

**Subject:** Final Minutes, Quarterly Restoration Advisory Board (RAB)  
Meeting, Longhorn Army Ammunition Plant (LHAAP)

**Location of Meeting:** Karnack Community Center, Karnack, Texas

**Date of Meeting:** August 7, 2014, 6:00 – 7:00 PM

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**Meeting Participants:**

**LHAAP/BRAC:** Rose M. Zeiler,  
**USACE:** Aaron Williams  
**USAEC:** Robin Paul  
**AECOM:** Dave Wacker, Bill Gabehart  
**TCEQ:** April Palmie  
**USEPA Region 6:** Rich Mayer, Kent Becher (USGS liaison)  
**USFWS:** Paul Bruckwicki, Jason Roesner  
**RAB:** **Present:** Charles Dixon, Paul Fortune, Carol Fortune, Judy Vandeventer, Judith Johnson, Tom Walker, Richard LeTourneau, Terry Britt  
**Absent:** Ken Burkhalter, Robert Cargill, Lee Guice, Ted Kurz, James Lambright, Nigel Shivers, Pickens Winters, John Pollard, Jr.

**Public:**

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An agenda handout for the RAB meeting, fact sheets on the Groundwater Treatment Plant performance, Harrison Bayou and Goose Prairie Creek and Perimeter Well data, in addition to a hard copy of the AECOM slide presentation were provided for the meeting. Draft May 15, 2014 RAB meeting minutes will be provided with these minutes for combined review. (Note: May 15, 2014 minutes were provided to RAB members on August 15 for a 30-day review period.)

**Welcome and Introduction**

Dr. Zeiler opened the meeting and asked that Mr. Wacker introduce guest Mr. Bill Gabehart with AECOM who has supported on-site work for over a year and is substituting for Gretchen McDonnell who was absent due to illness.

### *Tour of Longhorn Sites Recap*

Mr. Wacker spoke briefly about the highlights of the tour and site visit to LHAAP-29 and showed pictures from the tour. The tour took place at 3:00 p.m. on May 15 with three RAB members attending. (The tour handout and sign-in sheet were appended to the May 2014 RAB meeting minutes for the record.)

### **Open Items – Dr. Rose Zeiler**

#### *Website Update*

Dr. Zeiler informed the group that the “Longhorn Army Ammunition Plant, Environmental Restoration Program” website is ready to launch for public viewing and will be available within the week. She said the RAB will have a chance to review the website before it is made available to the public, and that a notice introducing the website to the local public will be published in the Marshall and Shreveport newspapers.

Mr. Wacker then explained the website contains information varying from the history of Longhorn to current activities taking place for each site where remediation is occurring today. He discussed how the website will have an interactive map, in which the viewer can click on individual sites to view more detailed information. Mr. Wacker said there will also be a *Remedial Technologies* page on the website where viewers can see some of the remedies that are currently in place, ranging from the use of a ground water treatment plant (GWTP), to in-situ bioremediation. He stated there will also be interactive *Plume Maps*, and a section where viewers can click on a specific site to see the most current final documents for that site. The *Administrative Record* section of the website will contain the entire Longhorn Administrative Record for the last 30 years, and will be available for viewer download. Finally, Mr. Wacker stated that there is a *RAB* page on the website, detailing the purpose of the RAB, providing a link to the charter, and announcing the schedule and location for the next RAB meeting schedule.

### **Defense Environmental Restoration Program (DERP) Update – AECOM (Dave Wacker)**

#### Environmental Status of Sites (LHAAP-18/24 and LHAAP-29)

Mr. Wacker began the DERP Update discussion, and said that since the last RAB meeting, the majority of field work has been completed at sites LHAAP-18/24 and LHAAP-29. He explained that LHAAP-18/24, known as Burning Grounds Number 3 and the Unlined Evaporation Pond (where the Groundwater Treatment Plant is located), is comprised of approximately 34.5 acres, with the primary contaminants of concern (COCs) being: perchlorate, VOCs (TCE and MC) and metals. Two primary groundwater contamination source areas have been identified within site LHAAP-18/24: the Air Curtain Destructor area and the Unlined Evaporation Pond area. One of the main objectives of this summer’s field work in these two locations was to further identify COC source areas in groundwater. In the Unlined Evaporation Pond area, this most recent investigation using a grid pattern sampling

technique identified additional source contamination resulting in the delineation of a larger source area in this location.

Mr. Wacker said that historical data for the Air Curtain Destructor indicated estimated dimensions of the contamination source area to be approximately 300 feet x 200 feet in area. This most recent investigation indicates the source area is actually significantly smaller than previously presumed, approximately 70 feet x 70 feet in horizontal dimension, at a shallow depth range of approximately 30 feet to 50 feet below ground surface. Because of the additional investigation of these two areas, Mr. Wacker stated there is an increased level of confidence in the measurements of extent of COCs for both locations.

### Treatability Studies

Mr. Wacker explained that different treatment technologies have been or will be evaluated for multiple sites at Longhorn, with information on site soil type, groundwater characteristics, site specific COCs and concentrations of COCs used to determine which technology would be best-suited in treating a specific contamination problem. He said that these studies also provide data supporting the estimated cost to implement each remedy.

Mr. Wacker discussed the four different treatability studies at LHAAP-18/24 that are currently being completed. These studies include: thermal treatability testing, in-situ microcosm testing, bench-scale microcosm testing, and zero-valent iron/emulsified zero-valent iron microcosm testing. He stated that once all of these test are completed, a Revised Feasibility Study and a Proposed Plan for the preferred remedy will be presented.

Mr. Wacker said that similar treatability studies are underway at LHAAP-29, but aquifer testing will also be completed at this site to assess specific aquifer characteristics.

### Monitored Natural Attenuation (MNA) Sites (LHAAP-46, 50, 58 and 67)

Data for the first year of groundwater MNA monitoring should be available for several sites at the next RAB meeting, and the annual reports for these sites will be underway. The annual reports will include an analysis of COC trends, and an initial evaluation of MNA effectiveness at each site.

### GWTP Update

Mr. Wacker said that treated water continues to be returned to LHAAP-18/24 through the sprinkler system, or to Harrison Bayou when sufficient flow is present. Due to the current lack of flow in the bayou, water is being discharged back to LHAAP-18/24 via a sprinkler system.

Mr. Wacker stated that another round of compliance sampling data has been collected, and is currently under review by EPA and TCEQ. He said that maintenance and repairs of wells, pumps, tanks and ancillary equipment is on-going.

Dr. Zeiler asked the RAB if the supplied data handouts are useful to the members. Mr. Britt replied that they were useful, especially the information applying to Harrison Bayou.

Mr. Walker asked why water cannot be discharged to the bayou all the time? Ms. Palmie replied that GWTP treated water is not allowed to negatively impact the bayou, and nutrients in the discharge could disrupt water quality in the bayou if released when insufficient water is present to dilute the nutrients. Dr. Zeiler added that the holding pond is not being used much anymore, instead the water is being returned to the LHAAP-18/24 ground surface through the sprinkler system.

Mr. Wacker presented the surface water handout, showing four years of historical data compared to the most recent data collected June 2014.

Ms. Palmie asked if it would be possible to add a quarterly summary showing how much treated water was discharged into the Bayou versus applied to the ground surface within the site by sprinkler. Mr. Wacker replied that since it is a lot of information to add, that the best way to present this information will be explored and presented to the group.

## **Other Environmental Restoration Issues – Rose Zeiler**

### Site LHAAP-37 Bioplug Demonstration

Dr. Zeiler discussed the July 23<sup>rd</sup> sampling event that results will be returned in August, which is important because the demonstration ends in October, and it is hopeful to get positive results guiding us toward our best options moving forward to either continue the study or bring it to a close.

Ms. Paul discussed the benefits of sampling short term vs. long term to identify if there really was a trend in contamination to support continuing or ending the study.

### Dispute Status Update

Mr. Mayer informed the group that we should hear a result in mid-August. Dr. Zeiler added that next month the dispute will have been going on for three years and that the data is getting old. She also stated that Army is considering moving forward with groundwater remedies at some of the disputed sites, where the TCEQ and USEPA have concurred with the clean-up approach, but won't sign the ROD due to the dispute. Ms. Robin Paul, AEC commented that obtaining regulator concurrence with implementation of the groundwater remedies outside the disputed RODs is important to AEC, which funds the work. Mr. Mayer indicated that he will consult with others at Region 6 on this issue.

### Schedule

Mr. Wacker said the next RAB meeting is scheduled for November 20<sup>th</sup> from 6:00PM to 7:30PM at the Karnack Community Center.

## Environmental Condition of Property VI and VII

Dr. Zeiler presented a map of the transferred and transferring acreage. She discussed the ECP VI acreage stating that Site 49, the Static Test and Igniter Areas and other sites are included in ECOP VI which is being reviewed by USFWS. The next ECP, ECP VII will include the former range sites and the Construction Debris Landfill Parcel. The ECOP V area was transferred to USFWS earlier this year.

## Upcoming Field Work Update

Mr. Wacker discussed that sampling will continue for groundwater monitoring networks at LHAAP-46, 50, 58, 67 in addition to semi-annual compliance sampling for LHAAP-18/24.

Mr. Wacker said that completion reports are in-progress for remedial actions conducted at LHAAP-37, 46, 50, 58 and 67. He said that the first annual Remedial Action Operation reports are also being developed for LHAAP-46 and 67. Results for all the field work completed over the summer for LHAAP-18/24 and 29 will also be put into reports over the winter. Sites where work has ceased pending the dispute resolution include: LHAAP-03, 04, 47, 16, 17, 29, 001-R-01 and 003-R-01.

## Questions or Comments

Ms. Vandeventer reported that someone from the EPA called Karnack Water Supply Corporation saying they wanted to do some sampling. Mr. Mayer said it was he who had made the call, and all EPA wants to do is take a sample out of the Karnack Water Supply Corporation well closest to site LHAAP-46. Ms. Vandeventer asked Mr. Mayer to please provide the results of sampling to Karnack Water Supply Corporation when available. He agreed to do so.

## **Adjourn**

### **August Meeting Attachments and Handouts:**

- *Meeting Agenda*
- *AECOM PowerPoint Presentation*
- *GWTP Treated Groundwater Volumes Handout*
- *Surface Water Sampling Results Handout*
- *LHAAP Perimeter Well Sampling Results Handout*

### **Acronyms**

ACD	Air curtain destructor
AECOM	AECOM Technical Services, Inc.
BRAC	Base Realignment and Closure
CERCLA	Comprehensive, Environmental Response, Compensation, and Liability Act
CLI	Caddo Lake Institute
CPT/MIP	Cone Penetrometer Testing/Membrane Interface Probe
DERP	Defense Environment Response Program

DNAPL	Dense Non-Aqueous Phase Liquid
DPT	Direct Push Technology
FFA	Federal Facility Agreement
GWTP	Groundwater Treatment Plant
ICT	interceptor-collector trench
INF	Intermediate-Range Nuclear Forces
ISB	In-Situ Bioremediation
LHAAP	Longhorn Army Ammunition Plant
LNAPL	Light Non-Aqueous Phase Liquid
MNA	Monitored Natural Attenuation
PCE	tetrachloroethylene
RAB	Restoration Advisory Board
ROD	Record of Decision
TAG	Technical Assistance Grant
TCE	trichloroethene
TCEQ	Texas Commission on Environmental Quality
UEP	Unlined Evaporation Pond
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Center
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
µg/L	micrograms per liter
VOC	volatile organic compound



LONGHORN ARMY AMMUNITION PLANT  
RESTORATION ADVISORY BOARD  
Karnack, Texas  
(479) 635-0110

**AGENDA**

**DATE:** Thursday, August 7, 2014  
**TIME:** 6:00 – 7:30 PM  
**PLACE:** Karnack Community Center, Karnack, Texas

- 06:00** Welcome and Introduction
- 06:05** Open Items {RMZ}
- RAB Administrative Issues
  - Minutes
  - Tour Recap
  - Website
- 06:15** Defense Environmental Restoration Program (DERP) Update {AECOM}
- On-going work LHAAP 18/24, LHAAP 29
  - Treatability Studies Overview
  - MNA Site Overview (LHAAP-46, 50, 58, 67)
  - Groundwater Treatment Plant (GWTP) Update
  - Surface Water and Perimeter Well Sampling
- 07:15** Other Environmental Restoration Issues {RMZ}
- Bioplug Demonstration at LHAAP-37
  - Dispute Status Update
  - Schedule
  - Environmental Condition of Property VII
- 07:20** Next RAB Meeting Schedule (November 20) and Closing Remarks
- 07:30** Adjourn {RMZ}

# **Longhorn Army Ammunition Plant Restoration Advisory Board Meeting August 7, 2014**

AECOM Environment



# Agenda

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# RAB Administrative Issues

- RAB Tour Recap



# RAB Administrative Issues

- RAB Tour Recap



# RAB Administrative Issues

- Minutes from May RAB Meeting
- Website Update

HOME BACKGROUND SITES ▼ REMEDIAL TECHNOLOGIES PLUME MAPS ADMIN RECORD GET INVOLVED ▼

## Longhorn Army Ammunition Plant Environmental Restoration Program

The next RAB meeting will take place Thursday, August 7th at 6:00 pm. [See the Calendar.](#)

# RAB Administrative Issues

[HOME](#) [BACKGROUND](#) [SITES](#) [REMEDIAL TECHNOLOGIES](#) [PLUME MAPS](#) [ADMIN RECORD](#) [GET INVOLVED](#)

## Overview

[Print this Overview](#)

### Welcome

Welcome to the website for Longhorn Army Ammunition Plant (also known as LHAAP). LHAAP is a former government-owned facility located in Karnack, Texas, about 40 miles west of Shreveport, Louisiana. The site was placed on the National Priorities List on August 9, 1990. The cleanup is taking place under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) with the United States Army as the lead agency in coordination with the United States Environmental Protection Agency (USEPA) Region 6 and the Texas Commission on Environmental Quality (TCEQ). The Army Base Realignment and Closure Division (BRAC) is overseeing the environmental cleanup of contamination at the site that resulted from the production of various defense items (such as explosives, pyrotechnics, illuminants and rocket motors) beginning near the start of WWII, through the early 1990s. As a result of these efforts, approximately 7,000 acres of the 8,416-acre former installation have been found suitable for transfer to the United States Fish and Wildlife Service (USFWS) and are now being managed as the Caddo Lake National Wildlife Refuge.



# RAB Administrative Issues

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## Background

Longhorn Army Ammunition Plant (LHAAP) is a former, government-owned, contractor-operated and maintained Department of Defense facility located in central-east Texas in the northeastern corner of Harrison County. The footprint of the former U.S. Army installation occupies 8,416 acres between State Highway 43 at Karnack, Texas, and the southwestern shore of Caddo Lake. The nearest cities are Marshall, Texas, approximately 14 miles to the southwest, and Shreveport, Louisiana, approximately 40 miles to the southeast. Caddo Lake, a large freshwater lake situated on the Texas-Louisiana border, bounds LHAAP to the north and east. (See maps below).



### Photos



[Historical Photos \(PDF\)](#)



# RAB Administrative Issues

HOME BACKGROUND SITES REMEDIAL TECHNOLOGIES PLUME MAPS ADMIN RECORD GET INVOLVED

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Click each site on map, will take you to that site page

Carido Lake

LHAAP-16  
LHAAP-58  
LHAAP-04  
LHAAP-03  
LHAAP-37  
LHAAP-29  
LHAAP-50  
LHAAP-67  
LHAAP-12  
LHAAP-18  
LHAAP-17  
LHAAP-24  
LHAAP-18  
LHAAP-003-R-01  
LHAAP-001-R-01

Legend  
Streams  
Roads  
LHAAP Boundary  
Site Boundaries  
Lake/Pond

0 1,500 3,000 6,000 Feet  
Longhorn Army Ammunition Plant

LHAAP was declared excess to Army's needs in July 1997, with the U.S. Army issuing a contract to remove salvageable property a year later. In 2003 administrative control of the installation was transferred within the Army to the Base Realignment and Closure

## Remedial Technologies

### Groundwater Treatment Plant

The Groundwater Treatment Plant (GWTP) is a wastewater treatment plant, located just outside of Site LHAAP-18/24.

The GWTP treats extracted water through air stripping, precipitation, and biological methods. Treated water that is deemed below regulated contamination standards (or clean) is released to Harrison Bayou, if the Bayou has ample flowing water. If the water flow in Harrison Bayou is low, the treated water is then released onto LHAAP-18/24 via a sprinkler system, or into a holding pond, for later treatment.

### Monitored Natural Attenuation

Monitored natural attenuation (MNA) is the monitoring of groundwater to confirm whether natural attenuation (or gradual lessening of contaminants) processes are occurring, and occurring at a sufficient rate.

Monitoring is achieved by periodic groundwater sampling of monitoring wells at each site. These wells are located both inside the known contaminant plume, and outside of it. This helps to find the extent of the contamination, and determine if the plume is growing, shrinking, or moving.

### ISB

In-situ bioremediation (ISB) can sound like a very complicated procedure, but it explains

### Groundwater Treatment Plant





# RAB Administrative Issues

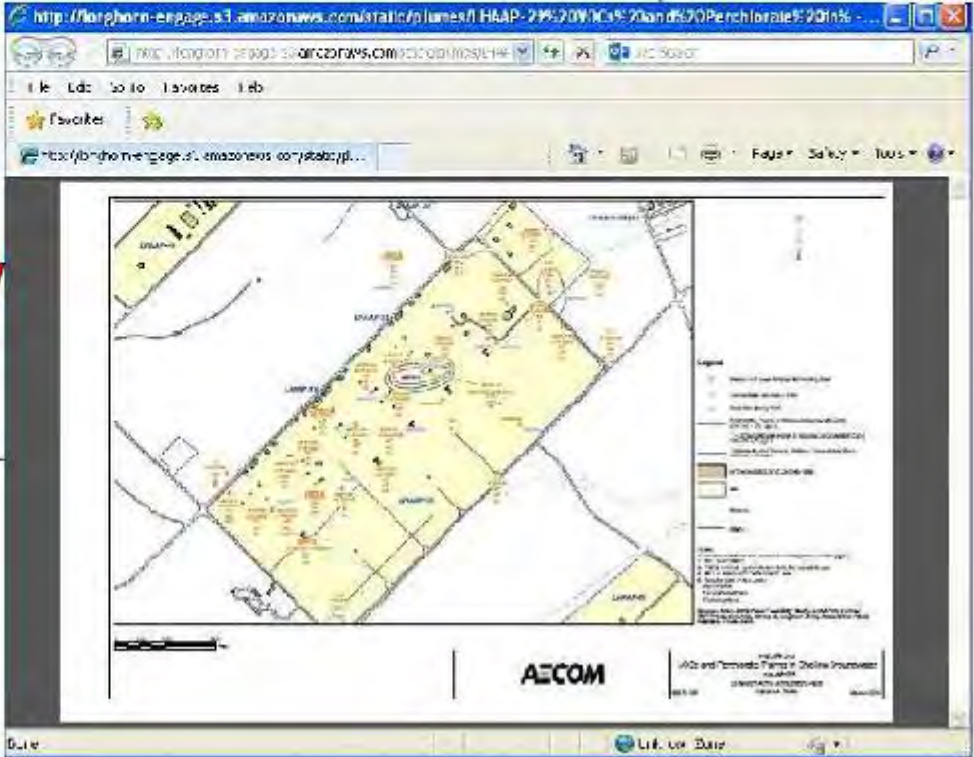
HOME BACKGROUND SITES ▾ REMEDIAL TECHNOLOGIES PLUME MAPS ADMIN RECORD GET INVOLVED ▾

## Longhorn Army Ammunition Plant Environmental Restoration Program

### Plume Maps

- LHAAP-04 Perchlorate Concentration in Groundwater.pdf
- LHAAP-12 GwPlumesJul2009.pdf
- LHAAP-17 VOC and Perchlorate Plume Map.pdf
- LHAAP-29 VOCs and Perchlorate in Shallow Groundwater.pdf
- LHAAP-46 TCE in Intermediate Zone.pdf
- LHAAP-46 TCE in Shallow Zone.pdf
- LHAAP-47 cis and VC in Shallow Intermediate GW.pdf
- LHAAP-47 Perchlorate in Shallow GW.pdf
- LHAAP-47 TCE and PCE in Shallow Intermediate GW.pdf
- LHAAP-47 TCE in Intermediate Groundwater.pdf
- LHAAP-47 TCE in Shallow GW.pdf
- LHAAP-50 Extent of Perchlorate in Shallow GW.pdf
- LHAAP-50 Extent of VOCs in Shallow GW.pdf
- LHAAP-59 VOC Groundwater Plume Map.pdf
- LHAAP-67 Contaminant Plumes in Shallow Groundwater.pdf

**Click map link, opens in new webpage**



http://longhorn-enrpage.s3.amazonaws.com/strat/plumes/lhaap-29%20VOCs%20and%20Perchlorate%20in%20shallow%20groundwater.pdf

File Edit Go to Favorites Help

http://longhorn-enrpage.s3.amazonaws.com/strat/plumes/lhaap-29%20VOCs%20and%20Perchlorate%20in%20shallow%20groundwater.pdf

Legend

AECOM

WQs and Perchlorate Plumes in Shallow Groundwater

0.1 mi

Link Use Data

# RAB Administrative Issues

HOME BACKGROUND SITES REMEDIAL TECHNOLOGIES PLUME MAPS ADMIN RECORD GET INVOLVED

## Longhorn Army Ammunition Plant

Environmental Restoration Program

**Click link, opens in new webpage**

### Admin Record

The following is a list of historical Admin Records.

- 1976-2000 Admin Record Chronology Index
- 1978 Volume 1
- 1980 Volume 1
- 1984 Volume 1
- 1985 Volume 1
- 1986 Volume 1
- 1988 Volume 1
- 1990 Volume 2
- 1989 Volume 1
- 1989 Volume 2
- 1989 Volume 3
- 1989 Volume 4
- 1989 Volume 5
- 1990 Volume 1
- 1991 Volume 1
- 1992 Volume 1
- 1992 Volume 2

**LONGHORN ARMY AMMUNITION PLANT**

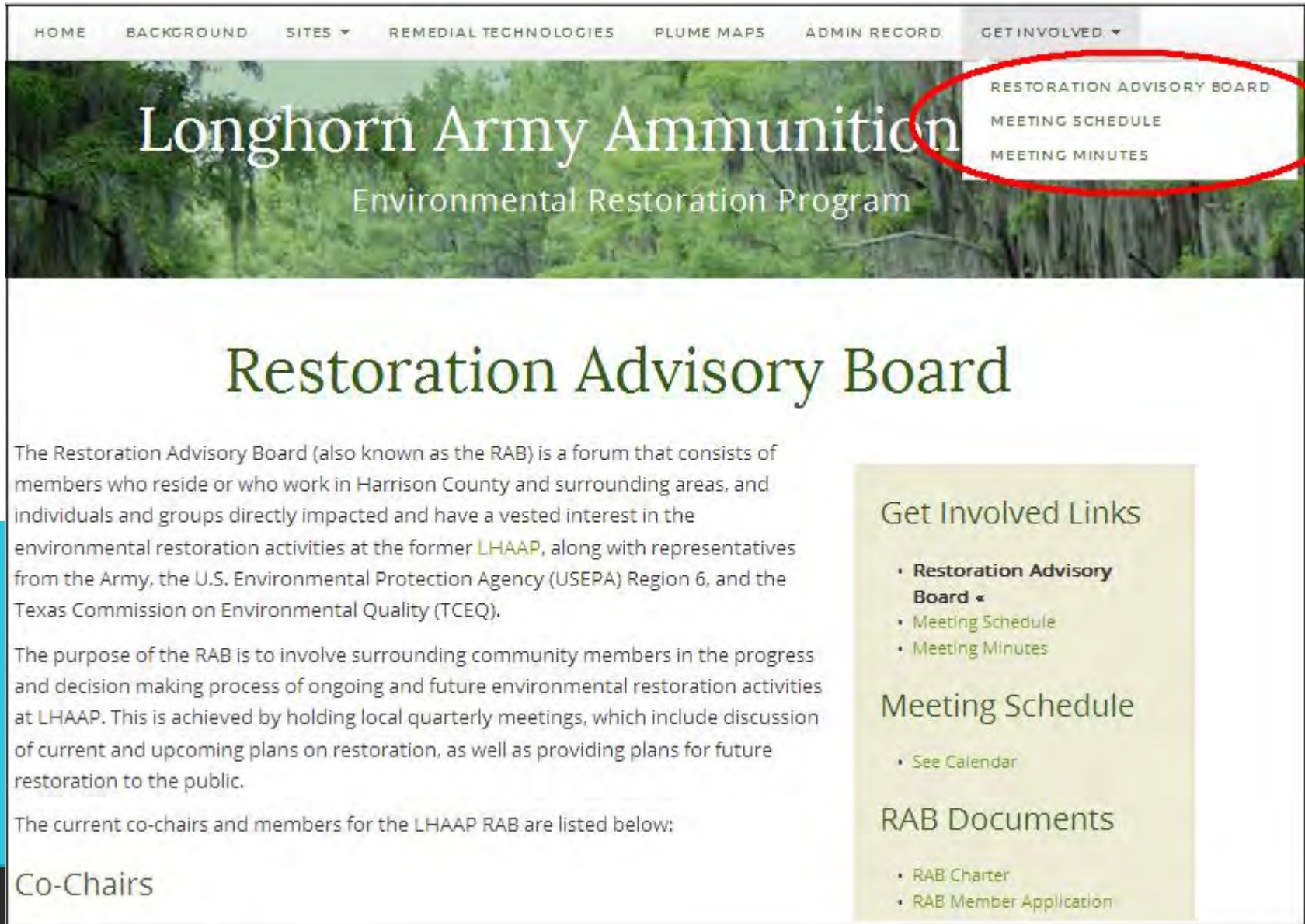
**KARNACK, TEXAS**

**ADMINISTRATIVE RECORD**

**A note on downloading files**

Many of these files in the Admin Record are large PDFs - some in excess of 500MB. Please be patient while downloading.

# RAB Administrative Issues



HOME BACKGROUND SITES ▼ REMEDIAL TECHNOLOGIES PLUME MAPS ADMIN RECORD GET INVOLVED ▼

## Longhorn Army Ammunition

Environmental Restoration Program

### Restoration Advisory Board

The Restoration Advisory Board (also known as the RAB) is a forum that consists of members who reside or who work in Harrison County and surrounding areas, and individuals and groups directly impacted and have a vested interest in the environmental restoration activities at the former LHAAP, along with representatives from the Army, the U.S. Environmental Protection Agency (USEPA) Region 6, and the Texas Commission on Environmental Quality (TCEQ).

The purpose of the RAB is to involve surrounding community members in the progress and decision making process of ongoing and future environmental restoration activities at LHAAP. This is achieved by holding local quarterly meetings, which include discussion of current and upcoming plans on restoration, as well as providing plans for future restoration to the public.

The current co-chairs and members for the LHAAP RAB are listed below:

#### Co-Chairs

#### Get Involved Links

- [Restoration Advisory Board](#)
- [Meeting Schedule](#)
- [Meeting Minutes](#)

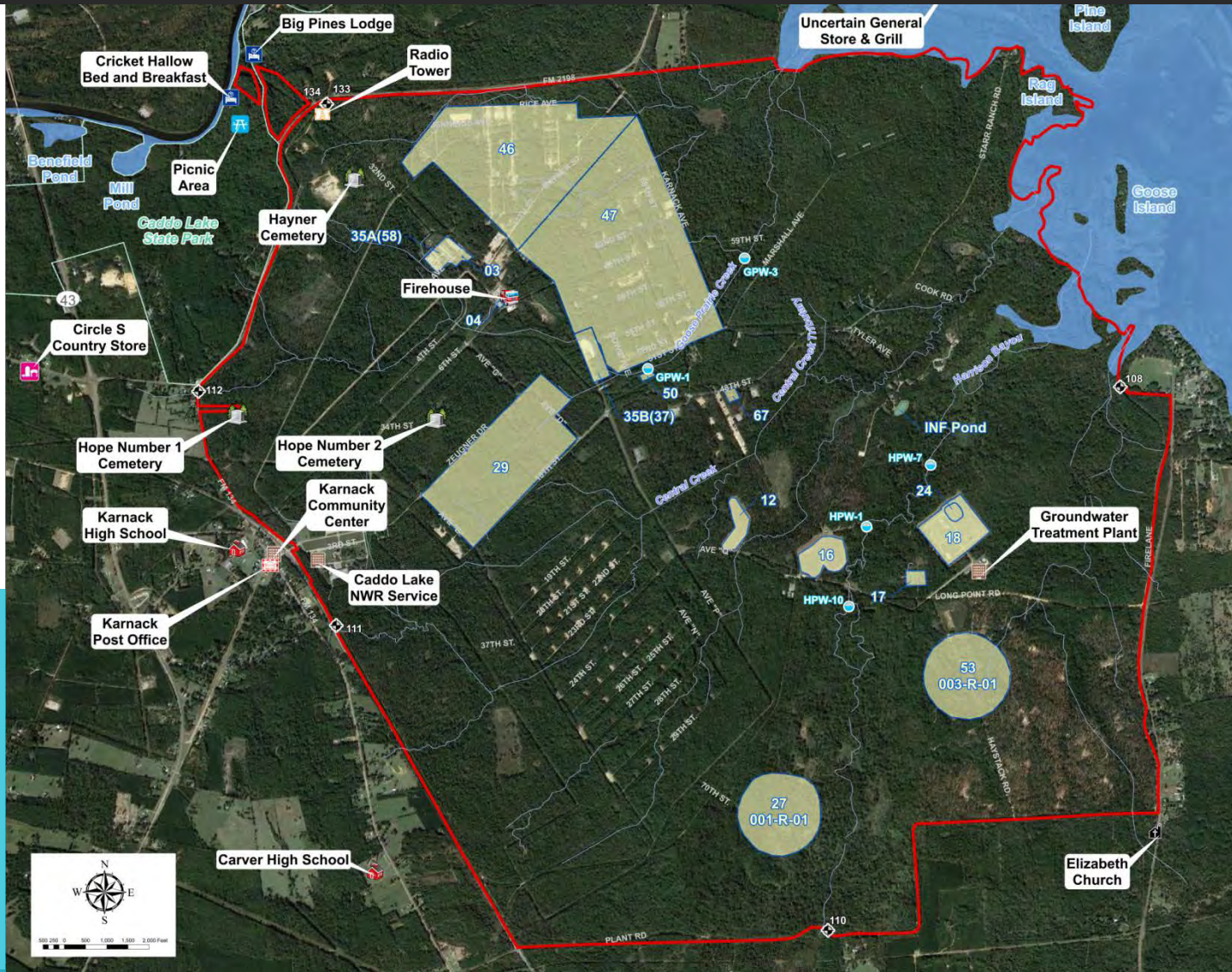
#### Meeting Schedule

- [See Calendar](#)

#### RAB Documents

- [RAB Charter](#)
- [RAB Member Application](#)

# Longhorn Map



# Longhorn Active Site List

LHAAP-03	Building 722 Paint Shop
LHAAP-04	Pilot Wastewater Treatment Plant
LHAAP-12	Landfill 12
LHAAP-16	Landfill 16
LHAAP-17	Burning Ground No.2/Flashing Area
LHAAP-18	Burning Ground No.3
LHAAP-24	Unlined Evaporation Pond
LHAAP-29	Former TNT Production Area
LHAAP-37	Chemical Laboratory Waste Pad
LHAAP-46	Plant Area 2
LHAAP-47	Plant Area 3
LHAAP-50	Former Sump Water Tank
LHAAP-58	Maintenance Complex
LHAAP-67	Aboveground Storage Tank Farm
LHAAP-001-R-01	South Test Area/Bomb Test Area
LHAAP-003-R-01	Ground Signal Test Area

# Status of Environmental Sites

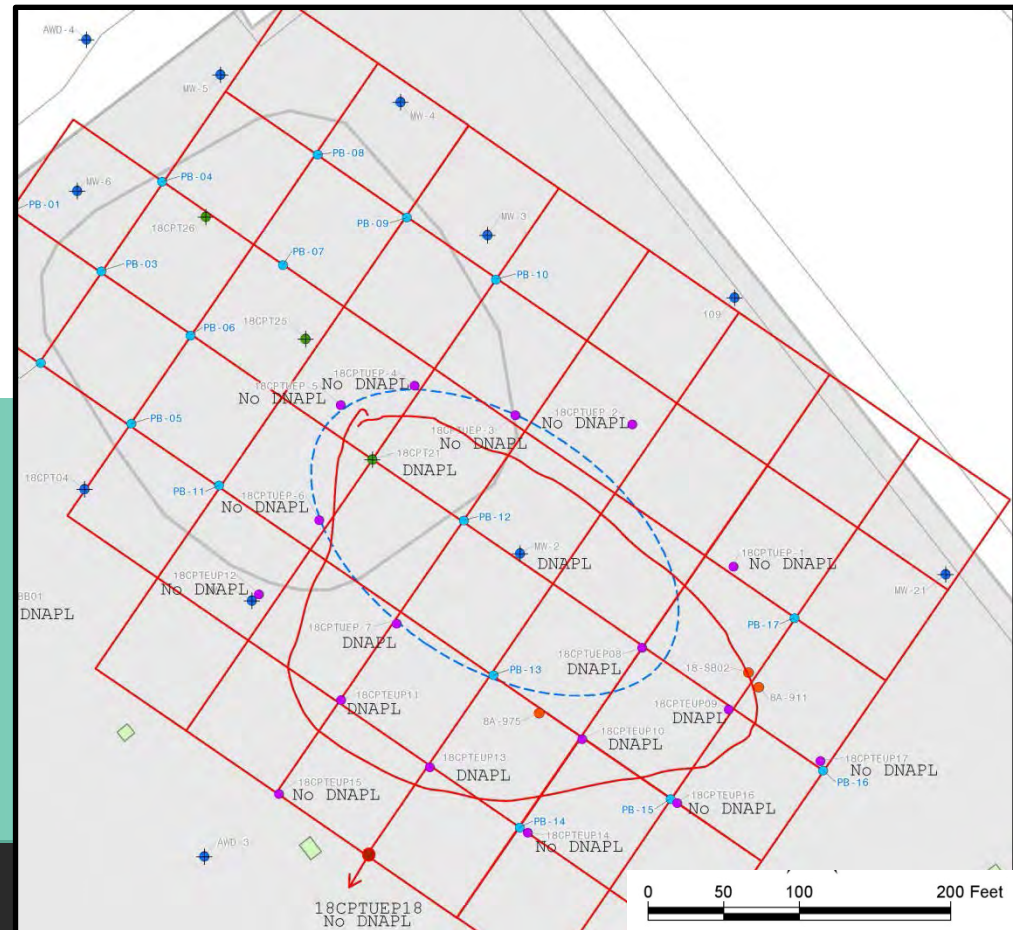
- Primary work activities completed since last RAB meeting were for sites LHAAP-18/24 and LHAAP-29
- LHAAP-18/24 – Burning Grounds #3 and Unlined Evaporation Pond
  - Interim remedy: Continuous extraction and treatment of groundwater from collection trenches surrounding and within the site (green in image below)
  - Contaminants of Concern: Perchlorate, VOCs (TCE, MC), Metals



# Status of Environmental Sites (cont)

## LHAAP-18/24 – Burning Grounds #3 and Unlined Evaporation Pond

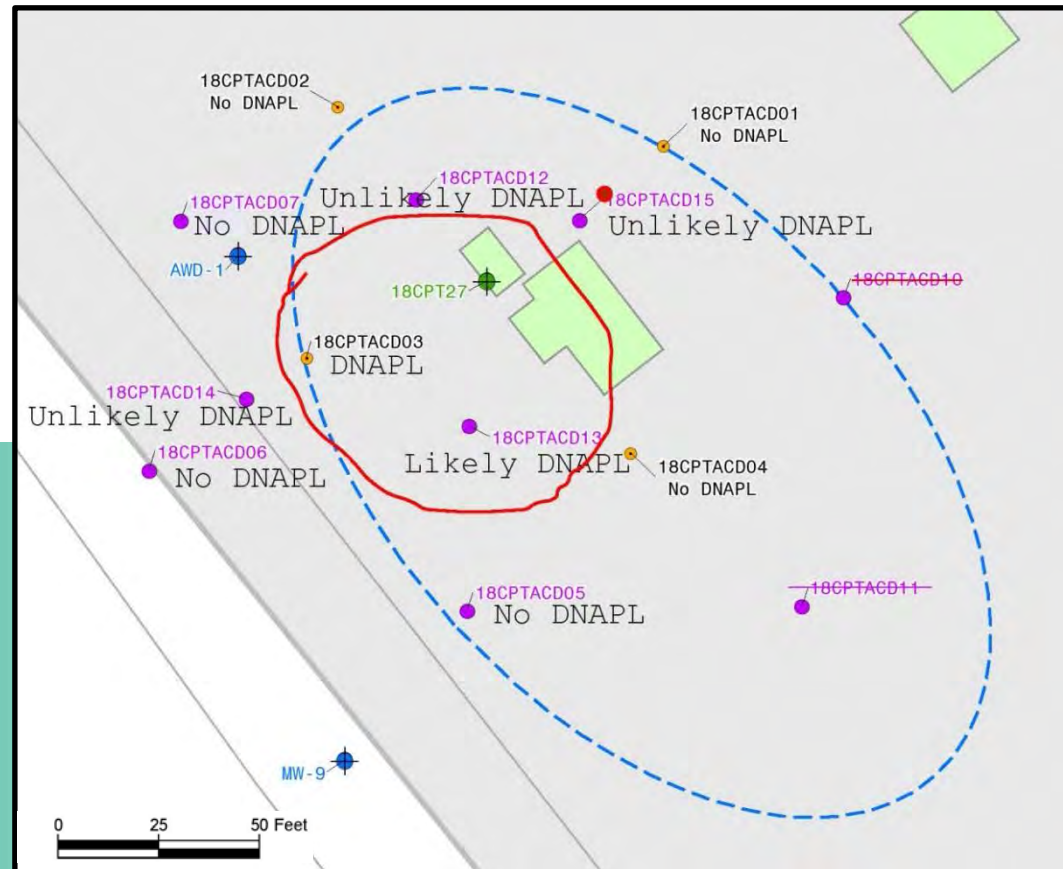
- Investigation of Dense Non-Aqueous Phase Liquid and Soil Source Material at Unlined Evaporation Pond
- DNAPL area extends farther south and east than previously estimated
- Work activities appear to have delineated extent of DNAPL



# Status of Environmental Sites (cont)

## LHAAP-18/24 – Burning Grounds #3 and Air Curtain Destructor

- Investigation of Dense Non-Aqueous Phase Liquid and Soil Source Material at Air Curtain Destructor
- DNAPL area smaller than previously estimated
- Work activities appear to have delineated extent of DNAPL





# Treatability Studies Overview

Treatability testing is often conducted to:

- 1) Determine whether a potential remediation treatment technology should be successful in treating a specific contamination problem; and,
- 2) Evaluate site-specific characteristics that will impact the estimated cost to implement the remedy



# Treatability Studies Overview

## LHAAP-18/24 Treatability Testing

- Thermal Treatability Testing – Determines the amount of electric current needed to heat soil or groundwater to break the bonds of contaminant molecules, allowing evaluation of whether thermal or electrokinetic remediation is suitable and cost effective
- In-Situ Microcosm Testing – evaluates the occurrence and extent of biodegradation in a groundwater plume; testing conducted in the field utilizing Bio-Trap<sup>®</sup> passive samplers that are submitted for laboratory analysis
- Bench-Scale Microcosm Testing – determines whether bacteria that can degrade the target contaminant are present at the site and demonstrates whether the natural biodegradation processes can be enhanced to remediate contamination; testing is conducted in the laboratory using soil and groundwater collected from the site
- Emulsified Zero Valent Iron Microcosm Testing – determines the optimum ZVI-to-soil ratio to degrade contaminants

# Treatability Studies Overview (cont)

## LHAAP-29 Treatability Testing

- Thermal Treatability Testing – Determines the amount of electric current needed to heat soil or groundwater to break the bonds of contaminant molecules, allowing evaluation of whether thermal or electrokinetic remediation is suitable and cost effective
- In-Situ Microcosm Testing – evaluates the occurrence and extent of biodegradation in a groundwater plume; testing conducted in the field utilizing Bio-Trap<sup>®</sup> passive samplers that are submitted for laboratory analysis
- Aquifer Pumping Test – provides information on groundwater flow characteristics required to estimate costs for remedies that include a groundwater extraction or hydraulic control component

# Status of Environmental Sites (cont)

- Monitored Natural Attenuation Sites
  - LHAAP-46 – Plant Area 2
  - LHAAP-35B (37) – Chemical Laboratory
  - LHAAP-50 – Former Sump Water Tank
  - LHAAP-58 – Shops Area
  - LHAAP-67 – Aboveground Storage Tank Farm
- 1<sup>st</sup> Annual Report for each of these sites will be developed in the next quarter containing trend analysis



## Status of Environmental Sites (cont)

- LHAAP-03 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-04 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-16 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-17 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-47 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-001-R-01 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-003-R-01 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute

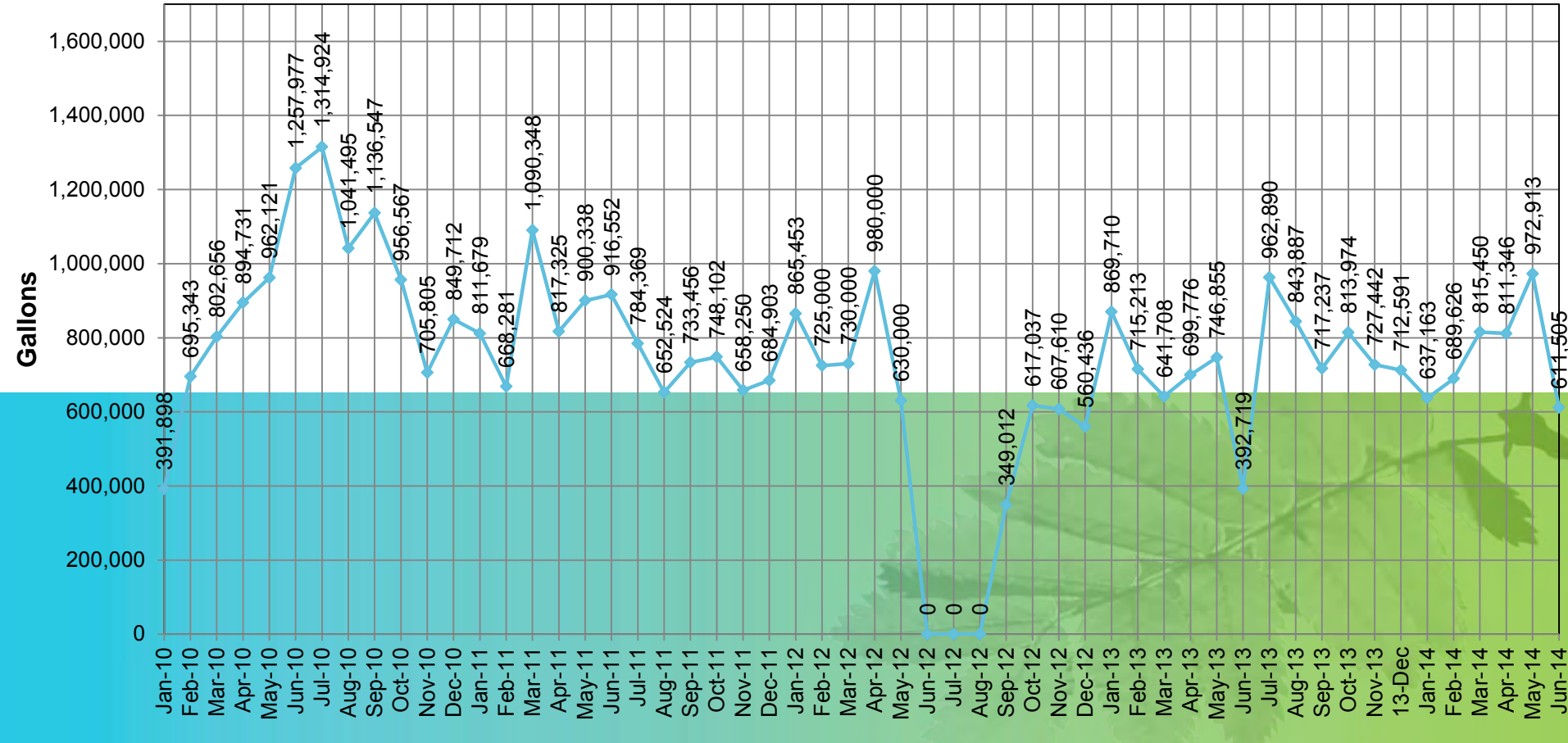
# Groundwater Treatment Plant Operations and Management

- The Groundwater Treatment Plant continues to operate to contain the plume at LHAAP-18/24 and LHAAP-16.
- Water continues to be returned to LHAAP-18/24 or into Harrison Bayou, depending on the amount of water in the bayou.
- Compliance monitoring continues per existing sampling plan.
- Maintenance and repairs of wells, pumps, tanks, and ancillary equipment is ongoing.



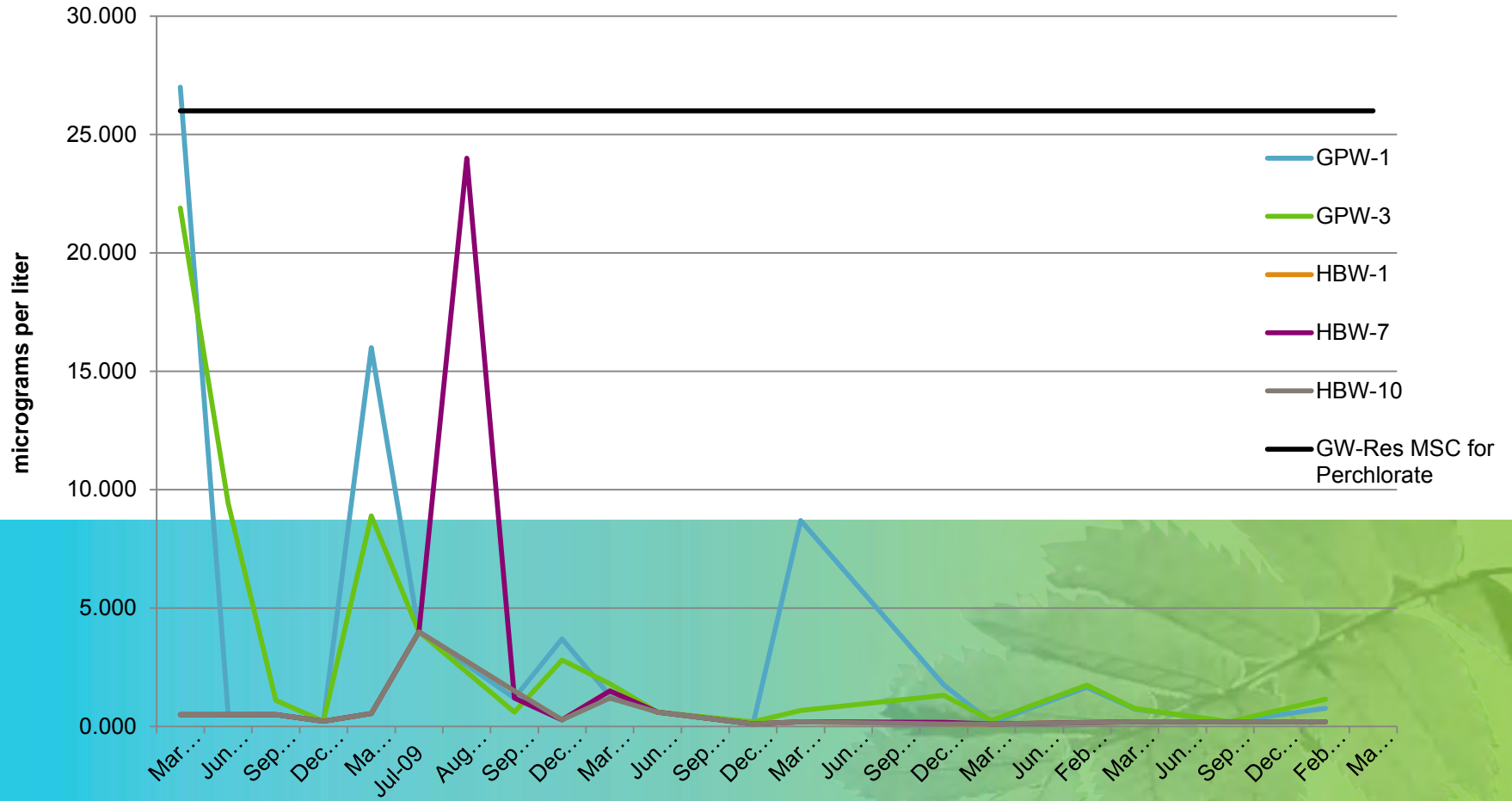
# GWTP O&M (cont)

**Figure ES-3**  
**Water Treated Monthly from January 2010 through June 2014**



# Surface Water Sample Results

## Surface Water Samples - Perchlorate



GPW – Goose Prairie Creek  
 HBW – Harrison Bayou



# LHAAP-37 Bioplug Demonstration Update

- Demonstration scheduled to end October 2014.
- Data from July sampling event will be reviewed to determine effectiveness of the demonstration.
- Additional update will be provided at next RAB meeting.



# Dispute Status

Sites at which Work has Ceased Pending Resolution of the Dispute

TIMELINE →	2011			2012												2013												2014												2015	2016	2017 Sep																																																										
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J	F	M	A	M	J	J	A	S	O	N	D																																																													
SITE ↓																																				↓																																																																
LHAAP-16																																				ROD is with Regulators in Dispute / AECOM has submitted RAWP to U.S. Army																																																																
Site in Dispute																																																																																																				
LHAAP-17																																				ROD is with Regulators in Dispute / AECOM has submitted RAWP to U.S. Army																																																																
Site in Dispute																																																																																																				
LHAAP-001-R-01																																				ROD is with Regulators in Dispute																																																																
Site in Dispute																																																																																																				
LHAAP-003-R-01																																				ROD is with Regulators in Dispute																																																																
Site in Dispute																																																																																																				
LHAAP-29																																				ROD is with Regulators																																																																
Site in Dispute																																																																																																				
LHAAP-04																																				Work completed through DF ROD												ROD with Regulators																																																				
Site in Dispute																																																																																																				
LHAAP-47																																				Work completed through DF ROD												ROD with Regulators																																																				
Site in Dispute																																																																																																				

Notes:  
 AECOM AECOM Technical Services, Inc. PP Proposed Plan  
 EE/CA Engineering Evaluation/Cost Analysis PSI Post-Screening Investigation  
 FFS Focused Feasibility Study ROD Record of Decision  
 LHAAP Longhorn Army Ammunition Plant

[\\work\60256135\LONGHORN Firm Fixed Price\1.0 Project Management\1.2 Six Month Tracker\Dispute](#)

## Code of Federal Regulations – 40 CFR 300.415

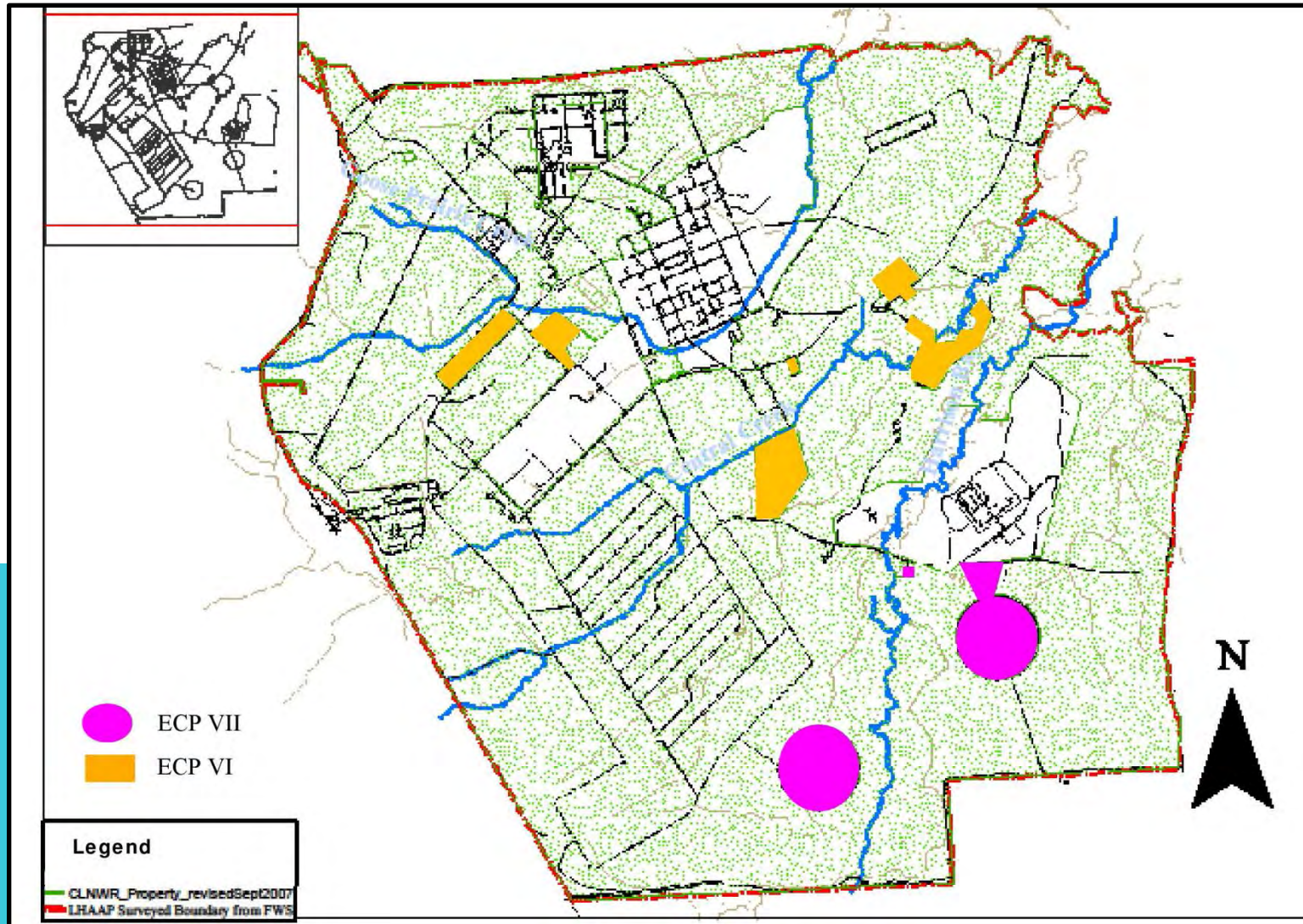
*At any release, regardless of whether the site is on the NPL, where the lead agency makes the determination, based on the factors in paragraph (b)(2) of this section, that there is a threat to public health or welfare of the United States or the environment, the lead agency may take any appropriate removal action to abate, prevent, minimize, stabilize, mitigate, or eliminate the release or the threat of release.*

**The lead agency at Longhorn is the United States Army.**

# Upcoming Fieldwork, Meetings, and Documents

1. Continue sampling for groundwater monitoring networks at LHAAP-46, 50, 58, 67, in addition to semi-annual compliance sampling for LHAAP-18/24.
2. Final Completion Reports in progress for LHAAP-37, 46, 50, 58, 67.
3. First annual Remedial Action Operation reports being developed for LHAAP-46 and LHAAP-67, followed by 37, 50, 58.
4. LHAAP-18/24 and LHAAP-29 – Reports for current activities leading to an FS for each site planned for fall 2014.
5. Sites where work has ceased pending dispute resolution:
  1. LHAAP-03
  2. LHAAP-04
  3. LHAAP-47
  4. LHAAP-16
  5. LHAAP-17
  6. LHAAP-29
  7. LHAAP-001-R-01
  8. LHAAP-003-R-01

# ECP VI and VII

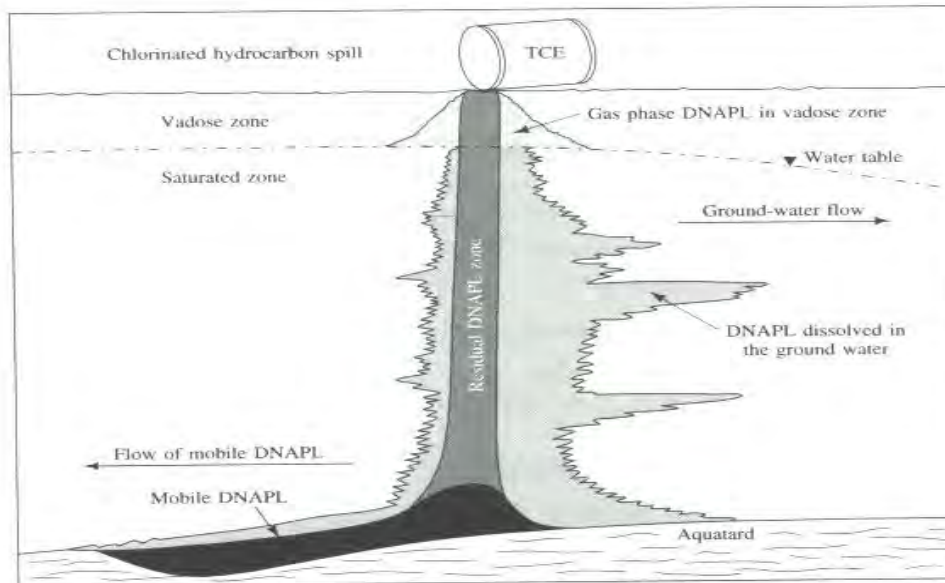


# Back-up Slides

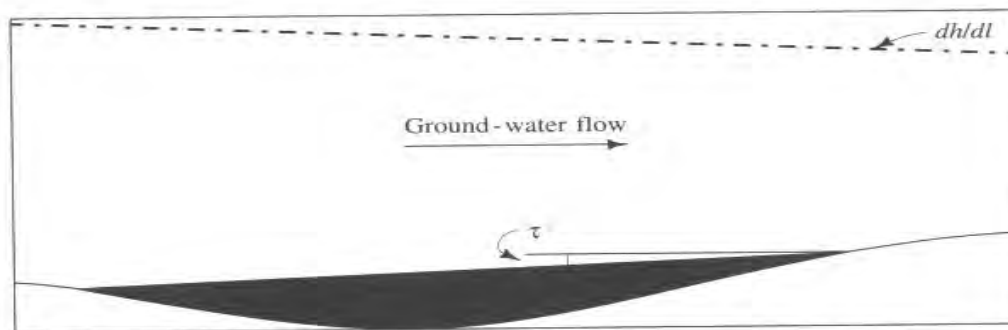
# Dense Non-Aqueous Phase Liquid (DNAPL)

- Dense Non-Aqueous Phase Liquids are present at LHAAP-29 and LHAAP-18/24
  - Typically chlorinated hydrocarbons, such as trichloroethylene (TCE) and Methylene Chloride (MC)
  - Compounds with densities greater than water or specific gravity greater than 1
  - These compounds 'sink' until they reach a confined unit (aquitar) then spread via preferential pathways along the aquitar (which may be opposite of groundwater flow direction)
- Present in two locations in shallow groundwater at LHAAP-18/24 and one location at LHAAP-29, all three of these locations are proposed for further work to delineate the extent of DNAPL this spring

# DNAPL (cont)



**FIGURE 5.28** Distribution of a dense nonaqueous phase liquid in the vadose and saturated zone.



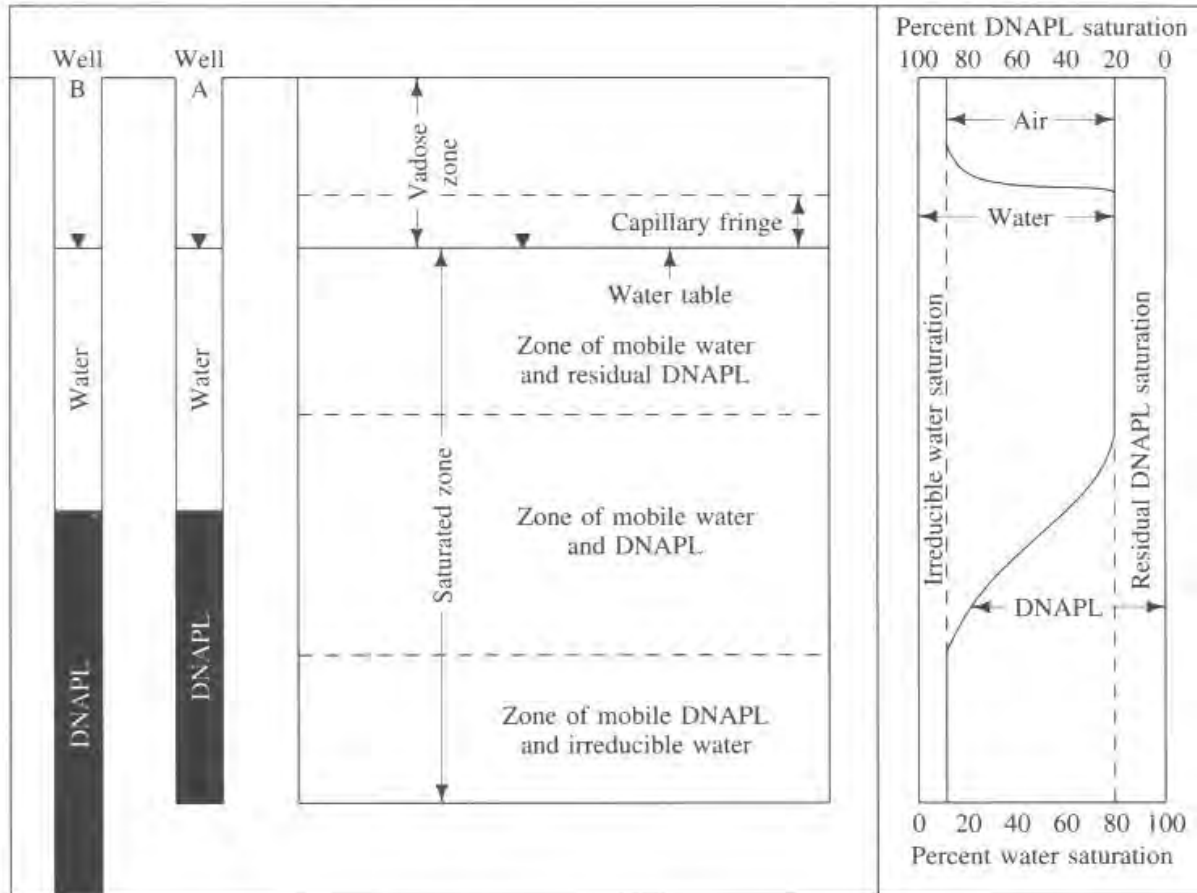
**FIGURE 5.29** Sloping interface between a static layer of DNAPL and flowing ground water.



# DNAPL (cont)

Multiphase Flow

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**FIGURE 5.26** Zones of a DNAPL and the relationship of mobile DNAPL and nonmobile DNAPL to the DNAPL saturation; relationship of mobile DNAPL thickness to thickness of DNAPL is measured in a monitoring well.

# Additional DNAPL Information

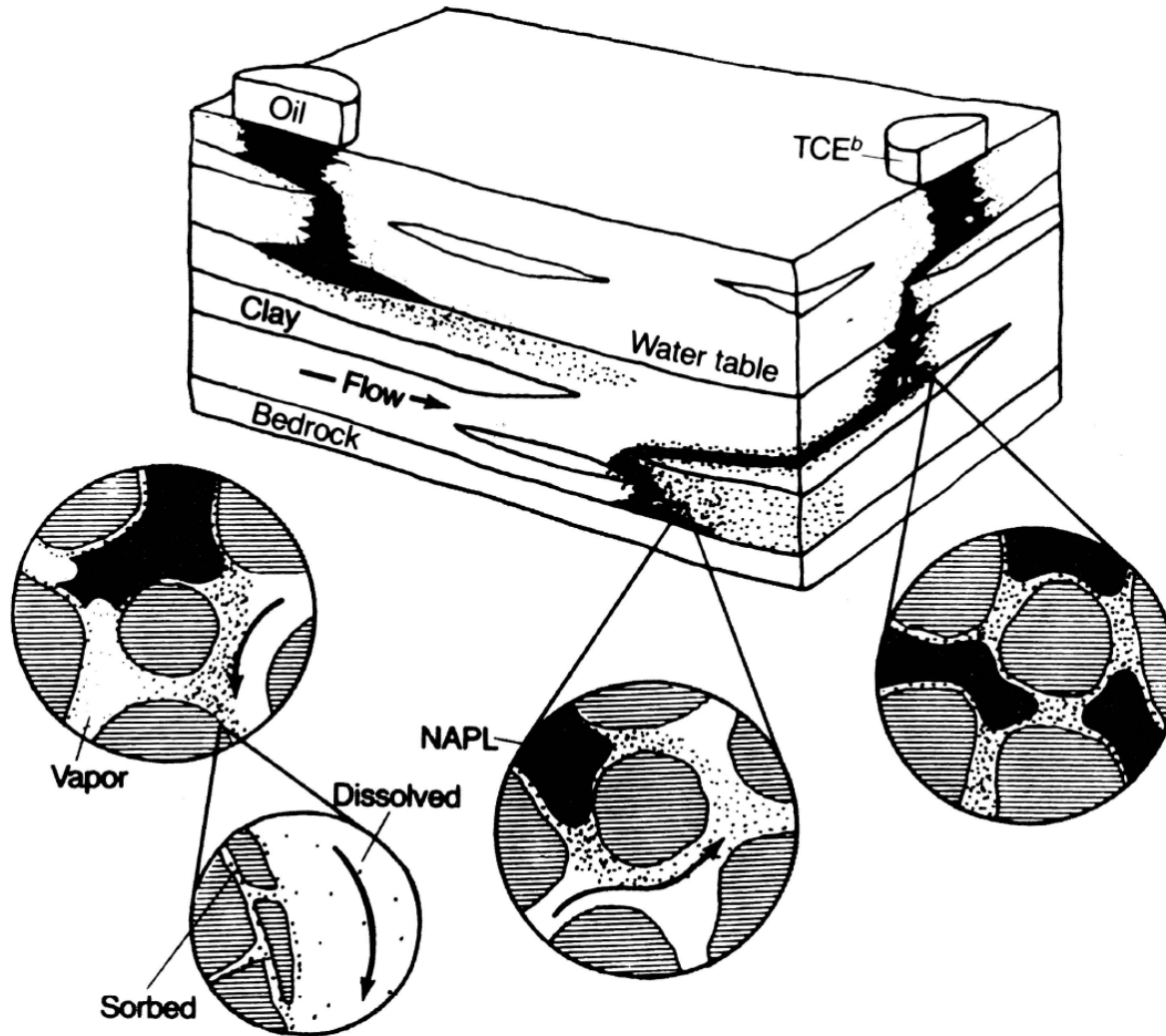
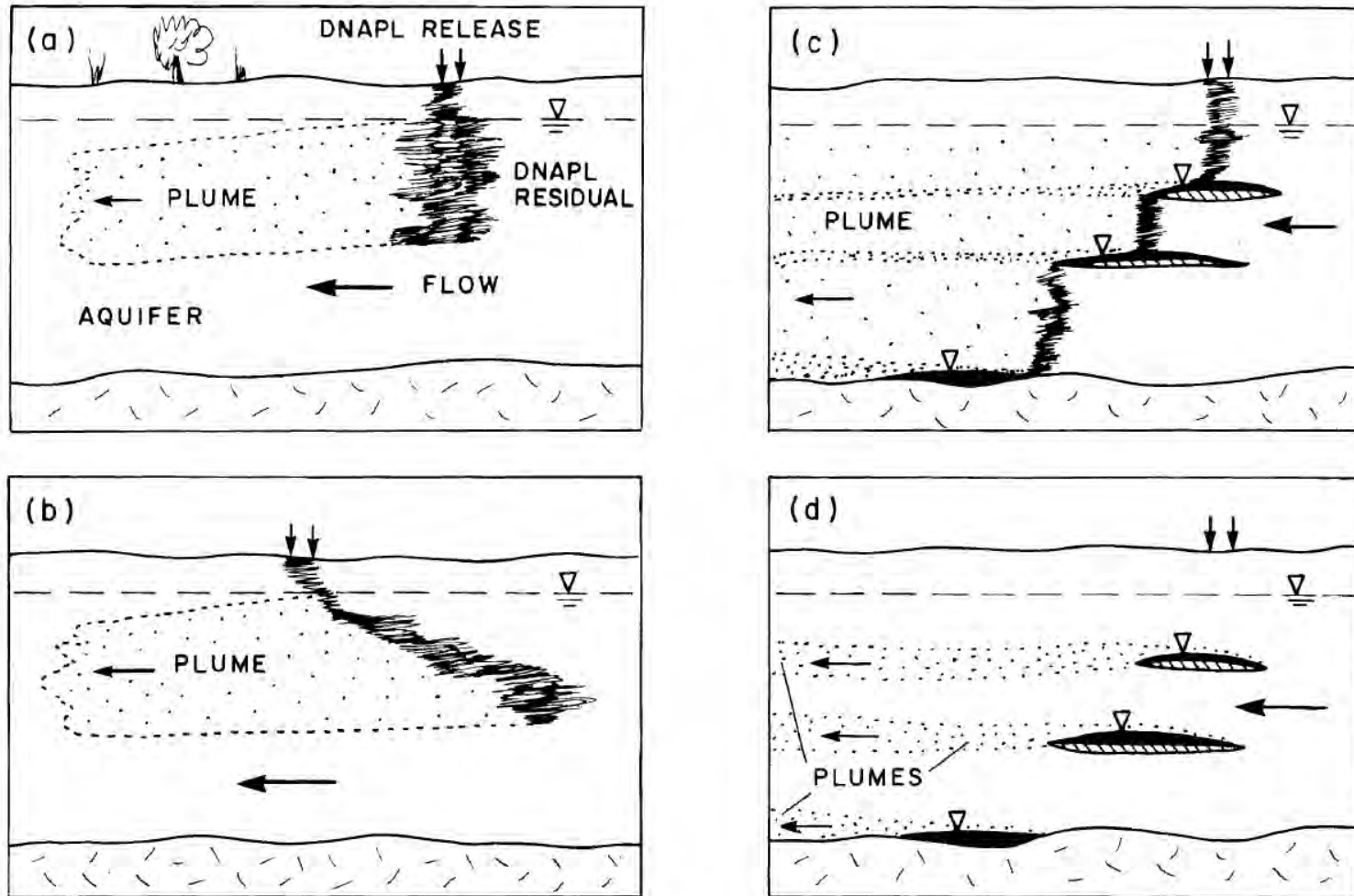


Figure 2.1 Schematic illustration of a DNAPL and a LNAPL in a porous medium, showing geologic and pore scales. A low-permeability clay layer deflects the DNAPL. DNAPL dissolution causes a plume (from Mackay and Cherry, 1989).

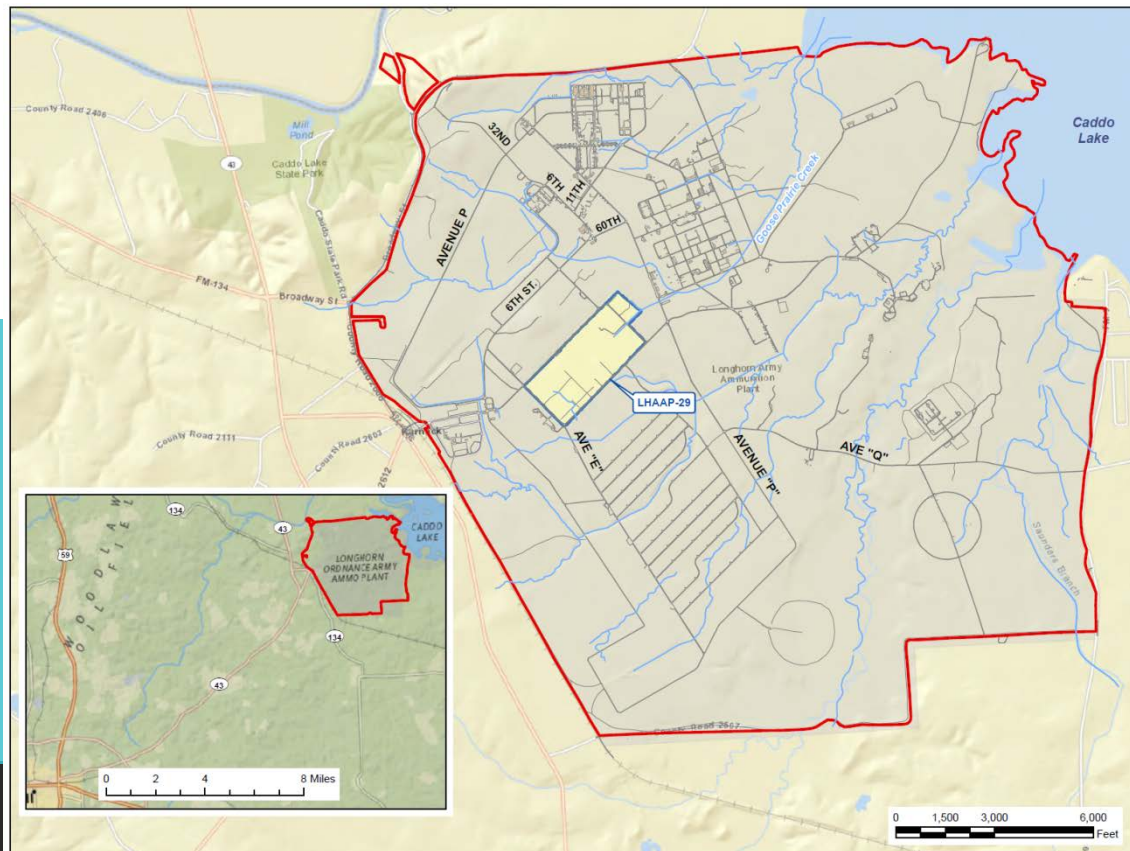
# Additional DNAPL Information (cont)



**Figure 2.5** Conceptual scenarios for a DNAPL in the groundwater zone in granular aquifers: a) partial penetration; b) partial penetration with offset; c) full penetration with offset; and d) same as part c, but at a later stage after DNAPL residual has disappeared due to dissolution in flowing groundwater. (Pankow and Cherry, 1996)

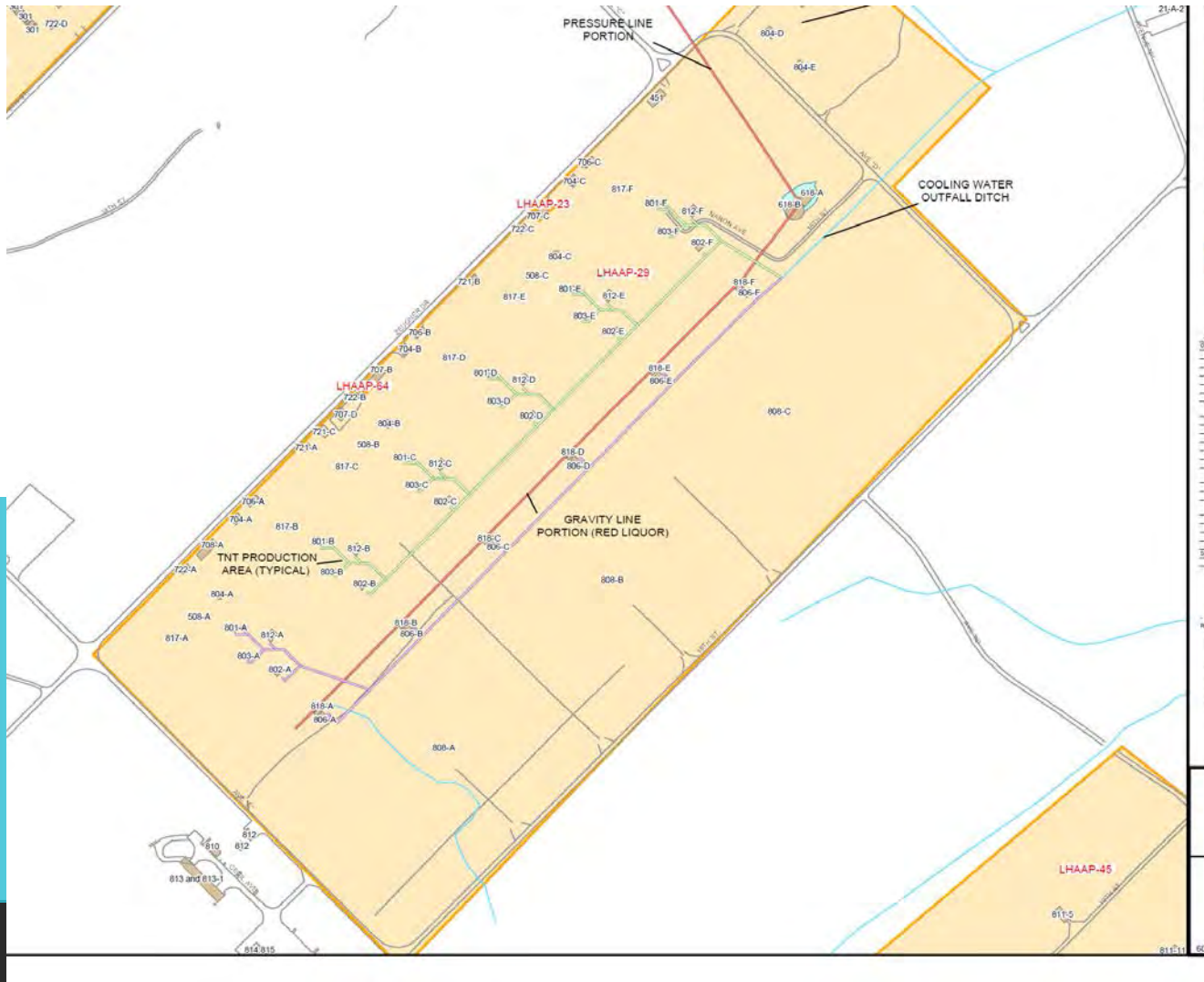
# Status of Environmental Sites (cont)

- LHAAP-29 Former TNT Production Area
  - 85-acre site that historically manufactured TNT for use during World War II. Subsequently this area was used for “soak out” or solvent bath of out-of-specification rocket motors from the 1950’s through the 1970’s
  - Contaminants of Concern: Perchlorate, VOCs (TCE, MC), Explosives



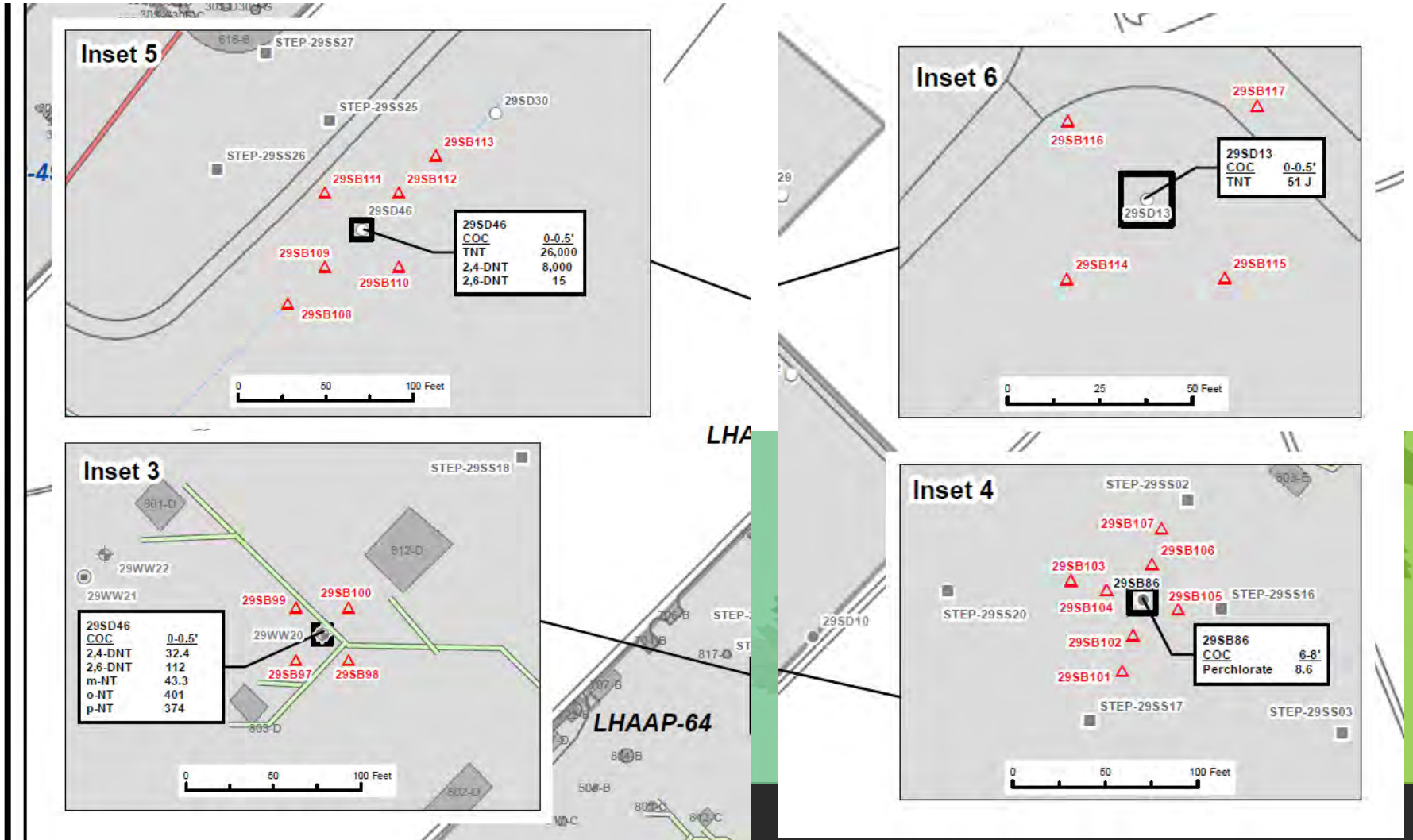
# Status of Environmental Sites (cont)

## – LHAAP-29 Former TNT Production Area



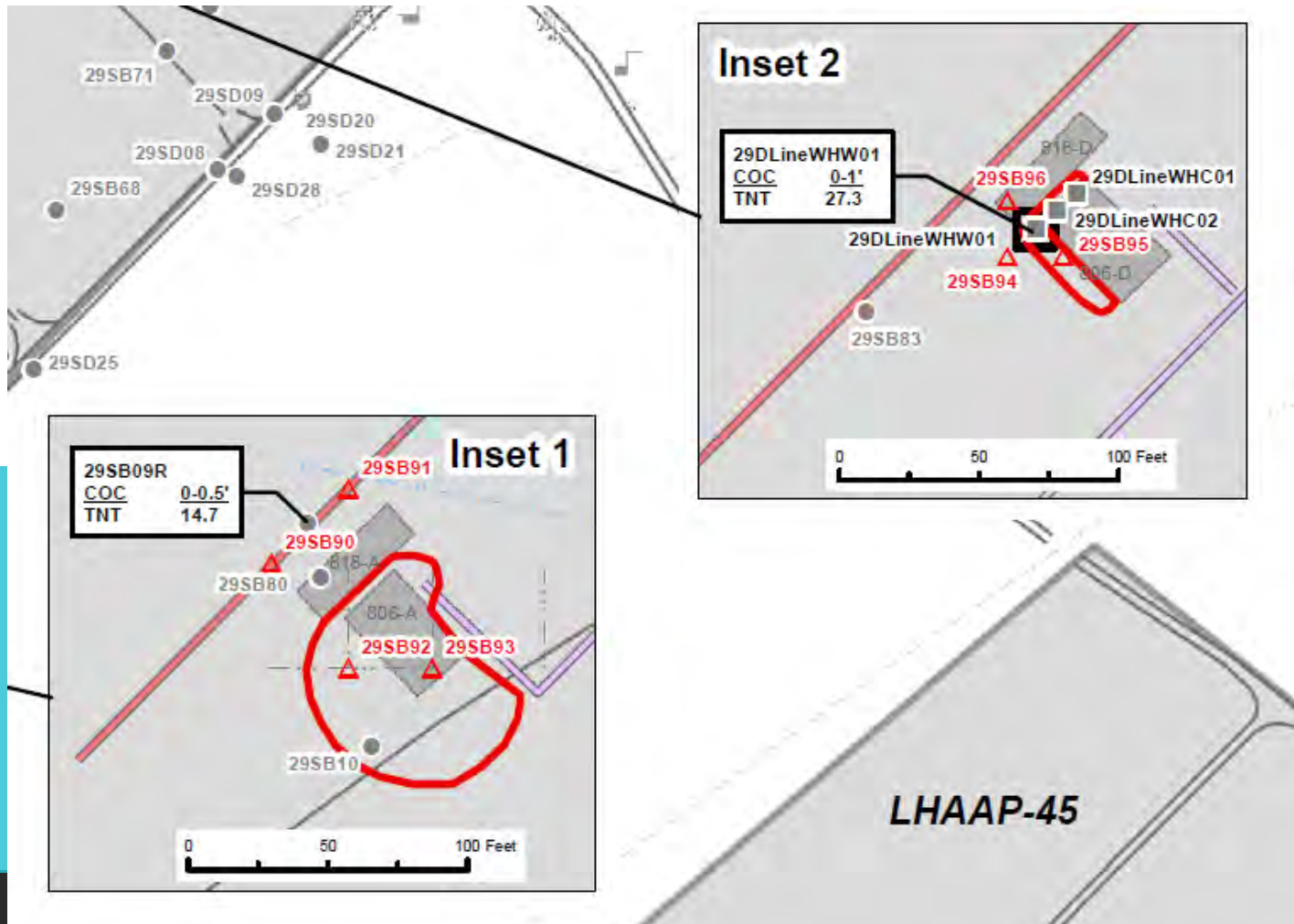
# Status of Environmental Sites (cont)

- LHAAP-29 Former TNT Production Area- Planned Soil Sampling



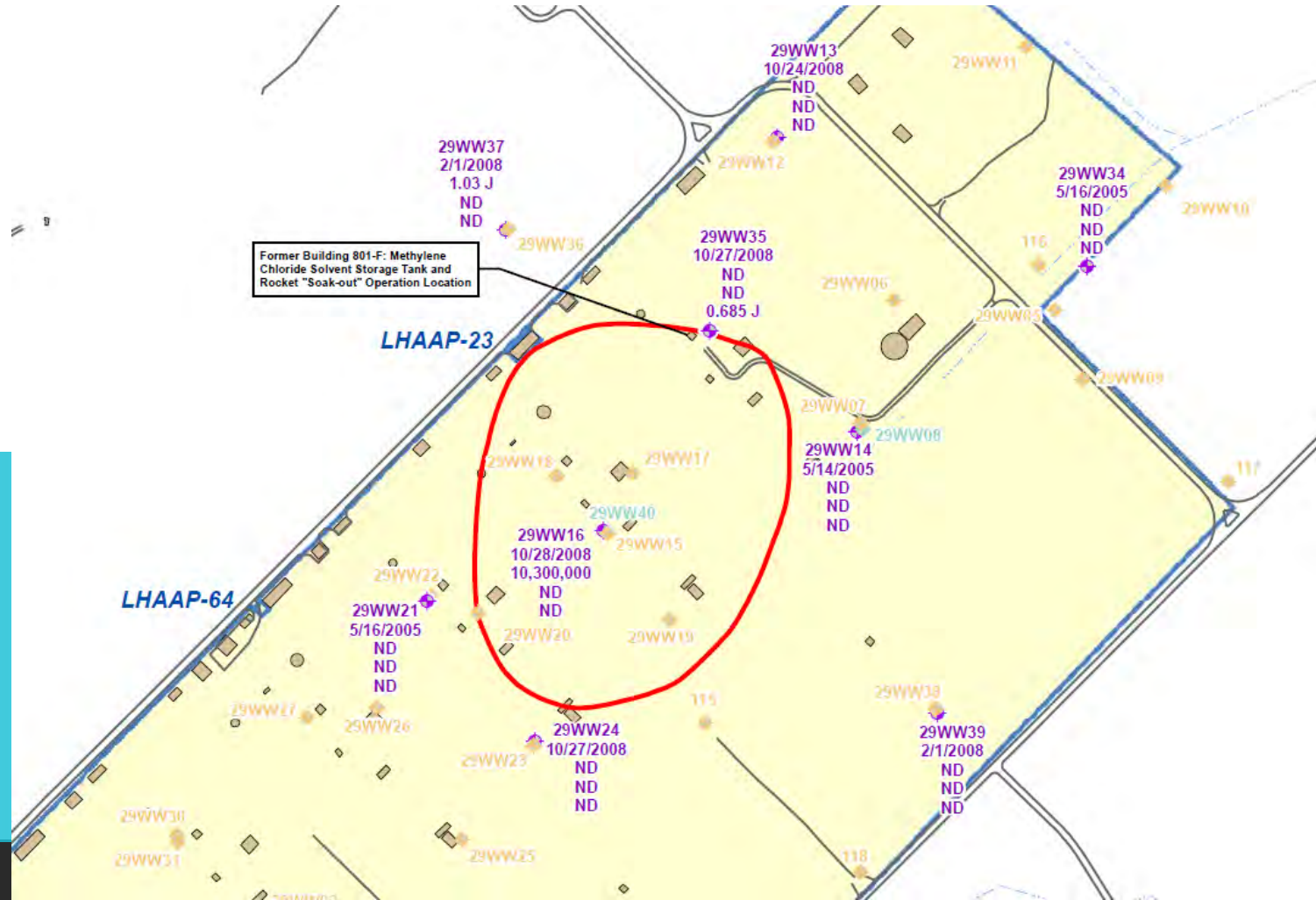
# Status of Environmental Sites (cont)

- LHAAP-29 Former TNT Production Area- Planned Soil Sampling (cont)



# Status of Environmental Sites (cont)

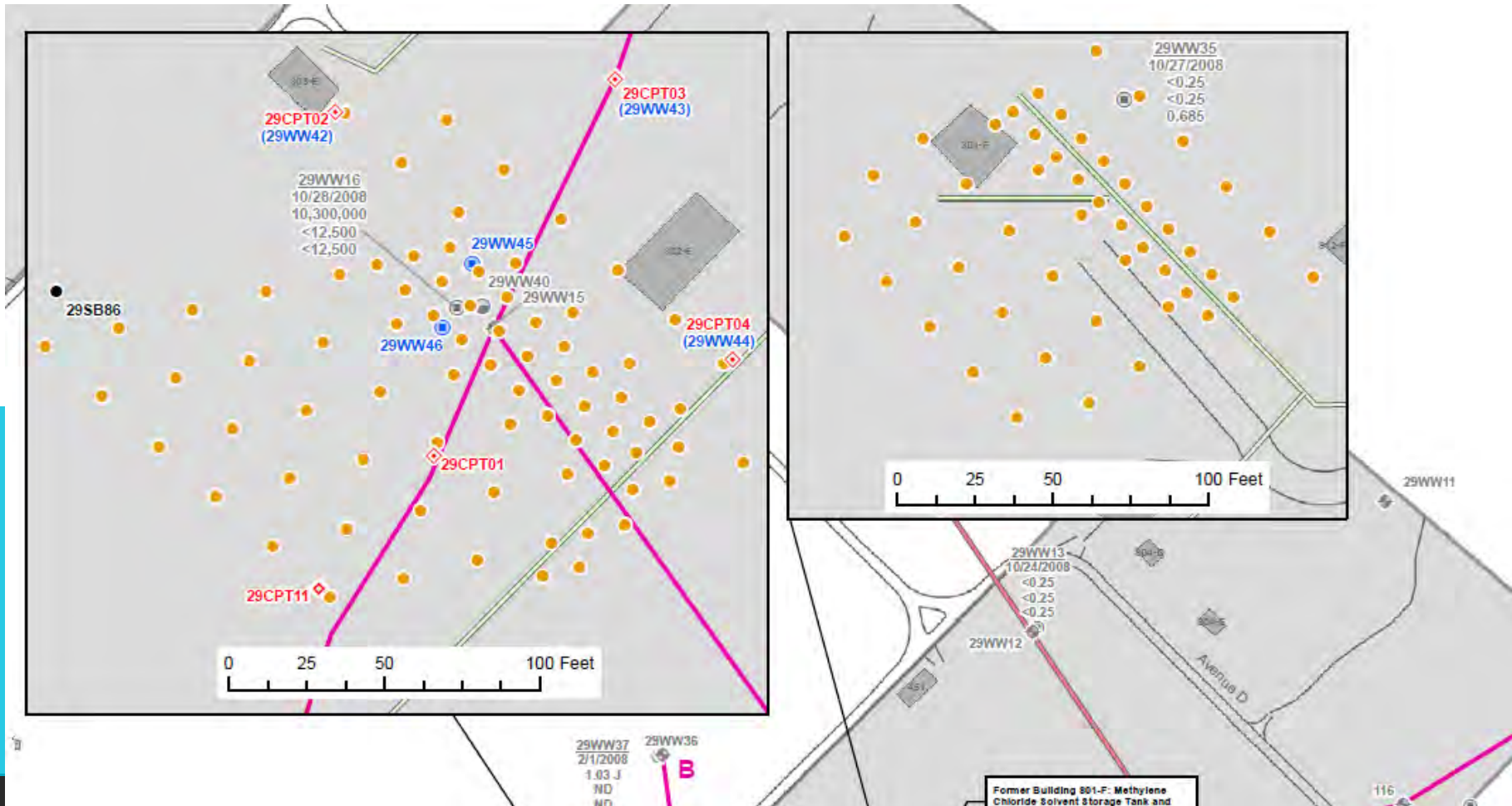
- LHAAP-29 Former TNT Production Area- Methylene Chloride in Intermediate GW





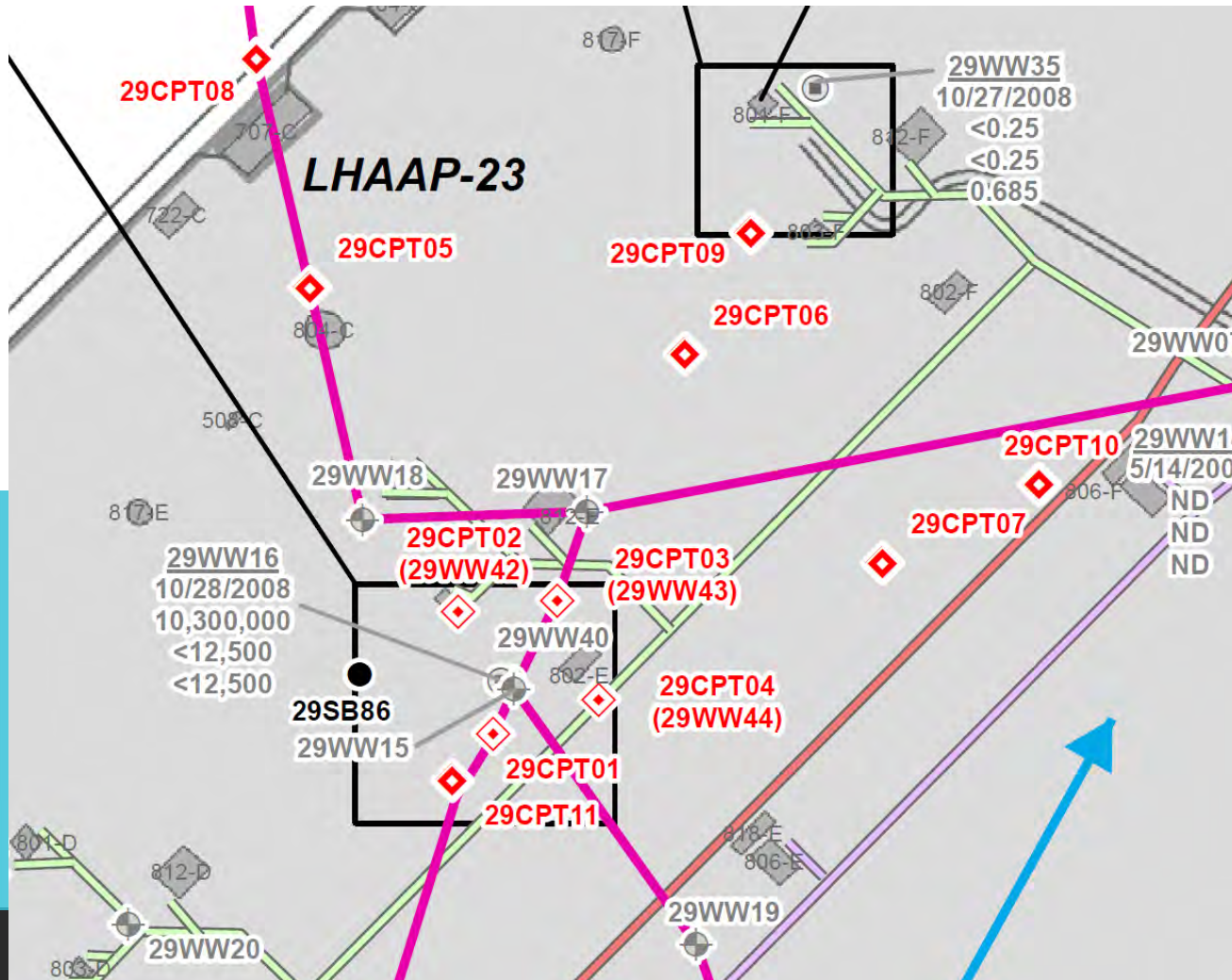
# Status of Environmental Sites (cont)

- LHAAP-29 Former TNT Production Area- Planned Soil Gas/Soil Sampling



# Status of Environmental Sites (cont)

- LHAAP-29 Former TNT Production Area- Planned Cone Penetrometer Testing



# Groundwater Treatment Plant - Treated Groundwater Volumes

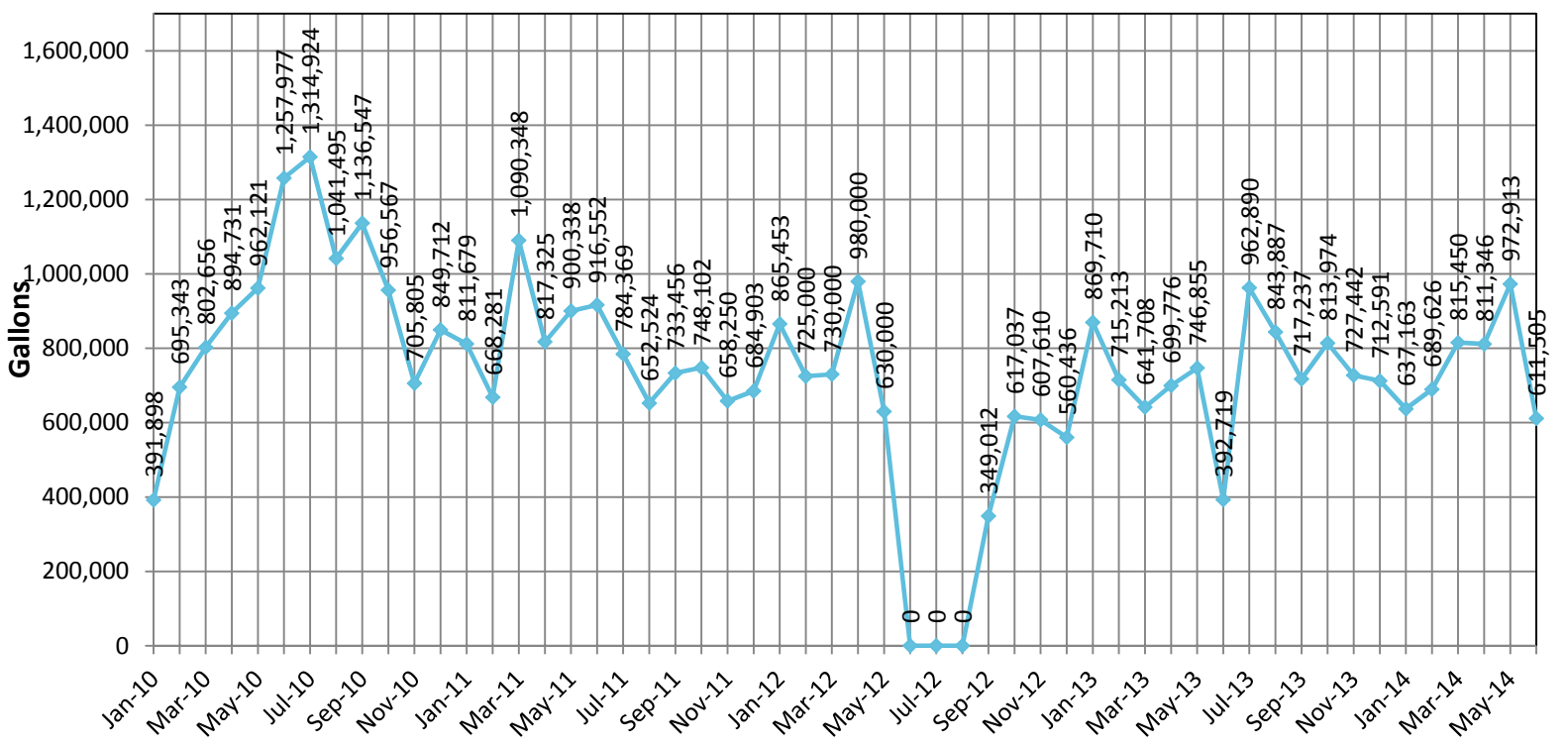
The amount of groundwater treated is determined by measuring the number of gallons of treated water returned to LHAAP-18/24, released to the INF Pond, or discharged to Harrison Bayou.

## Treated Water Data (in gallons)

Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
1,041,491	848,356	804,822	792,148	665,883	818,872	791,306	568,812	776,904	748,377	690,052	617,199
Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09
655,059	619,274	726,118	552,299	598,144	433,800	488,807	526,958	387,644	0	414,853	735,716
Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10
808,322	636,306	727,492	391,898	695,343	802,656	894,731	962,121	1,257,977	1,314,924	1,041,495	1,136,547
Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
956,567	705,805	849,712	811,679	668,281	1,090,348	817,325	900,338	916,552	784,369	652,524	733,456
Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12
748,102	658,250	684,903	865,453	725,000*	730,000*	980,000*	630,000*	0	0	0	349,012
Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13
617,037	607,610	560,436	869,710	751,213	641,708	699,776	746,885	392,719	962,890	843,887	717,237
Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14			
813,974	727,442	712,591	552,657	738,701	844,095	811,346	972,913	611,505			

\*Indicates Estimate

**Figure ES-3  
Water Treated Monthly from January 2010 through June 2014**

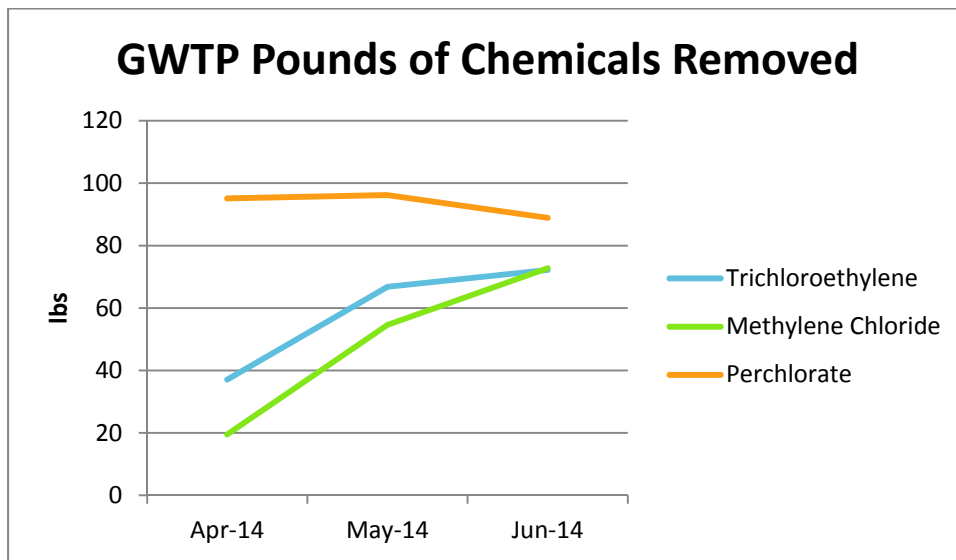


The pounds of chemicals removed for the 2<sup>nd</sup> Quarter of 2014 can be found below and are calculated by the following formula:

$$\frac{(\text{GWTP Influent Contaminant Concentration } [\mu\text{g/L}] \times \text{Volume } [\text{gallons}] \times 3.785 \text{ [liters per gallon]})}{(453,600,000 \mu\text{g per pound})}$$

### Pounds of Chemicals Removed From LHAAP-18/24, 2nd Quarter 2014

	Trichloroethylene	Methylene Chloride	Perchlorate
Apr-14	37.1	19.48	95.1
May-14	66.8	54.59	96.2
Jun-14	72.2	72.76	88.9



# Harrison Bayou and Goose Prairie Creek – Perchlorate Data

Surface water samples are collected quarterly from each location in Harrison Bayou and Goose Prairie Creek unless the creek sampling location is dry.

## Historic Surface Water Sample Data (in micrograms per liter)

Quarter	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>
Creek Sample ID	Jul 1999	Sep 1999	Feb 2000	Apr 2000	Aug 2000	Dec 2000	Feb 2001	Apr 2001	July 2001	Oct 2001	Jan 2002
GPW-1	<1.0U	-	4	<4.0 U	<4.0 U	<4.0 U	-	2.65	<4.0 U	<4.0 U	<4.0 U
GPW-3	<1.0U	<4.0 U	17	8	<4.0 U	<4.0 U	-	2.28	<4.0 U	<4.0 U	<4.0 U
HBW-1	-	<80.0 U	310	23	-	-	<4.0 U	-	<4.0 U	<4.0 U	<4.0 U
HBW-7	-	<8.0 U	370	110	-	-	<4.0 U	-	<4.0 U	<4.0 U	<4.0 U
HBW-10	-	<8.0 U	905	650	<4.0 U	-	<4.0 U	-	<4.0 U	-	-

Quarter	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>
Creek Sample ID	June 2002	Sept 2002	Dec 2002	Feb 2003	June 2003	Aug 2003	July 2004	Dec 2006	May 2007	Aug 2007	Dec 2007
GPW-1	<4.0 U	<4.0 U	18.3	18.6	59.9	-	2.25	-	<1.0 U	<1.0 U	10.7
GPW-3	<4.0 U	<4.0 U	5.49	12.6	14.7	-	2.2	-	<1.0 U	<1.0 U	7.48
HBW-1	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	99.3	<0.2U	<1.0 U	<1.0 U	122	<1.0 U
HBW-7	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	<4.0 U	<0.2U	<1.0 U	<1.0 U	1.02	<1.0 U
HBW-10	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	-	<0.2U	<1.0 U	<1.0 U	<1.0 U	<1.0 U

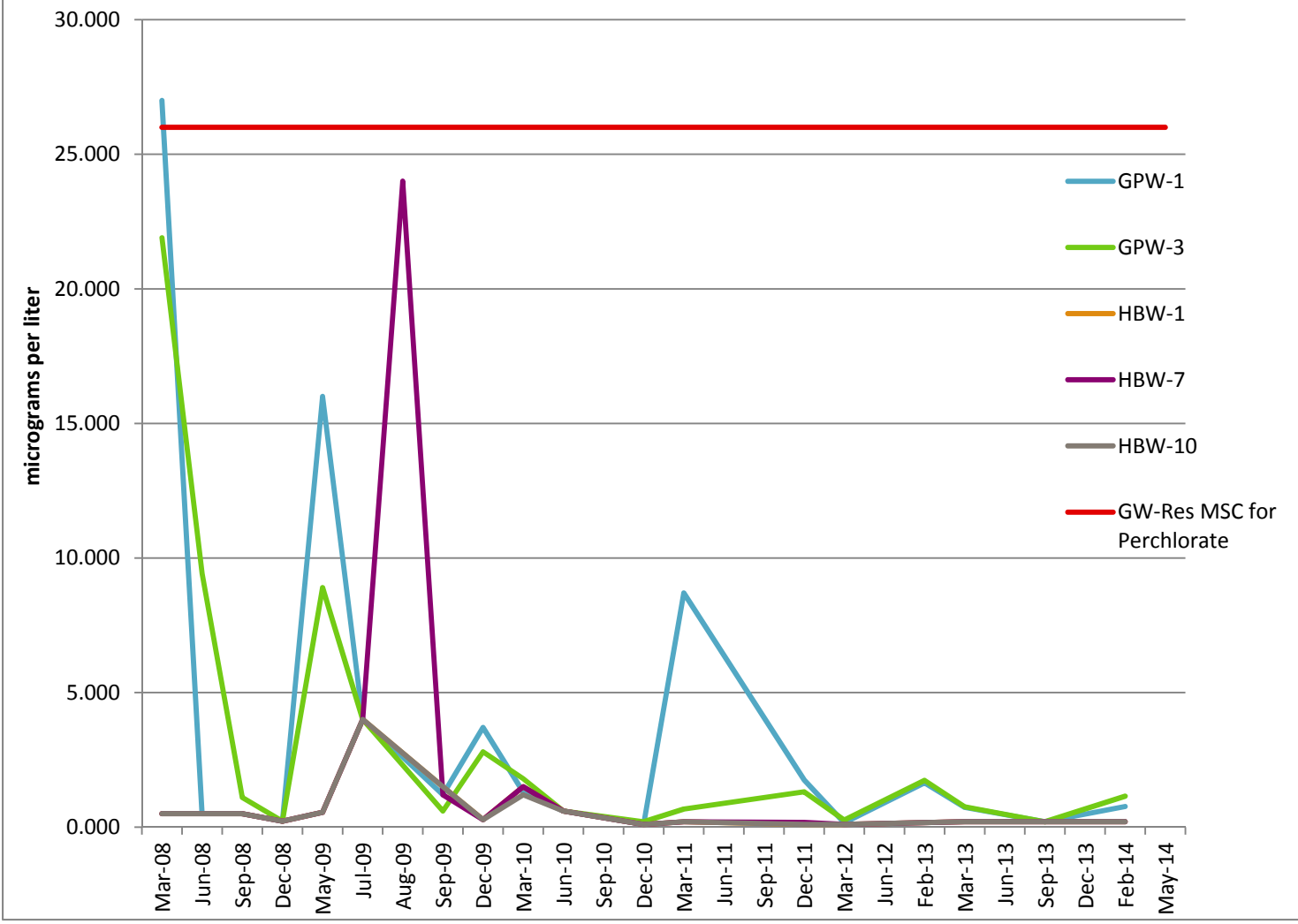
Quarter	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	3 <sup>rd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>
Creek Sample ID	Mar 2008	Jun 2008	Sep 2008	Dec 2008	May 2009	Jul 2009	Aug 2009	Sep 2009	Dec 2009	Mar 2010	Jun 2010
GPW-1	27	<0.5U	<0.5U	<0.22U	16	<4U	NS	<1.2U	3.7	1.3J	<0.6U
GPW-3	21.9	9.42	1.1	<0.22U	8.9	<4U	NS	<0.6U	2.8	1.8J	<0.6U
HBW-1	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	NS	<1.5U	<0.275U	1.5U	<0.6U
HBW-7	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	24	<1.2U	<0.275U	1.5U	<0.6U
HBW-10	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	NS	<1.5U	<0.275U	1.2U	<0.6U

Quarter	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>
Creek Sample ID	Sep 2010	Dec 2010	Mar 2011	Jun 2011	Sep 2011	Dec 2011	Mar 2012	Jun 2012	Not Applicable	Jan & Feb 2013	Mar 2013
GPW-1	dry	<0.1U	8.7	dry	dry	1.76	0.163J	dry	NC	1.65	0.735
GPW-3	dry	0.199J	0.673	dry	dry	1.31	0.261	dry	NC	1.74	0.754
HBW-1	dry	<0.1U	<0.2U	dry	dry	<0.1U	0.1U	dry	NC	<0.2U	<0.2U
HBW-7	dry	<0.1U	<0.2U	dry	dry	0.171J	0.1U	dry	NC	<0.2U	<0.2U
HBW-10	dry	<0.1U	<0.2U	dry	dry	<0.1U	0.1U	dry	NC	<0.2U	<0.2U

Quarter	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>
Creek Sample ID	Jun 2013	Sept 2013	Dec 2013	Feb 2014	May 2014
GPW-1	dry	<0.2 U	dry	0.766	dry
GPW-3	dry	<0.2 U	dry	1.15	dry
HBW-1	<0.2U	<0.2 U	dry	<0.2U	dry
HBW-7	<0.2U	<0.2 U	dry	0.201J	dry
HBW-10	<0.2U	<0.2 U	dry	<0.2U	dry

Notes:  
 J Estimated  
 U Non-detect  
 NC Not Collected  
 NS Not Sampled  
 dry Sampling location was dry  
 - No historical data available

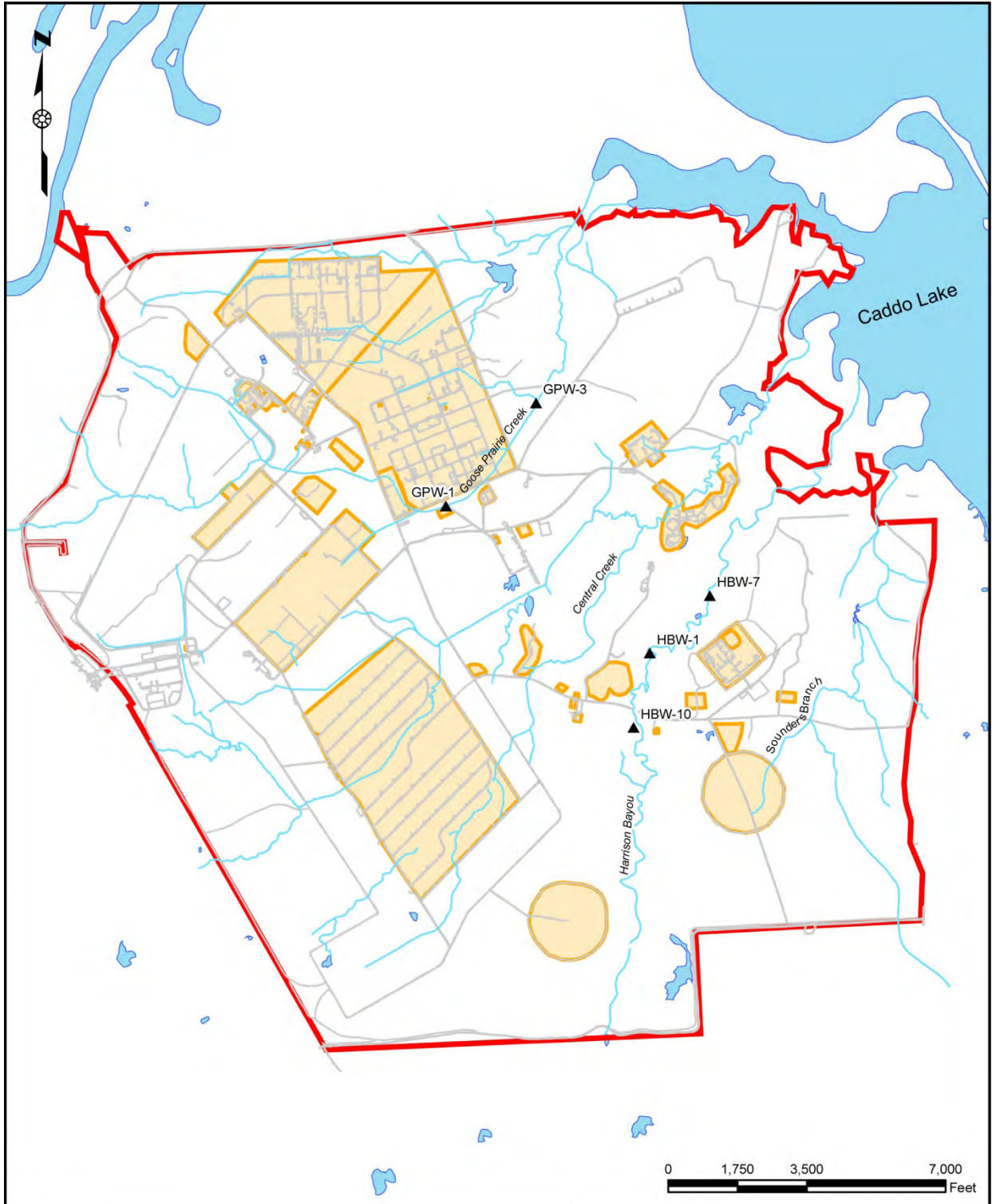
# Surface Water Samples - Perchlorate



Notes:

Perchlorate Screening Criteria - TCEQ GW<sub>Res</sub> (micrograms per liter) 26

**Longhorn Army Ammunition Plant Map with creek sampling locations.**



Legend	
▲	Surface Water Sampling Location
—	Stream
—	Road
■	Site
■	Lake

U.S. ARMY CORPS OF ENGINEERS TULSA DISTRICT TULSA, OKLAHOMA	
SURFACE WATER SAMPLING LOCATION  LONGHORN ARMY AMMUNITION PLANT KARNACK, TEXAS	

# LHAAP Perimeter Well Monitoring – Perchlorate Data

Groundwater samples are currently collected quarterly from six wells on the LHAAP perimeter.

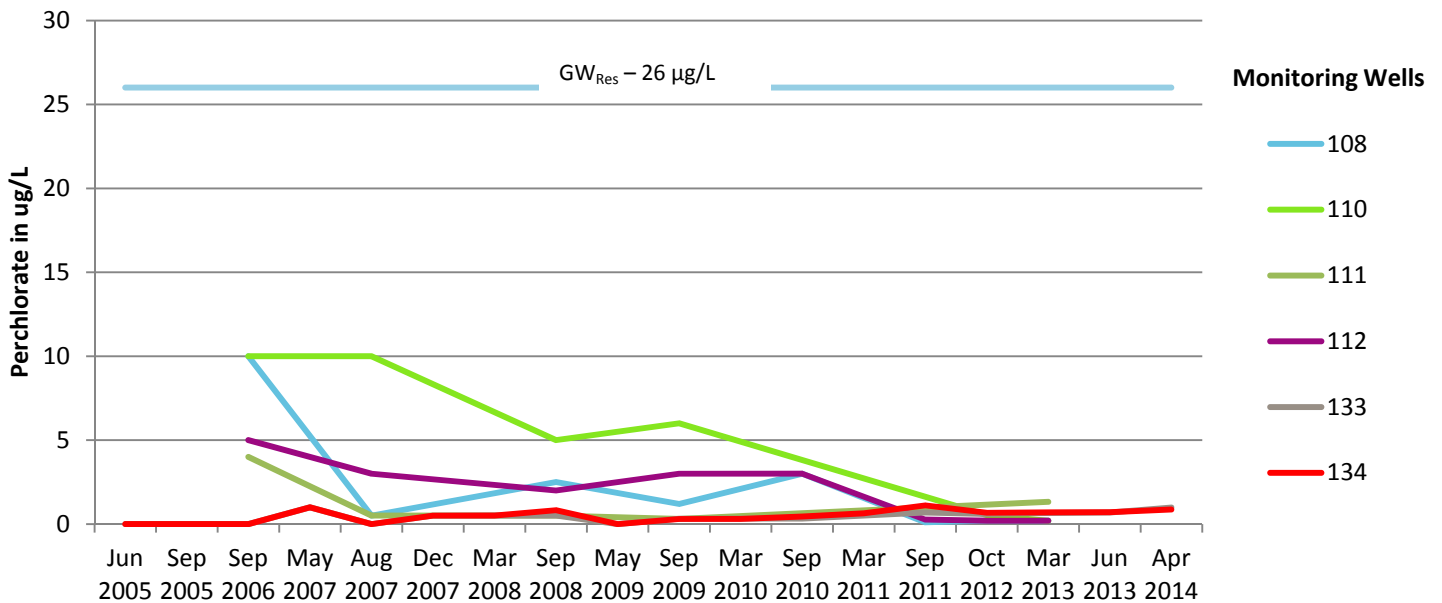
## Historic Perimeter Well Sample Data (in micrograms per liter)

Well ID	June 2005	Sep 2005	Sep 2006	May 2007	Aug 2007	Dec 2007	Mar 2008	Sep 2008	May 2009	Sep 2009	Mar 2010
108	Dry	Dry	10 U	Dry	0.5 U	Dry	Dry	2.5 U	Dry	1.2 U	Dry
110	Dry	Dry	10 U	Dry	10 U	Dry	Dry	5.0 U	Dry	6 U	Dry
111	Dry	Dry	4 U	Dry	0.5 U	Dry	Dry	0.5 U	Dry	0.3 U	Dry
112	Dry	Dry	5 U	Dry	3 U	Dry	Dry	2.0 U	Dry	3 U	Dry
133	0.541	0.597	1.08	1 U	1.09	0.5 U	0.5 U	0.5 U	0.47 J	0.32	Dry
134	0.881	0.725	0.708 J	1 U	0.949 J	0.5 U	0.5 U	0.829 U	0.04 J	0.3 U	0.3 U

Well ID	Sep 2010	Mar 2011	Sep 2011	Oct 2012	Mar 2013	June 2013	Apr 2014
108	3 U	Dry	0.1 U	0.2 U	0.2 U	Dry	Dry
110	Dry	Dry	Dry	0.535	0.2 U	Dry	Dry
111	Dry	Dry	Dry	Dry	1.32	Dry	Dry
112	3 U	Dry	0.26	0.2 U	0.2 U	Dry	Dry
133	0.32	Dry	0.68	0.598	0.655	0.685	0.988
134	0.45	0.636	1.11	0.671	0.698	0.706	0.863

Notes:  
 J Estimated  
 U Non-Detect  
 Dry Well Dry

## Perimeter Wells - Perchlorate



Note: Perchlorate Screening Criteria - TCEQ GW<sub>Res</sub> (micrograms per liter) 26



**Longhorn Army Ammunition Plant Map with Perimeter Well Locations**

