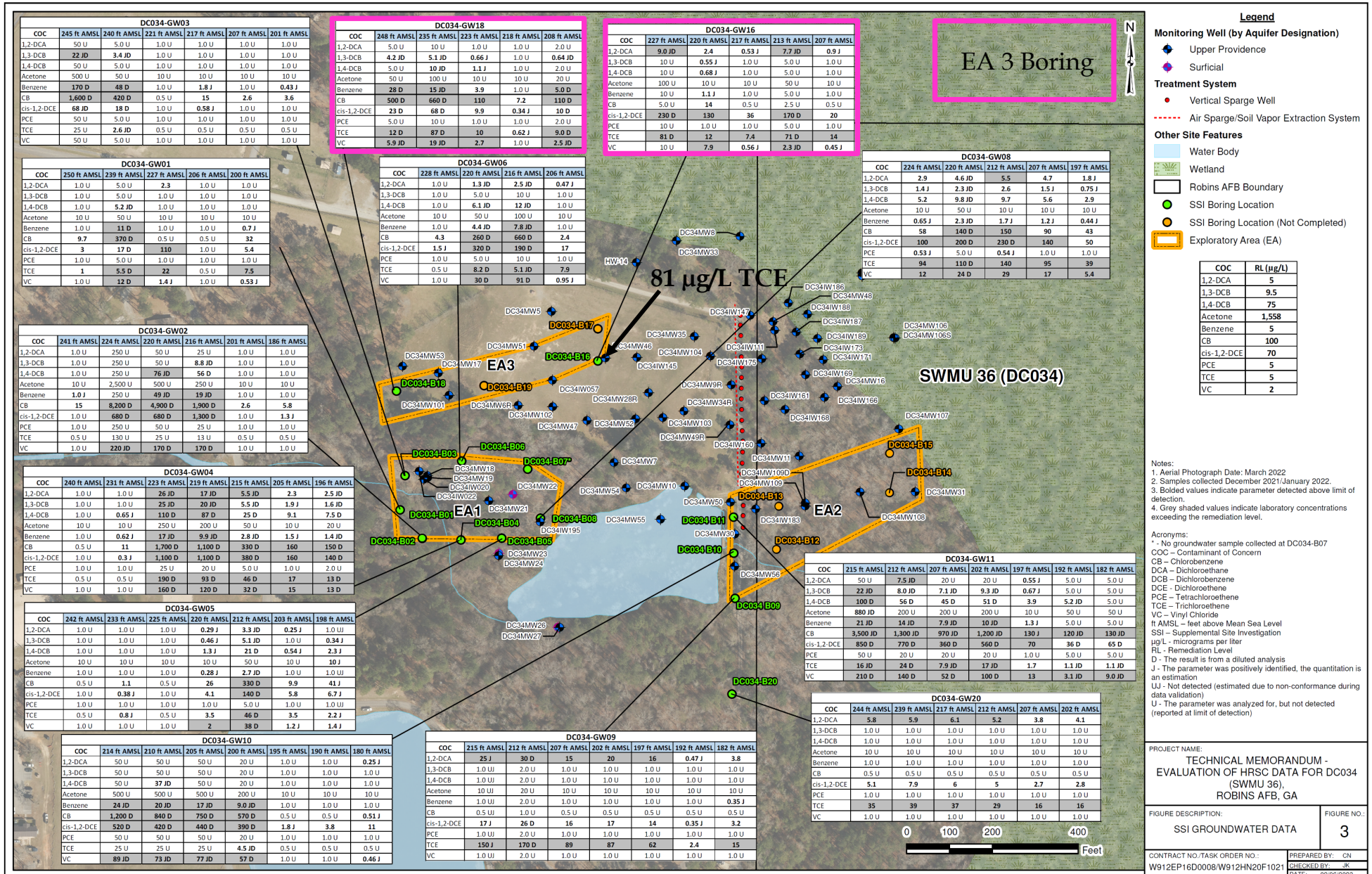
- Soil samples at bottom of clay unit

- Discrete groundwater sampling





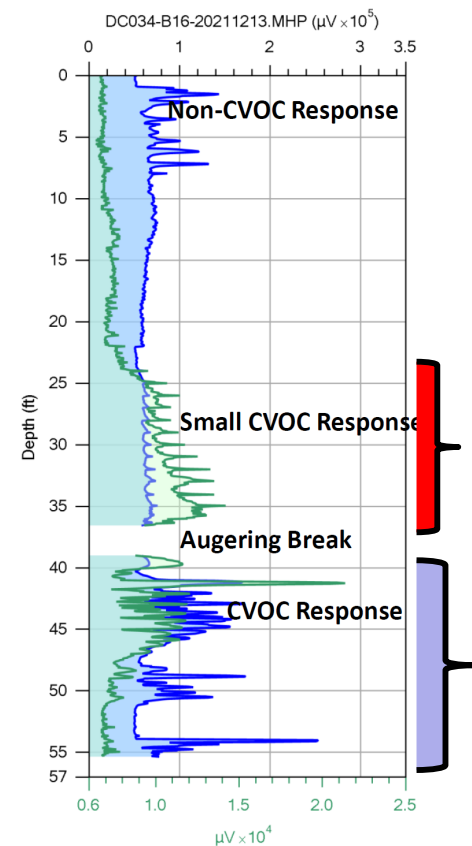
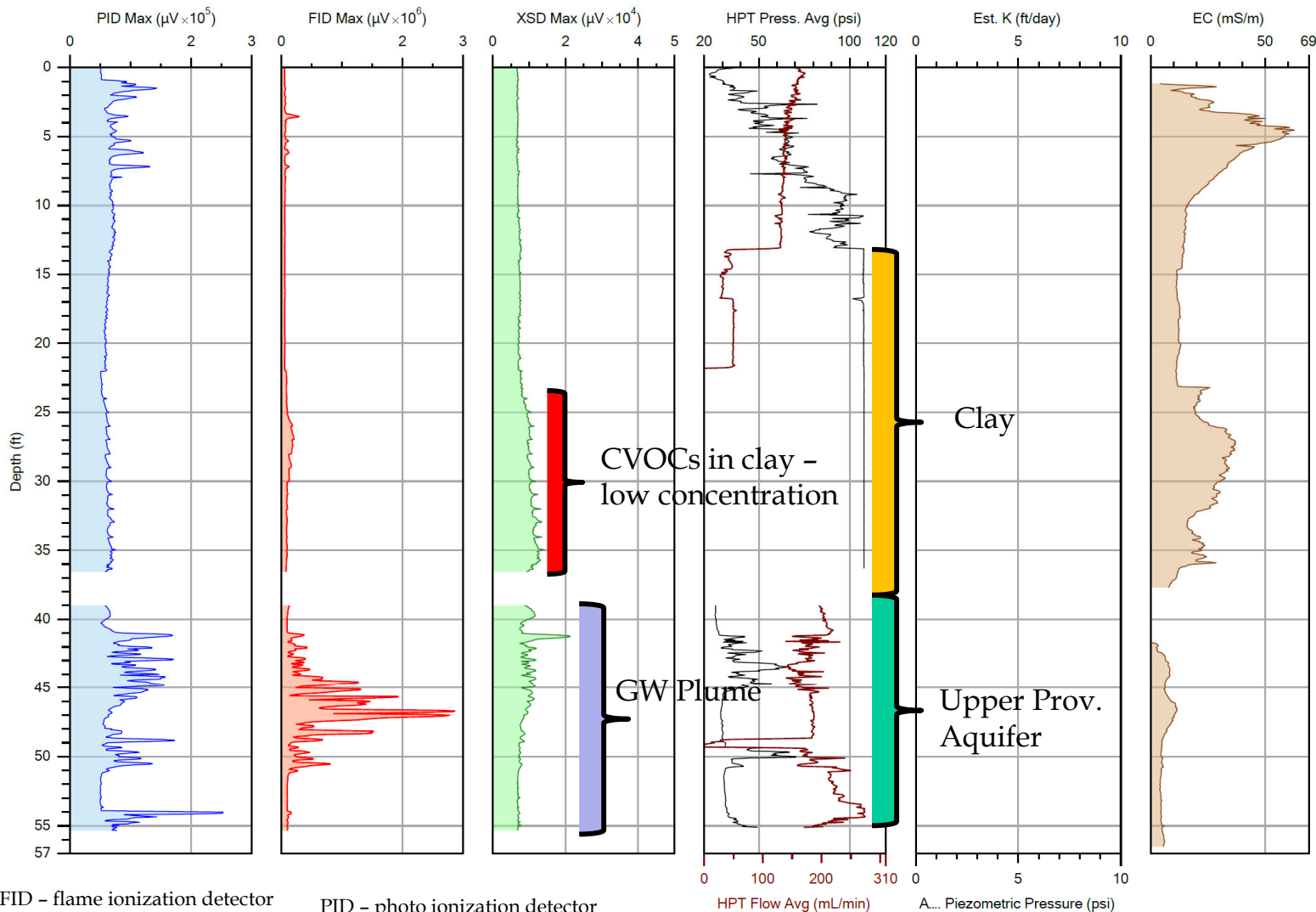
EA 3 Results





EA 3 Results

MiHpt at DC034-B16



FID - flame ionization detector
GW - groundwater
mL/m - milliliter per minute
mS/m - milli siemens per meter

PID - photo ionization detector
psi - pounds per square inch
 μV - microvolts
XSD - halogenated compounds



EA 3

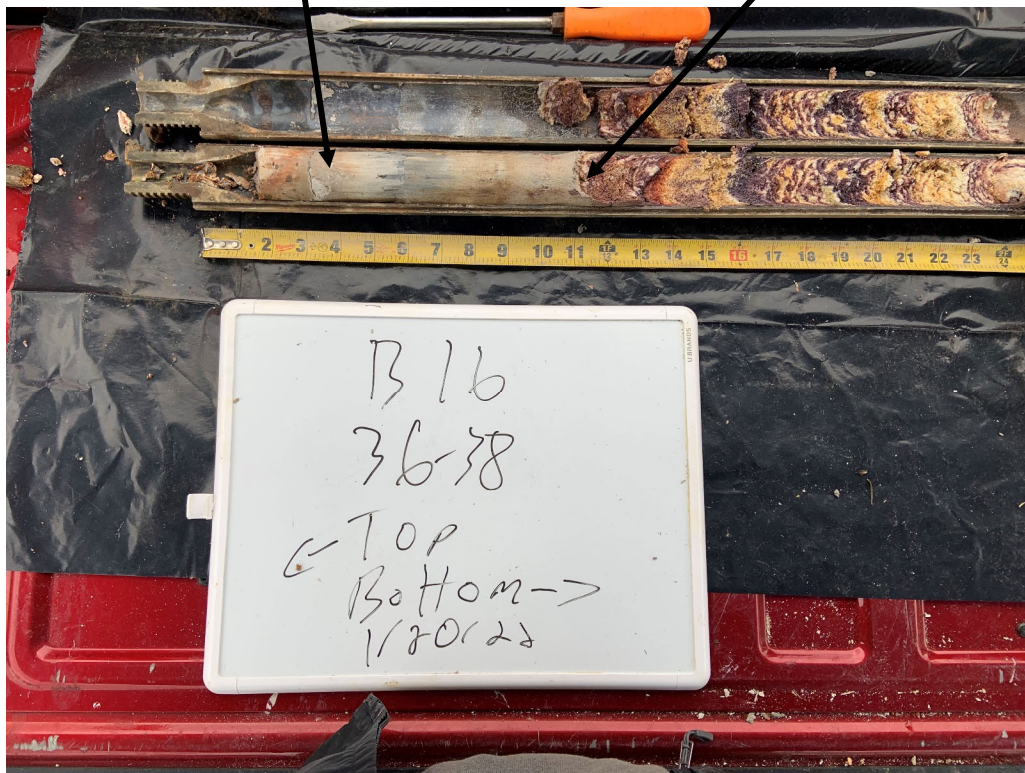
Results

DC034-B16: 36 to 38 ft bgs

Soil Sample: DC034-B16 at 36 to 36.5 ft bgs

Clay/Sand Interface

GW Sample: DC034-B16 at 40 ft bgs



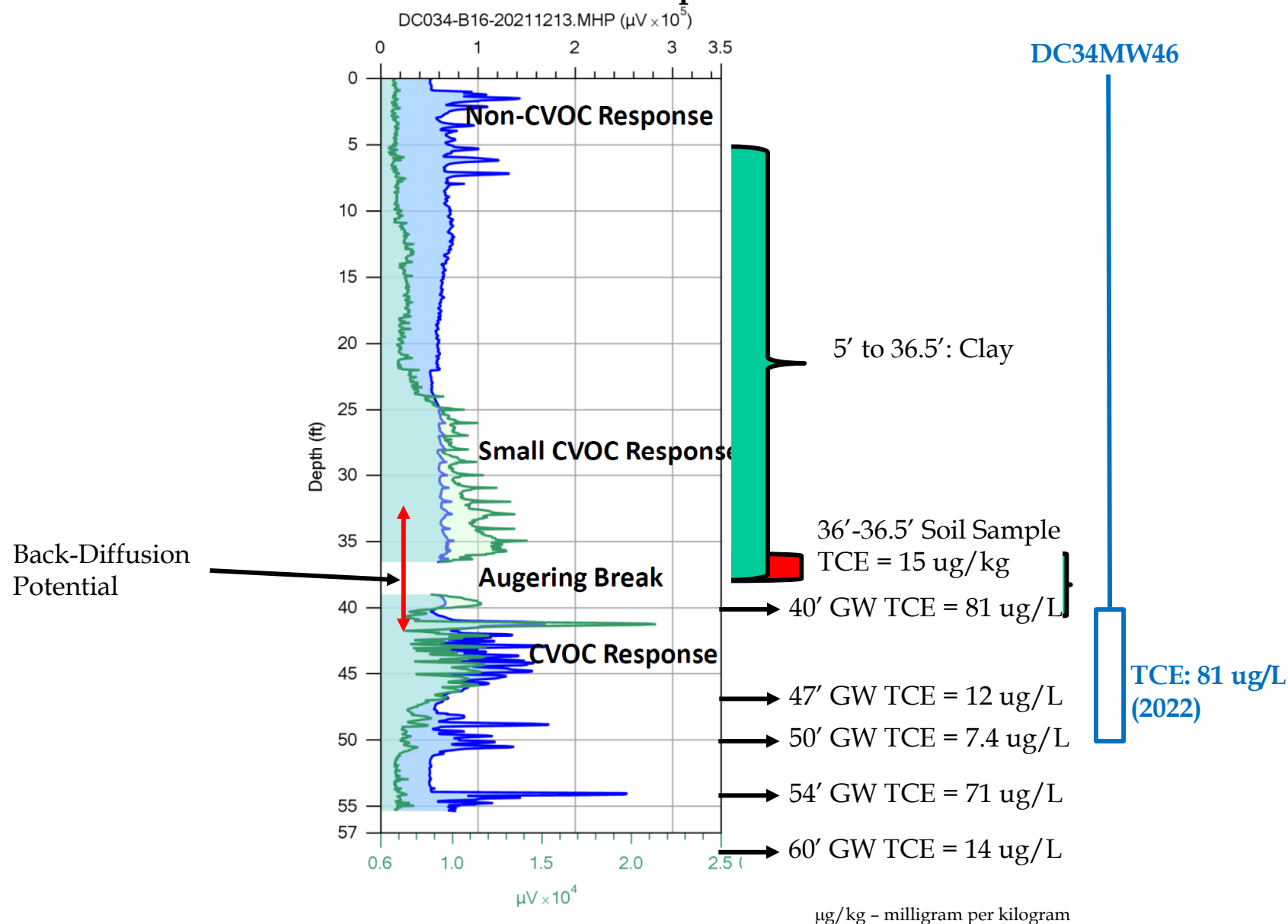
Kaolinitic Clay: 36 to 36.9 ft bgs
Sand: 37 to 38 ft bgs



EA 3

Results

MiHpt at DC034-B16





EA 3

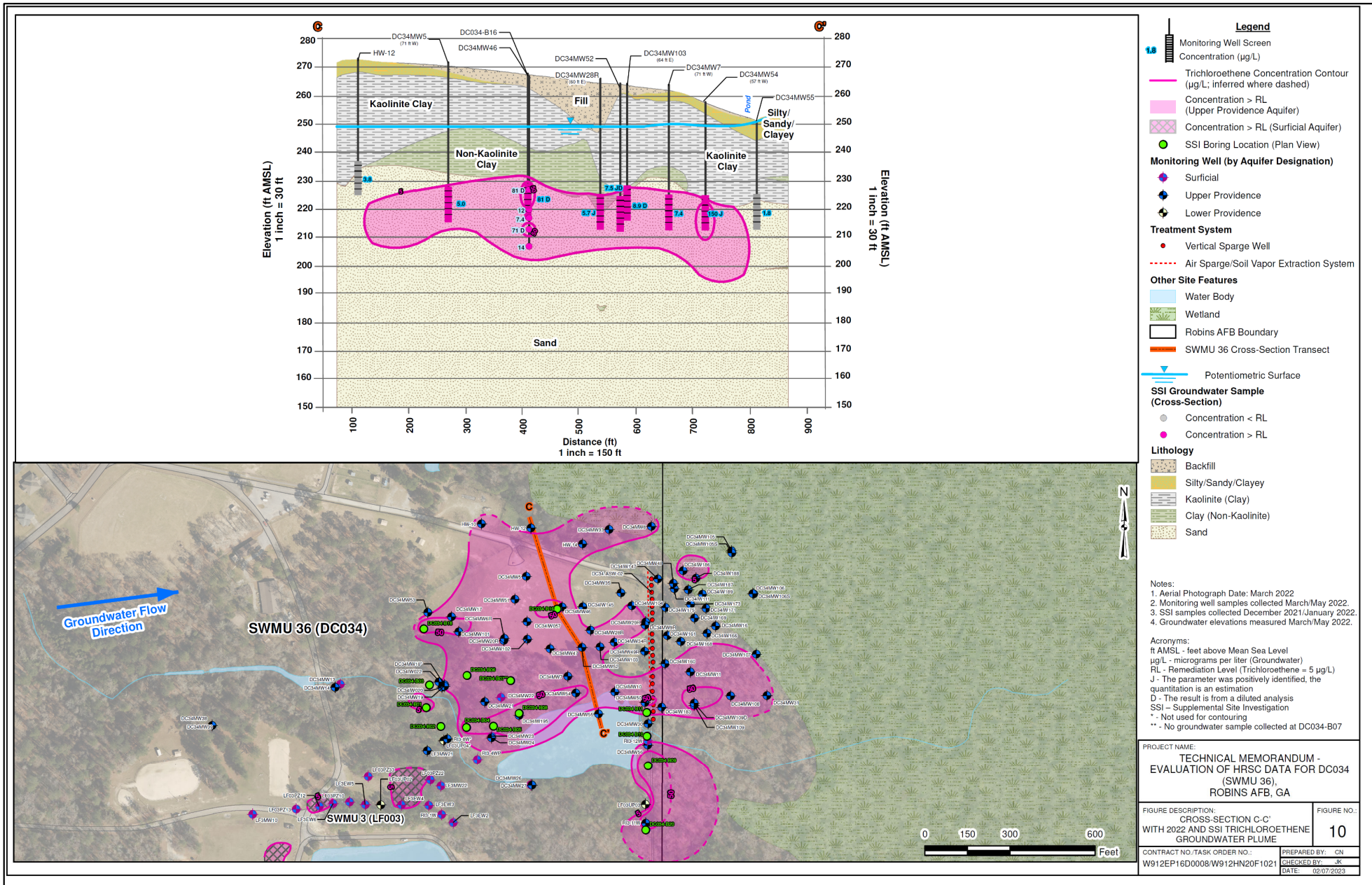
Results

■ Back Diffusion Evaluation

- **Screening with TCE MCL-based SSL**
 - 15 ug/kg > Default MCL-Based SSL (1.8 ug/kg)
 - CAP Site-Specific RL for TCE in soil – 370 and 240 ug/kg
- **Matrix Diffusion Toolkit (MDT)**
 - Input several set of assumptions into MDT
 - In general, results show that diffusion alone cannot explain the data (not enough mass in clay to see observed concentrations) based on SSI single data point
 - Diffusion could be sustaining concentrations at locations not showing reducing concentrations
 - Diffusion not significant at locations where decreasing trends are observed

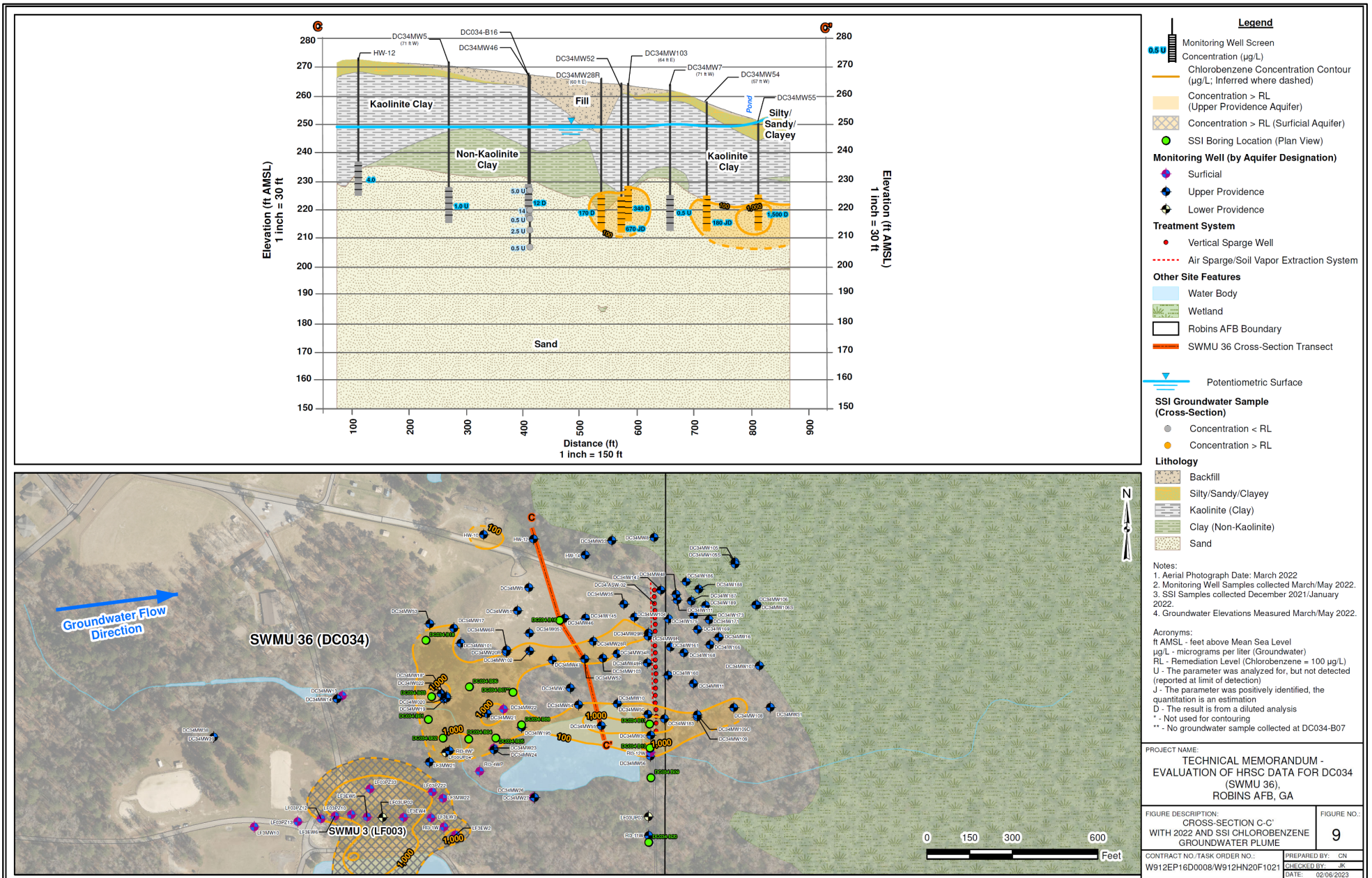


EA 3 Results





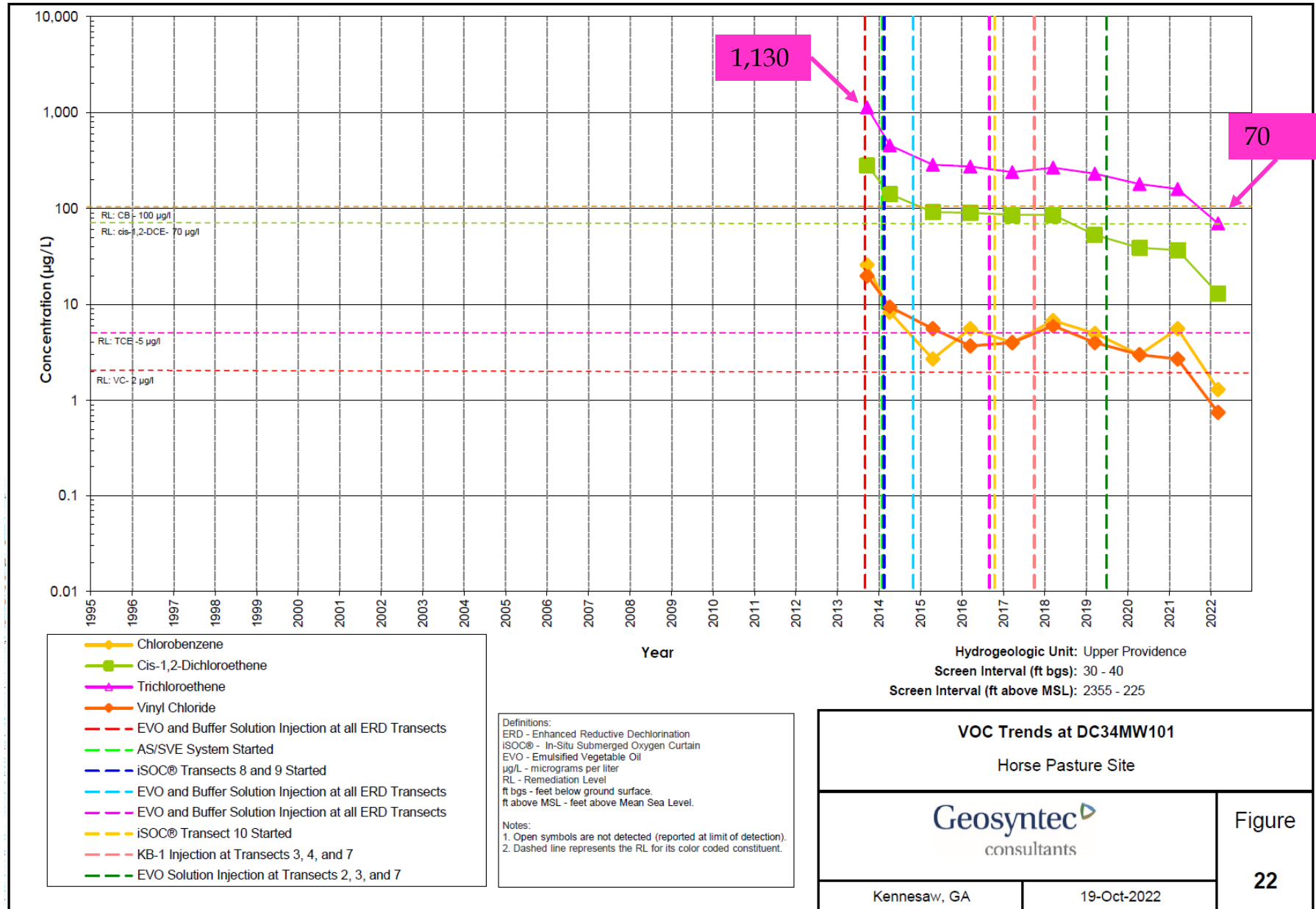
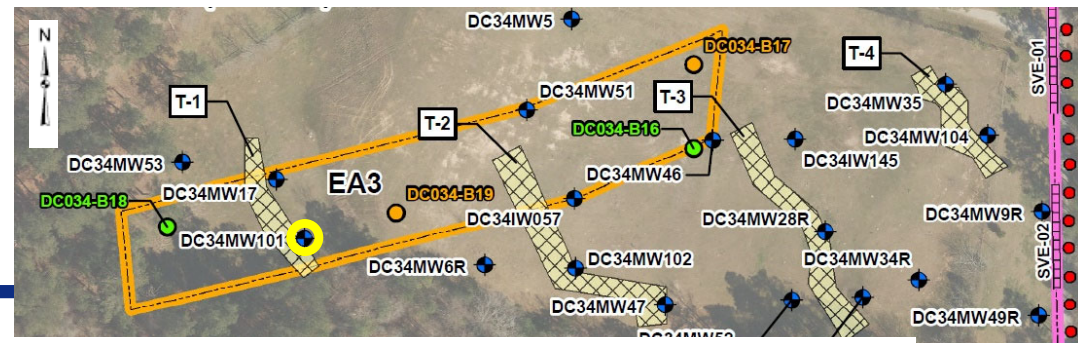
EA 3 Results





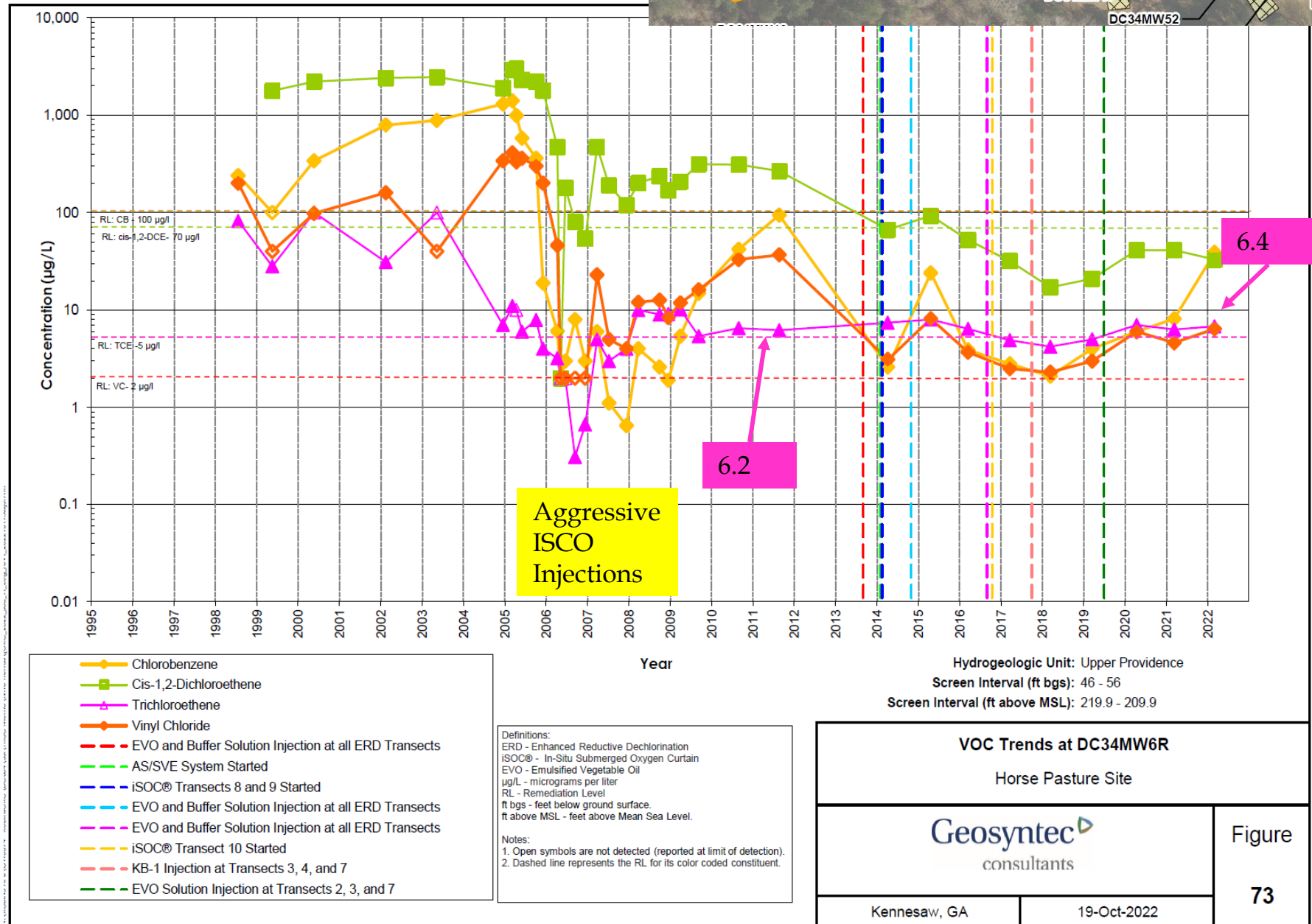
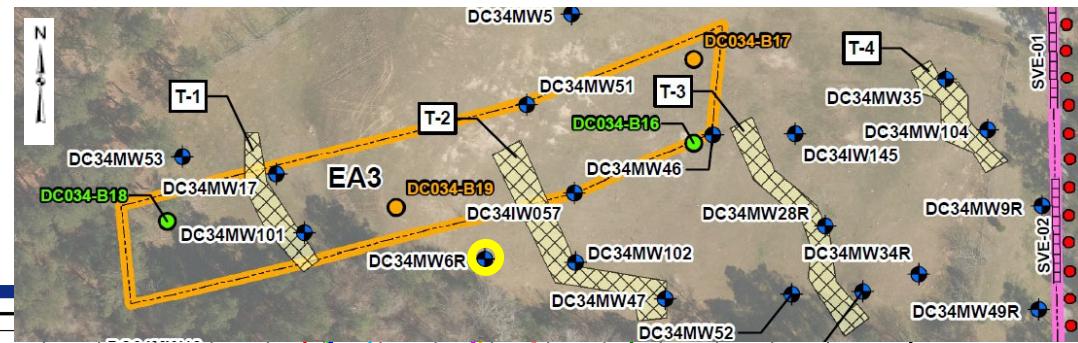
EA3 Results

DC34MW101





DC34MW6R





EA 3

Proposed Path Forward

- **Last ERD injections were between 2017 and 2019; Continue to see generally reducing trends of TCE concentrations in wells within ERD radius of influence**
- Continue to evaluate COC concentrations near ERD transects for at least two more years without additional ERD injections



Proposed Path Forward

■ Ongoing Operations and Maintenance (O&M)

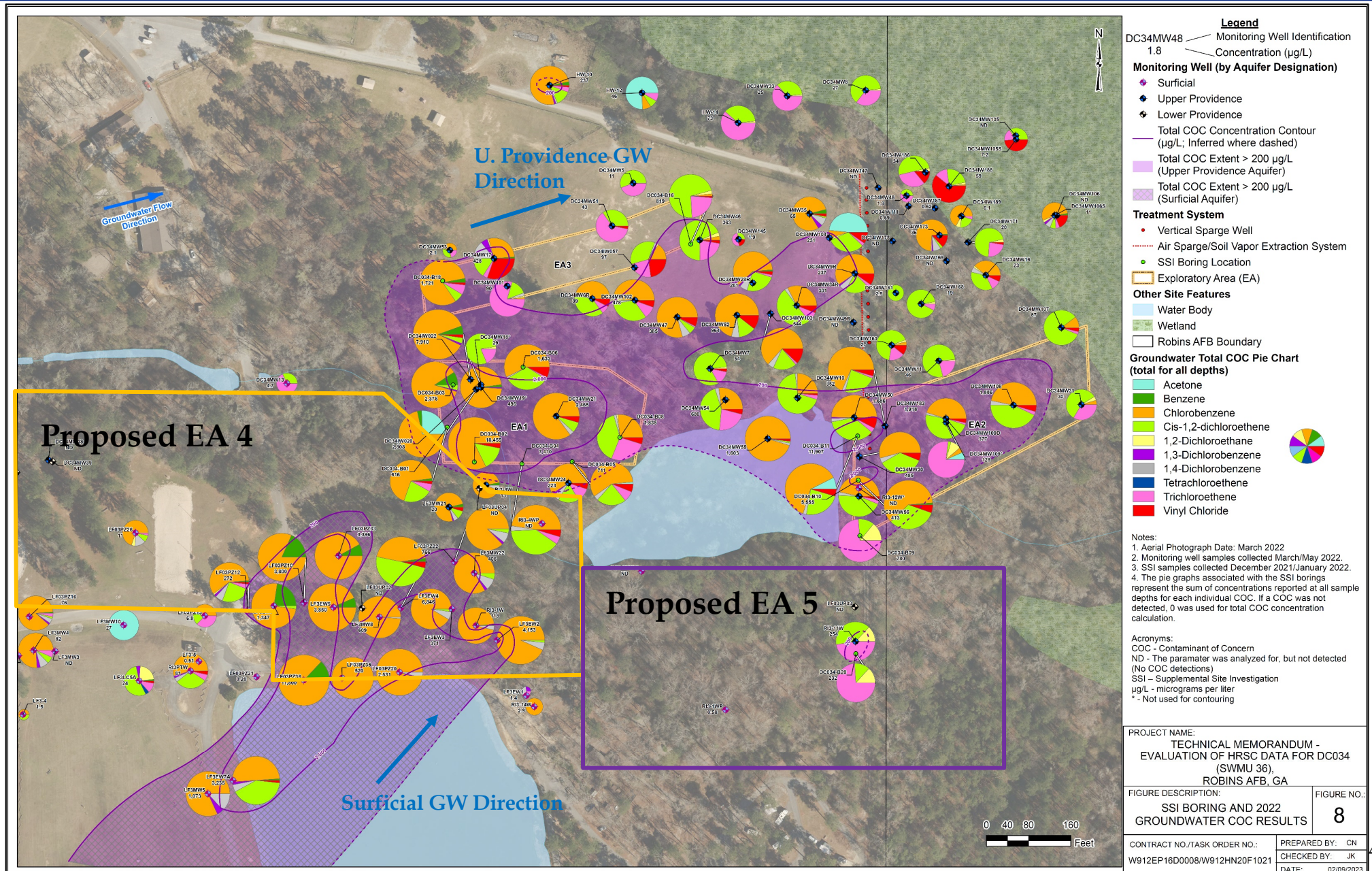
- Continue to run AS/SVE system to cut plume off at boundary
- Continue to run iSOC transects
- Continue evaluating COC concentration trends without additional ERD injections

■ Additional SSI Activities following contract modification

- Expand SSI scope to investigate EAs 4 and 5 prior to remedy evaluation
 - Chlorobenzene concentrations showing increasing trends in many wells (focus on upgradient source of chlorobenzene)
 - TCE observed in groundwater beyond southeastern corner of SWMU 36 (focus on upgradient source and southern extent of TCE plume)



Proposed Path Forward





Questions?



New Business and Program Closing

**Ms. Shan Williams
EAB Installation Co-chair**



Next EAB Meeting

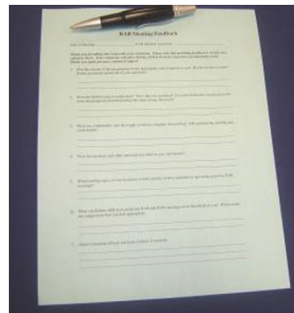
Thursday, November 2, 2023





Please...

**Complete the meeting evaluation and
feedback form and return to sign-in table or leave at seat**



**Leave your name tag at the sign-in table or seat for the
next meeting**



Thank you!