

Welcome



Environmental Advisory Board Meeting

Robins Air Force Base
May 2, 2019



Welcome and Program Introduction

**Ms. Laurel Cordell
EAB Manager**



Acronyms and Abbreviations

- **AFCEC - Air Force Civil Engineer Center**
- **AFFF - Aqueous Film Forming Foam**
- **AS - Air Sparging**
- **AST - Aboveground Storage Tank**
- **BDL - Below Detection Limit**
- **CB - Chlorobenzene**
- **CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act**
- **COC - Contaminant of Concern**
- **DoD - Department of Defense**
- **EC - Emerging Contaminant**
- **EPA - United States Environmental Protection Agency**



Acronyms and Abbreviations

- ERD - Enhanced Reductive Dechlorination
- GBIA - Greater Base Industrial Area
- HA - Health Advisory
- ISCO - In Situ Chemical Oxidation
- iSOC[®] - In Situ Submerged Oxygen Curtain
- LNAPL - Light Non-Aqueous Phase Liquid
- MNA - Monitored Natural Attenuation
- µg/L - microgram(s) per liter
- OES - Optimized Exit Strategy
- PA - Preliminary Assessment
- PFOA - Perfluorooctanoic Acid
- PFOS - Perfluorooctane Sulfonate
- POL - Petroleum, Oil, and Lubricants



Acronyms and Abbreviations

- ppt - part per trillion
- RCRA - Resource Conservation and Recovery Act
- R&D - Research and Development
- RI - Remedial Investigation
- SI - Site Inspection
- SVE - Soil Vapor Extraction
- SWMU - Solid Waste Management Unit
- TCE - Trichloroethene
- TPH - Total Petroleum Hydrocarbons
- UST - Underground Storage Tank
- VI - Vapor Intrusion
- VOC - Volatile Organic Compound



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Perfluorooctane Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA)

Fred Otto, P.G.
Restoration Program Manager
Robins AFB, Georgia

May 2, 2019



Overview

- **What are PFOS and PFOA**
 - Background
- **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**
- **Air Force response**
 - Identify
 - Respond
 - Prevent
- **Robins AFB**
 - Drinking water
 - CERCLA investigation
- **More information**





What are PFOS and PFOA?

PFOS and PFOA are synthetic fluorinated organic compounds used in many industrial and consumer products, including: nonstick cookware, waterproof fabric, some food packaging, and the firefighting agent Aqueous Film Forming Foam (AFFF).

- **AFFF is widely used to extinguish petroleum fires at civilian and military airports across the United States. The Air Force began using AFFF in 1970.**
- **In 2009, the Environmental Protection Agency (EPA) issued provisional health advisories (HA) for PFOS and PFOA, followed by a lifetime HA.**
- **PFOS/PFOA are classified as emerging contaminants (ECs) because:**
 - ☑ **They have reasonable pathways to reach drinking water sources.**
 - ☑ **They present a potential unacceptable risk to human health.**
 - ☑ **Regulatory standards are evolving.**



What are PFOS and PFOA? Background

- **The Air Force is taking aggressive measures to reduce risk of mission-related PFOS/PFOA contamination to drinking water sources**
 - **In June 2009, Department of Defense (DoD) established policy and assigned responsibilities for the identification, assessment, and risk management of EC**
 - **In 2010, Air Force Civil Engineer Center (AFCEC) began a comprehensive assessment that determined AFFF may have been released at the following locations:**

| | |
|--------------------------|--------------------------|
| Active Bases | Fire Training Areas |
| Reserve Bases | Emergency Response Sites |
| Air National Guard Bases | Aircraft Crash Sites |
| Closed Bases | Other release areas |



CERCLA

Comprehensive Environmental Response, Compensation and Liability Act

The Air Force's investigation work and mitigation actions are guided by CERCLA, applicable state laws and EPA drinking water **lifetime** HA of 70 parts per trillion (ppt).

AFCEC is moving forward aggressively in accordance with the CERCLA process to identify, define, and mitigate potential contamination.



The CERCLA process:

- Ensures thorough investigation work
- Promotes accountability, community involvement, and long-term protectiveness



Air Force Response

The Air Force is using a three-step approach to assess the potential for PFOS/PFOA contamination of drinking water and respond appropriately.

1. Identify

- Determine potential AFFF releases
- Verify releases through sampling
- Determine if contaminant pathways to drinking water exist

2. Respond

- PFOS/PFOA > HA, provide alternate drinking water supply
- If PFOS/PFOA < HA, establish monitoring schedule

3. Prevent

- Legacy AFFF disposal
- Transition to new AFFF
- Retrofit fire vehicles



Air Force Response Identify

IDENTIFY:

Preliminary Assessment (PA)

A base-wide records review identifies fire training areas, crash sites and other areas at installations where AFFF may have been released.

Site Inspection (SI)

AFCEC conducts groundwater, surface water, soil, and sediment sampling to verify releases and map contamination and potential pathways to drinking water.

If SI sampling indicates potential pathways to drinking water supplies, AFCEC expands the SI footprint and may test public water systems and private wells.

Once SI is complete, AFCEC determines if investigation yielded adequate data to fully map contamination or if more investigation work is needed.



Air Force Response Respond

RESPOND:

Mitigation

When AFCEC determines PFOS/PFOA levels exceed the lifetime HA in drinking water, the Air Force will take measures to reduce risk and, if needed, provide an alternate drinking water source, like bottled water, until a permanent solution is in place.





Air Force Response Prevent

PREVENT:

Legacy AFFF Disposal: The Air Force is eliminating legacy AFFF through incineration at authorized disposal facilities.

AFFF Replacement: AFCEC is replacing legacy AFFF in fire vehicles, stockpiles and hangar systems with more environmentally responsible formulations.

Retrofit fire vehicles: AFCEC is retrofitting fire vehicles with an ecologic system that prevents foam discharge during equipment testing.





Robins AFB Drinking Water

- **August 2016 - Samples collected from all active Robins AFB drinking water wells (1, 5, 8, 16, 17, and 18)**
- **All results below EPA lifetime health advisory of 70 ppt**
- **All results below detection limits (< 2 ppt)**
- **No impacts to Robins AFB drinking water**



Robins AFB CERCLA Investigation

- **PA completed in May 2015**
- **SI**
 - **Fieldwork - March to April 2017**
 - **Soil and shallow groundwater sampled at 30 areas**
 - **Final Report - June 2018**
 - **Recommended further investigation at 29 areas**
- **Addition investigation timeline not yet determined**
 - **Low risk due to incomplete path to drinking water**



More Information

For more information on PFOS/PFOA, visit:

Air Force Civil Engineer Center

www.afcec.af.mil/

<http://www.afcec.af.mil/WhatWeDo/Environment/Perfluorinated-Compounds>

Environmental Protection Agency

www.epa.gov/

Agency for Toxic Substances and Disease Registry

www.atsdr.cdc.gov/



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Update on Progress at Select Restoration Sites

Mike Perlmutter, P.E.
Jacobs

May 2, 2019



Site Updates

- **Solid Waste Management Unit (SWMU) 17 (OT017)**
- **SWMU 36 (DC034)**
- **SWMU 47 (CG-C504)**
- **SWMU 10B (SS040)**



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SWMU 17 (OT017) Update on Progress

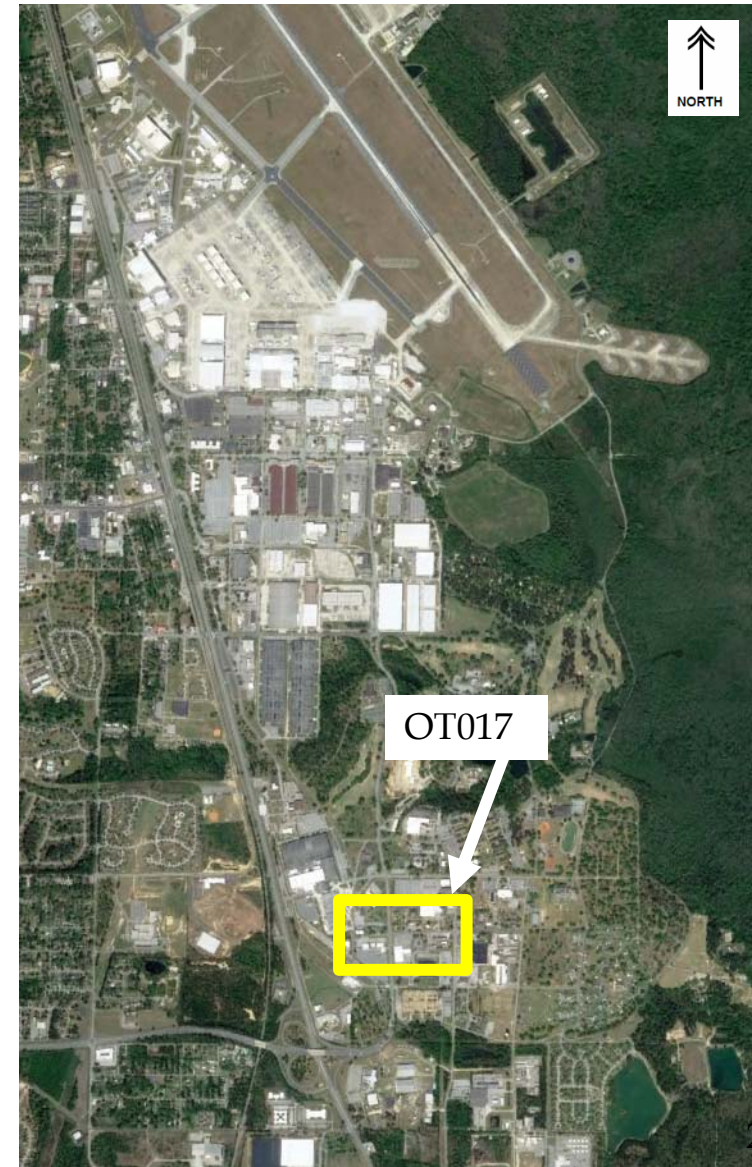
**Mike Perlmutter, P.E.
Technical Lead
Jacobs**

May 2, 2019



Background

- 5,000-gallon waste solvent underground storage tank (UST) located northwest of Building 645; used from 1971 to 1988
- In 1987, the trichloroethene (TCE) concentration exceeded the drinking water standard [5 micrograms per liter ($\mu\text{g}/\text{L}$)] in a Base water supply well east of Building 645
- TCE plume had migrated more than 2,000 feet from the former UST; OT017 encompasses the contaminated groundwater
- Part of site within high security avionics repair facility





Regulatory Summary

OT017

Initial Remedies

- Groundwater extraction and treatment
- Soil Vapor Extraction (SVE)

Updated Remedy

- Continue SVE (but shut down groundwater extraction)
- Enhanced reductive dechlorination (ERD)

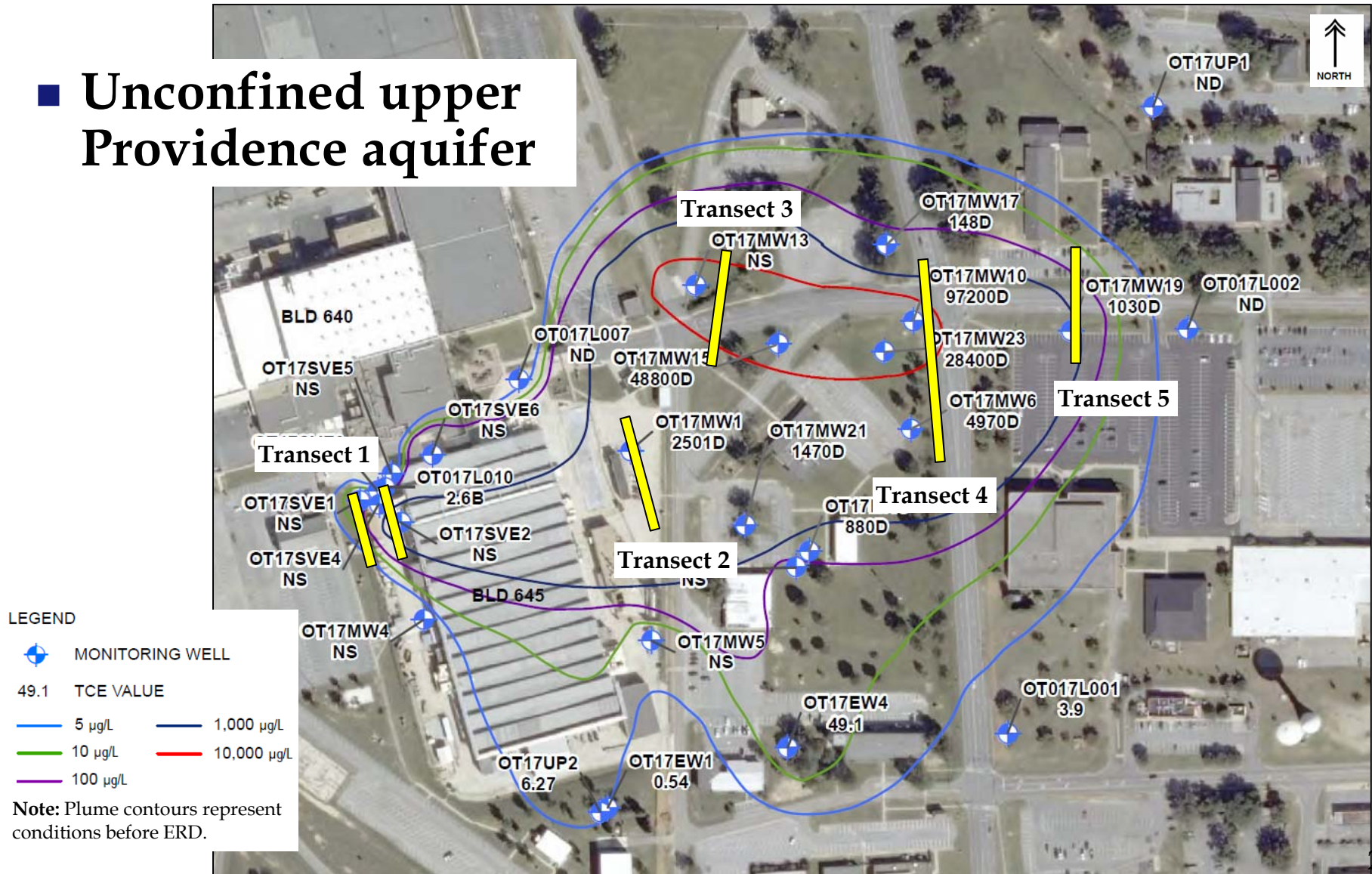
Key Contract Performance Metrics

- Reduction of TCE concentrations in 4 unconfined upper Providence wells as compared to April 2011
- Reduction of TCE concentrations in 4 confined upper Providence wells as compared to April 2013
- Reduction of total volatile organic concentrations (VOCs) concentrations in 4 unconfined upper Providence wells as compared to April 2015
- Reduction of total VOC concentrations in 4 confined upper Providence wells as compared to April 2015



Remedial System - Injection Well Transects

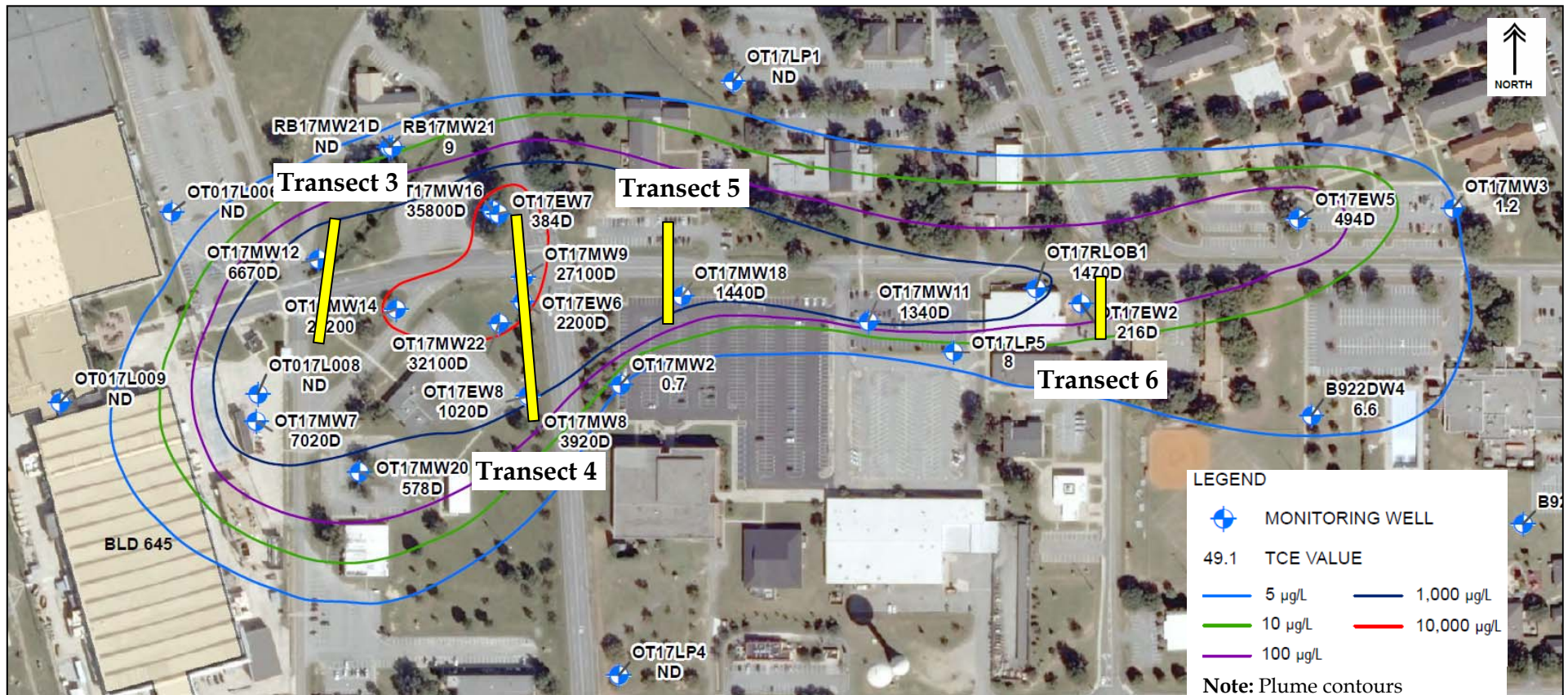
■ Unconfined upper Providence aquifer





Remedial System - Injection Well Transects

■ Confined upper Providence aquifer



LEGEND

- MONITORING WELL
- 49.1 TCE VALUE
- 5 µg/L
- 10 µg/L
- 100 µg/L
- 1,000 µg/L
- 10,000 µg/L

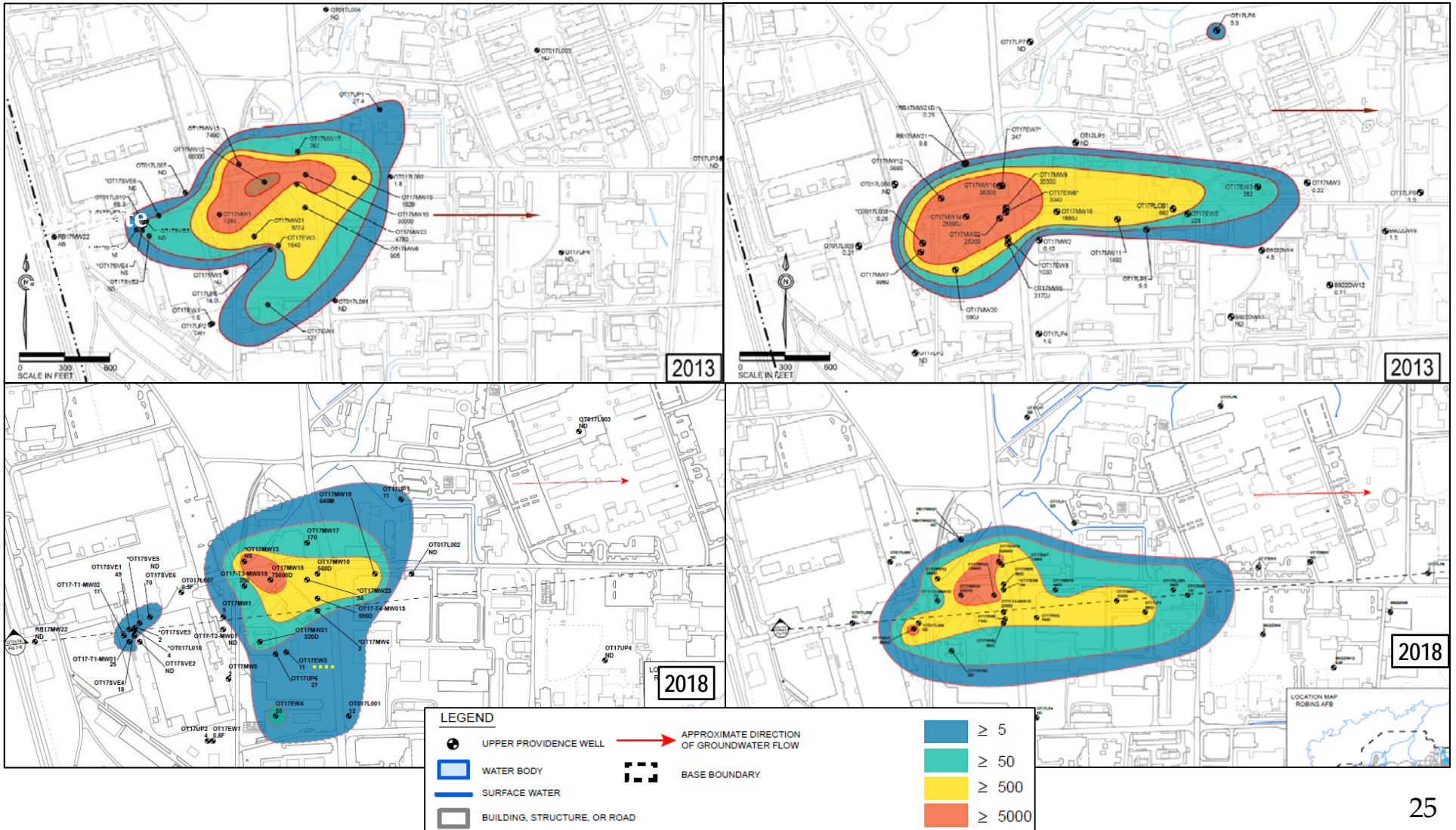
Note: Plume contours represent conditions before ERD.



Current Status

TCE Plume in unconfined upper Providence

TCE Plume in confined upper Providence

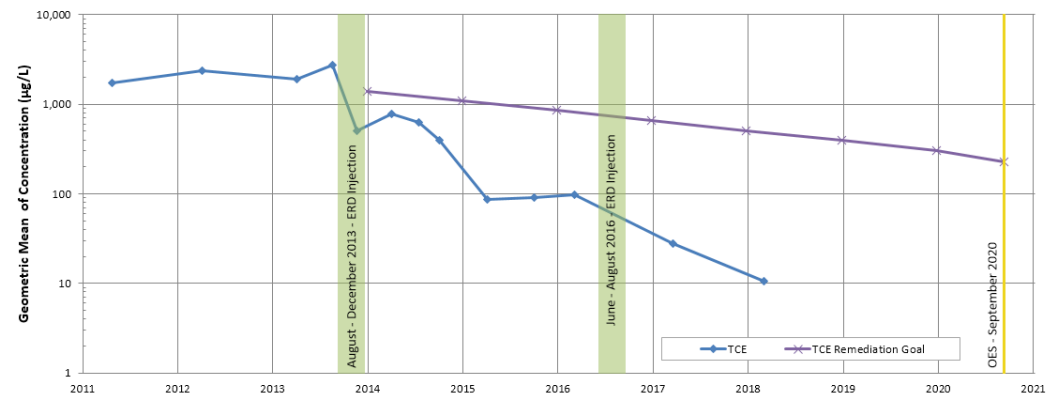




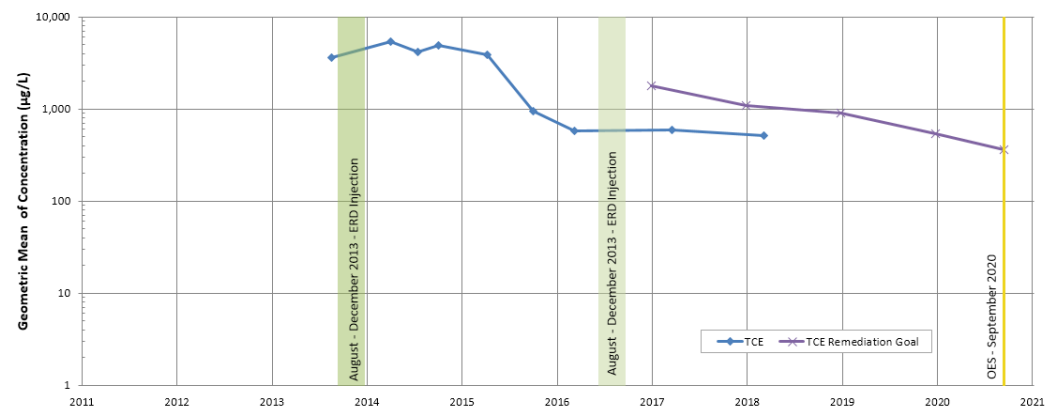
Current Status

- Conduct another carbon substrate and buffering agent injection event in summer 2019
- Continue groundwater performance monitoring
- Continue SVE system operation and monitoring

Geometric Mean of TCE in OT017 Performance Wells (Unconfined)



Geometric Mean of TCE in OT017 Performance Wells (Confined)





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SWMU 36 (DC034) Update on Progress

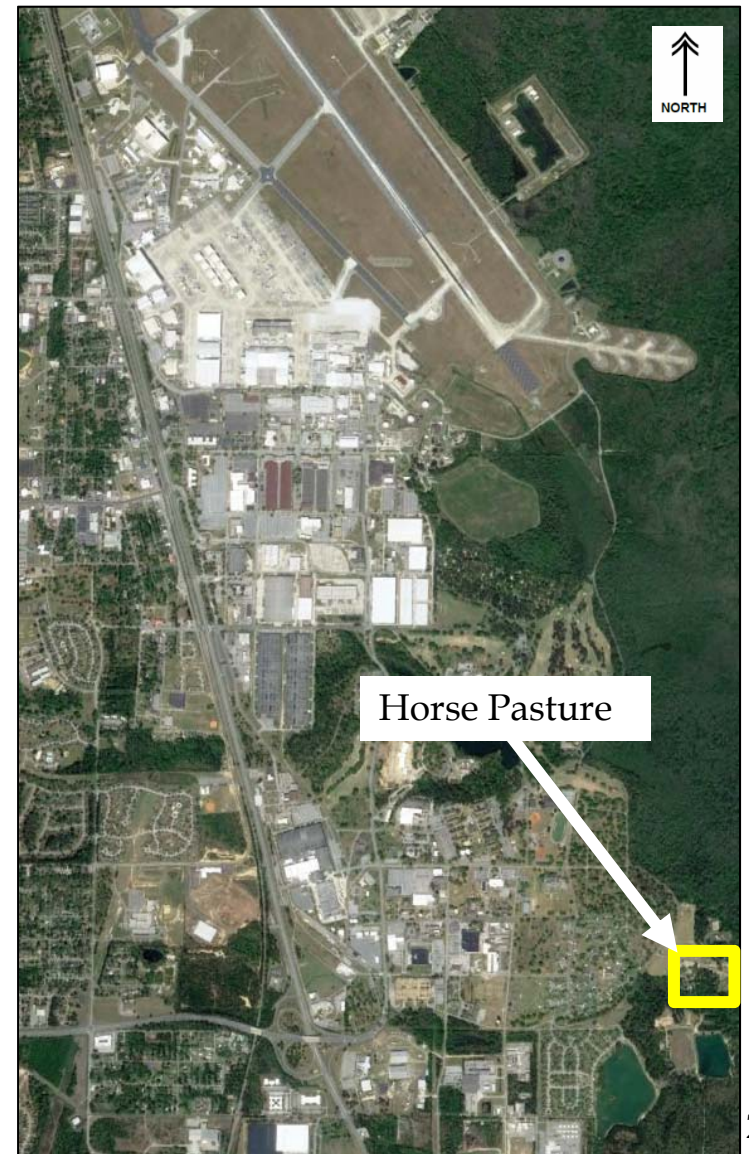
**Mike Perlmutter, P.E.
Technical Lead
Jacobs**

May 2, 2019



Background

- **Horse Pasture Trench Disposal Site**
 - Used for disposal of wastes in pits and trenches from mid 1950s to mid 1970s
- **Environmental investigation started in 1998**





Regulatory Summary

Horse Pasture

- | | |
|----------------------------------|---|
| Initial Remedies | <ul style="list-style-type: none">• Nearly 64,000 tons of impacted soil excavated and disposed offsite in November 2004• In situ chemical oxidation (ISCO) in groundwater |
| Updated Remedy | <ul style="list-style-type: none">• ERD (biostimulation and bioaugmentation)• Aerobic bioremediation• Air Sparge (AS)/SVE cut-off barrier |
| Key Contract Performance Metrics | <ul style="list-style-type: none">• <u>ERD</u> - Reduction of TCE concentrations in 7 wells as compared to April 2009• <u>ERD</u> - Reduction of total VOC concentrations in 7 wells as compared to April 2015• <u>In situ submerged oxygen curtain (iSOC®)</u> - Reduction of chlorobenzene (CB) concentrations in 3 wells as compared to April 2009• <u>AS/SVE</u> - Reduction of total VOC concentrations in 3 wells as compared to December 2013 |



Remedial System



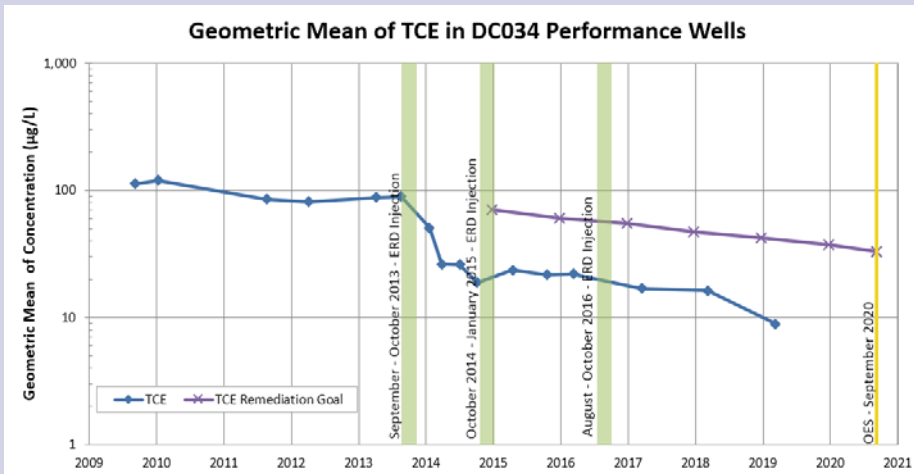
- LEGEND**
- TREATMENT SYSTEM MONITORING WELL
 - EXISTING MONITORING WELL
 - ERD WELL
 - ISOC[®] WELL
 - AIR SPARGE WELL
 - EXISTING INJECTION WELL
 - BRADLEY PLYWOOD PROPERTY BOUNDARY
 - FENCELINE
 - ISOC[®] TRANSECT
 - ERD BIOBARRIER
 - SOIL VAPOR EXTRACTION TRENCH
 - SOIL VAPOR EXTRACTION WELL
 - 2013 TOTAL cVOC CONTOUR (100 PPB, DASHED WHERE INFERRED)
 - 2013 TOTAL cVOC CONTOUR (1000 PPB, DASHED WHERE INFERRED)
 - 2013 TOTAL cVOC CONTOUR (10000 PPB, DASHED WHERE INFERRED)



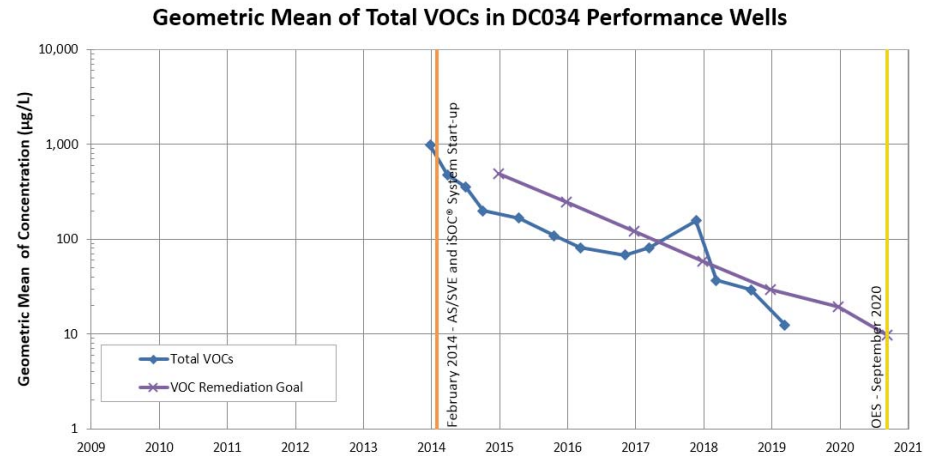


Current Status

ERD Metrics



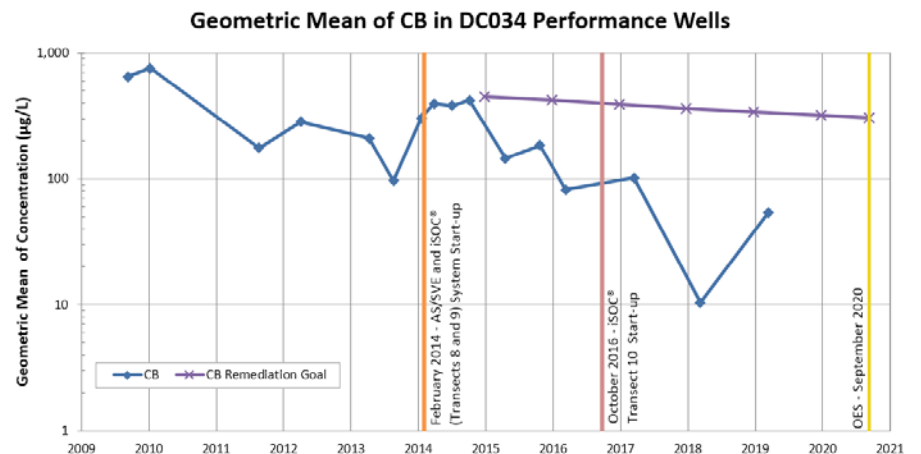
AS/SVE Metric



Total VOC reduction

- 2018 goal is 10 percent total molar reduction
- 64 percent reduction as of March 2019

CB Metric





Current Status

- **Conduct another carbon substrate and buffering agent injection event in summer 2019**
- **No changes, other than continued operation optimization, are recommended for the operation of the AS/SVE and iSOC[®] systems**
- **Continue annual groundwater monitoring to assess system performance**



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SWMU 47 (CG-C504) Update on Progress

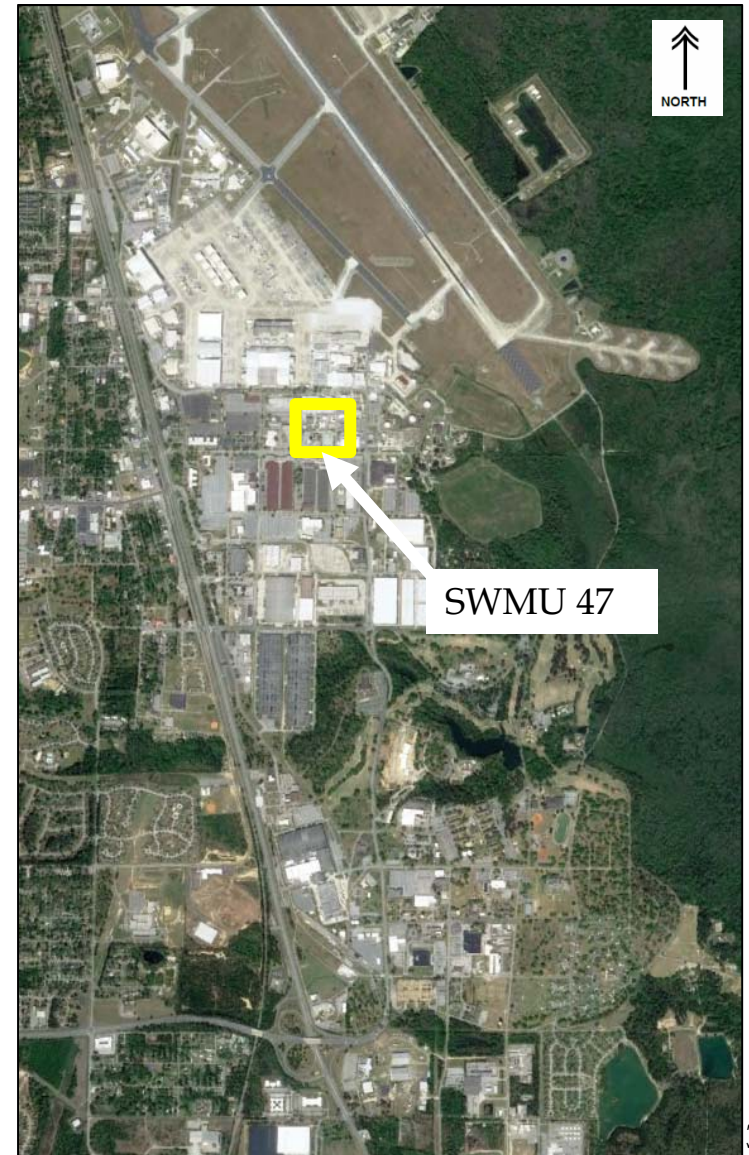
**Mike Perlmutter, P.E.
Technical Lead
Jacobs**

May 2, 2019



Background

- SWMU 47 is east of Building 177 in vicinity of 250,000-gallon aboveground storage tank (AST) that contains No. 2 diesel fuel and is connected to Base's tank farm
- Building 177 is a steam plant that supports Greater Base Industrial Area (GBIA) and other areas
- In 1996, petroleum-contaminated soil was encountered by contractors during upgrades made to AST containment dike and fuel lines
- Resource Conservation and Recovery Act (RCRA) Facility Investigation completed in 1997





Regulatory Summary

SWMU 47

Initial Remedies

- Light Non-aqueous Phase Liquid (LNAPL) recovery using dual-phase extraction
- Biosparging

Updated Remedy

- Continued LNAPL recovery
- Surfactant flushing using biodegradable surfactant to promote mobilization, solubilization, and recovery of LNAPL
- Excavation of arsenic-impacted soil
- Sample soil to assess extent of hexavalent chromium

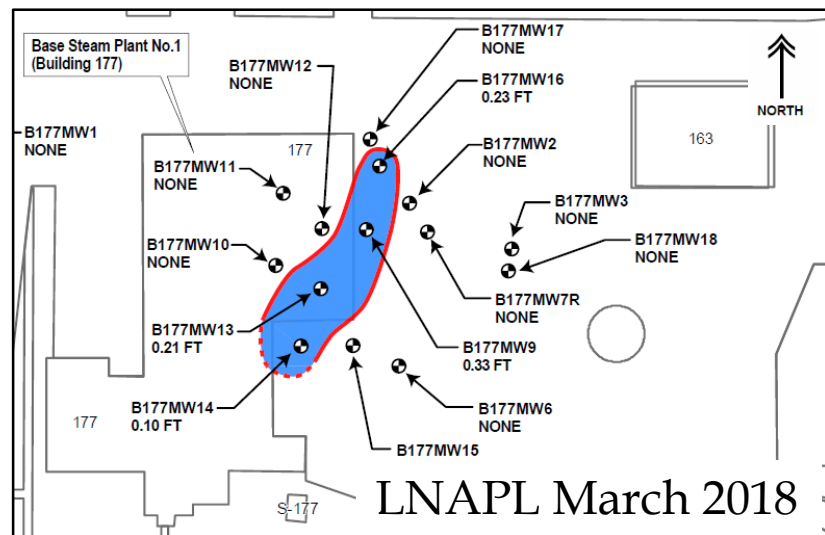
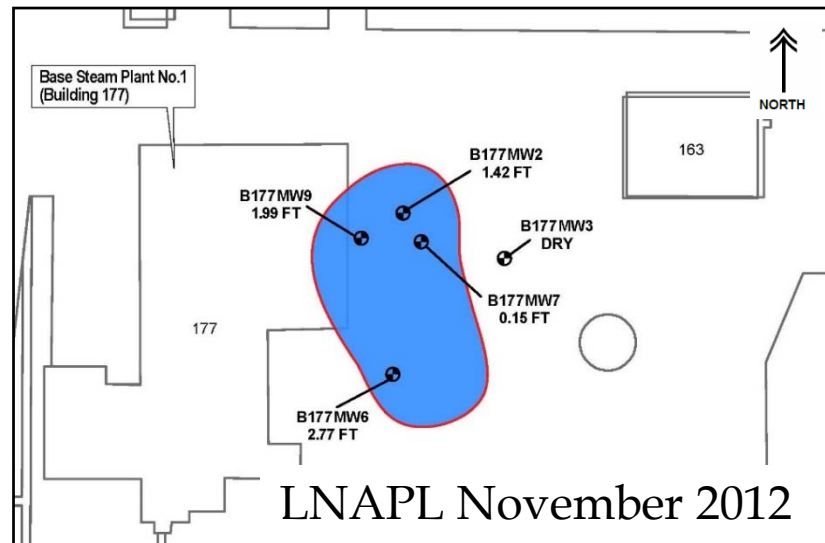
Key Contract Performance Metrics

- *Pending final approval of Supplemental Site Investigation (SSI) and Optimized Exit Strategy Plan*



Current Status

- More than 12,000,000 gallons of groundwater have been extracted and treated (system currently inactive)
- LNAPL removal
 - From July 1, 2017 to June 30, 2018 (last reporting period): 1.3 gallons via manual bailing
 - Since implementation of the optimized remedy in 2013: 600 gallons
 - Since the start of all corrective actions at the site in 2000: more than 1,400 gallons





Current Status

| COC | RL (µg/L) | Above RL? | Number of Wells with RL Exceedance | Maximum Value (µg/L) 4Q2018 | Maximum Value (µg/L) 2013* |
|-------------------------------|-----------|-----------|------------------------------------|-----------------------------|----------------------------|
| 1,2,4-Trimethylbenzene | 4.2 | Yes | 2 of 8 | 39 | 134 |
| 1,3,5-Trimethylbenzene | 156 | No | 0 of 8 | 3 | 43 |
| 1-Methylnaphthalene | 2.94 | Yes | 2 of 8 | 120 | 720 |
| 2-Methylnaphthalene | 62.6 | Yes | 2 of 8 | 95 | 936 |
| Arsenic | 10 | Yes | 2 of 8 | 27.1 | 27.1 |
| Benzene | 5 | No | 0 of 8 | 2 | 3 |
| Benzo(a)anthracene | 1 | No | 0 of 8 | 0.08 | 0.08 |
| Dibenzo(a,h)anthracene | 1 | No | 0 of 8 | 0.02 | 0.047 |
| Naphthalene | 0.19 | Yes | 4 of 8 | 50 | 186 |

Notes:

COC = contaminant of concern

LNAPL = light non-aqueous phase liquid

µg/L = microgram(s) per liter

RL = remedial level

BDL = below detection limit

* Before implementation of the updated remedy

- **Highest dissolved-phase concentrations are co-located with residual LNAPL**



Current Status

- **Awaiting final approval of SSI**
- **Update remediation objectives/metrics based on LNAPL extent and thicknesses**
- **Continue to optimize remediation strategy at the site to maximize LNAPL removal and groundwater treatment**



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SWMU 10B (SS040) Update on Progress

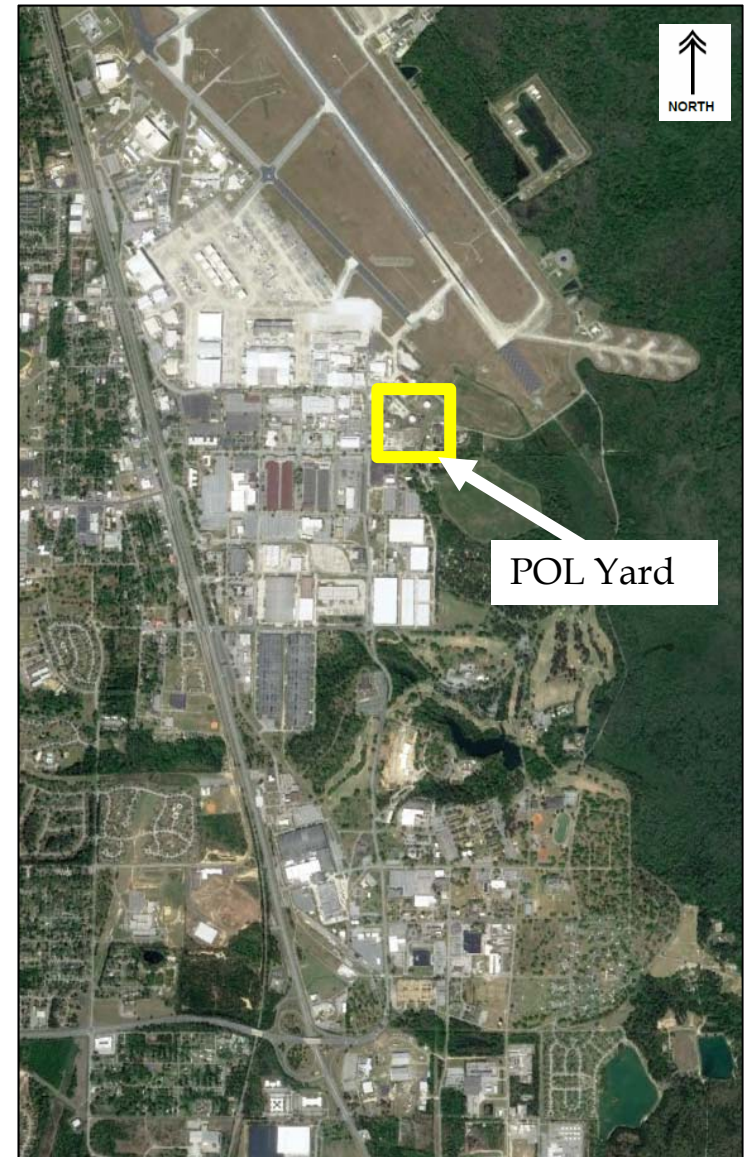
**Mike Perlmutter, P.E.
Technical Lead
JACOBS**

May 2, 2019



Background

- Centrally located at Robins AFB, east of the GBIA
- Includes soil and groundwater contamination from past petroleum spills and leaking fuel lines in the Petroleum, Oil, and Lubricants (POL) Yard
- Includes aboveground storage tanks for Jet Propellant Fuel No. 8, control buildings, and underground fuel lines
- Six Jet Propellant Fuel No. 4 tanks were previously located on the western end of the POL Yard





Regulatory Summary

POL Yard

Initial Remedies

- SVE
- AS/SVE curtain along Richard Ray Boulevard
- Biosparging (shut down in April 2011)
- Monitoring and removal of LNAPL
- Monitored Natural Attenuation (MNA)

Updated Remedy

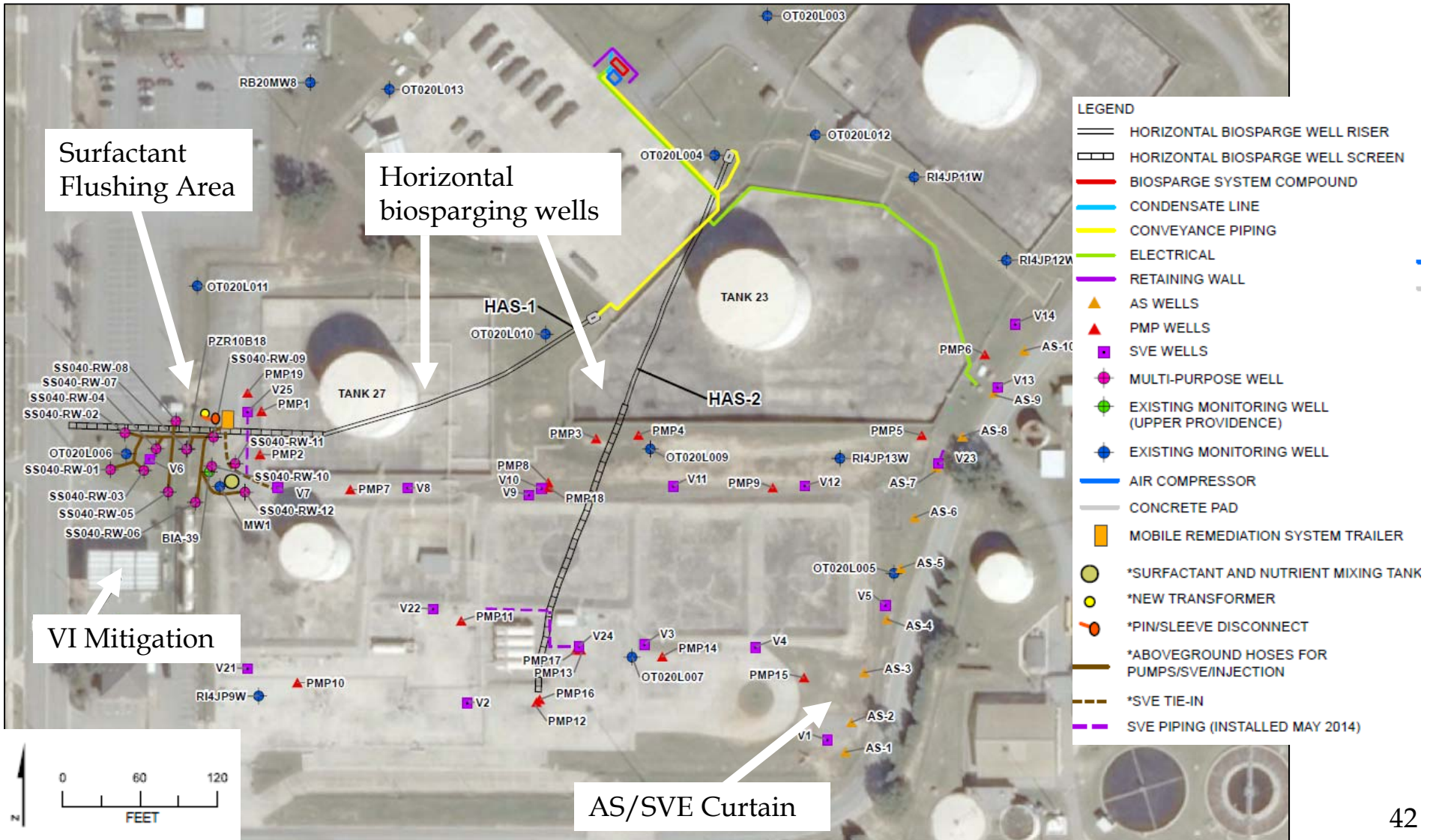
- Continue operation of existing SVE and AS/SVE systems
- Surfactant flushing to promote LNAPL recovery and biodegradation
- Install and operate sub-slab depressurization system for vapor intrusion (VI) mitigation
- Install and operate two horizontal biosparging wells
- Continue MNA

Key Contract Performance Metrics

- Demonstrate reduction of measurable LNAPL in all site monitoring wells to below measurable levels
- Demonstrate reduction of benzene concentrations



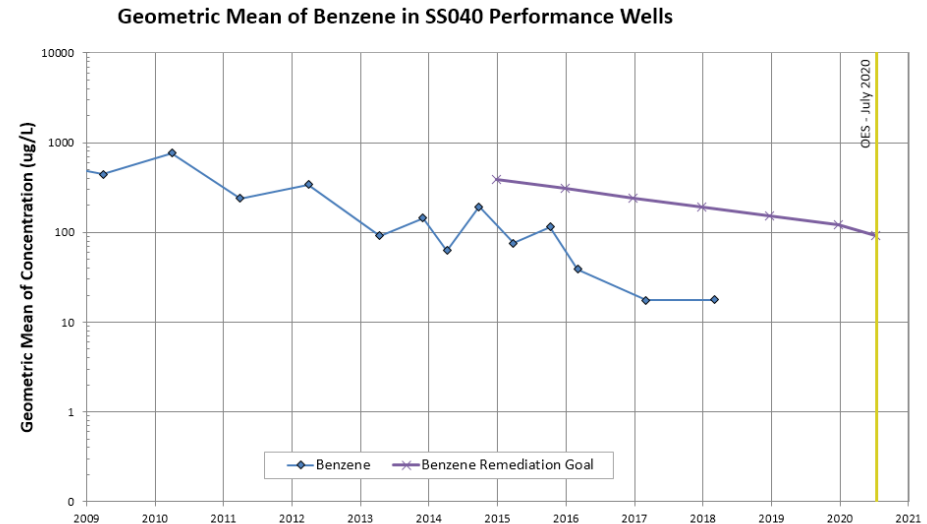
Remedial System





Current Status

- No LNAPL detected since May 2017
- Approximately 74.5 pounds of VOCs and 3,850 pounds of total petroleum hydrocarbons (TPH) were removed from the subsurface from July 2017 to June 2018
- In comparison...
 - 610 pounds of VOCs and 13,400 pounds of TPH were removed in 2015
 - 3,000 pounds of VOCs and 87,000 pounds of TPH have been removed since 2012



■ Ongoing action items:

- Consider fewer LNAPL monitoring events
- Continue system operation
- Continue routine groundwater sampling



New Business and Program Closing

**Laurel Cordell
EAB Manager**



Next EAB Meeting

Thursday, 1 August 2019





Please...

Complete the meeting evaluation and feedback form and leave at your seat



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



Thank you!