Welcome

Restoration Advisory Board (RAB) Meeting

Robins Air Force Base (AFB)

March 14, 2024

Welcome and Program Introduction

Mr. Heyward Singleton
RAB Installation Co-chair

Acronyms and Abbreviations

- AFB – Air Force Base
- AMSL – above Mean Sea Level
- AO – Alternate Objective
- APS – Advanced Profiling System
- AS – Air Sparge
- CAP – Corrective Action Plan
- Cis-1,2-DCE – Cis-1,2-dichloroethene
- COC – Contaminant of Concern
- CPT – Communication Test Point
- CSM – Conceptual Site Model
- EAB – Environmental Advisory Board
- ERD – Enhanced Reductive Dechlorination
- ft bgs – feet below ground surface
- GA EPD – Georgia Environmental Protection Division
- HDD – Horizontal Directional Drilled
- HVS – High Volume Sampling
- JP-8 – Jet Propellant Number 8

Acronyms and Abbreviations

- Ik – Relative Hydraulic Conductivity
- iSOC – In-situ Oxygen Curtain
- JP-4 – Jet Propellant Number 4
- LNAPL – Light Non-Aqueous Phase Liquid
- µg/kg – microgram per kilogram
- µg/L – microgram per liter
- µg/m^3 – microgram per cubic meter
- MNA – Monitored Natural Attenuation
- O&M – Operations and Maintenance
- PCE – Tetrachloroethene
- PFM – Passive Flux Meter
- ppb – part per billion
- ppm – part per million
- RAB – Restoration Advisory Board
- RC – Response Complete
- RL – Remediation Level
- ROI – Radius of Influence

Acronyms and Abbreviations

- **SSI – Supplemental Site Investigation**
- **SVE – Soil Vapor Extraction**
- **SWMU – Solid Waste Management Unit**
- **TCE – Trichloroethene**
- **UST – Underground Storage Tank**
- **VOC – Volatile Organic Compound**

RAB Modifications

Fred Otto
Restoration Program Manager/
RAB Manager

March 14, 2024

Restoration Advisory Board

- **Meeting time**
  - **Meetings will begin at 6:00 pm (social period at 5:30 pm)**
- **Meeting frequency**
  - **Meetings will be semi-annual**
    - March/September
- **Structure change to align with Air Force guidance**
  - **Environmental Advisory Board (EAB) to RAB**
  - **RAB Installation Co-chair**
- **RAB Charter and Mission/Vision Update**

Restoration Advisory Board

Supplementary Site Investigation (SSI) at Solid Waste Management Unit (SWMU) 17 (OT017) – Robins AFB, Georgia

Kip Gray, PhD
Senior Engineer
Geosyntec Consultants, Inc.

March 14, 2024

Overview

- Alternate Objective (AO) site overview
- SWMU 17 background
- SSI Phase 1 overview
- Area under Building 645
- Trichloroethene (TCE) hot spots
- Clay aquitard
- Path forward

AO Site Overview

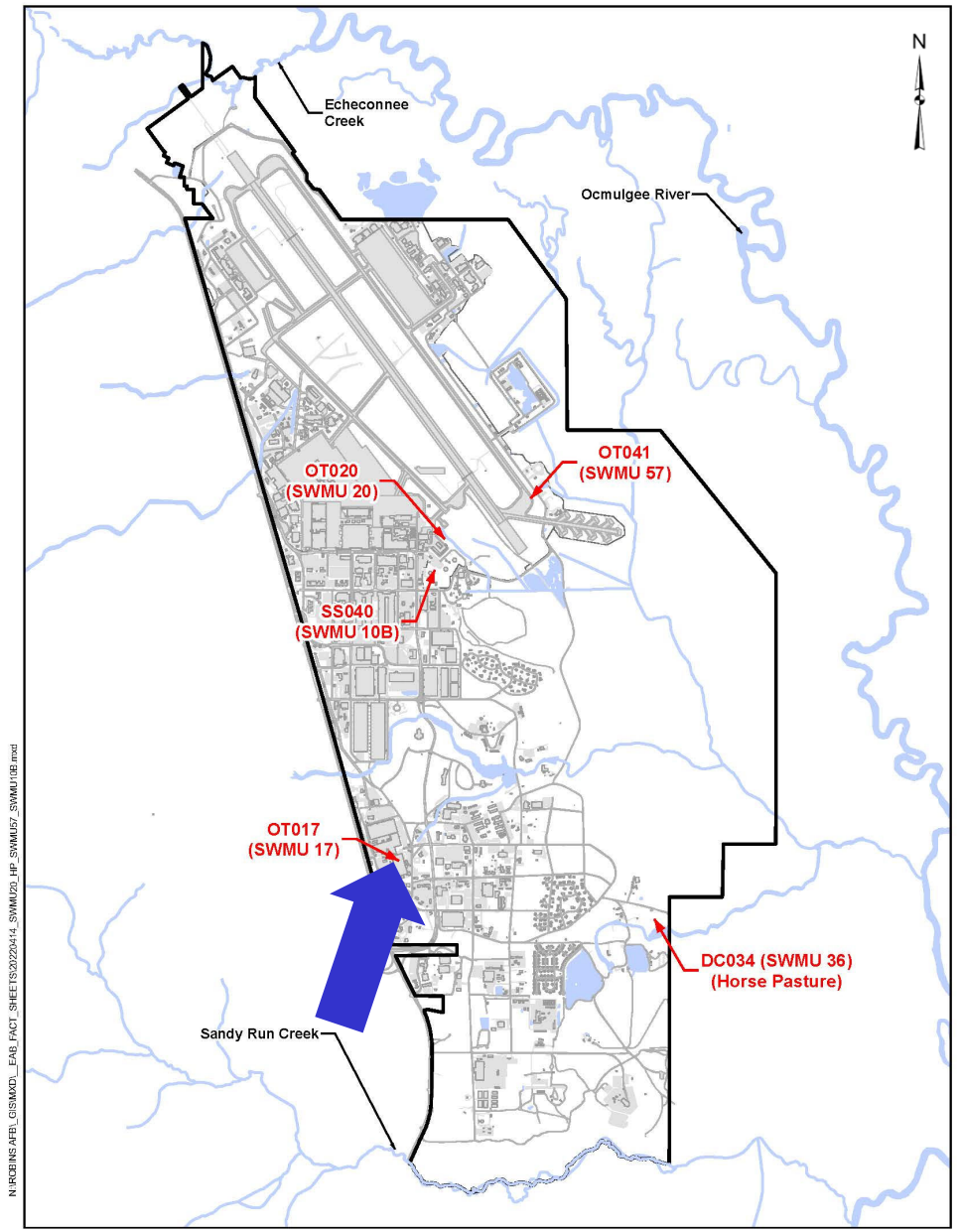
- **Sites with *"complex attributes that have, to date, inhibited progress toward the achievement of RC [Response Complete]."***
- **AO site remedies are expected to require longer than 30 years to achieve Response Complete under current approach**
- **AO site activities**
  - **SSI activities to refine Conceptual Site Model (CSM)**
  - **Remedy Evaluation and Recommendation**
  - **Decision Document amendment, as applicable**

  } Implementation of these tasks based on outcome of site investigations

- **Continued remedial system operation and monitoring**

AO Site Overview

- **Robins AFB AO sites**
  - *SWMU 17 (OT017)*
  - **SWMU 20**
  - **SWMU 36**
  - **SWMU 57**
  - **SWMU 10B**



SWMU 17 Background

SWMU 17 Groundwater COCs

COC	RL (µg/L)
Benzene	5
Chloroform	80
1,2-Dichlorobenzene	600
1,3-Dichlorobenzene	3,200
1,4-Dichlorobenzene	75
1,1-DCE	7
cis-1,2-DCE	70
PCE	5
TCE	5
1,2,4-Trichlorobenzene	70

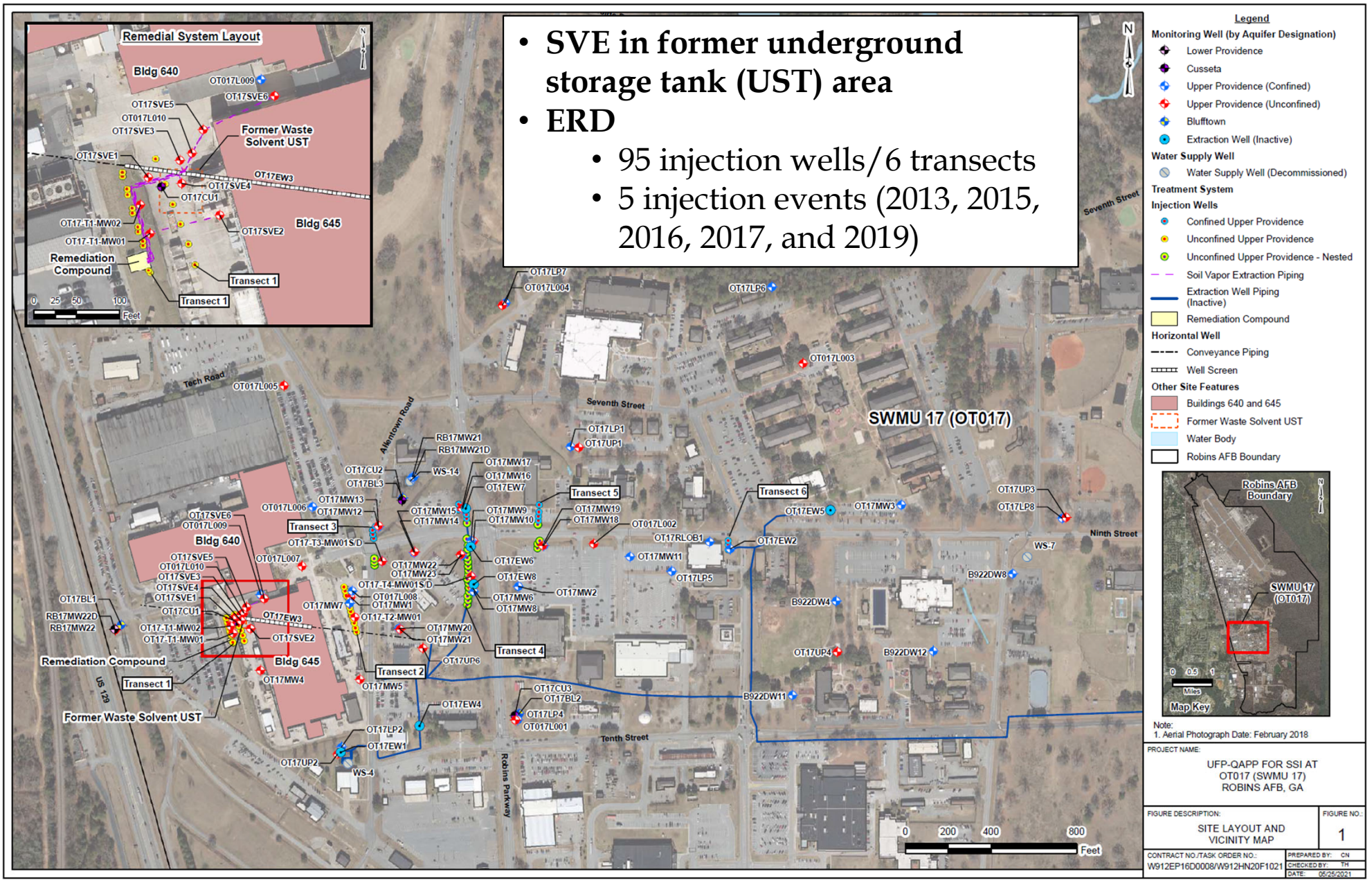
Notes:

cis-1,2-DCE	cis-1,2-dichloroethene
COC	contaminant of concern
DCE	dichloroethene
µg/L	microgram(s) per liter
PCE	tetrachloroethene
RL	remediation level
TCE	trichloroethene

Source: Corrective Action Plan (CAP) [Cape, 2013]

- **Current CAP objectives**
  - **Reduce contaminants of concern (COCs) in groundwater to below site-specific Remediation Levels (RLs)**
- **Selected remedy**
  - **Soil Vapor Extraction (SVE) in Source Area**
  - **Enhanced Reductive Dechlorination (ERD) injections (on hold during SSI)**

SWMU 17 Background

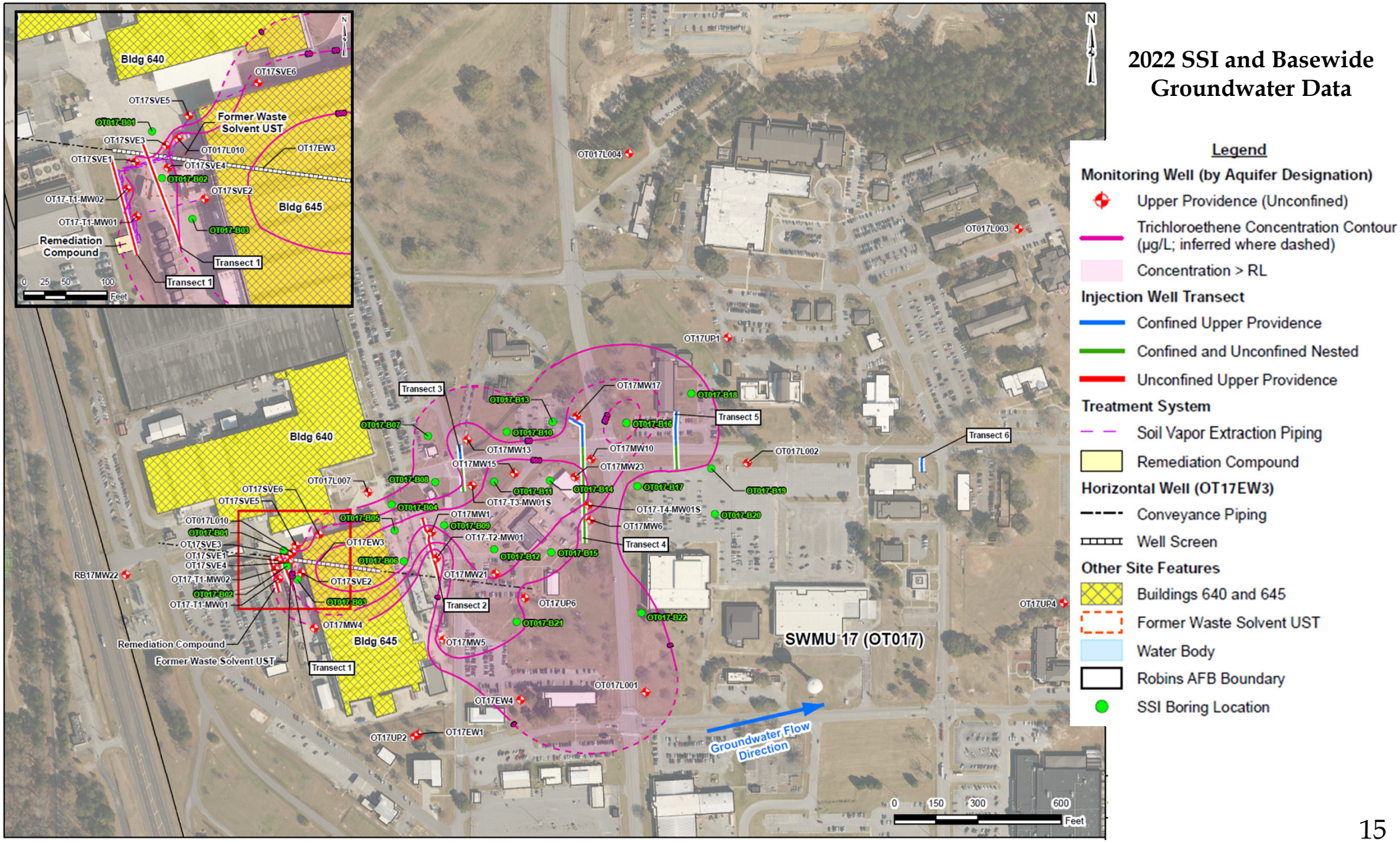


- **SVE in former underground storage tank (UST) area**
- **ERD**
  - 95 injection wells/6 transects
  - 5 injection events (2013, 2015, 2016, 2017, and 2019)

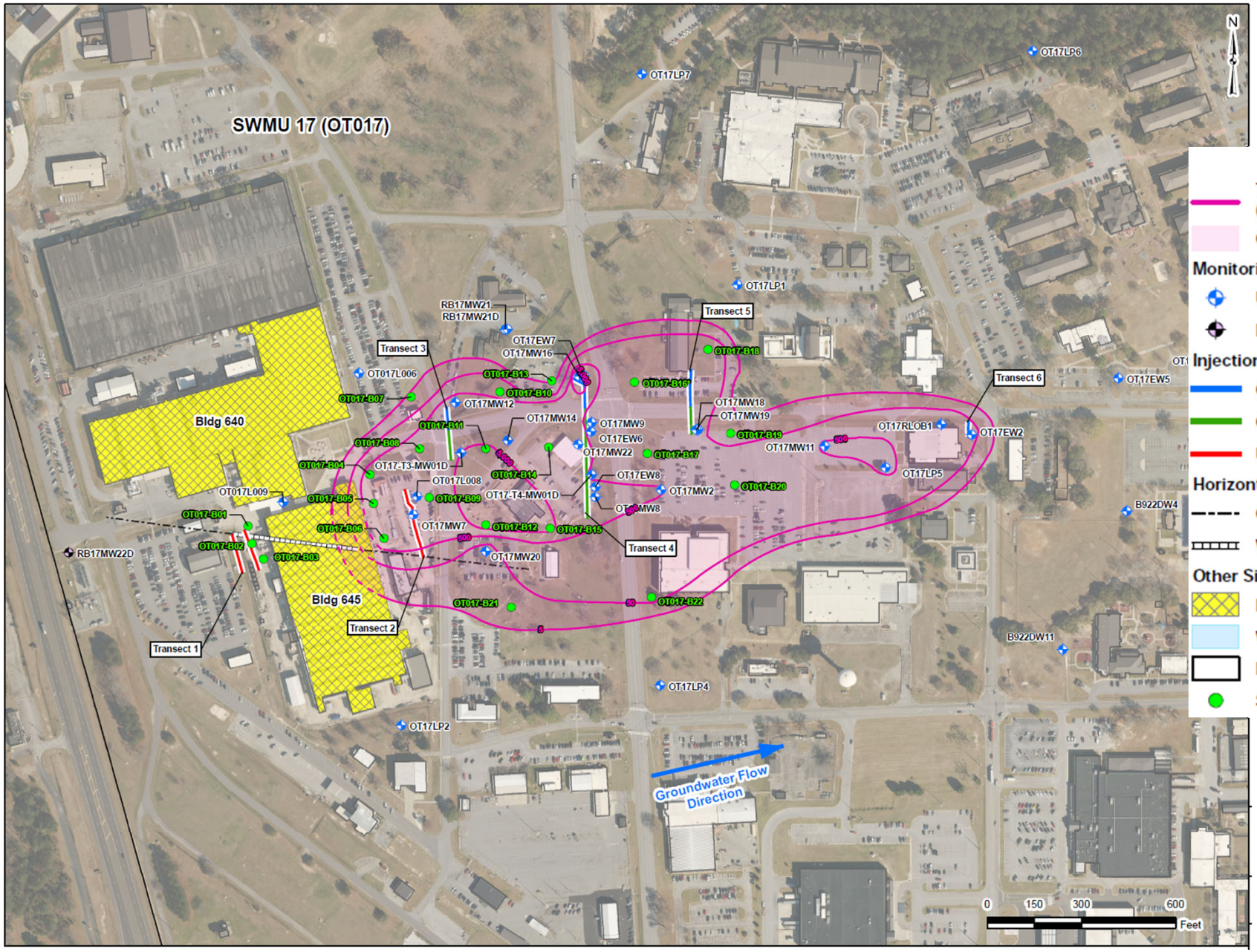
SWMU 17 Background

- Historical release of TCE to groundwater from a subsequently removed UST migrated beneath Building 645 due to groundwater flow
- Kaolinitic clay aquitard divides upper unconfined and lower confined groundwater aquifer and affects horizontal and vertical migration of COCs
- Discontinued pump and treat system has also affected impact extents

SWMU 17 Background



SWMU 17 Background



2022 SSI and Basewide Groundwater Data

Legend

- Trichloroethene Concentration Contour (µg/L; inferred where dashed)
- Concentration > RL

Monitoring Well (by Aquifer Designation)

- Upper Providence (Confined)
- Lower Providence

Injection Well Transect

- Confined Upper Providence
- Confined and Unconfined Nested
- Unconfined Upper Providence

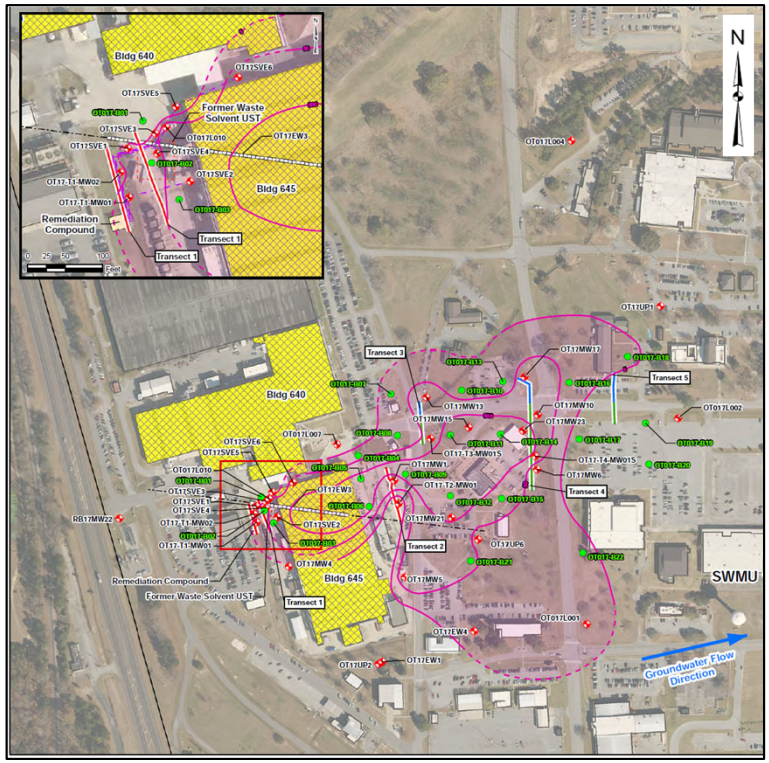
Horizontal Well (OT17EW3)

- Conveyance Piping
- Well Screen

Other Site Features

- Buildings 640 and 645
- Water Body
- Robins AFB Boundary
- SSI Boring Location

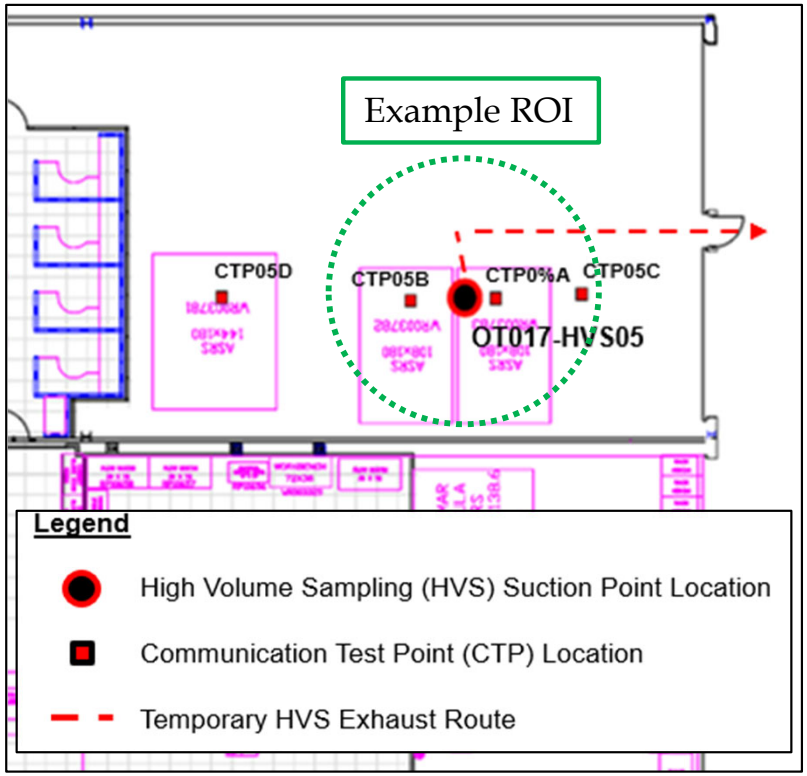
SSI Phase 1 Overview

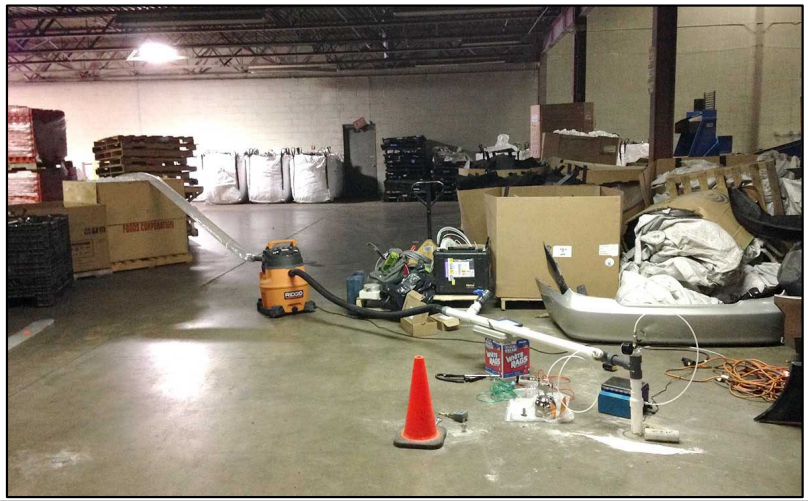


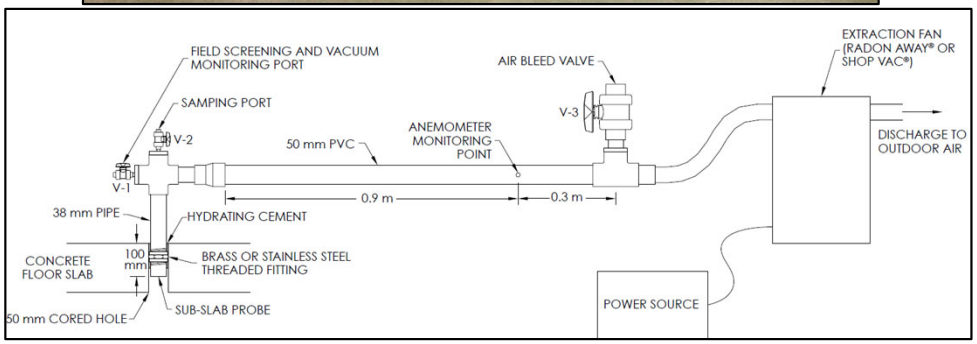
- **CSM data gaps**
  - **Area under Building 645**
    - What is extent and magnitude of impacts beneath Building 645?
    - Does source area plume connect to downgradient plume?
  - **Evaluation of TCE hot spots**
    - What is extent of dissolved TCE plume greater than 100x RLs?
  - **Evaluation of clay aquitard**
    - Are there preferential pathways, thin spots, and/or lateral discontinuities?
    - Is there stored TCE mass within clay layer and is there potential for impacted clay layer to act as secondary source of groundwater contamination?

SSI Phase 1 Overview

- **High Volume Sampling (HVS) used to collect sub-slab soil gas**
  - **Assess potential for discrete vadose zone source beneath Building 645 slab**
  - **Estimate contributions of target volatile organic compounds (VOCs) to soil gas from groundwater**

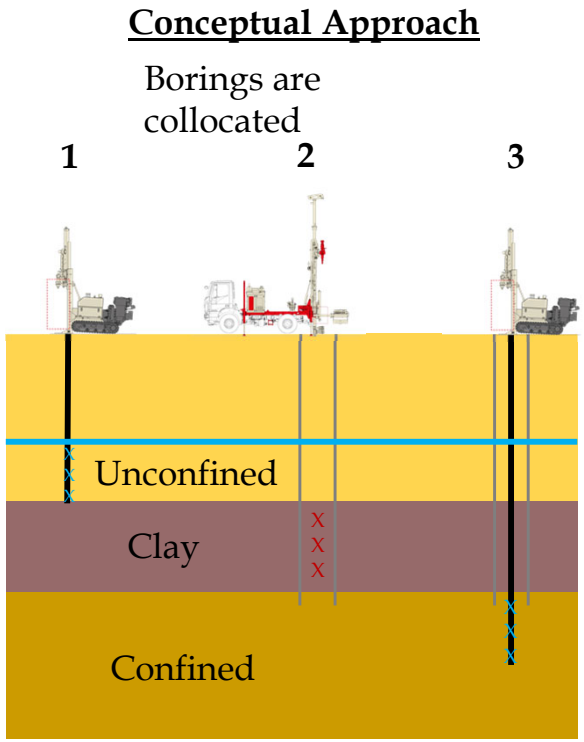






SSI Phase 1 Overview

- Sequenced approach to minimize potential cross-contamination between unconfined and confined aquifers
- Step 1: Collect discrete groundwater samples from upper unconfined aquifer and measure relative hydraulic conductivity (Ik)
- Step 2A: Collect discrete soil samples in clay confining unit and observe lithology
- Step 2B: Temporary casing set from ground surface through aquitard to isolate upper and lower aquifers
- Step 3: Advance through casing and collect groundwater samples in lower confined aquifer and measure Ik

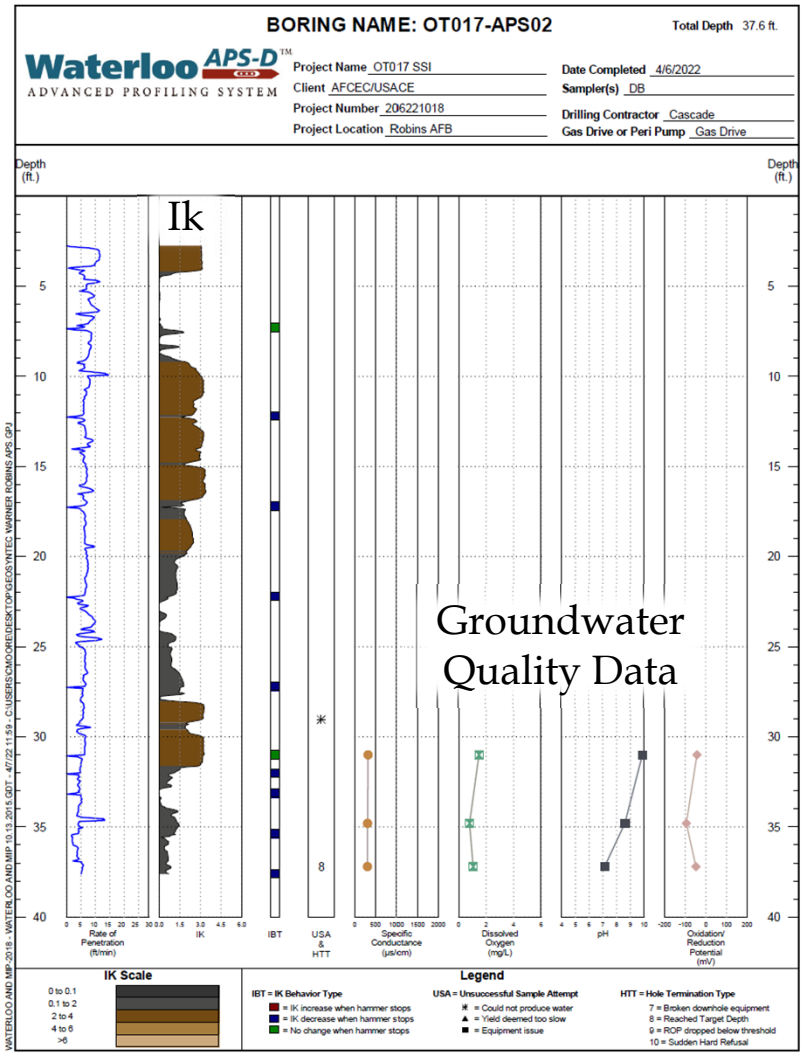


SSI Phase 1 Overview

- **Waterloo Aquifer Profiling System (APS)**

APS Tip

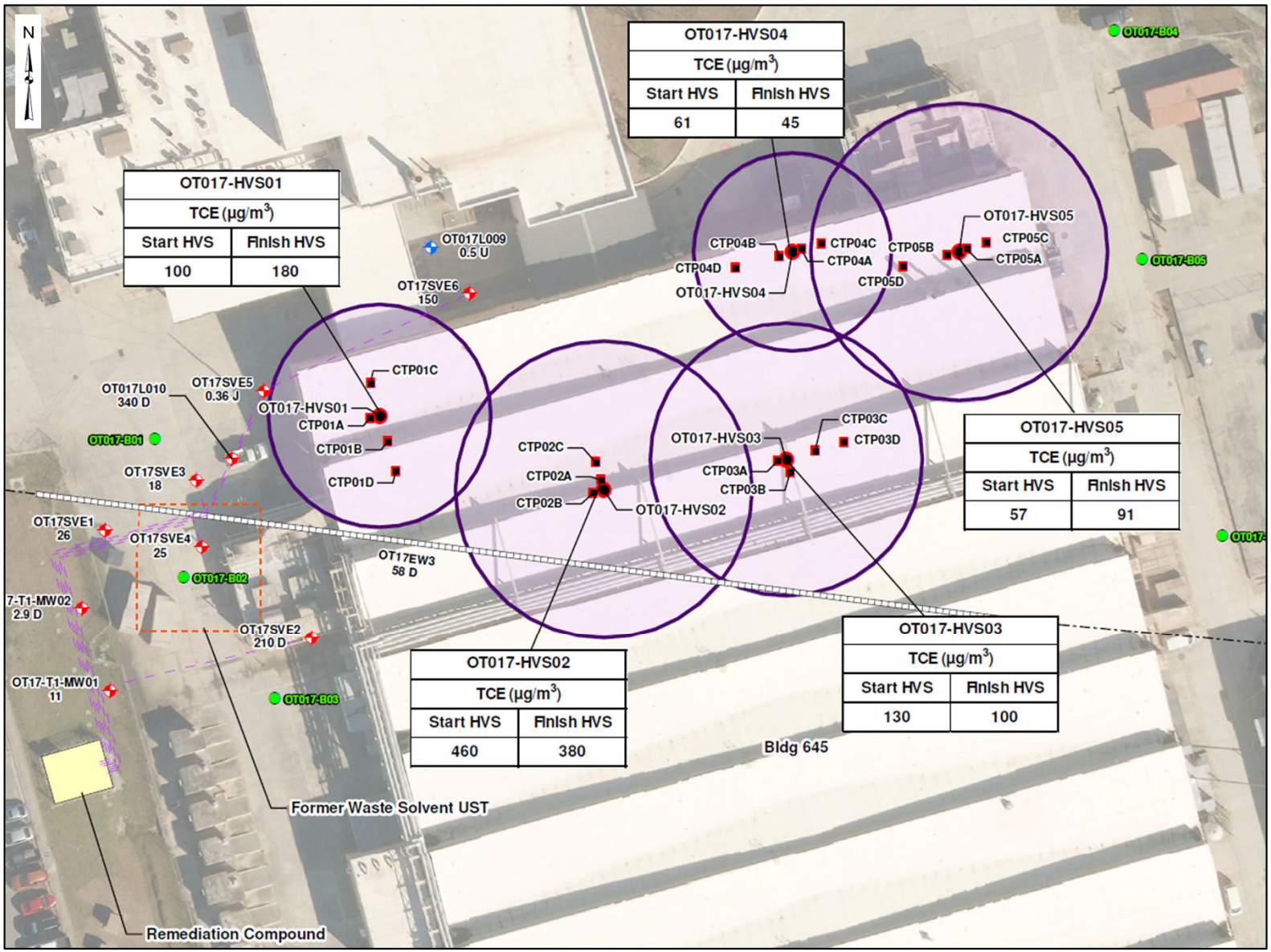
APS Groundwater Sample Collection



APS Data

Area under Building 645

HVS Results



Legend

OT017L008 0.5 U — Monitoring Well Identification; TCE Concentration (µg/L)

Monitoring Well (by Aquifer Designation)
- Upper Providence (Confined)
- Upper Providence (Unconfined)

Treatment System
- Soil Vapor Extraction Piping
- Remediation Compound

Horizontal Well (OT17EW3)
- Conveyance Piping
- Well Screen

Other Site Features
- Former Waste Solvent UST
- High Volume Sampling (HVS) Suction Point Location
- Communication Test Point (CTP) Location
- Estimated HVS Radius of Influence (ROI)
- SSI Boring Location

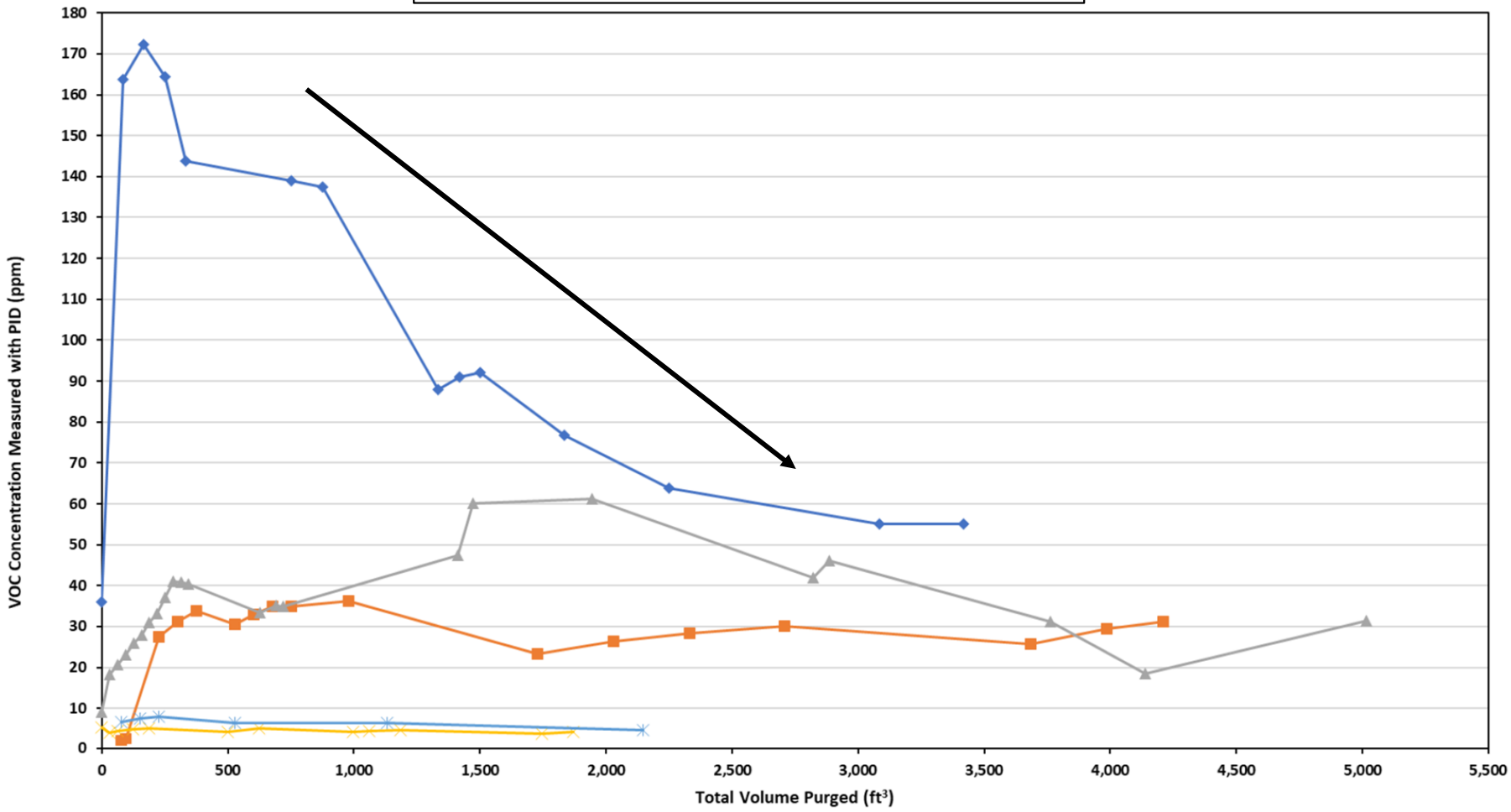
HVS Location	Estimated ROI (ft)
OT017-HVS01	45
OT017-HVS02	60
OT017-HVS03	55
OT017-HVS04	40
OT017-HVS05	60

Notes:
1. Aerial Photograph Date: March 2022
2. Groundwater samples collected March 2022.
3. High Volume Sampling (HVS) suction point samples collected April 2022.

Acronyms:
µg/L - micrograms per liter
µg/m3 - micrograms per mubic meter of air.
ft - feet
TCE - Trichloroethene
RL - Remediation Level (Trichloroethene = 5 µg/L)
HVS - High Volume Sampling
ROI - Radius of Influence
U - The parameter was analyzed for, but not detected (reported at limit of detection)
J - The parameter was positively identified, the quantitation is an estimation
D - The result is from a diluted analysis

Area under Building 645

HVS Results



Legend

- HVS-01
- HVS-02
- HVS-03
- HVS-04
- HVS-05

Acronyms:
ft - feet
PID - photoionization detector
ppm - parts per million
VOC - volatile organic compound

PREPARED BY: Geosyntec consultants	PROJECT NAME: TECHNICAL MEMORANDUM – EVALUATION OF HRSC DATA FOR OT017 (SWMU 17), ROBINS AFB, GA
	FIGURE DESCRIPTION: VOC PID MEASUREMENTS vs. TOTAL VOLUME PURGED
PREPARED BY: KG CHECKED BY: TH DATE: 04/27/2023	CONTRACT NO./TASK ORDER NO.: W912EP16D0008/W912HN20F1021
	FIGURE NO.: 7

Area under Building 645

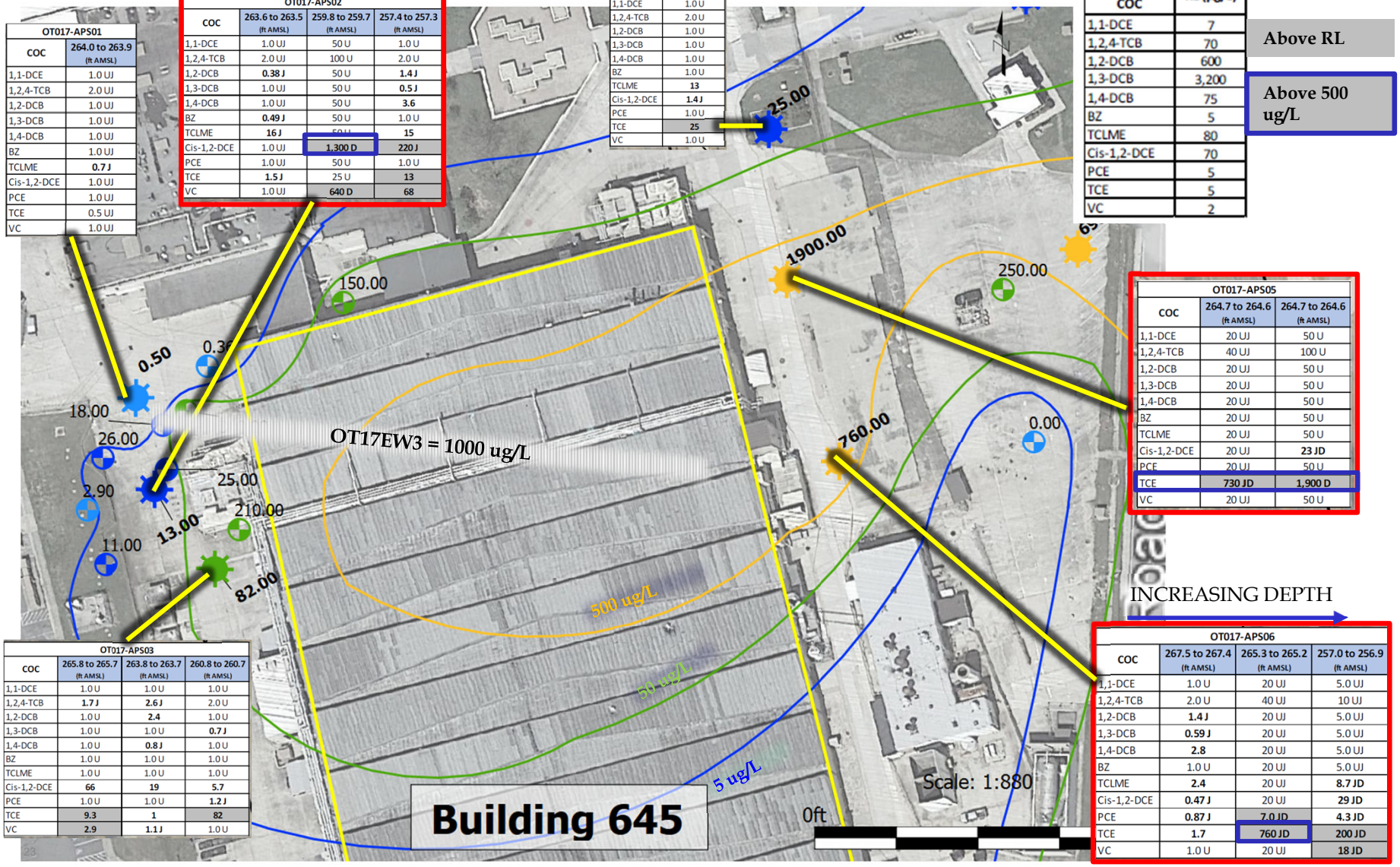
LEGEND

0.44 — Monitoring Well TCE [ppb]

25.00 — Max Discrete GW TCE [ppb]

- <5 ppb
- 5 – 50 ppb
- 50 – 500 ppb
- 500 – 5000 ppb
- >5000 ppb

Unconfined Aquifer Groundwater Results



OT017-APS01

COC	264.0 to 263.9 (ft AMSL)
1,1-DCE	1.0 UJ
1,2,4-TCB	2.0 UJ
1,2-DCB	1.0 UJ
1,3-DCB	1.0 UJ
1,4-DCB	1.0 UJ
BZ	1.0 UJ
TCLME	**0.7 J**
Cis-1,2-DCE	1.0 UJ
PCE	1.0 UJ
TCE	0.5 UJ
VC	1.0 UJ

OT017-APS02

COC	263.6 to 263.5 (ft AMSL)	259.8 to 259.7 (ft AMSL)	257.4 to 257.3 (ft AMSL)
1,1-DCE	1.0 UJ	50 U	1.0 U
1,2,4-TCB	2.0 UJ	100 U	2.0 U
1,2-DCB	**0.38 J**	50 U	**1.4 J**
1,3-DCB	1.0 UJ	50 U	**0.5 J**
1,4-DCB	1.0 UJ	50 U	**3.6**
BZ	**0.49 J**	50 U	1.0 U
TCLME	**16 J**	50 U	**15**
Cis-1,2-DCE	1.0 UJ	**1,300 D**	**220 J**
PCE	1.0 UJ	50 U	1.0 U
TCE	**1.5 J**	25 U	**13**
VC	1.0 UJ	**640 D**	**68**

OT017-APS04

COC	267.4 to 267.3 (ft AMSL)
1,1-DCE	1.0 U
1,2,4-TCB	2.0 U
1,2-DCB	1.0 U
1,3-DCB	1.0 U
1,4-DCB	1.0 U
BZ	1.0 U
TCLME	**13**
Cis-1,2-DCE	**1.4 J**
PCE	1.0 U
TCE	**25**
VC	1.0 U

Groundwater COC	RL (µg/L)
1,1-DCE	7
1,2,4-TCB	70
1,2-DCB	600
1,3-DCB	3,200
1,4-DCB	75
BZ	5
TCLME	80
Cis-1,2-DCE	70
PCE	5
TCE	5
VC	2

Above RL

Above 500 ug/L

OT017-APS05

COC	264.7 to 264.6 (ft AMSL)	264.7 to 264.6 (ft AMSL)
1,1-DCE	20 UJ	50 U
1,2,4-TCB	40 UJ	100 U
1,2-DCB	20 UJ	50 U
1,3-DCB	20 UJ	50 U
1,4-DCB	20 UJ	50 U
BZ	20 UJ	50 U
TCLME	20 UJ	50 U
Cis-1,2-DCE	20 UJ	**23 JD**
PCE	20 UJ	50 U
TCE	**730 JD**	**1,900 D**
VC	20 UJ	50 U

OT017-APS03

COC	265.8 to 265.7 (ft AMSL)	263.8 to 263.7 (ft AMSL)	260.8 to 260.7 (ft AMSL)
1,1-DCE	1.0 U	1.0 U	1.0 U
1,2,4-TCB	**1.7 J**	**2.6 J**	2.0 U
1,2-DCB	1.0 U	**2.4**	1.0 U
1,3-DCB	1.0 U	1.0 U	**0.7 J**
1,4-DCB	1.0 U	**0.8 J**	1.0 U
BZ	1.0 U	1.0 U	1.0 U
TCLME	1.0 U	1.0 U	1.0 U
Cis-1,2-DCE	**66**	**19**	**5.7**
PCE	1.0 U	1.0 U	**1.2 J**
TCE	**9.3**	**1**	**82**
VC	**2.9**	**1.1 J**	1.0 U

OT017-APS06

COC	267.5 to 267.4 (ft AMSL)	265.3 to 265.2 (ft AMSL)	257.0 to 256.9 (ft AMSL)
1,1-DCE	1.0 U	20 UJ	5.0 UJ
1,2,4-TCB	2.0 U	40 UJ	10 UJ
1,2-DCB	**1.4 J**	20 UJ	5.0 UJ
1,3-DCB	**0.59 J**	20 UJ	5.0 UJ
1,4-DCB	**2.8**	20 UJ	5.0 UJ
BZ	1.0 U	20 UJ	5.0 UJ
TCLME	**2.4**	20 UJ	**8.7 JD**
Cis-1,2-DCE	**0.47 J**	20 UJ	**29 JD**
PCE	**0.87 J**	**7.0 JD**	**4.3 JD**
TCE	**1.7**	**760 JD**	**200 JD**
VC	1.0 U	20 UJ	**18 JD**

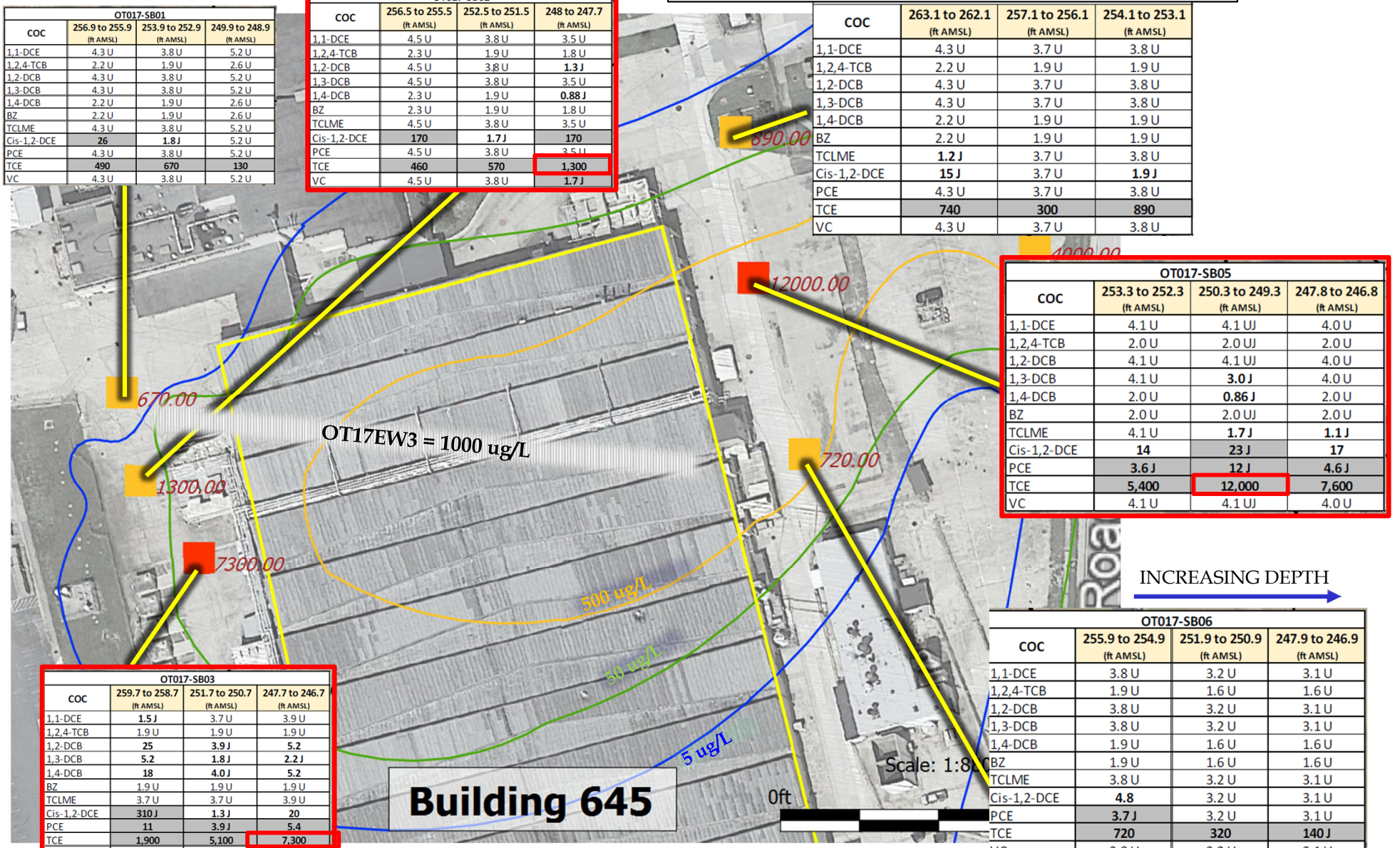
Area under Building 645

LEGEND

4000.00 Max Discrete Soil TCE [ppb]

- <5 ppb
- 5 – 50 ppb
- 50 – 500 ppb
- 500 – 5000 ppb
- >5000 ppb

Aquitard Soil Results



OT017-SB01			
COC	256.9 to 255.9 (ft AMSL)	253.9 to 252.9 (ft AMSL)	249.9 to 248.9 (ft AMSL)
1,1-DCE	4.3 U	3.8 U	5.2 U
1,2,4-TCB	2.2 U	1.9 U	2.6 U
1,2-DCB	4.3 U	3.8 U	5.2 U
1,3-DCB	4.3 U	3.8 U	5.2 U
1,4-DCB	2.2 U	1.9 U	2.6 U
BZ	2.2 U	1.9 U	2.6 U
TCLME	4.3 U	3.8 U	5.2 U
Cis-1,2-DCE	**26**	**1.8 J**	5.2 U
PCE	4.3 U	3.8 U	5.2 U
TCE	**490**	**670**	**130**
VC	4.3 U	3.8 U	5.2 U

OT017-SB02			
COC	256.5 to 255.5 (ft AMSL)	252.5 to 251.5 (ft AMSL)	248 to 247.7 (ft AMSL)
1,1-DCE	4.5 U	3.8 U	3.5 U
1,2,4-TCB	2.3 U	1.9 U	1.8 U
1,2-DCB	4.5 U	3.8 U	**1.3 J**
1,3-DCB	4.5 U	3.8 U	3.5 U
1,4-DCB	2.3 U	1.9 U	**0.88 J**
BZ	2.3 U	1.9 U	1.8 U
TCLME	4.5 U	3.8 U	3.5 U
Cis-1,2-DCE	**170**	**1.7 J**	**170**
PCE	4.5 U	3.8 U	3.5 U
TCE	**460**	**570**	**1,300**
VC	4.5 U	3.8 U	**1.7 J**

COC	263.1 to 262.1 (ft AMSL)	257.1 to 256.1 (ft AMSL)	254.1 to 253.1 (ft AMSL)
1,1-DCE	4.3 U	3.7 U	3.8 U
1,2,4-TCB	2.2 U	1.9 U	1.9 U
1,2-DCB	4.3 U	3.7 U	3.8 U
1,3-DCB	4.3 U	3.7 U	3.8 U
1,4-DCB	2.2 U	1.9 U	1.9 U
BZ	2.2 U	1.9 U	1.9 U
TCLME	**1.2 J**	3.7 U	3.8 U
Cis-1,2-DCE	**15 J**	3.7 U	**1.9 J**
PCE	4.3 U	3.7 U	3.8 U
TCE	**740**	**300**	**890**
VC	4.3 U	3.7 U	3.8 U

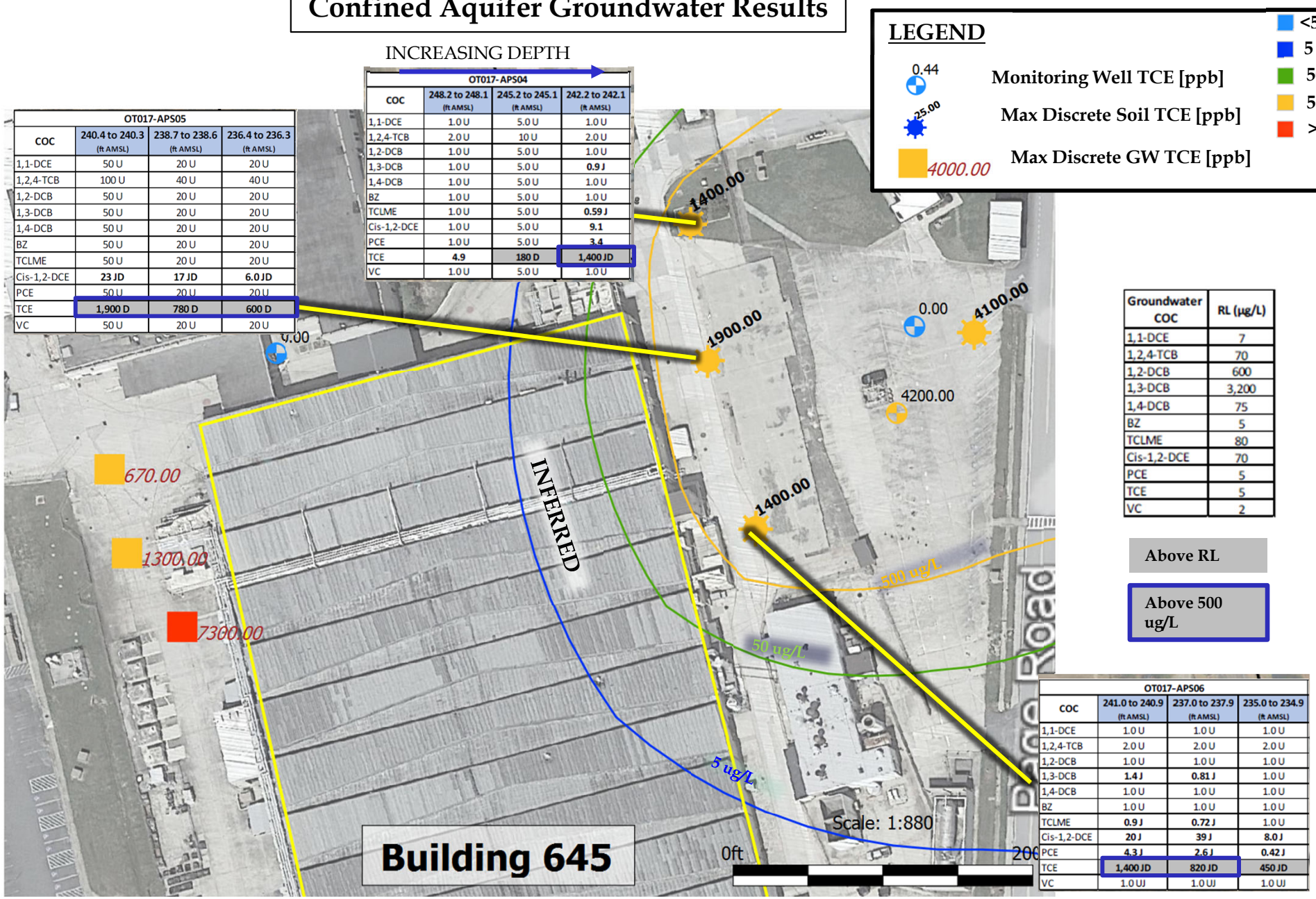
OT017-SB05			
COC	253.3 to 252.3 (ft AMSL)	250.3 to 249.3 (ft AMSL)	247.8 to 246.8 (ft AMSL)
1,1-DCE	4.1 U	4.1 UJ	4.0 U
1,2,4-TCB	2.0 U	2.0 UJ	2.0 U
1,2-DCB	4.1 U	4.1 UJ	4.0 U
1,3-DCB	4.1 U	**3.0 J**	4.0 U
1,4-DCB	2.0 U	**0.86 J**	2.0 U
BZ	2.0 U	2.0 UJ	2.0 U
TCLME	4.1 U	**1.7 J**	**1.1 J**
Cis-1,2-DCE	**14**	**23 J**	**17**
PCE	**3.6 J**	**12 J**	**4.6 J**
TCE	**5,400**	**12,000**	**7,600**
VC	4.1 U	4.1 UJ	4.0 U

OT017-SB03			
COC	259.7 to 258.7 (ft AMSL)	251.7 to 250.7 (ft AMSL)	247.7 to 246.7 (ft AMSL)
1,1-DCE	**1.5 J**	3.7 U	3.9 U
1,2,4-TCB	1.9 U	1.9 U	1.9 U
1,2-DCB	**25**	**3.9 J**	**5.2**
1,3-DCB	**5.2**	**1.8 J**	**2.2 J**
1,4-DCB	**18**	**4.0 J**	**5.2**
BZ	1.9 U	1.9 U	1.9 U
TCLME	3.7 U	3.7 U	3.9 U
Cis-1,2-DCE	**310 J**	**1.3 J**	**20**
PCE	**11**	**3.9 J**	**5.4**
TCE	**1,900**	**5,100**	**7,300**
VC	3.7 U	3.7 U	3.9 U

OT017-SB06			
COC	255.9 to 254.9 (ft AMSL)	251.9 to 250.9 (ft AMSL)	247.9 to 246.9 (ft AMSL)
1,1-DCE	3.8 U	3.2 U	3.1 U
1,2,4-TCB	1.9 U	1.6 U	1.6 U
1,2-DCB	3.8 U	3.2 U	3.1 U
1,3-DCB	3.8 U	3.2 U	3.1 U
1,4-DCB	1.9 U	1.6 U	1.6 U
BZ	1.9 U	1.6 U	1.6 U
TCLME	3.8 U	3.2 U	3.1 U
Cis-1,2-DCE	**4.8**	3.2 U	3.1 U
PCE	**3.7 J**	3.2 U	3.1 U
TCE	**720**	**320**	**140 J**
VC	3.8 U	3.2 U	3.1 U

Area under Building 645

Confined Aquifer Groundwater Results



COC	240.4 to 240.3 (ft AMSL)	238.7 to 238.6 (ft AMSL)	236.4 to 236.3 (ft AMSL)
1,1-DCE	50 U	20 U	20 U
1,2,4-TCB	100 U	40 U	40 U
1,2-DCB	50 U	20 U	20 U
1,3-DCB	50 U	20 U	20 U
1,4-DCB	50 U	20 U	20 U
BZ	50 U	20 U	20 U
TCLME	50 U	20 U	20 U
Cis-1,2-DCE	23 JD	17 JD	6.0 JD
PCE	50 U	20 U	20 U
TCE	1,900 D	780 D	600 D
VC	50 U	20 U	20 U

COC	248.2 to 248.1 (ft AMSL)	245.2 to 245.1 (ft AMSL)	242.2 to 242.1 (ft AMSL)
1,1-DCE	1.0 U	5.0 U	1.0 U
1,2,4-TCB	2.0 U	10 U	2.0 U
1,2-DCB	1.0 U	5.0 U	1.0 U
1,3-DCB	1.0 U	5.0 U	0.9 J
1,4-DCB	1.0 U	5.0 U	1.0 U
BZ	1.0 U	5.0 U	1.0 U
TCLME	1.0 U	5.0 U	0.59 J
Cis-1,2-DCE	1.0 U	5.0 U	9.1
PCE	1.0 U	5.0 U	3.4
TCE	4.9	180 D	1,400 JD
VC	1.0 U	5.0 U	1.0 U

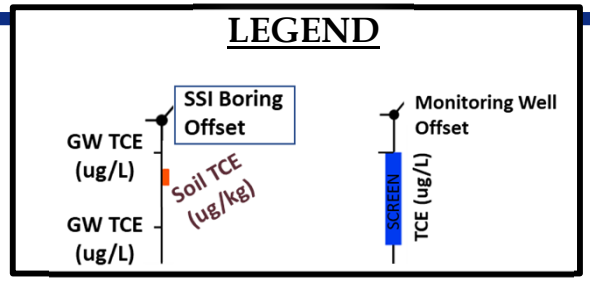
Groundwater COC	RL (µg/L)
1,1-DCE	7
1,2,4-TCB	70
1,2-DCB	600
1,3-DCB	3,200
1,4-DCB	75
BZ	5
TCLME	80
Cis-1,2-DCE	70
PCE	5
TCE	5
VC	2

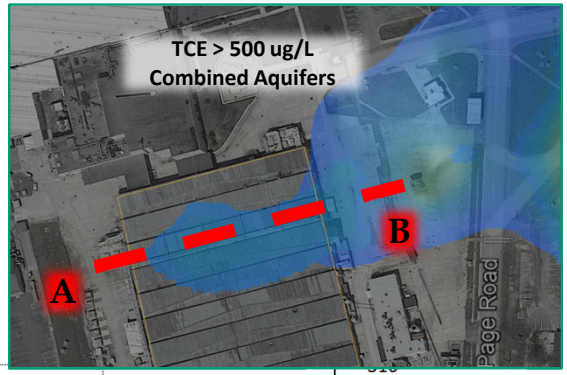
Above RL

Above 500 ug/L

COC	241.0 to 240.9 (ft AMSL)	237.0 to 237.9 (ft AMSL)	235.0 to 234.9 (ft AMSL)
1,1-DCE	1.0 U	1.0 U	1.0 U
1,2,4-TCB	2.0 U	2.0 U	2.0 U
1,2-DCB	1.0 U	1.0 U	1.0 U
1,3-DCB	1.4 J	0.81 J	1.0 U
1,4-DCB	1.0 U	1.0 U	1.0 U
BZ	1.0 U	1.0 U	1.0 U
TCLME	0.9 J	0.72 J	1.0 U
Cis-1,2-DCE	20 J	39 J	8.0 J
PCE	4.3 J	2.6 J	0.42 J
TCE	1,400 JD	820 JD	450 JD
VC	1.0 UJ	1.0 UJ	1.0 UJ

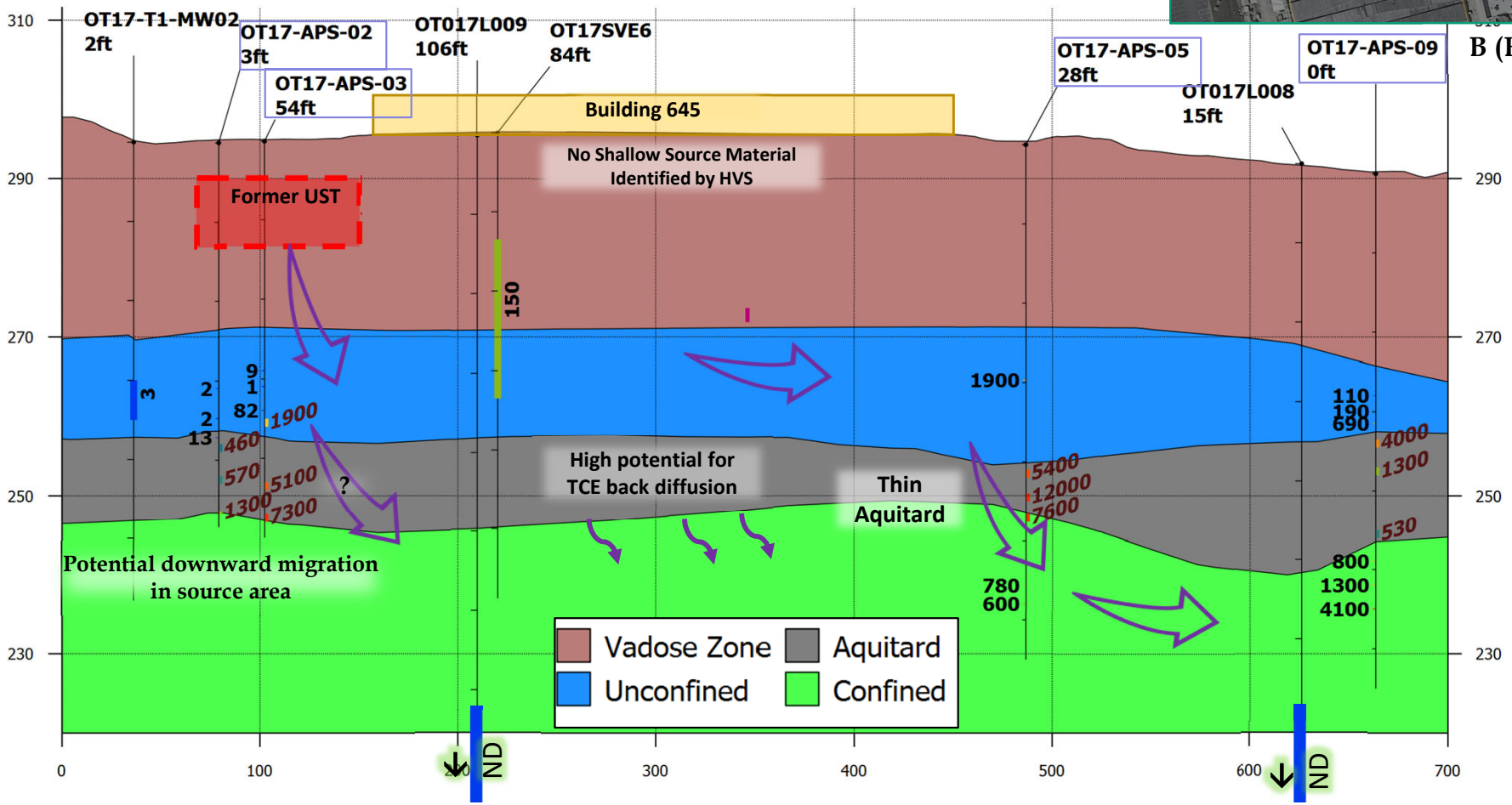
Area under Building 645





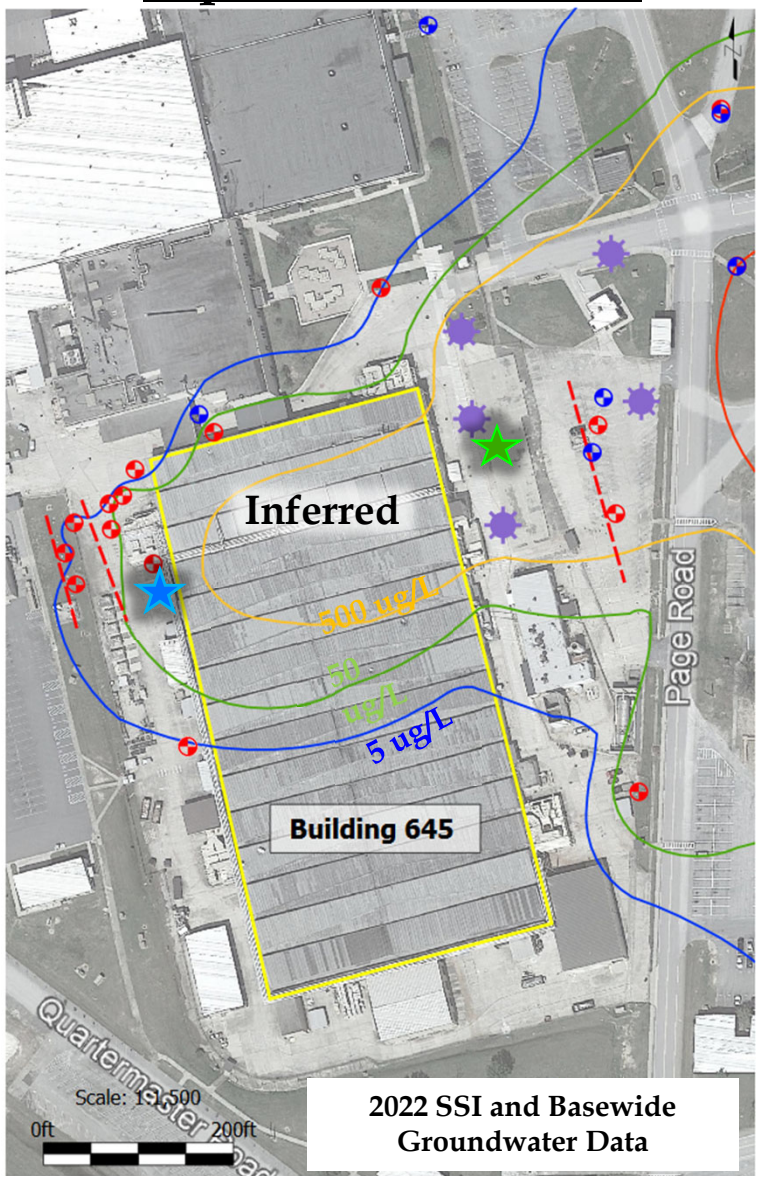
A (West)

B (East)



Area under Building 645

Combined Unconfined/Confined Aquifer TCE Extents

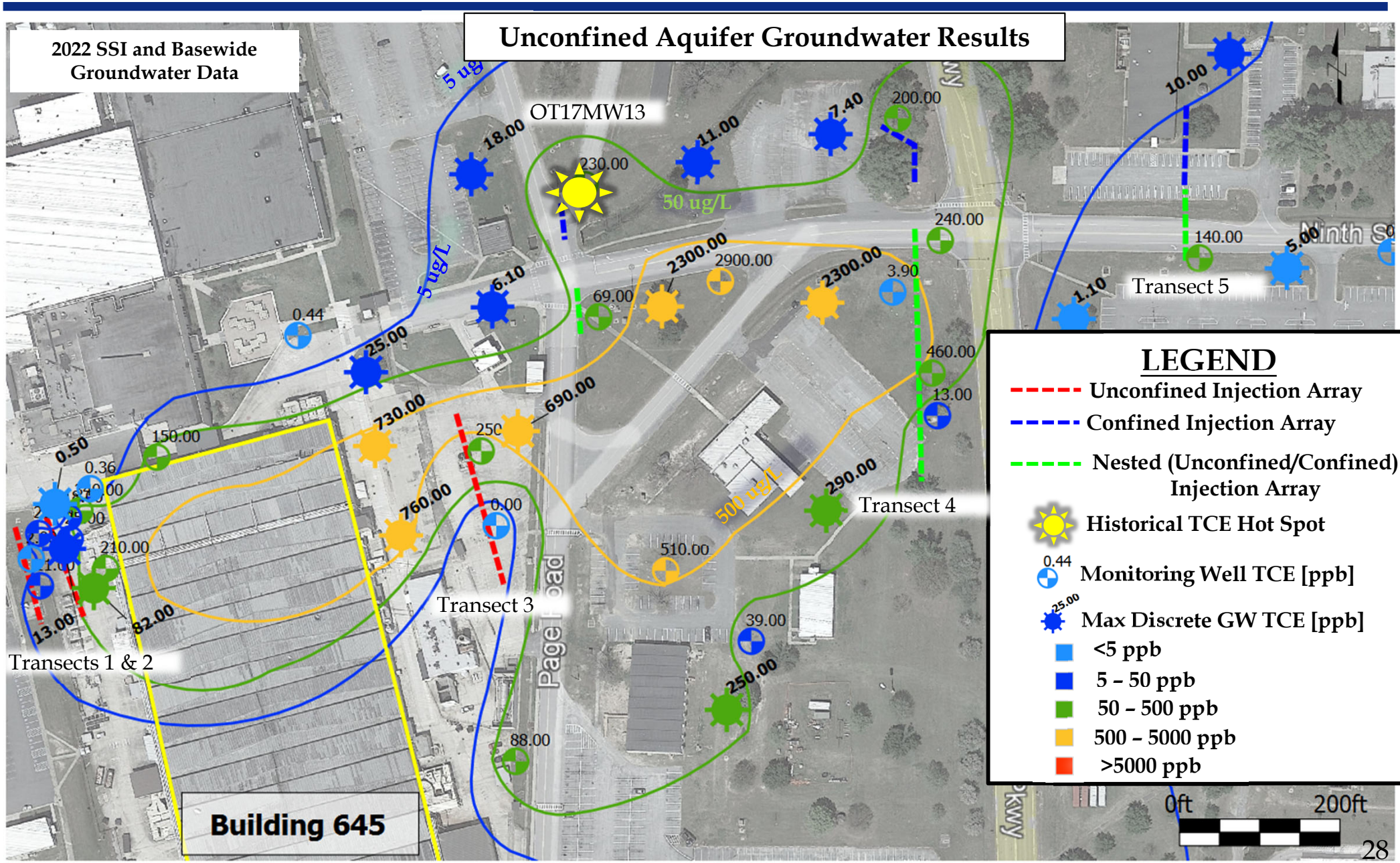


- **Path forward**
  - **Install confined aquifer monitoring well in proximity to former UST area**
  - **Install paired monitoring wells east of Building 645**

LEGEND

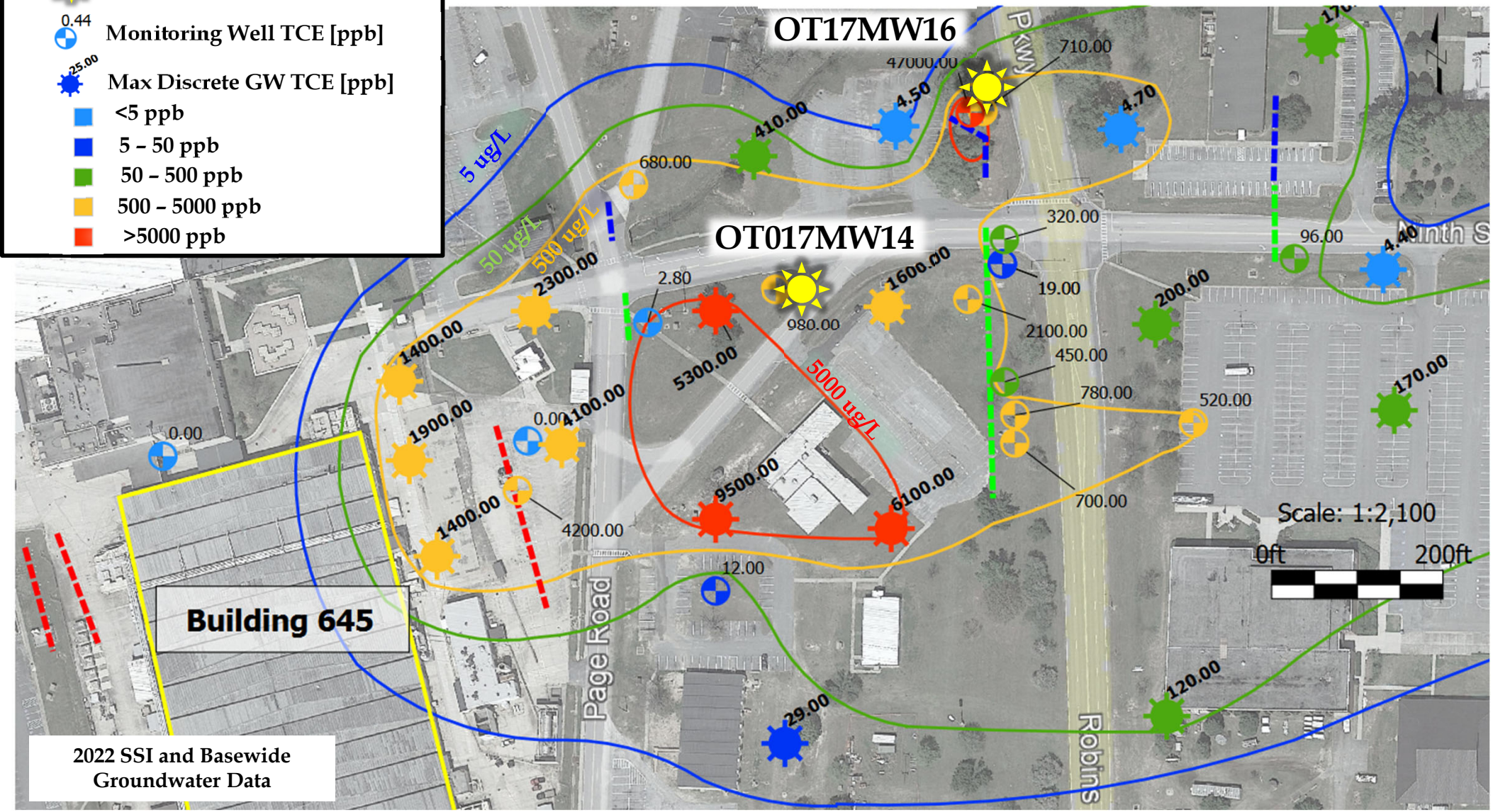
- Proposed Paired Unconfined/Confined MW
- Proposed Confined MW
- Unconfined MW
- Confined MW
- SSI Confined GW
- Unconfined Injection Array

TCE HOT SPOT

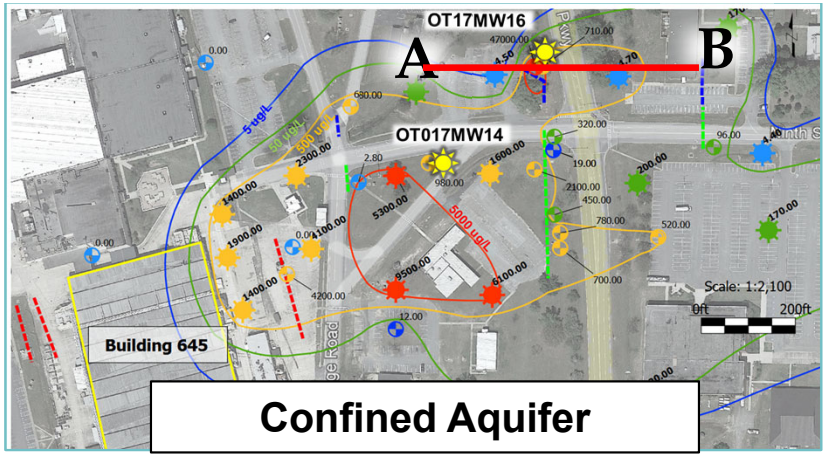

2022 SSI and Basewide Groundwater Data
Unconfined Aquifer Groundwater Results
OT17MW13
5 ug/L
50 ug/L
500 ug/L
Transect 1 & 2
Transect 3
Transect 4
Transect 5
Building 645
Page Road
Ninth St
LEGEND
Unconfined Injection Array
Confined Injection Array
Nested (Unconfined/Confined) Injection Array
Historical TCE Hot Spot
Monitoring Well TCE [ppb]
Max Discrete GW TCE [ppb]
<5 ppb
5 – 50 ppb
50 – 500 ppb
500 – 5000 ppb
>5000 ppb
0ft
200ft

TCE HOT SPOT

Confined Aquifer Groundwater Results



TCE HOT SPOT



Legend

- Vadose Zone
- Aquitard
- Unconfined
- Confined

Confined Aquifer

Historical TCE Hot Spot

SSI Boring Offset

Monitoring Well Offset

GW TCE (ug/L)

Soil TCE (ug/kg)

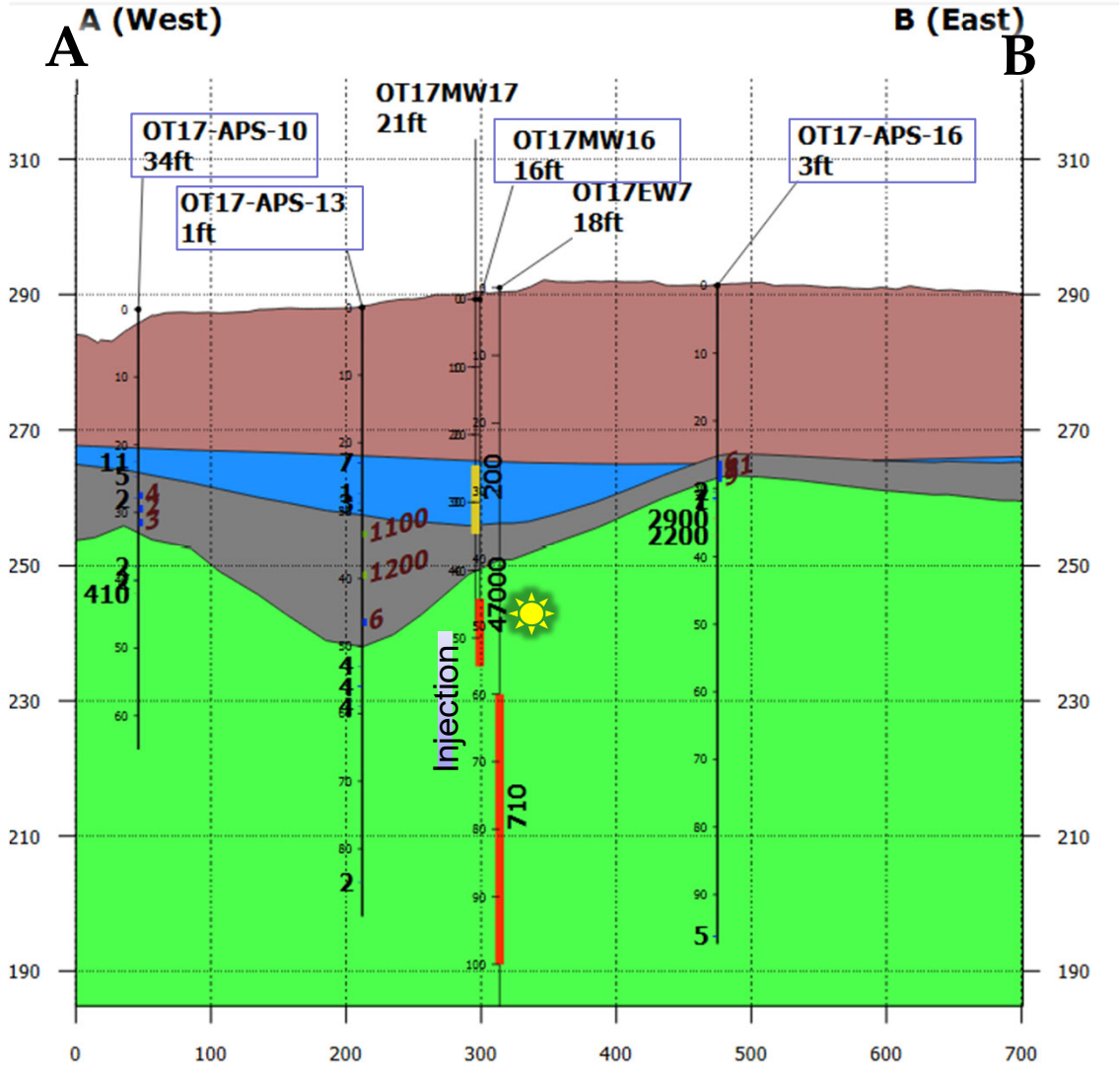
GW TCE (ug/L)

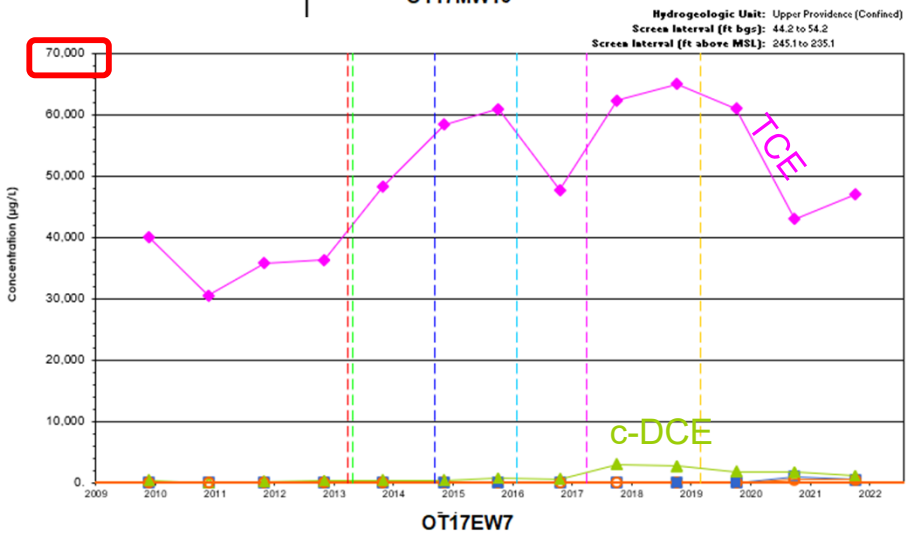
SCREEN

TCE (ug/L)

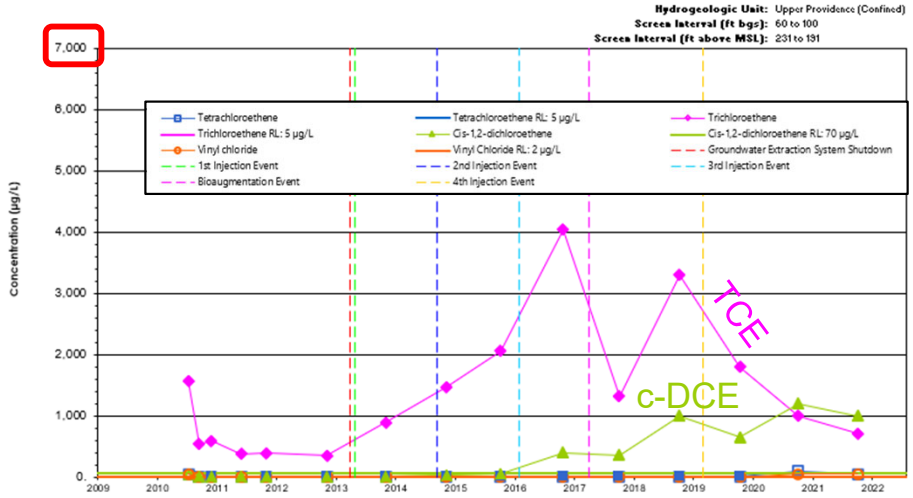
Injection Screen

OT17MW16

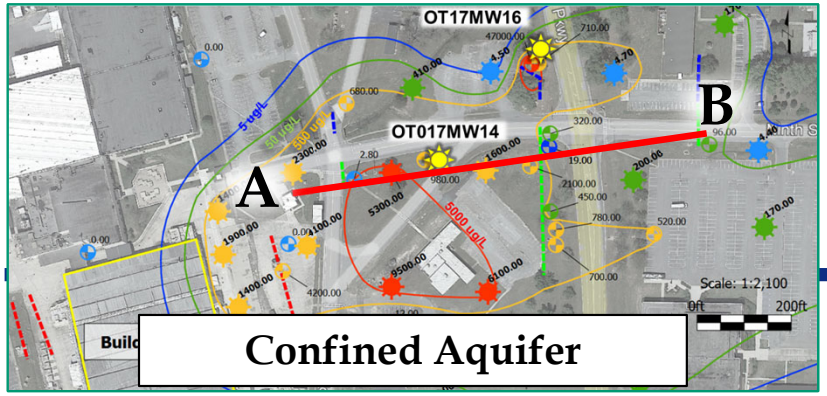


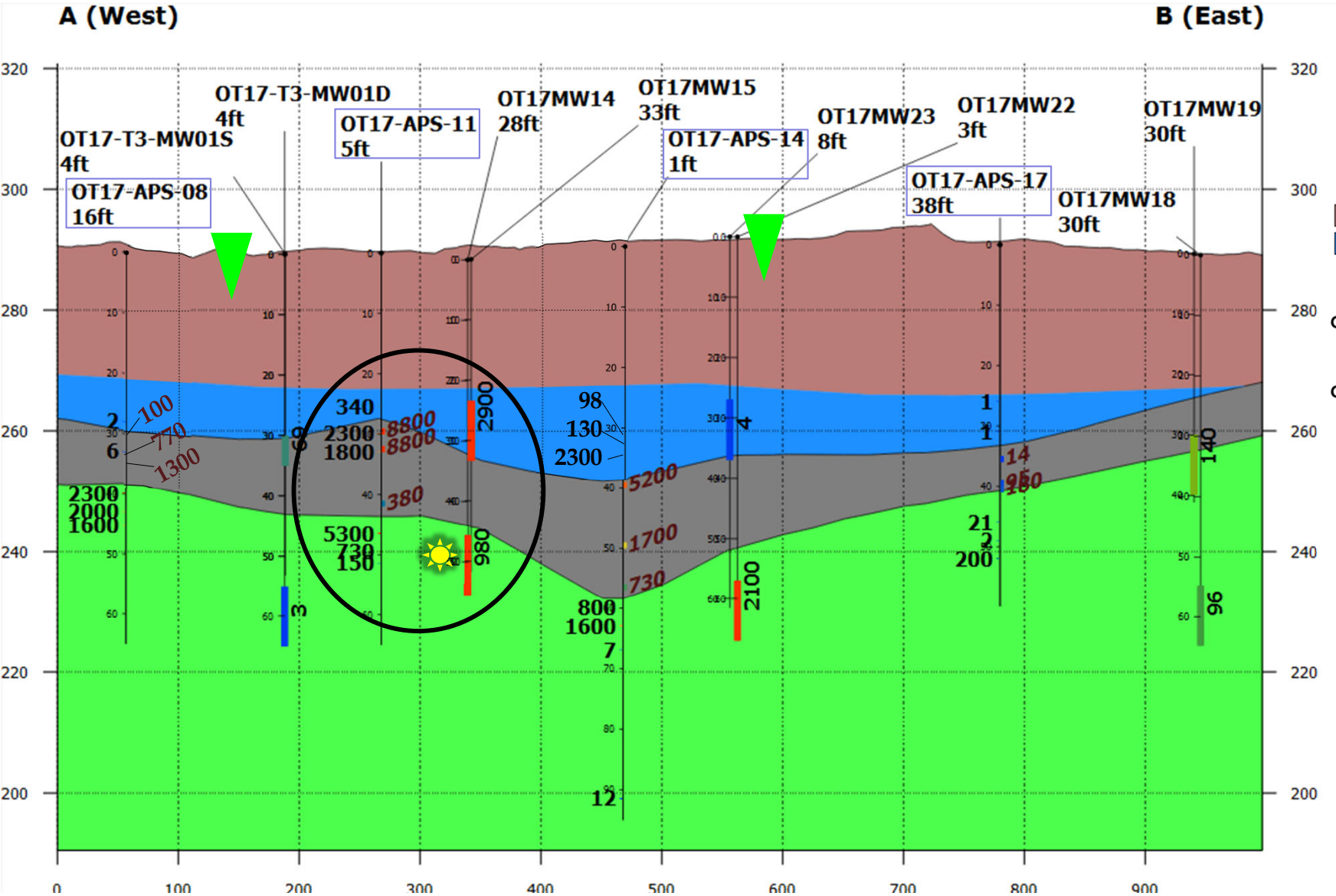


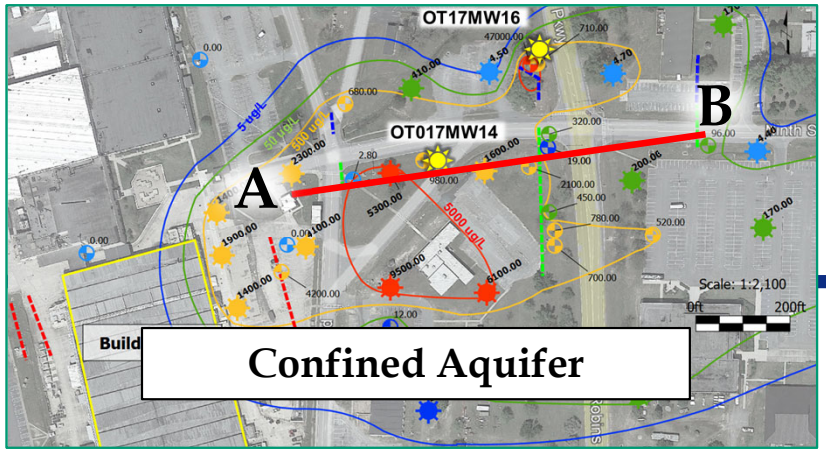
OT17EW7



TCE HOT SPOT

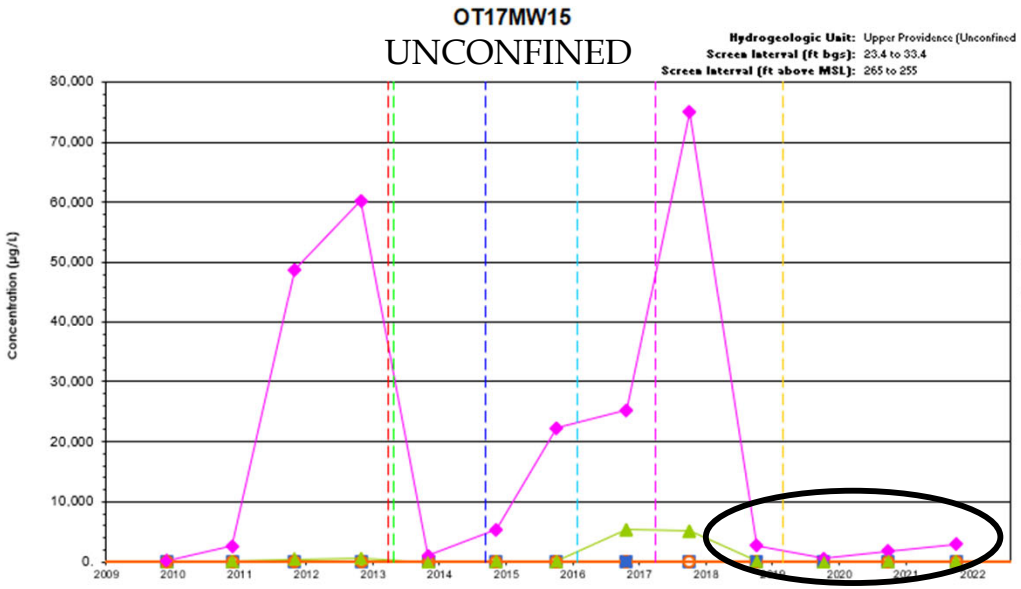

OT17MW16
OT017MW14
A
B
Scale: 1:2,100
0ft
200ft
Confined Aquifer

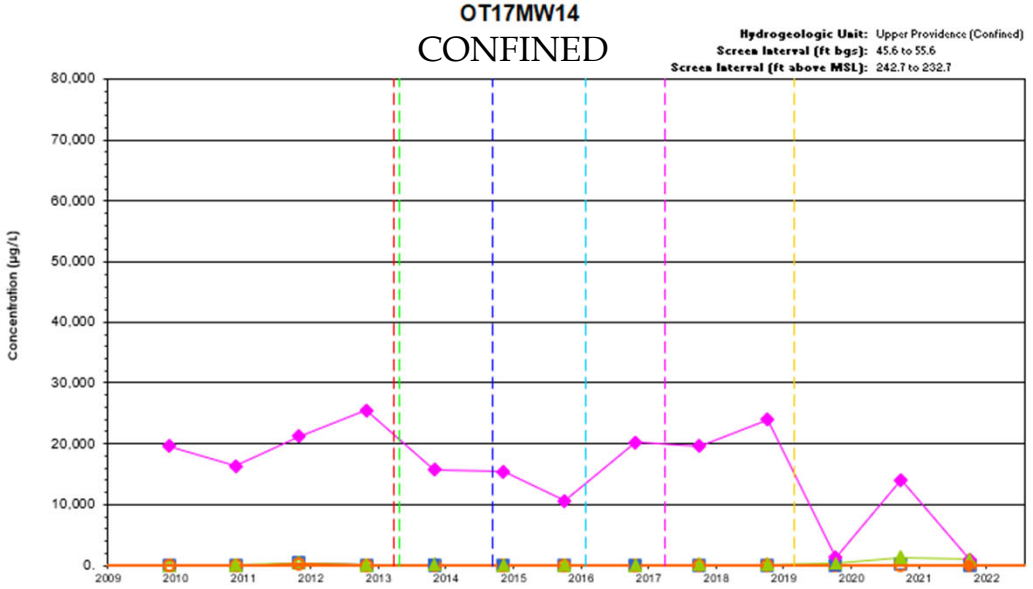

A (West)
B (East)
OT17-T3-MW01S
4ft
OT17-T3-MW01D
4ft
OT17-APS-08
16ft
OT17-APS-11
5ft
OT17MW14
28ft
OT17MW15
33ft
OT17-APS-14
1ft
OT17MW23
8ft
OT17MW22
3ft
OT17-APS-17
38ft
OT17MW18
30ft
OT17MW19
30ft
Legend
Vadose Zone
Aquitard
Unconfined
Confined
SSI Boring Offset
GW TCE (ug/L)
Soil TCE (ug/kg)
GW TCE (ug/L)
Monitoring Well Offset
SCREEN
TCE (ug/L)
Nested Injection Array
Historical TCE Hot Spot

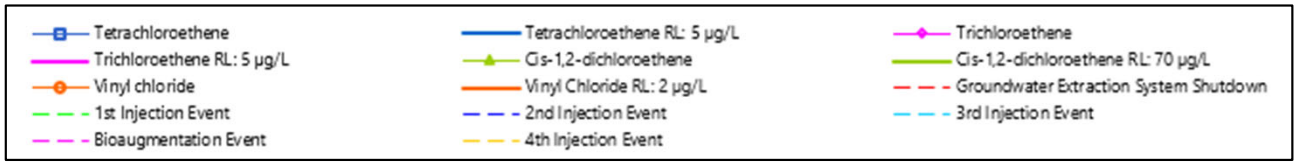


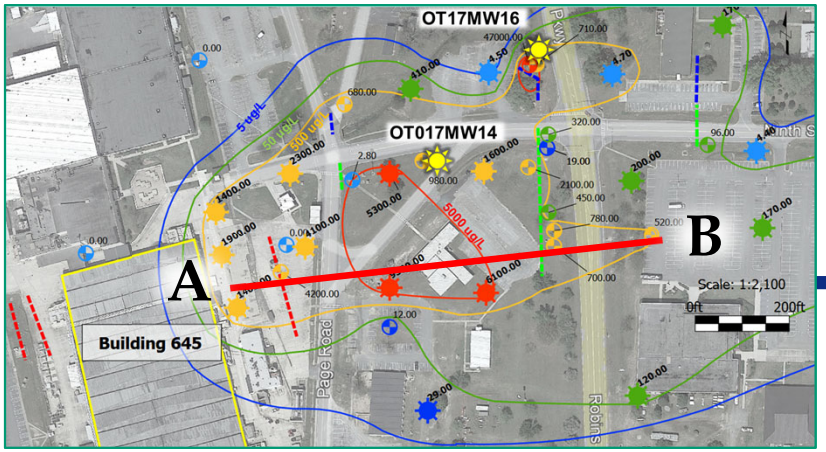
TCE HOT SPOT

Collocated OT17 MW15 and -MW14

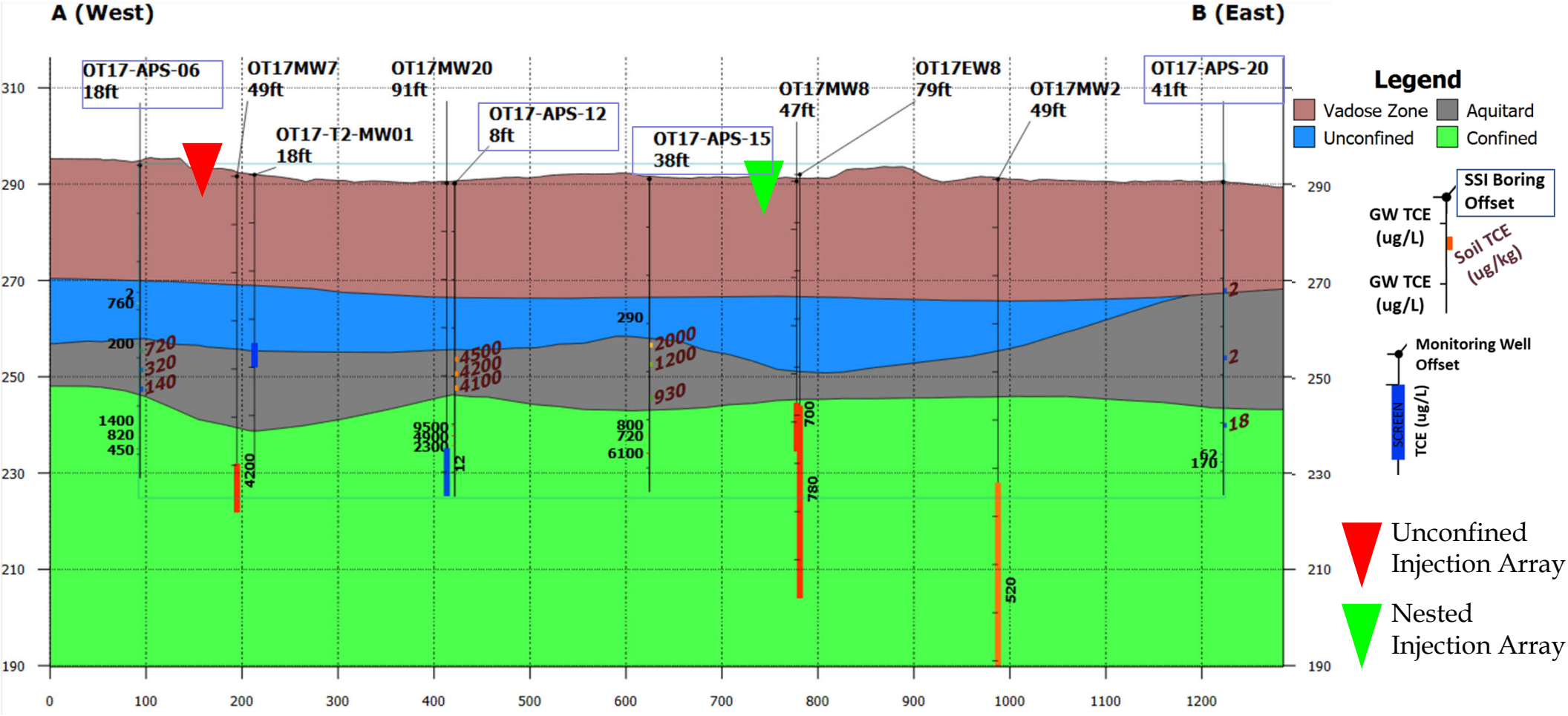






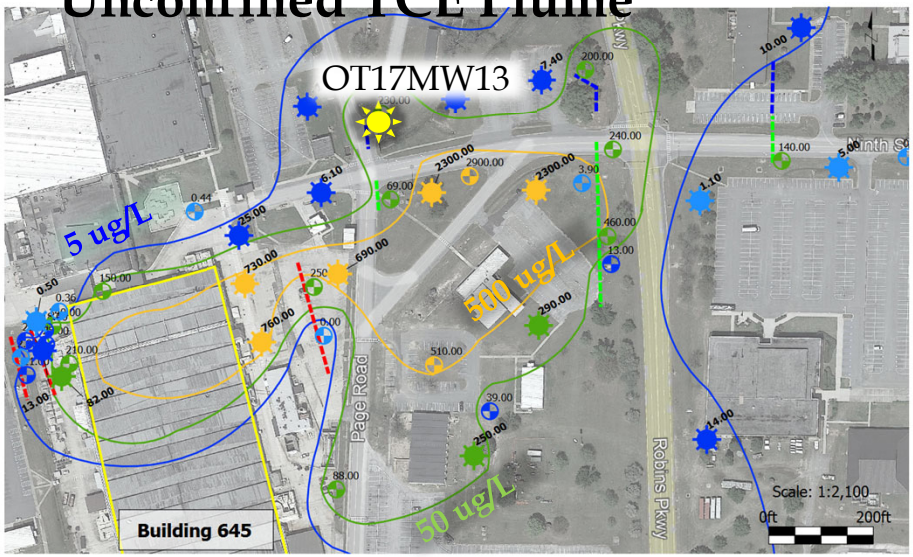

OT17MW16
OT017MW14
A
B
Building 645
Page Road
Scale: 1:2,100
0ft
200ft

TCE HOT SPOT


A (West)
B (East)
OT17-APS-06
18ft
OT17MW7
49ft
OT17MW20
91ft
OT17-APS-12
8ft
OT17-T2-MW01
18ft
OT17-APS-15
38ft
OT17MW8
47ft
OT17EW8
79ft
OT17MW2
49ft
OT17-APS-20
41ft
Legend
Vadose Zone
Aquitard
Unconfined
Confined
SSI Boring Offset
GW TCE (ug/L)
Soil TCE (ug/kg)
GW TCE (ug/L)
Monitoring Well Offset
SCREEN
TCE (ug/L)
Unconfined Injection Array
Nested Injection Array
310
290
270
250
230
210
190
0
100
200
300
400
500
600
700
800
900
1000
1100
1200

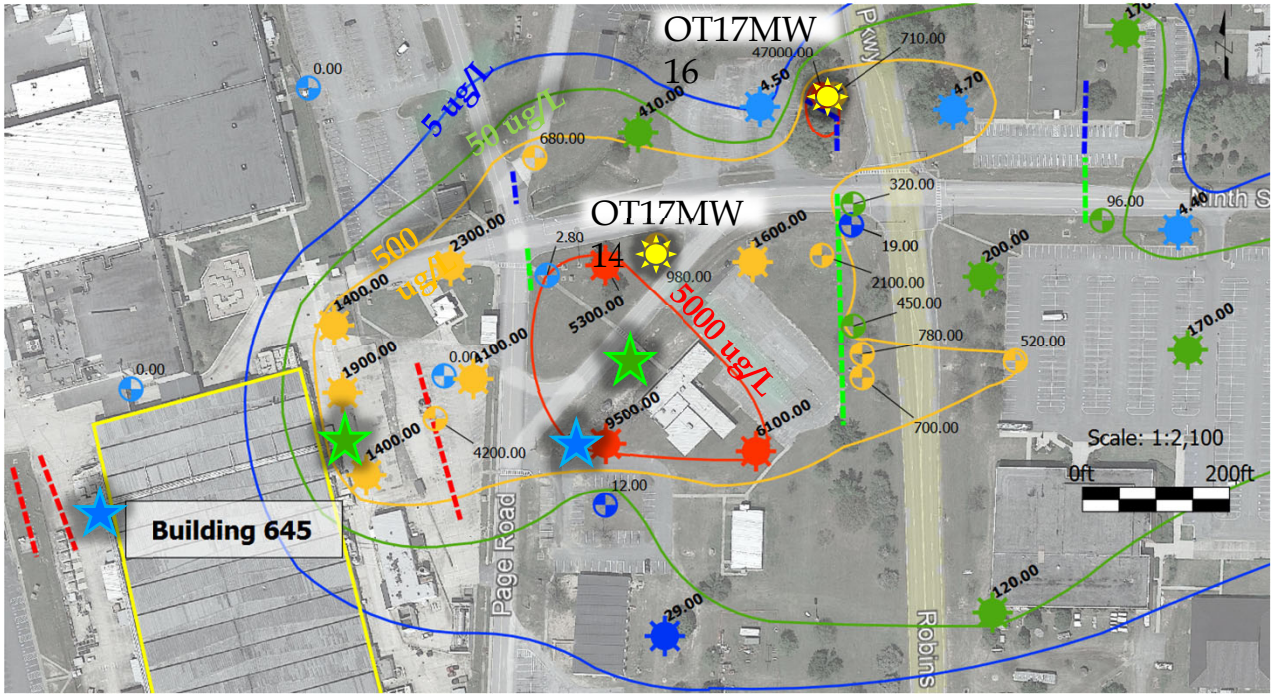
TCE HOT SPOT

Unconfined TCE Plume



- **Key Findings**
  - **Unconfined hot spot limited in extent**
  - **Treatment of confined aquifer hot spot less effective**
- **Path Forward:**
  - **Install additional monitoring wells to refine future remedy footprint**

Confined TCE Plume



LEGEND

- Proposed Paired Unconfined/Confined MW
- Proposed Confined MW
- Historical TCE Hot Spot
- MW (TCE ug/L)
- SSI Maximum GW (TCE ug/L)
- Unconfined Injection Array
- Confined Injection Array
- Nested Injection Array

Clay Aquitard

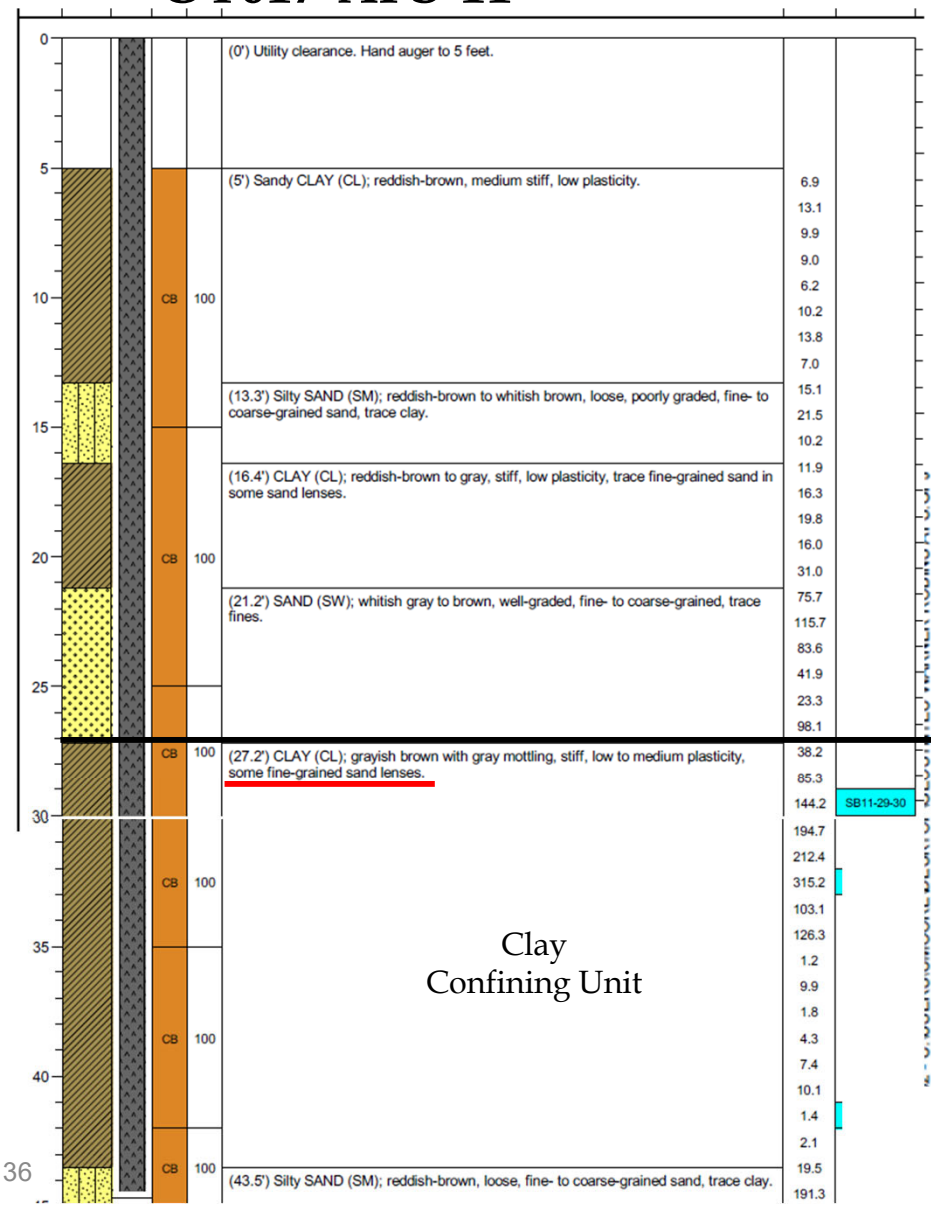
- Potential aquitard unit encountered at each location
- Described as grayish brown, low plasticity clay, with varying amounts of sand
- Median clay unit thickness: 11 feet
  - Less than 4 ft thick at OT017-B05 (east of Building 645)
- Sand lenses encountered in some locations may act as preferential flow paths

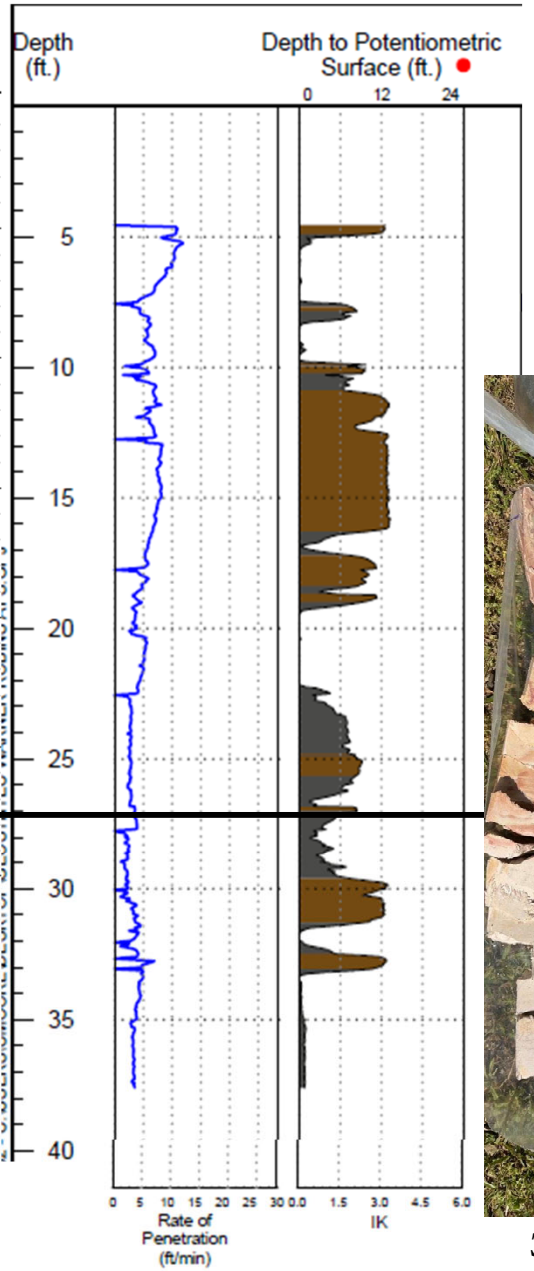
35

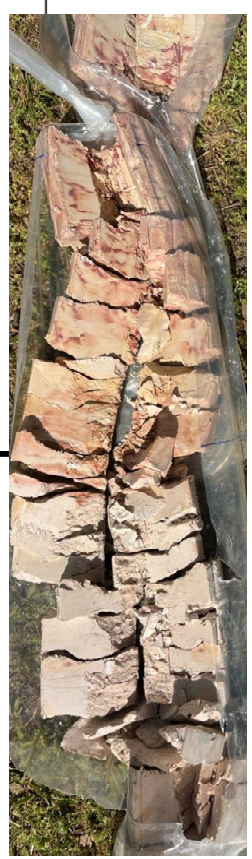
Clay Aquitard

Index of Hydraulic Conductivity (Ik)

OT017-APS-11







31 ft bgs

34 ft bgs

36

Clay Aquitard

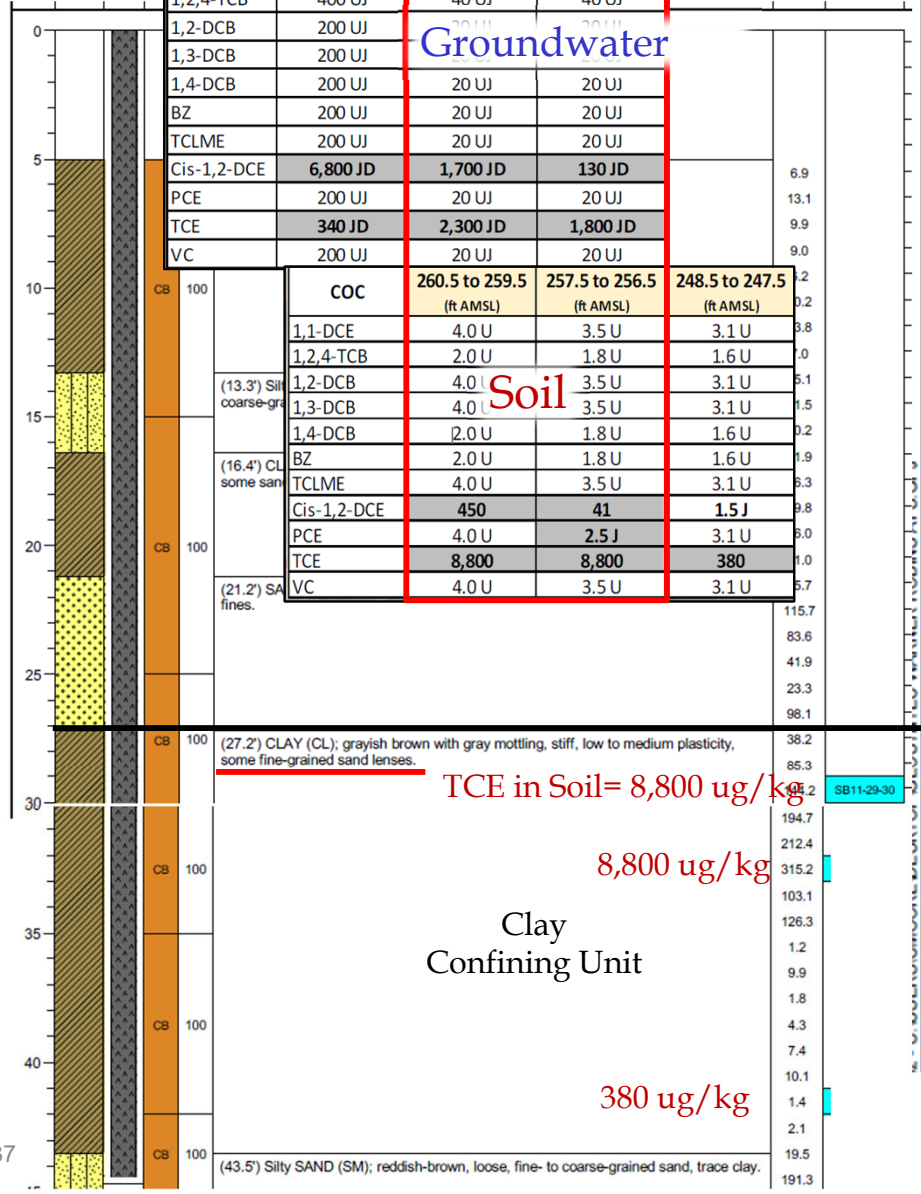
Index of Hydraulic Conductivity (Ik)

COC	264.1 to 264.0 (ft AMSL)	259.6 to 259.5 (ft AMSL)	256.6 to 256.5 (ft AMSL)
1,1-DCE	200 UJ	20 UJ	20 UJ
1,2,4-TCB	400 UJ	40 UJ	40 UJ
1,2-DCB	200 UJ	20 UJ	20 UJ
1,3-DCB	200 UJ	20 UJ	20 UJ
1,4-DCB	200 UJ	20 UJ	20 UJ
BZ	200 UJ	20 UJ	20 UJ
TCLME	200 UJ	20 UJ	20 UJ
Cis-1,2-DCE	**6,800 JD**	**1,700 JD**	**130 JD**
PCE	200 UJ	20 UJ	20 UJ
TCE	**340 JD**	**2,300 JD**	**1,800 JD**
VC	200 UJ	20 UJ	20 UJ

Groundwater

COC	260.5 to 259.5 (ft AMSL)	257.5 to 256.5 (ft AMSL)	248.5 to 247.5 (ft AMSL)
1,1-DCE	4.0 U	3.5 U	3.1 U
1,2,4-TCB	2.0 U	1.8 U	1.6 U
1,2-DCB	4.0 U	3.5 U	3.1 U
1,3-DCB	4.0 U	3.5 U	3.1 U
1,4-DCB	2.0 U	1.8 U	1.6 U
BZ	2.0 U	1.8 U	1.6 U
TCLME	4.0 U	3.5 U	3.1 U
Cis-1,2-DCE	**450**	**41**	**1.5 J**
PCE	4.0 U	**2.5 J**	3.1 U
TCE	**8,800**	**8,800**	**380**
VC	4.0 U	3.5 U	3.1 U

Soil

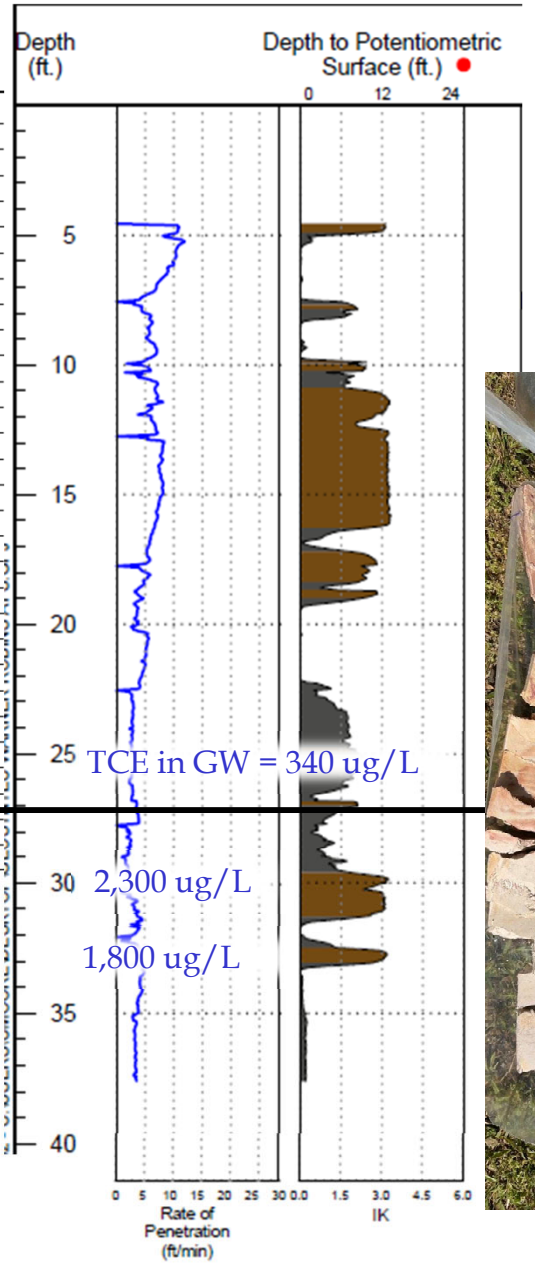


TCE in Soil= 8,800 ug/kg

8,800 ug/kg

Clay
Confining Unit

380 ug/kg



TCE in GW = 340 ug/L

2,300 ug/L

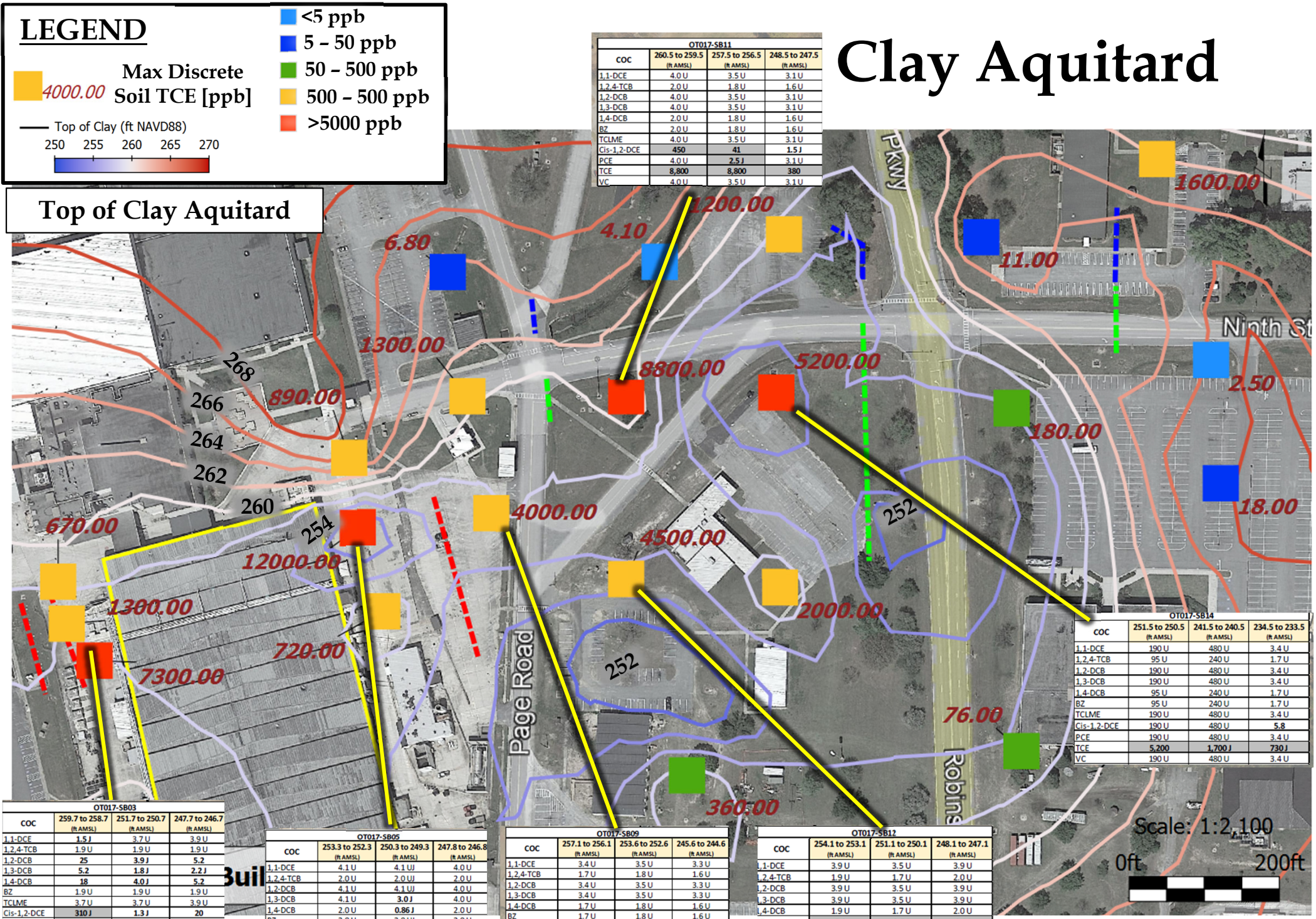
1,800 ug/L

31 ft bgs

34 ft bgs

37

Clay Aquitard



OT017-SB11			
COC	260.5 to 259.5 (ft AMSL)	257.5 to 256.5 (ft AMSL)	248.5 to 247.5 (ft AMSL)
1,1-DCE	4.0 U	3.5 U	3.1 U
1,2,4-TCB	2.0 U	1.8 U	1.6 U
1,2-DCB	4.0 U	3.5 U	3.1 U
1,3-DCB	4.0 U	3.5 U	3.1 U
1,4-DCB	2.0 U	1.8 U	1.6 U
BZ	2.0 U	1.8 U	1.6 U
TCLME	4.0 U	3.5 U	3.1 U
Cis-1,2-DCE	450	41	1.5 J
PCE	4.0 U	2.5 J	3.1 U
TCE	8,800	8,800	380
VC	4.0 U	3.5 U	3.1 U

OT017-SB14			
COC	251.5 to 250.5 (ft AMSL)	241.5 to 240.5 (ft AMSL)	234.5 to 233.5 (ft AMSL)
1,1-DCE	190 U	480 U	3.4 U
1,2,4-TCB	95 U	240 U	1.7 U
1,2-DCB	190 U	480 U	3.4 U
1,3-DCB	190 U	480 U	3.4 U
1,4-DCB	95 U	240 U	1.7 U
BZ	95 U	240 U	1.7 U
TCLME	190 U	480 U	3.4 U
Cis-1,2-DCE	190 U	480 U	5.8
PCE	190 U	480 U	3.4 U
TCE	5,200	1,700 J	730 J
VC	190 U	480 U	3.4 U

OT017-SB03			
COC	259.7 to 258.7 (ft AMSL)	251.7 to 250.7 (ft AMSL)	247.7 to 246.7 (ft AMSL)
1,1-DCE	1.5 J	3.7 U	3.9 U
1,2,4-TCB	1.9 U	1.9 U	1.9 U
1,2-DCB	25	3.9 J	5.2
1,3-DCB	5.2	1.8 J	2.2 J
1,4-DCB	18	4.0 J	5.2
BZ	1.9 U	1.9 U	1.9 U
TCLME	3.7 U	3.7 U	3.9 U
Cis-1,2-DCE	310 J	1.3 J	20
PCE	11	3.9 J	5.4
TCE	1,900	5,100	7,300
VC	3.7 U	3.7 U	3.9 U

OT017-SB05			
COC	253.3 to 252.3 (ft AMSL)	250.3 to 249.3 (ft AMSL)	247.8 to 246.8 (ft AMSL)
1,1-DCE	4.1 U	4.1 UJ	4.0 U
1,2,4-TCB	2.0 U	2.0 UJ	2.0 U
1,2-DCB	4.1 U	4.1 UJ	4.0 U
1,3-DCB	4.1 U	3.0 J	4.0 U
1,4-DCB	2.0 U	0.86 J	2.0 U
BZ	2.0 U	2.0 UJ	2.0 U
TCLME	4.1 U	1.7 J	1.1 J
Cis-1,2-DCE	14	23 J	17
PCE	3.6 J	12 J	4.6 J
TCE	5,400	12,000	7,600
VC	4.1 U	4.1 UJ	4.0 U

OT017-SB09			
COC	257.1 to 256.1 (ft AMSL)	253.6 to 252.6 (ft AMSL)	245.6 to 244.6 (ft AMSL)
1,1-DCE	3.4 U	3.5 U	3.3 U
1,2,4-TCB	1.7 U	1.8 U	1.6 U
1,2-DCB	3.4 U	3.5 U	3.3 U
1,3-DCB	3.4 U	3.5 U	3.3 U
1,4-DCB	1.7 U	1.8 U	1.6 U
BZ	1.7 U	1.8 U	1.6 U
TCLME	3.4 U	3.5 U	3.3 U
Cis-1,2-DCE	4.1 J	2.8 J	1.2 J
PCE	2.3 J	3.5 U	3.3 U
TCE	4,000	1,300	530
VC	3.4 UJ	3.5 UJ	3.3 UJ

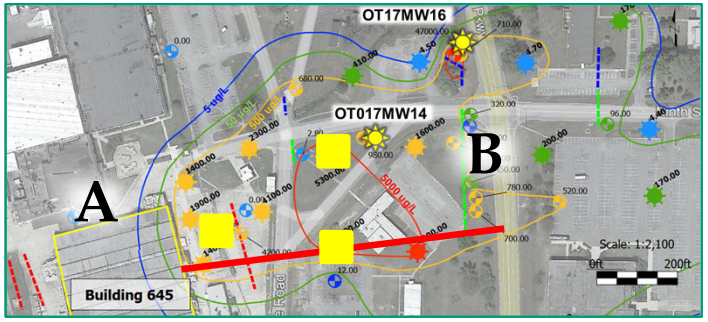
OT017-SB12			
COC	254.1 to 253.1 (ft AMSL)	251.1 to 250.1 (ft AMSL)	248.1 to 247.1 (ft AMSL)
1,1-DCE	3.9 U	3.5 U	3.9 U
1,2,4-TCB	1.9 U	1.7 U	2.0 U
1,2-DCB	3.9 U	3.5 U	3.9 U
1,3-DCB	3.9 U	3.5 U	3.9 U
1,4-DCB	1.9 U	1.7 U	2.0 U
BZ	5.3	3.5 J	4.4 J
TCLME	3.9 U	3.5 U	3.9 U
Cis-1,2-DCE	5.4	5	5.1
PCE	3.9 U	3.5 U	3.9 U
TCE	4,500	4,200	4,100
VC	3.9 U	3.5 U	3.9 U

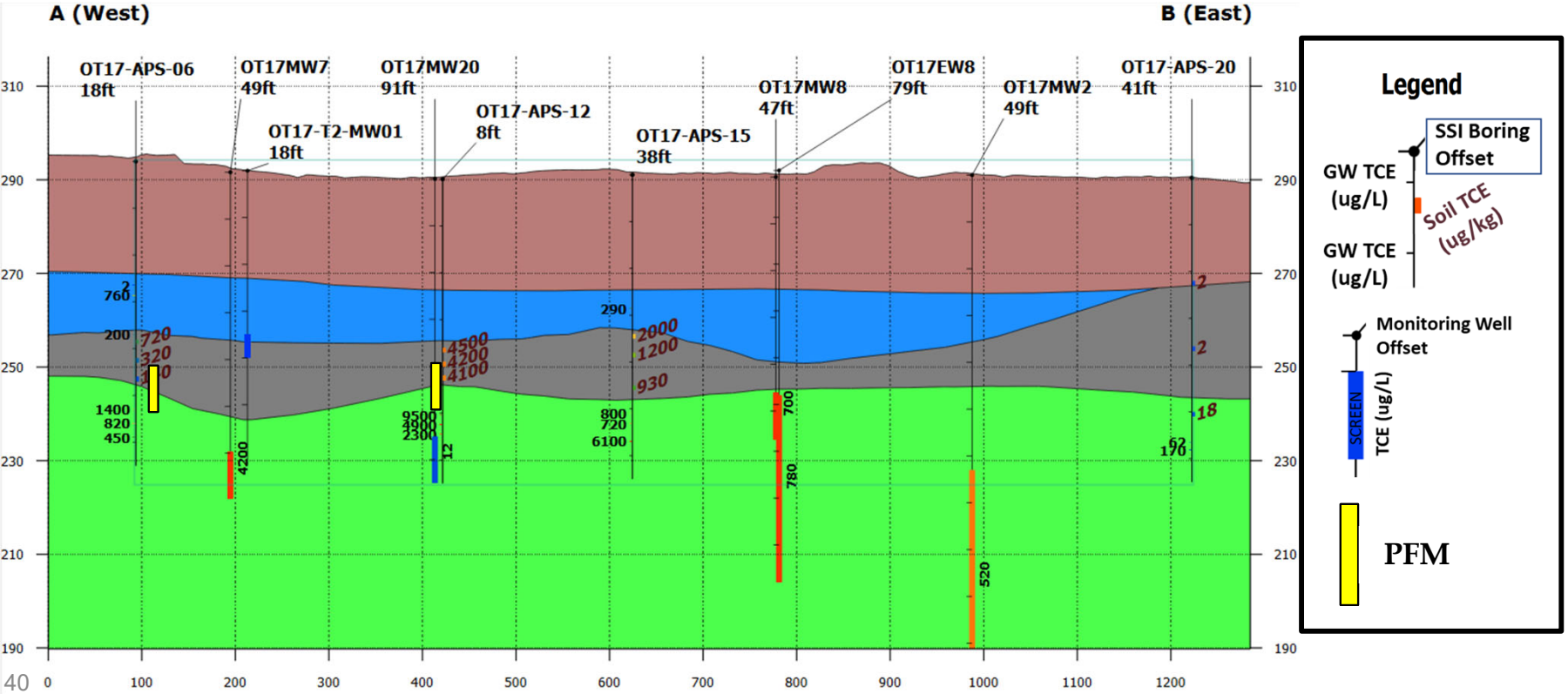
Clay Aquitard

- Substantial TCE entrained within clay layer
- Impacts to clay extend far down gradient from former UST area
- Highest concentrations of clay TCE co-located with thin bowl-like depression east of Building 645
- Minimal daughter products present in clay indicates aquitard is not presently affected by ERD injections
- High potential for clay aquitard to act as a secondary source via back diffusion

Clay Aquitard

- **Path forward recommendations:**
  - **Deploy passive flux meters (PFMs) to evaluate flux from clay to aquifer groundwater**





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Path forward

- **Ongoing Operations and Maintenance (O&M)**
  - Continue to run SVE in source area
- **Additional Phase 2 SSI Activities (January - March 2024)**
  - Install monitoring wells to refine remedy footprint
  - Install PFMs to evaluate flux from clay aquitard

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Questions?

SWMUs 59 & 60 (CG501 & CG502) – Update on Progress

Kip Gray, PhD
Senior Engineer
Geosyntec Consultants, Inc.

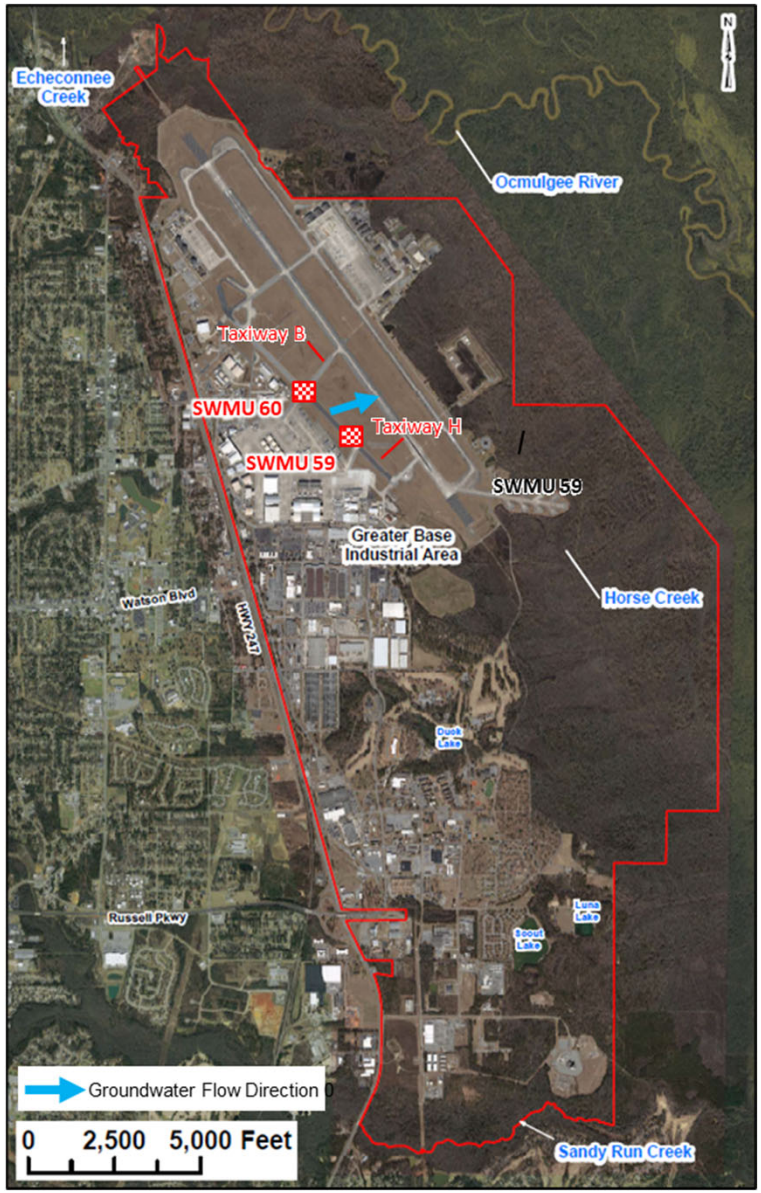
March 14, 2024

Overview

- Site background
- CAP addendum
- Construction activities
- Path forward

Site Background

- Located in flightline area
- 1995: Petroleum contamination discovered due to presumed historical release(s) from active/inactive buried fuel lines
- Inactive fuel line transported Jet Propellant Number 4 (JP-4) until mid-1990s and abandoned in place in 2000
- Active fuel line transported JP-4 until mid-1990s when Robins AFB converted to Jet Propellant 8 (JP-8) for aircraft fueling
- Historical release of light non-aqueous phase liquid (LNAPL) resulted in groundwater plume
- Numerous investigations have found no evidence of ongoing leak



SWMU 59 and 60 Location

Site History

- **2002: CAP Objectives**
  - SWMU 59 and 60 combined CAP due to proximity and similar nature of contamination
  - Reduce residual LNAPL to minimize continued release of fuel-related constituents into groundwater
  - Reduce or control fuel-related VOCs, including benzene, in source area groundwater
  - Minimize downgradient migration of VOCs in groundwater
- **2002 Remedy**
  - Air sparge and soil vapor extraction (AS/SVE) selected for source areas
  - Monitored Natural Attenuation (MNA) for downgradient areas

Contaminants of Concern (COCs)

Parameter	SWMU 59 Groundwater RL (µg/L)	SWMU 60 Groundwater RL (µg/L)
Volatile Organics		
1,2,4-Trimethylbenzene	12	12
1,3,5-Trimethylbenzene	12	12
Benzene	5	5
Toluene	1,000	1,000
Ethylbenzene	700	700
n-Propylbenzene	--	240
Semivolatile Organics		
Naphthalene	6.5	6.5

Parameter	SWMU 59 Soil RL (µg/kg)
Volatile Organics	
1,2,4-Trimethylbenzene	117
1,3,5-Trimethylbenzene	63
Benzene	120
Toluene	24,000
Ethylbenzene	22,700
m,p-Xylene	357,000
n-Propylbenzene	788
Semivolatile Organics	
Naphthalene	--

Notes:
RL = Remediation Level
µg/L = micrograms per liter
µg/kg = micrograms per kilogram

Source: CAP (CAPE, 2001)

Site History

- **2012 – 2013: System modified due to diminishing decreases in contamination**
  - AS converted to biosparge by reducing air injection flowrate
  - SVE shut down
  - Horizontal directional drilled (HDD) biosparge wells installed to expand treatment area downgradient
  - In-situ submerged oxygen curtains (iSOC®) to expand treatment area upgradient

Site History

- **2014 – 2019: SSI and source area investigations due to fluctuating concentrations**

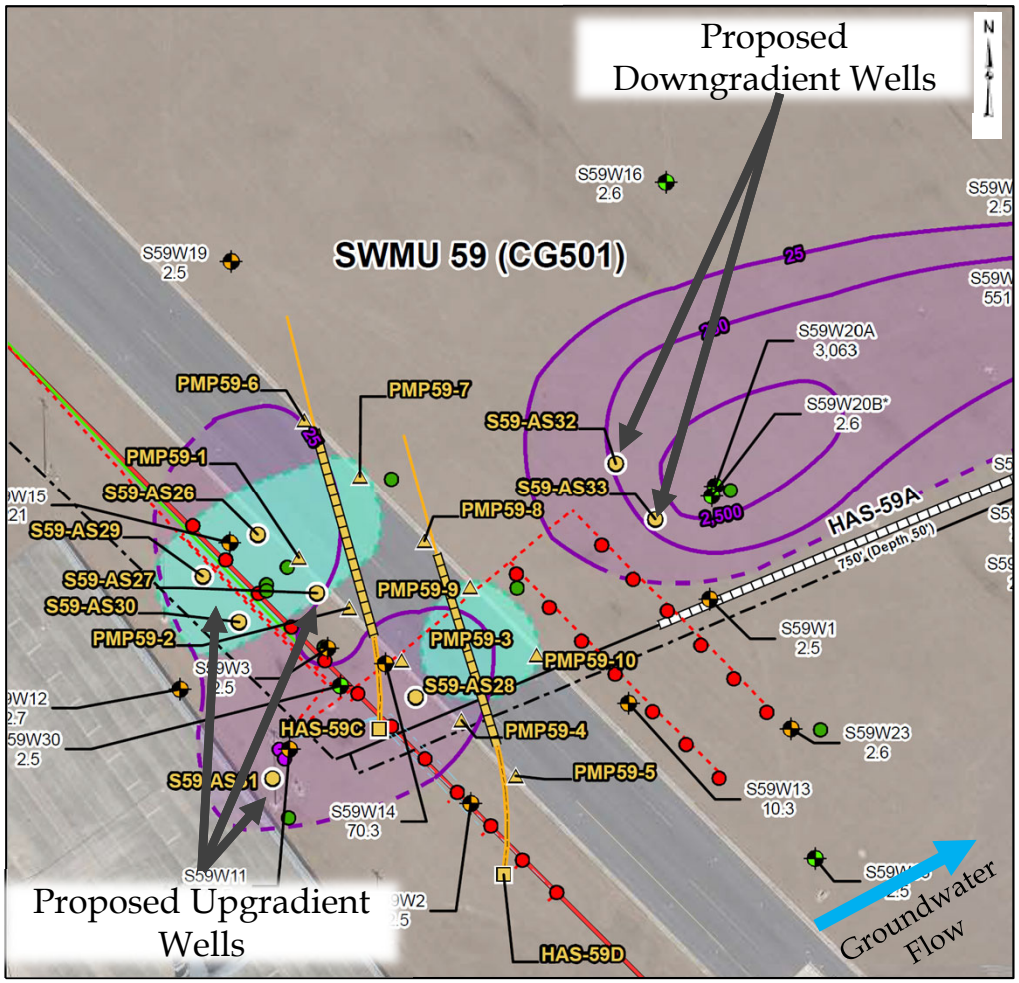
- **Key Findings**

  - Residual LNAPL identified
    - Beneath taxiway, near pipeline, and below water table
  - Residual LNAPL appears immobile and non-recoverable
  - Residual LNAPL is acting as ongoing source contributing to downgradient plume

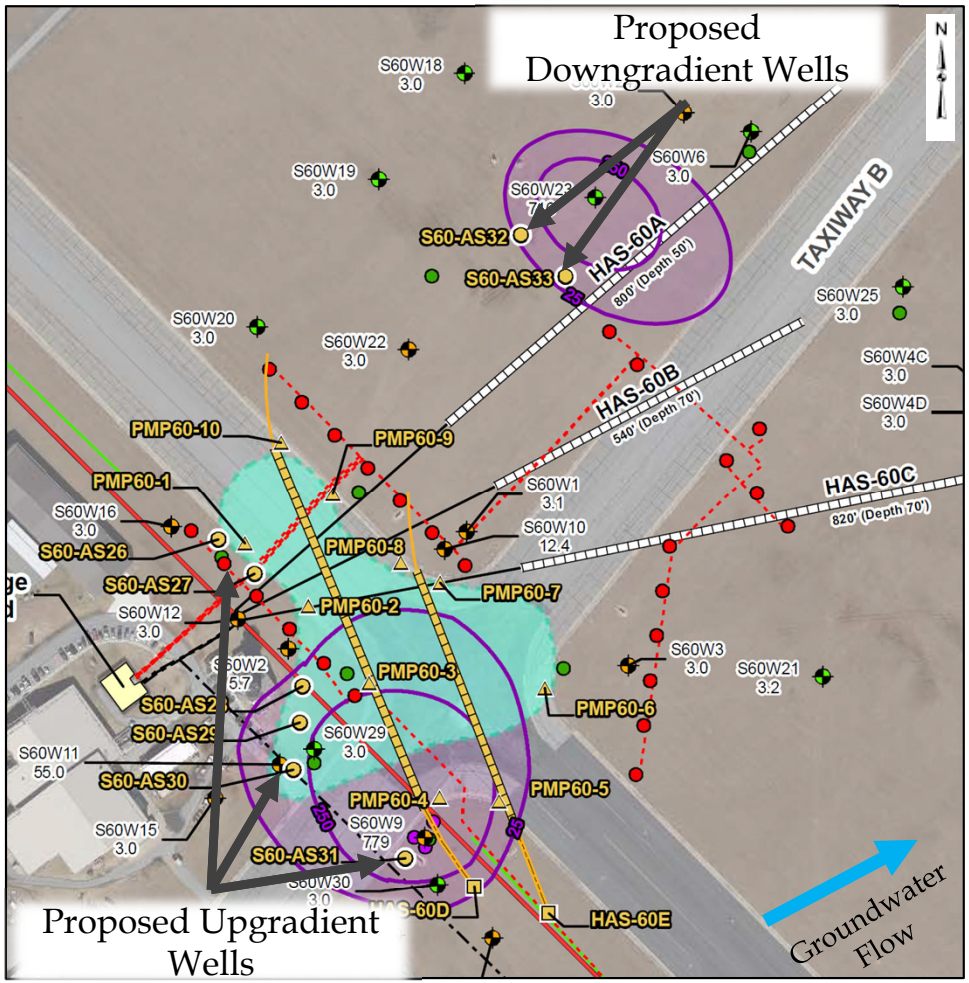
CAP Addendum

- **Current biosparge system has been shown to be effective within its zone of influence**
- **Enhance remedial approach to address source area**
- **CAP Addendum: Updated approach to accelerate cleanup approved by Georgia Environmental Protection Division (GA EPD) in October 2021**
  - Expand biosparge system to target residual LNAPL under taxiways and in areas beyond current biosparge influence
  - Downgradient concentrations will attenuate

CAP Addendum



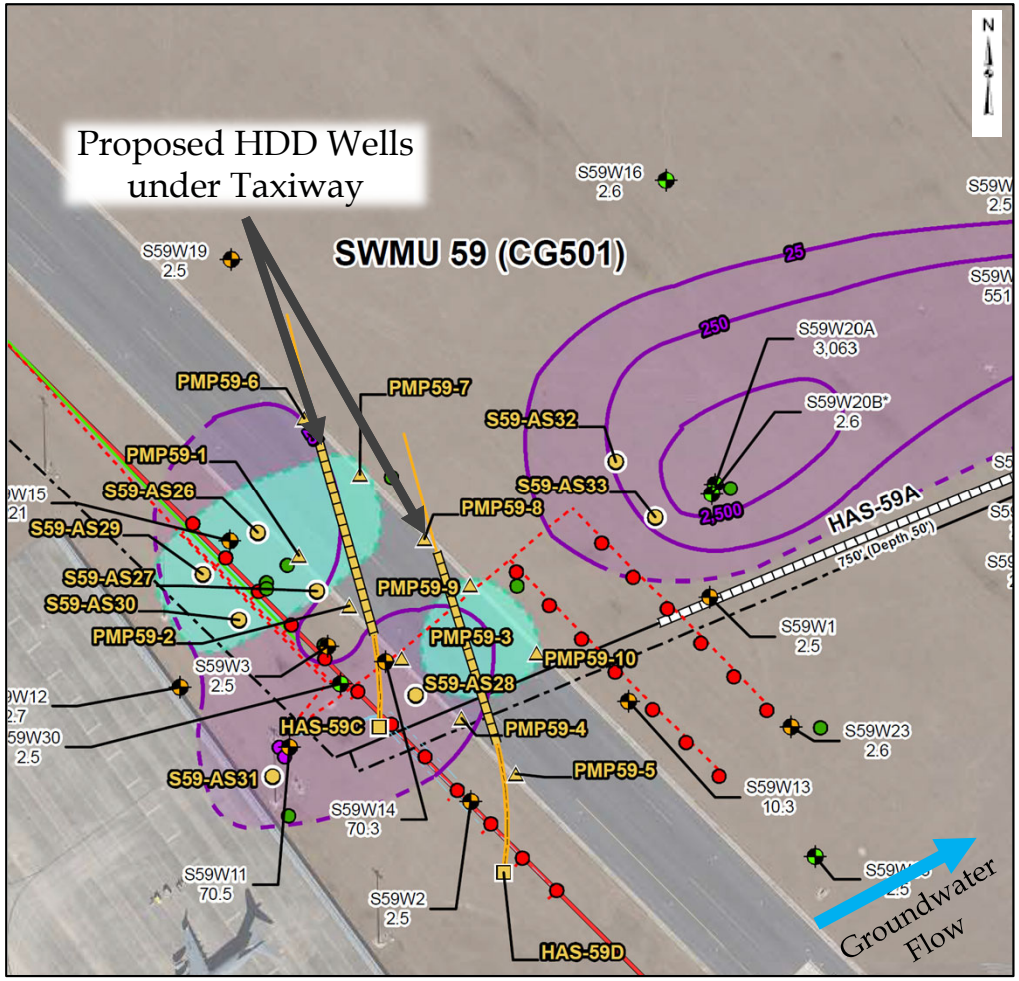
Proposed SWMU 59 Remediation Enhancements



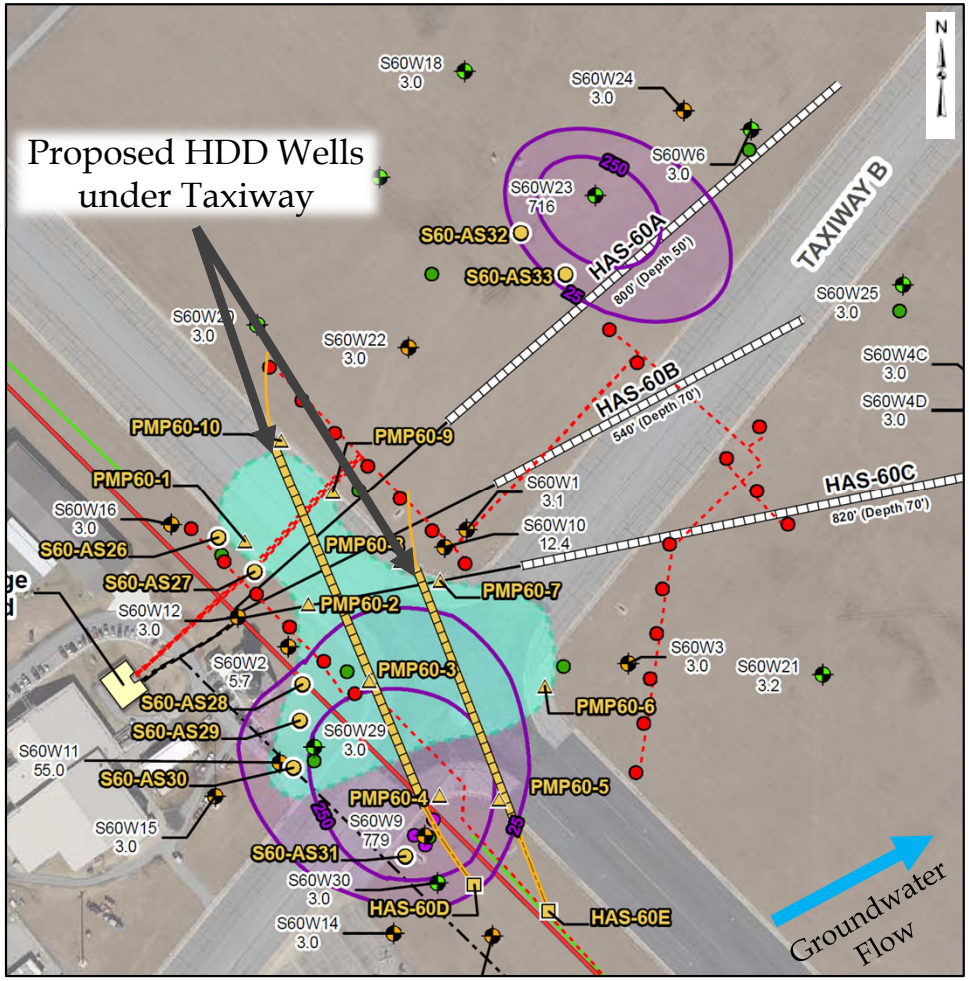
Proposed SWMU 60 Remediation Enhancements

Existing System:	**Proposed System Enhancements:**
Vertical Biosparge Well	Proposed Vertical Biosparge Well
HDD Bioparge Well	Proposed HDD Biosparge Well
iSOC® Well	Proposed Pressure Monitoring Point

CAP Addendum



Proposed SWMU 59 Remediation Enhancements



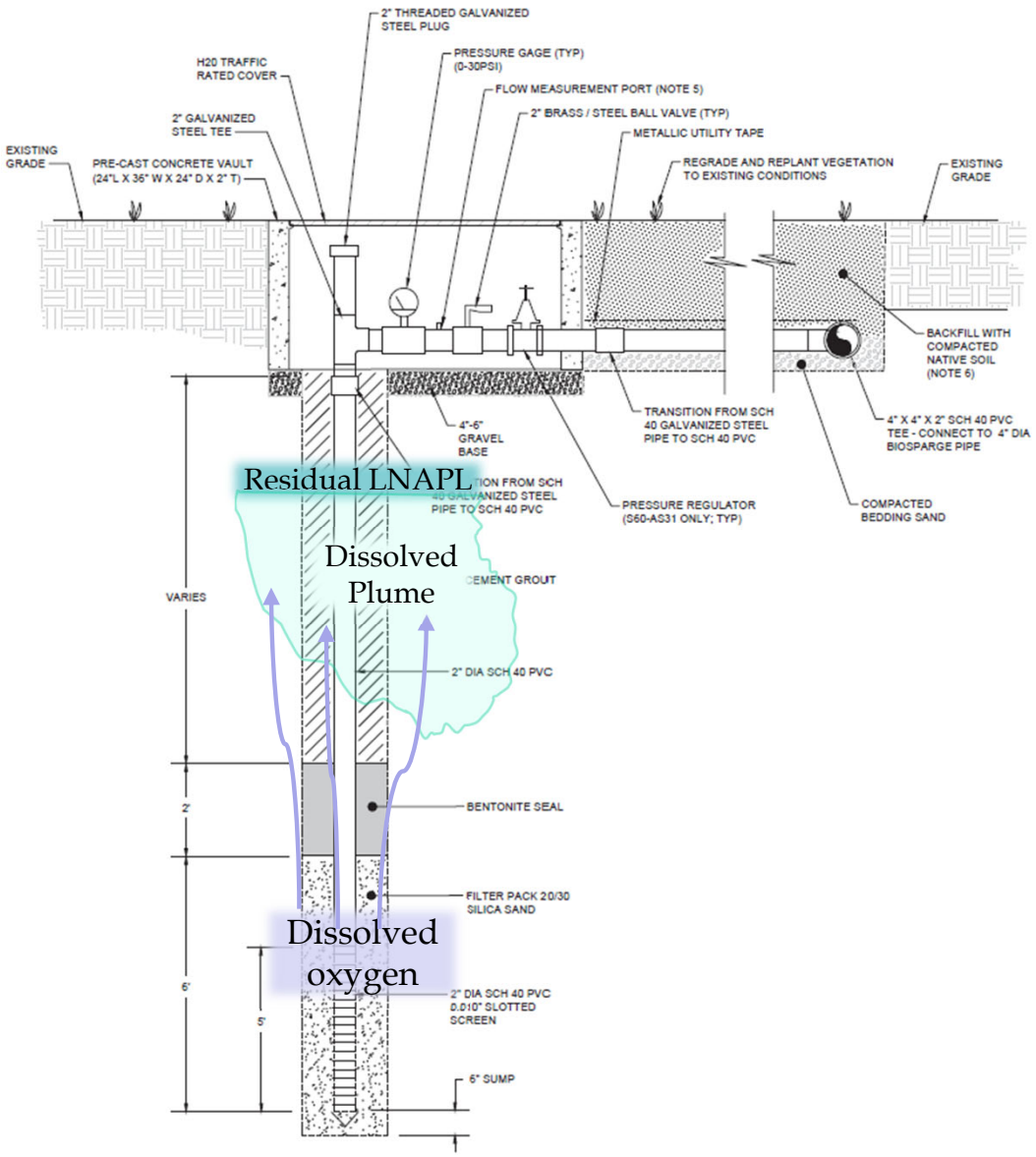
Proposed SWMU 60 Remediation Enhancements

Existing System:	**Proposed System Enhancements:**
Vertical Biosparge Well	Proposed Vertical Biosparge Well
HDD Bioparge Well	Proposed HDD Biosparge Well
iSOC® Well	Proposed Pressure Monitoring Point

Remedial Design

- **Remedial Design/Remedial Action (RD/RA) Work Plan planning documents submitted to GA EPD in June 2022**

- **System enhancements at each SWMU**
  - Six vertical biosparge wells to expand influence in upgradient areas
  - Two vertical biosparge wells to expand influence in downgradient areas



Proposed Vertical Biosparge Well

Construction Activities

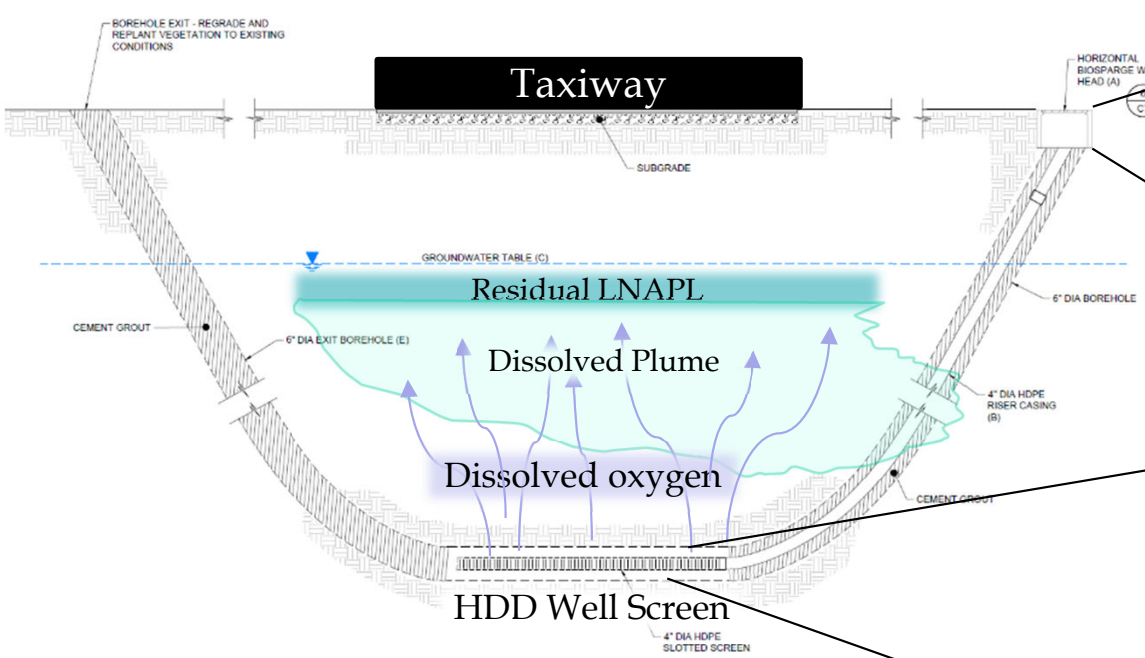
Vertical well drilling

Vertical well ready for temporary burial

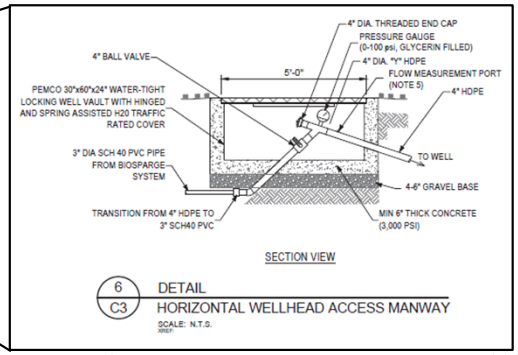
Installed vertical well

Remedial Design

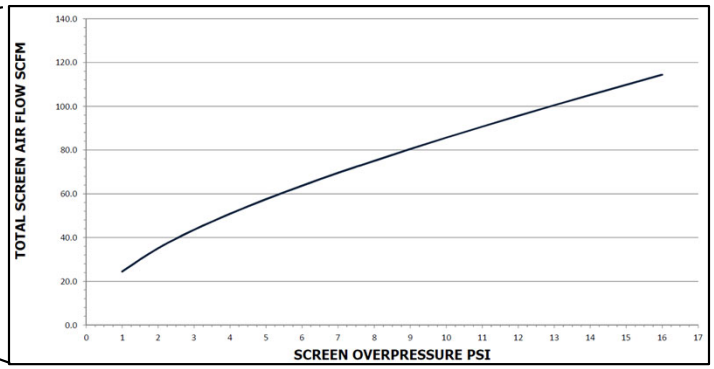
- **System enhancements at each SWMU**
  - Two HDD biosparge wells to address areas underneath taxiway
  - Custom well screens designed to provide uniform air distribution



Proposed HDD Biosparge Well Cross-section



Proposed HDD Biosparge Wellhead with Instrumentation



Predicted Air Flowrate based on Air Pressure Applied at Wellhead

Construction Activities

HDD drilling

Drilling mud recycler

Drill bit

Walkover receiver

Construction Activities

HDD exit pit

Borehole reamer

Well material pullback

Grouting

Construction Activities

Well development

Well capped for temporary burial

Path Forward

- **Q2 2024: Construction of biosparge conveyance piping and mechanical components**
- **Summer 2024: Biosparging with expanded system components**

Questions?

New Business
and
Program Closing

Mr. Heyward Singleton
RAB Installation Co-chair

Next RAB Meeting

Thursday, September 12, 2024

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!