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: October 23, 2019, 6:00 PM Central Daylight Time (CDT)

Meeting Participants:

Army BRAC:	Rose M. Zeiler
USACE:	Aaron Williams
USAEC:	Amanda Sherman and Troy Darr
Bhate:	Kim Nemmers
APTIM:	Bill Foss
USEPA Region 6:	Rich Mayer, Dorelle Harrison, and Kent Becher (KB)-USGS Liaison
TCEQ:	April Palmie
RAB:	Present: Judy VanDeventer, Deon Hall, John Fortune, Charles Dixon, Richard LeTourneau, and Sharron McAvoy Absent: Nigel R. Shivers, Carol Fortune; Terry Britt; John Pollard, Jr.; Tom Walker
Public:	Laura-Ashley Overdyke (Executive Director of the Caddo Lake Institute [CLI])

An agenda for the RAB meeting, a color copy of the Bhate Environmental Associates, Inc. (Bhate) slide presentation, and handouts (see list at end of meeting minutes) were provided for meeting attendees.

Welcome and Introduction

Ms. Rose Zeiler, RAB Installation Co-Chair, called the RAB meeting to order at 6:05 pm CDT. Ms. Zeiler welcomed everyone and asked if there was anyone present that had not attended before. Mr. Troy Darr stated that he was from the U.S. Army Environmental Command (USAEC) Public Affairs office and that he is in training to support environmental restoration. Mr. Darr stated that he also came to assist a person from the University of North Texas (UNT) in case he was at the meeting to shoot some video. However, the person from UNT was not at the meeting.

Ms. Zeiler explained the RAB meets every 3 months and that the purpose is to promote community awareness and obtain constructive community review and comments on environmental restoration activities. Ms. Zeiler stated that the Army is committed to protecting human health and the environment. Ms. Zeiler stated the importance of engaging the community and increasing public participation in the RAB. Ms. Zeiler explained that the RAB is expected to inform the community and hear the concerns. Ms. Zeiler asked if anyone had heard from John Pollard, one of the RAB members, who had not attended a meeting in the past year. Ms. Zeiler stated that she probably needed to send him a letter to find out if he was still interested in being on the board. Ms. Zeiler stated to let her know if anyone knew of someone interested in being on the RAB board also.

Ms. Zeiler stated that Paul Fortune had stepped down as RAB co-chair and the RAB needed to select a new co-chair. Ms. Zeiler then handed out sheets of paper with the names of each of the RAB members. Ms. Zeiler asked the RAB members present to select their 1st and 2nd choices for RAB co-chair and then hand them to Mr. Aaron Williams for tally. Ms. Zeiler explained the role of the new co-chair is speak for the RAB, generally starts the meeting and coordinate opinions from RAB members. Ms. Zeiler stated that concerns or issues by the public or other RAB members (e.g. frequency of RAB meeting) should be brought to the RAB co-chair.

Defense Environmental Restoration

Ms. Kim Nemmers stated that the RAB meeting slides were available along with handouts for the groundwater treatment plant (GWTP) and surface water samples. Ms. Nemmers pointed out that the slide packet contains a map of the installation sites along with a list of abbreviations and acronyms for reference.

LHAAP-50

Mr. Bill Foss presented LHAAP-50 and explained that the site is a small site south of LHAAP-47. Mr. Foss explained the site history for LHAAP-50, including that a remedy has been in place since the Record of Decision (ROD) was signed in 2010. Mr. Foss stated that the remedy has been monitored since that time. Mr. Foss explained that the site had a 47,000 gallon aboveground storage tank that received industrial waste water from sumps throughout LHAAP from the 1950s through the late 1980s. Mr. Foss stated that the constituents of concern were chlorinated solvents and perchlorate in groundwater and perchlorate in soil. Mr. Foss indicated that the remedy selected was monitored natural attenuation (MNA) for the groundwater, excavation of soil contamination that could leach into the groundwater, and land use controls (LUCs). The ROD also had a contingency remedy of enhanced in-situ bioremediation (EISB) if the MNA was not effective.

Mr. Foss explained that MNA was found to be ineffective based upon lines of evidence (in a process developed by the U.S. Environmental Protection Agency [USEPA]) in 2018 following years of groundwater monitoring. Mr. Foss explained that the concentrations of trichloroethylene (TCE) and perchlorate increased from 2013 to 2018. Based upon these increasing concentrations and other lines of evidence, Mr. Foss explained that the Army, Texas Commission on Environmental Quality (TCEQ), and USEPA agreed that the contingency remedy was needed to address the site plumes. Mr. Foss stated that initiation of the contingency remedy was documented in the Explanation of Significant Differences (ESD), which was co-signed by the USEPA and received concurrence from TCEQ.

Mr. Foss explained that, due to the expansion of the plume, an additional well was installed in July 2019. Mr. Foss stated that the groundwater collected from the new monitoring well did not have TCE or perchlorate above the screening levels such that the plume extent is now smaller than previously depicted. Mr. Foss stated that the Remedial Action Work Plan (RAWP) is being prepared to implement the contingency remedy. Mr. Foss stated that the remedy planned is injection of emulsified vegetable oil (EVO) along with microbial culture to enhance the degradation process of TCE and perchlorate. Mr. Foss stated that the goal is to treat the most

impacted portions of the plume. Mr. Foss stated that the implementation is planned for later 2019 or early 2020 depending on the time to get the RAWP approved by the USEPA and TCEQ.

Overview of Sites

Ms. Nemmers discussed the field work completed the previous 3 months. She explained that the area had received a large amount of rainfall for an extended period of time and that this has delayed implementation of several remedies until the past 3 months. Ms. Nemmers stated that remedies are being implemented at LHAAP-03, -04, -16, and -17. Ms. Nemmers stated bioremediation approaches, similar to what Mr. Foss presented for LHAAP-50, were being implemented at LHAAP-04 and LHAAP-16. Ms. Nemmers stated that soil excavation was being completed at LHAAP-03 and LHAAP-17. Ms. Nemmers stated that monitoring of the selected remedy has occurred at LHAAP-37, LHAAP-58, and LHAAP-18/24. Ms. Nemmers stated that new monitoring wells were installed at LHAAP-12, -16, -50, and -67 to confirm delineation of the site plumes. Ms. Nemmers stated that the extraction system, installed at LHAAP-18/24, has double-walled piping to transfer the extracted groundwater to the treatment plant. Based upon observed leaks, replacement of portions of this double-walled piping has been completed.

LHAAP-16

For LHAAP-16, Mr. Foss explained the site has perchlorate and TCE impacted groundwater similar to LHAAP-50, which he presented earlier. Mr. Foss then pointed out the location of the site. Mr. Foss explained that the plume emanates from a former landfill towards the bayou. Mr. Foss explained that the site had an extraction system for the plume. When LHAAP lost power in late December 2018, the outage continued into late August 2019 and the extraction system did not operate. Mr. Foss explained that when power was restored in August, the extraction system was operated for a couple of weeks and then the sampling was completed in September 2019 to confirm the October 2018 baseline results. Mr. Foss explained that two monitoring wells were installed on the east side of the Harrison Bayou at the beginning of August 2019. Ms. Zeiler stated that the installation of these wells was difficult and took a long time to get proper conditions for installation. Ms. Zeiler said that these wells were necessary to evaluate the performance of the remedy being implemented and determine if there was TCE across the Bayou in the groundwater.

Mr. Foss stated that injections have started at the site. Mr. Foss explained that the injections started with the Bayou Biobarrier, pointing out the location of this area on slide 13. Mr. Foss also pointed out the two new wells installed on slide 13 (16WW57 and 16WW58). Mr. Foss stated that these wells allow for evaluation of the plume along the downgradient edge. Mr. Foss explained that the area in yellow includes injection of EVO in a grid pattern using direct push technology (DPT) with recirculation to treat this area of elevated perchlorate and TCE. Mr. Foss explained that Biobarriers 1 and 3 have also used DPT for delivery of the EVO. Mr. Foss explained that Biobarrier 2 does not require DPT so the DPT rig has moved over to LHAAP-04. Mr. Richard LeTourneau asked if this site will respond better than others. Mr. Foss stated that everything went in well but the first round of groundwater monitoring, completed after all the injections are done, will help assess the performance. Ms. Laura-Ashley Overdyke asked about the data from the new wells. Mr. Foss stated that the groundwater results from the new wells will be presented in the Remedial Action Completion Report (RACR) that will be produced in 2020. Ms. Zeiler stated

that the groundwater results show that the TCE plume crosses the bayou and will be used to evaluate the effectiveness of the injections. Ms. Zeiler stated that surface water sampling will continue and that contamination is not being observed downgradient of the site. Ms. Zeiler pointed out that the field team is checking for injectate in the bayou which could be observed as a white milky material and could take away oxygen in surface water. Ms. Nemmers pointed out that the initial groundwater sampling results may not be representative of whether the site responds well because often it takes a year to observe microbial growth resulting in reduction of the TCE and perchlorate. Ms. Zeiler pointed out that the yellow area, shown on Slide 13 for LHAAP-16, is where the extraction system was located, which is now turned off, and that the area is a treatment area and not a barrier. High concentrations of TCE are found in the area in both the shallow and intermediate zone groundwater. Ms. Zeiler explained that a grid of injections is used in the shallow zone of the ISB treatment area to treat the contamination and existing extraction wells are used in the intermediate zone to recirculate injectate to get as much contact as possible with the TCE contamination in that zone. Ms. Zeiler pointed out that with the landfill being the source of the plume, additional injections will likely be needed in the future along the landfill biobarriers.

LHAAP-17

Mr. Foss explained that LHAAP-17 is located across the Bayou and southeast of LHAAP-16. Mr. Foss stated that LHAAP-17 was a burning ground and flashing site. Mr. Foss explained that the site was excavated beginning in August 2019 for explosives in the soil and that approximately 5,300 cubic yards of soil was expected to be removed. However, munition items were found during the excavation, which was unanticipated. The Army provided Ordnance and Explosives Safety Specialist (OESS) support. Mr. Foss stated that the initial rounds found were not live so the excavation continued under OESS supervision. Mr. Foss stated that the excavation was nearly completed but then additional munitions debris and munitions and explosives of concern (MEC) were found. Therefore, work has been stopped to be able to provide additional ordnance support and ensure safety of intrusive activities. Mr. Foss explained that as a safety measure the currently excavated areas will be backfilled in early November 2019.

Mr. Foss explained that the second part of the remedy involves the installation of a groundwater extraction system to treat perchlorate in groundwater. Mr. Foss stated that placement of that system will be above ground to avoid intrusive activities. Mr. Foss explained that this will allow the remedy to move forward. Ms. Judy VanDeventer asked if the remaining excavation will be done under this contract. Ms. Zeiler stated that the work will be under a separate contract. Mr. Foss stated that a report will be prepared to document the excavation and backfilling work completed at the site to date to support the scoping of follow-on excavation work. Ms. Nemmers pointed out that the dashed lines on slide 16 show the extent of the excavation. Ms. Nemmers stated that over excavation was necessary for some sidewalls as shown by dashed lines that move away from the planned excavation and that most of the planned excavation was completed.

Look Ahead

Ms. Nemmers then discussed the 3 month look ahead for LHAAP field work. Ms. Nemmers stated that the documents in the coming months include annual Remedial Action Operations [RA(O)]

Reports that document the progress of the remedies implemented. Ms. Nemmers stated that the RAWP for the injections at LHAAP-50 is going through the review process as previously discussed. Ms. Nemmers stated that the quarterly evaluation reports for the GWTP are in process for the second and third quarter of 2019.

Ms. Nemmers stated that the field work look ahead includes the four sites discussed throughout the meeting. Ms. Nemmers stated that LHAAP-03 is a small site with arsenic and lead in the soil that requires a little additional excavation based upon the soil sample results and then backfilling. Ms. Nemmers stated that LHAAP-17 field work will hopefully include installation of the extraction system in addition to backfilling the excavation. Ms. Nemmers stated that the injections will be completed at LHAAP-04 and LHAAP-16 in the coming weeks and then the sites will enter the performance monitoring phase. Ms. Nemmers stated that the other sites listed on slide 18 are the sites with remedies in place that have on-going RA(O) sampling. Ms. Zeiler reminded everyone that the field schedules are posted on the website and encouraged everyone to check for this information. Ms. Nemmers pointed out that the look ahead for documents is the same list that are currently being completed because the documents take time to get reviewed and approved. Ms. Zeiler pointed out that the Contingency RAWP is the document for the injection field work at LHAAP-50, discussed early on in the meeting.

Groundwater Treatment Plant

Ms. Nemmers stated that there were handouts with the information on the slides for the GWTP that provide more details. Ms. Nemmers pointed out that the chart depicts discharge of treated water that includes water from the INF Pond so the peaks and valleys of the chart indicate discharge to the Bayou from both the GWTP and the INF Pond if able. Ms. Nemmers explained that when the Bayou is not flowing that the treated groundwater is discharged to the INF Pond. Ms. Nemmers also stated that more water can be extracted from the ground when there is more precipitation. Mr. Charles Dixon asked if the purpose of discharging in this way was to keep the minerals low. Ms. Zeiler stated that chloride and sulfate is tested prior to discharge to the Bayou.

Surface Water Sampling

Ms. Nemmers presented the five locations sampled for surface water. Ms. Nemmers stated that surface water samples are collected on a quarterly basis when the Bayou is flowing. Ms. Nemmers explained that one of the surface water samples exceeded the screening criteria of 17 parts per billion (ppb) for perchlorate. Ms. Nemmers stated that the surface water location was resampled a couple of weeks later. Ms. Nemmers stated that the result from the resample was 1.2 J ppb, with J meaning that the result was estimated. Ms. Nemmers explained that the detection limit is typically 2 ppb and so the detection was seen by the laboratory but below the detection limit. Ms. Nemmers stated that the location of the surface water sample was the furthest downgradient sample location but has historically had detections of perchlorate. Ms. Nemmers stated that LHAAP-18/24 was sampled in this same time period and that monitoring wells upgradient of this surface water sample did not have detections of perchlorate. Ms. Nemmers stated that the surface water will be sampled in the fourth quarter but has not been sampled in October 2019 to date due to lack of surface water flow. Ms. Zeiler pointed out that the screening criteria is the groundwater drinking level. Ms. Nemmers stated that this

information is also provided in a handout.

LHAAP-18/24, LHAAP-29, and LHAAP-47

Mr. Williams explained that HDR, Inc., has a separate contract for sites that do not have a ROD and is responsible for selection of the final remedy at three sites (LHAAP-18/24, LHAAP-29, and LHAAP-47). Mr. Williams explained that the LHAAP-18/24 ROD is being reviewed by the regulators and that comments are expected later in October 2019. Mr. Williams hoped that the ROD could be signed in late 2019.

Mr. Williams stated that the Final ROD for LHAAP-29 was signed and is on compact disc (CD) at the Marshall Public Library. On October 13, 2019, Mr. Williams stated that the notice that the final ROD was available for review was put into the Marshall News Messenger and the Shreveport Times.

Mr. Williams stated that LHAAP-47 had old data so additional data was obtained. A new well installed had an elevated detection of TCE such that the remedy selected would not be effective at those high levels. Currently, Work Plan Addendum 2 is being completed. The additional investigation planned will focus on the area around monitoring well 47MW25R. Monitoring well 47MW25R had TCE detected at 120,000 ppb. Mr. Williams explained the field work planned included both soil and groundwater samples.

Ms. Overdyke asked if LHAAP-17 excavation could have contributed to the perchlorate detected in HBW-7. Ms. Zeiler stated that the excavation commenced after the surface water sampling was completed. Ms. Zeiler stated that groundwater results and water levels were evaluated but no reason for the detection could be identified. Ms. Zeiler pointed out that implementation of the remedies such as at LHAAP-18/24 makes the Army feel better about the overall progress at this site.

Next RAB Meeting Schedule and Closing Remarks

Ms. Zeiler then discussed the next meeting with the RAB members. It was decided that the next RAB Meeting will be held on **January 16, 2020,** with the **meeting starting at 6:00 pm Central Standard Time (CST)** at the Karnack Community Center.

Ms. Zeiler announced that Ms. VanDeventer was selected as the new co-chair. Ms. VanDeventer accepted the position. Mr. Kent Becher mentioned that Mr. Rich Mayer was retiring. Mr. Mayer said that he had been at the USEPA since January 1987 and will be retiring on December 31, 2019. Mr. Mayer stated that he's been with the EPA since January 1987. Mr. Mayer said that he had been reviewing documents, like those for LHAAP, for 33 years. Mr. Mayer said that he'd enjoyed working with the RAB and that a replacement had not yet been selected for him by the EPA.

Adjourn

Ms. VanDeventer made the motion to adjourn and Mr. Dixon seconded the motion. The meeting adjourned at 6:55 pm CDT.

October 2019 Meeting Attachments and Handouts:

- Color Copy of Bhate Presentation Slides
- GWTP – Processed Groundwater Volumes Handout
- Surface Water Sampling Handout

Longhorn Army Ammunition Plant Quarterly Restoration Advisory Board Meeting

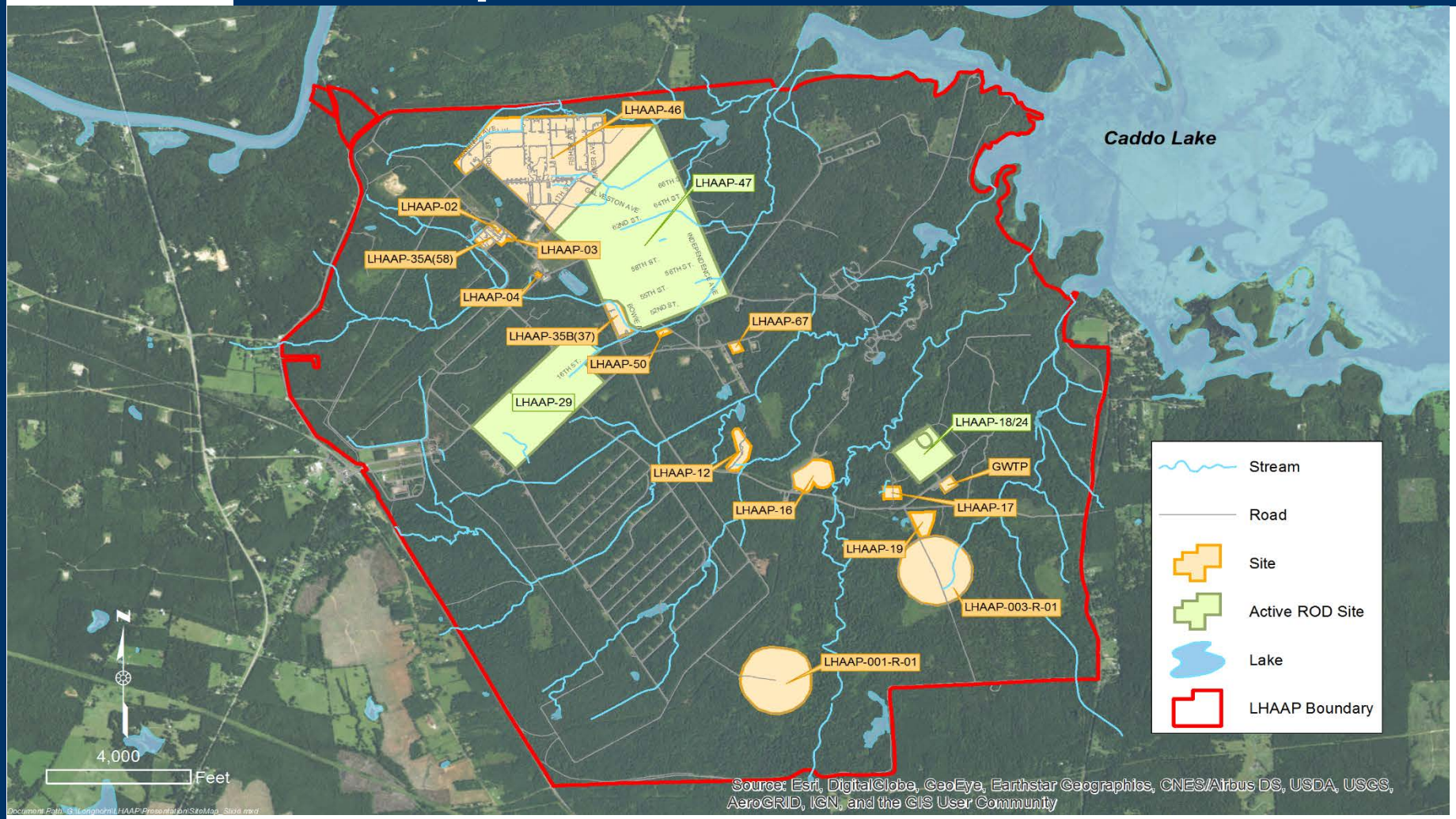
Karnack Community Center
October 23, 2019
6:00 PM CDT

APTIM

bhate

Restoration Advisory Board Meeting

Site Map



Abbreviations and Acronyms

µg/L	Micrograms per liter
DERP	Defense Environmental Restoration Program
DPT	Direct Push Technology
ESD	Explanation of Significant Differences
GPW	Goose Prairie Creek Water Sample
GW-Res	Residential Groundwater
GWTP	Groundwater Treatment Plant
HBW	Harrison Bayou Water Sample
ISB	In-situ bioremediation
LHAAP	Longhorn Army Ammunition Plant
MEC	Munitions and Explosives of Concern
MNA	Monitored natural attenuation
PCL	Protective Concentration Level
PSI	Pre-Screening Investigation
RAB	Restoration Advisory Board
RA(O)	Remedial Action Operation
RAWP	Remedial Action Work Plan
ROD	Record of Decision
TCE	Trichloroethylene
TCEQ	Texas Commission on Environmental Quality
TRRP	Texas Risk Reduction Program
USEPA	U.S. Environmental Protection Agency

Restoration Advisory Board Meeting

Agenda

06:00	Welcome and Introduction
06:05	Open Items
	Purpose of the Restoration Advisory Board (RAB) Meeting
	Ongoing Outreach/Website
	RAB Administrative Issues
	- Membership Update
	- Minutes (July 2019 RAB Meeting)
	- Election of new Co-Chair
06:15	Defense Environmental Restoration Program (DERP) Update
	LHAAP-50 Remedial Action Work Plan (RAWP)
	Documents and Field Work Completed Since Last RAB
	- LHAAP-16
	- LHAAP-17
	3 Month Look Ahead
	Groundwater Treatment Plant (GWTP) Update
06:45	Other DERP Update
	LHAAP-18/24 Record of Decision (ROD) and Responsiveness Summary
	- LHAAP-29 ROD and Responsiveness Summary
	- LHAAP-47 Additional Pre-Screening Investigation (PSI) Data & Revised ROD Schedule
	- Five Year Review Update – Recommendations for Sites 12, 50, and 67
06:55	Next RAB Meeting Schedule and Closing Remarks {RMZ}

Purpose of the RAB Meeting

- Held every 3 months
- The mission of the Longhorn Army Ammunition Plant (LHAAP) RAB is to promote community awareness and obtain constructive community review and comments on environmental restoration activities at the former LHAAP

The Army Wants You to be Informed

- The Army is committed to protecting human health and the environment; key to that commitment is engaging the community and increasing public participation in environmental restoration at LHAAP
- You are encouraged to:
  - Attend RAB Meetings and/or become a member of the RAB
  - Visit the Longhorn environmental website at www.longhornaap.com
    - Website is regularly updated to indicate the upcoming field events at each site including groundwater sampling, monitoring well installations, soil sampling, or remediation activities
  - Make suggestions for improving communication – the Army welcomes and appreciates community feedback

RAB Administrative Issues

- Membership Update
- Minutes (July 2019 RAB Meeting)
- Election of new Co-Chair

LHAAP-50 Contingency RAWP

- Site Background
  - LHAAP-50 had a 47,000-gallon aboveground storage tank receiving industrial wastewater from various production sumps throughout LHAAP between 1955 and 1988.
  - After solids were filtered, the water was discharged to Goose Prairie Creek.
  - Constituents of concern at LHAAP-50 were chlorinated solvents and perchlorate in groundwater and perchlorate in soil.
  - The selected remedy in the 2010 ROD was monitored natural attenuation (MNA), excavation of soil to eliminate groundwater contamination from contaminated soil, and land use controls as the remedy for groundwater. The ROD also included a contingency remedy for groundwater if MNA was not effective.

LHAAP-50 Contingency RAWP

- Site Background-Continued
  - In 2018, MNA was found to be ineffective based on evaluation of several lines of evidence.
  - Concentrations of trichloroethylene (TCE) and perchlorate increased from 2013 to 2018, and the TCE plume has expanded beyond its baseline footprint.
  - Final Explanation of Significant Differences (ESD) to the ROD for a contingency remedy was published in July 2019 and co-signed by the U.S. Environmental Protection Agency (USEPA) and Army and concurred by Texas Commission on Environmental Quality (TCEQ) in August 2019.
  - In July 2019, one additional monitoring well (50WW29) was installed and sampled.
  - Sample results confirmed the extent of the TCE and perchlorate plumes in groundwater.

LHAAP-50 Contingency RAWP Continued

Contingency RAWP

- RAWP is still in development and will undergo USEPA and TCEQ review and concurrence before implementation.
- The RAWP will include injection of emulsified vegetable oil, a microbial culture (SDC-9™), and nutrients to enhance biological degradation of perchlorate and TCE hot spots.
- Monitoring of the contingency remedy will include quarterly performance monitoring of selected wells for 2 years, as well as continued long-term monitoring of the larger plume area.
- Implementation of the Contingency RAWP is anticipated in late 2019.

Completed Field Work Since Last RAB Meeting

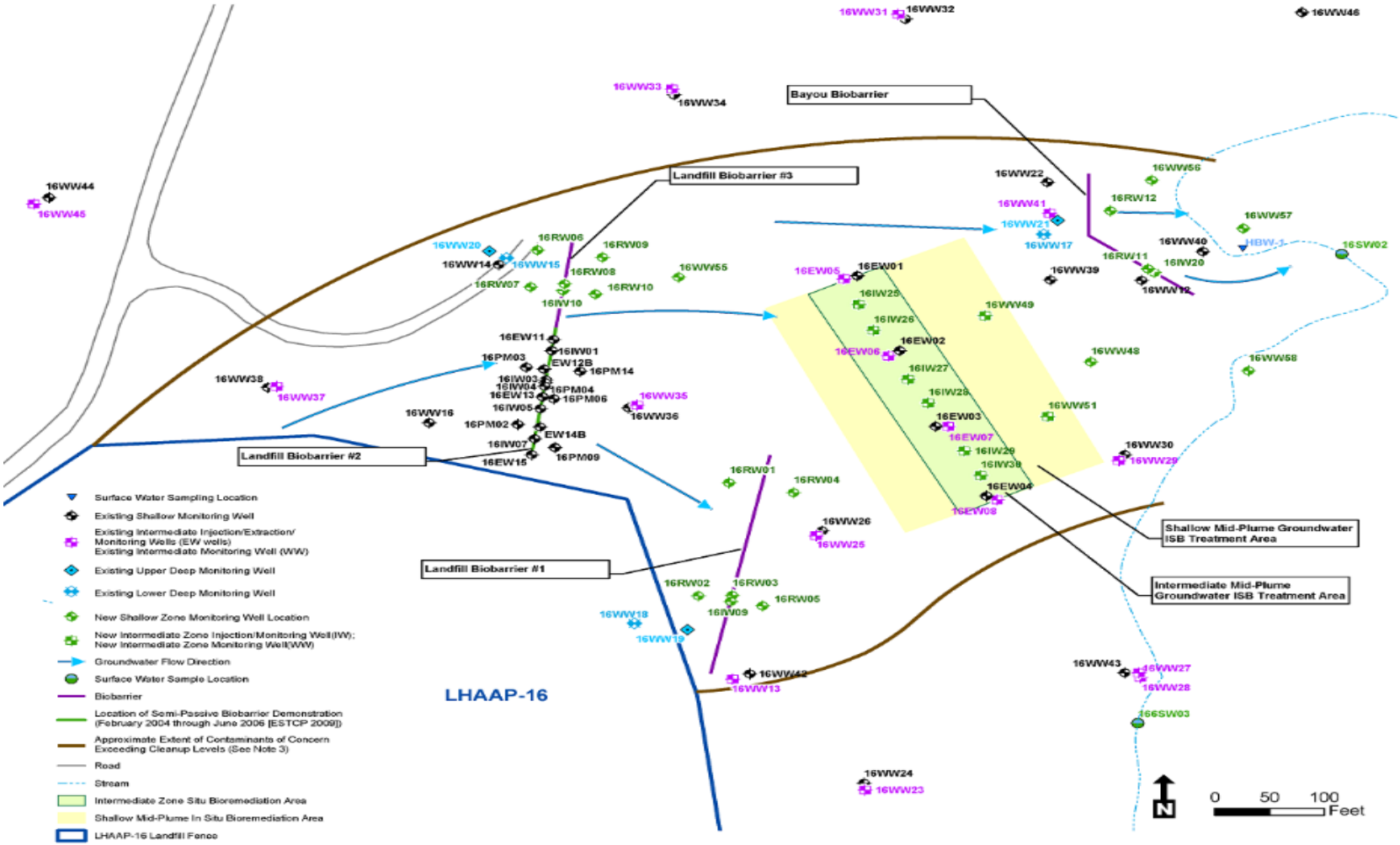
Site	Activity
LHAAP-03	Implementation of Remedial Action (Soil Excavation)
LHAAP-04	Implementation of Remedial Action (In-situ bioremediation [ISB] Injections)
LHAAP-16	Implementation of Remedial Action (ISB Injections)
LHAAP-17	Implementation of Remedial Action (Soil Excavation)
LHAAP-37	Remedial Action Operation [RA(O)] Sampling – August 2019
LHAAP-46	RA(O) Sampling – August 2019
LHAAP-58	RA(O) Sampling of Western Plume – September 2019
LHAAP-18/24	RA(O) Sampling – Maintenance/repairs
LHAAP-12/16/50/67	Installation of New Monitoring Wells

LHAAP-16 Remedial Action Update

- Power restored to site in late August 2019 and extraction system restarted.
- Two wells on east side of Harrison Bayou (16WW57 & 16WW58) and one remaining intermediate zone well (16WW49) installed in July/August 2019
- Baseline samples collected from selected wells in September 2019 to complement October 2018 Baseline Sampling
- Injections completed in the Bayou Biobarrier, Mid-Plume Area, Biobarrier #1, Biobarrier #2, and Biobarrier #3
- 80,874 gallons of ISB solution injected starting on September 24, 2019 with 102 injection locations

Restoration Advisory Board Meeting

LHAAP-16 Remedial Action Update



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LHAAP-17 Remedial Action Update

- Excavation of contaminated soil initiated on August 21, 2019
- During excavation, unanticipated munitions items were discovered and addressed by Army Explosive Ordnance Disposal teams
- Excavation continued with support from an Army Ordnance and Explosives Safety Specialist
- Approximately 6,000 cubic yards of soil was excavated between August 21 and September 28, 2019

Restoration Advisory Board Meeting

LHAAP-17 Remedial Action Update

- On September 28, additional munitions debris and potential munitions and explosives of concern (MEC)were discovered and excavation work was halted for further site evaluation
  - At Army direction, excavation work has ceased and open areas will be backfilled and no intrusive activities will be performed at the site.
  - Remaining excavation work will need to be completed under a separate contract that includes munitions response support.
- Existing excavation areas will be backfilled as a safety measure
- Options for constructing the LHAAP-17 groundwater extraction system without requiring intrusive activities are currently being considered

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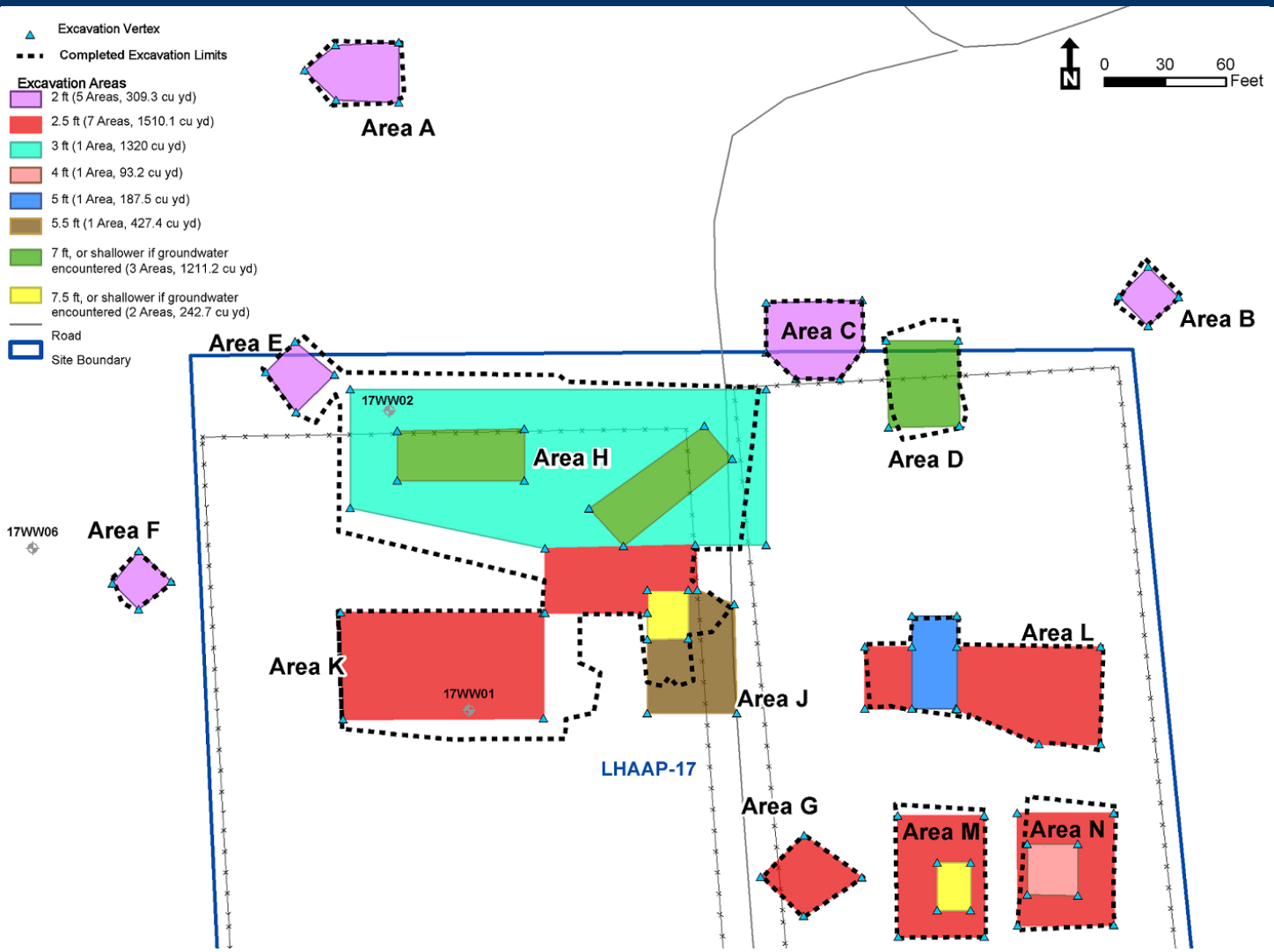
LHAAP-17 Remedial Action Update



Documents in Process

Site	Document
LHAAP-46	Annual RA(O) Report
LHAAP-50	Contingency RAWP
LHAAP-58	Annual RA(O) Report
LHAAP-67	Annual RA(O) Report
GWTP	Quarterly Evaluation Report: Second Quarter (April – June 2019) Quarterly Evaluation Report: Third Quarter (July – September 2019)

Restoration Advisory Board Meeting

3 Month Look Ahead - Field Work by Bhate Team

Site	Activity
LHAAP-03	Complete excavation backfill
LHAAP-04	Performance monitoring
LHAAP-16	Performance monitoring
LHAAP-17	Complete excavation backfill and extraction system installation
LHAAP-37	RA(O) Sampling – November 2019
LHAAP-50	RA(O) Sampling – November 2019
LHAAP-58	RA(O) Sampling – December 2019
LHAAP-67	RA(O) Sampling – November 2019
LHAAP-18/24	RA(O) Sampling – December 2019

3 Month Look Ahead – Documents by Bhate Team

Site	Document
LHAAP-50	Finalize the Contingency RAWP
LHAAP-58	Finalize the Year 5 RA(O) Report
GWTP, LHAAP-16, and LHAAP-18/24	Quarterly Evaluation Report: Second Quarter (April –June 2019) Quarterly Evaluation Report: Third Quarter (July –September 2019)

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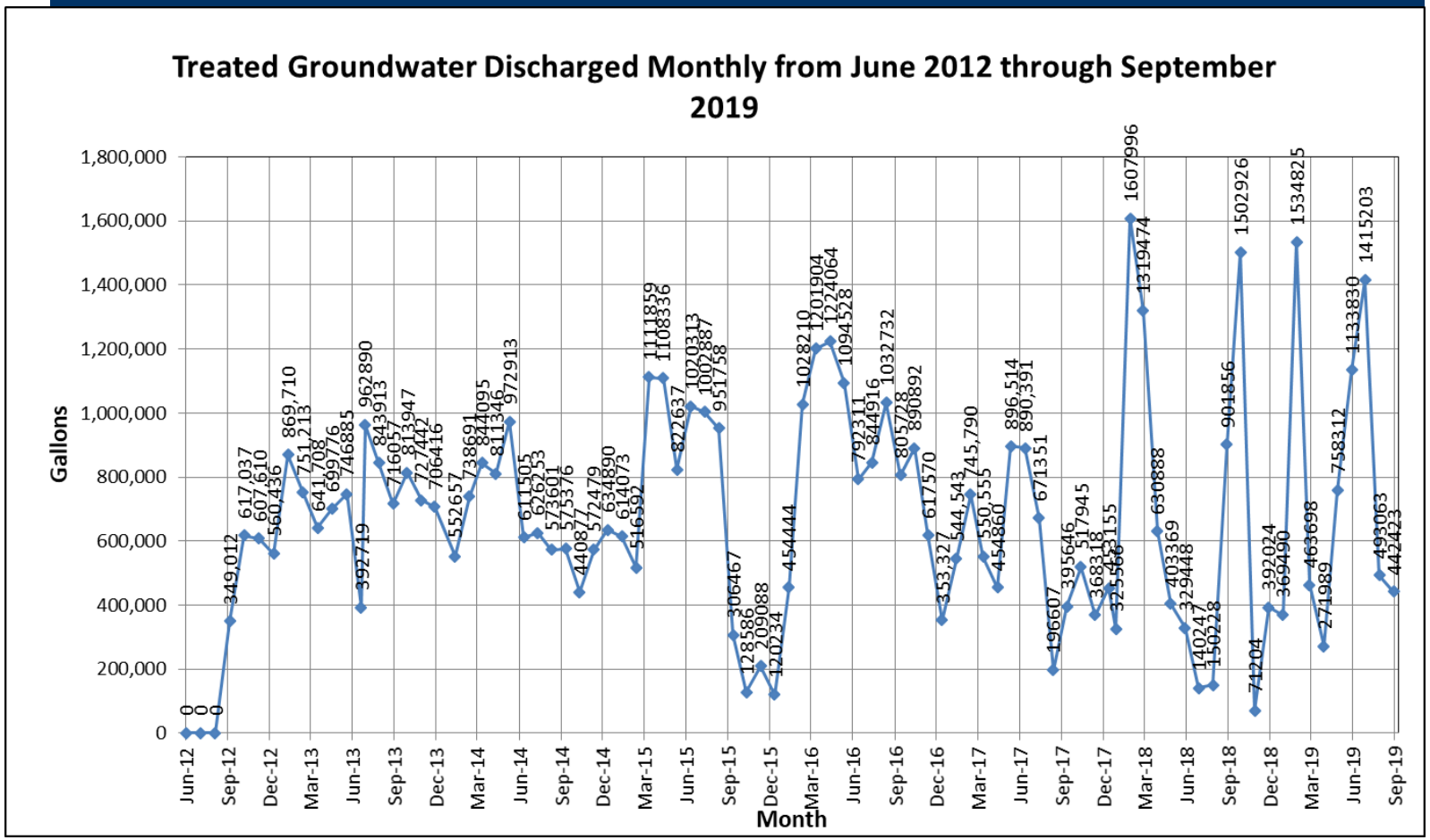
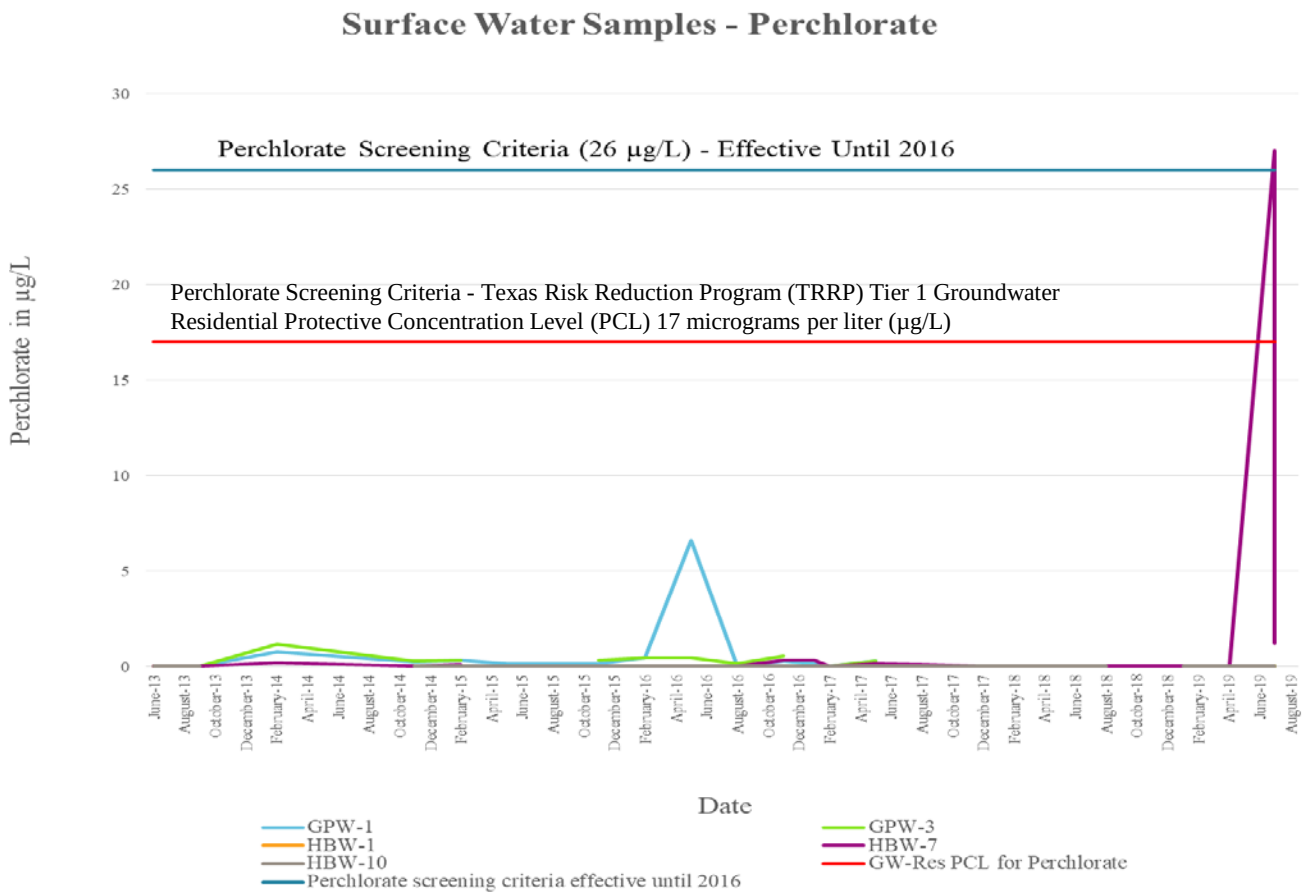
GWTP Update



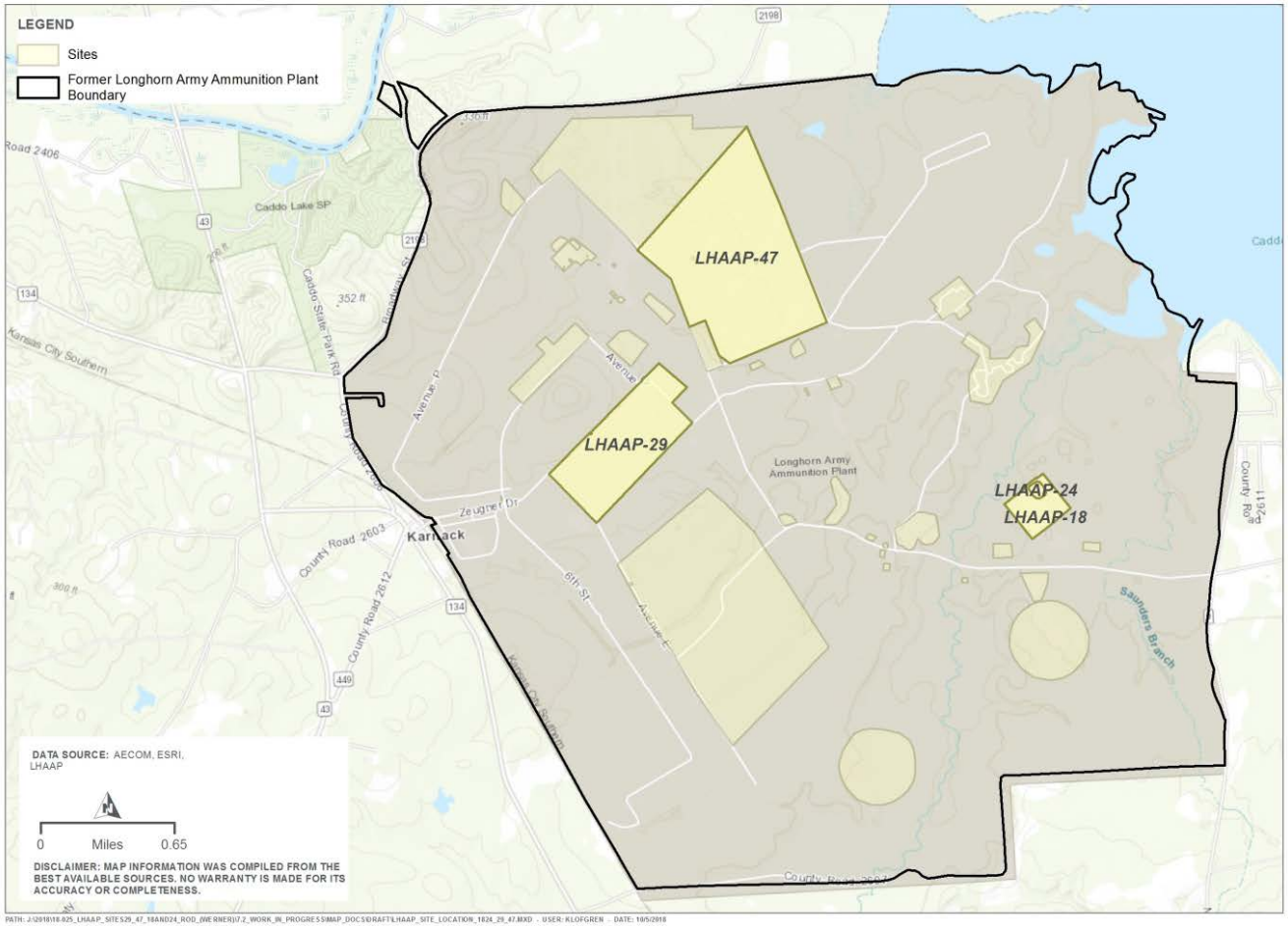
Restoration Advisory Board Meeting

Surface Water Sample Results



Note: Surface water at HBW-7 had a detection of 27 µg/L from a sample collected on 11 July 2019. Surface water at HBW-7 was resampled 19 days later (30 July 2019) with a detection of 1.2 J µg/L.

LHAAP-18/24, 29, 47 Status Update

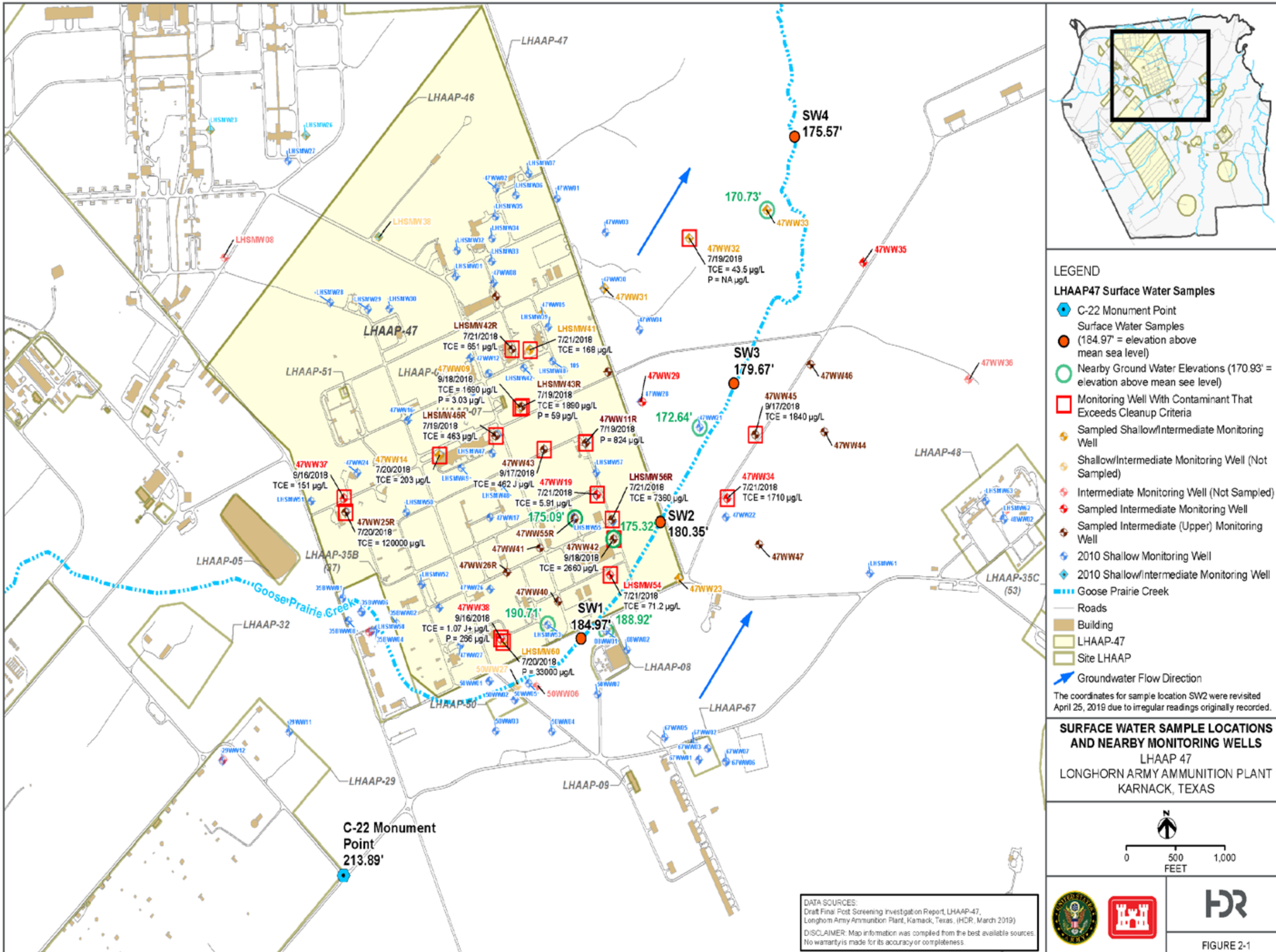


LHAAP-18/24 & 29 Document Status

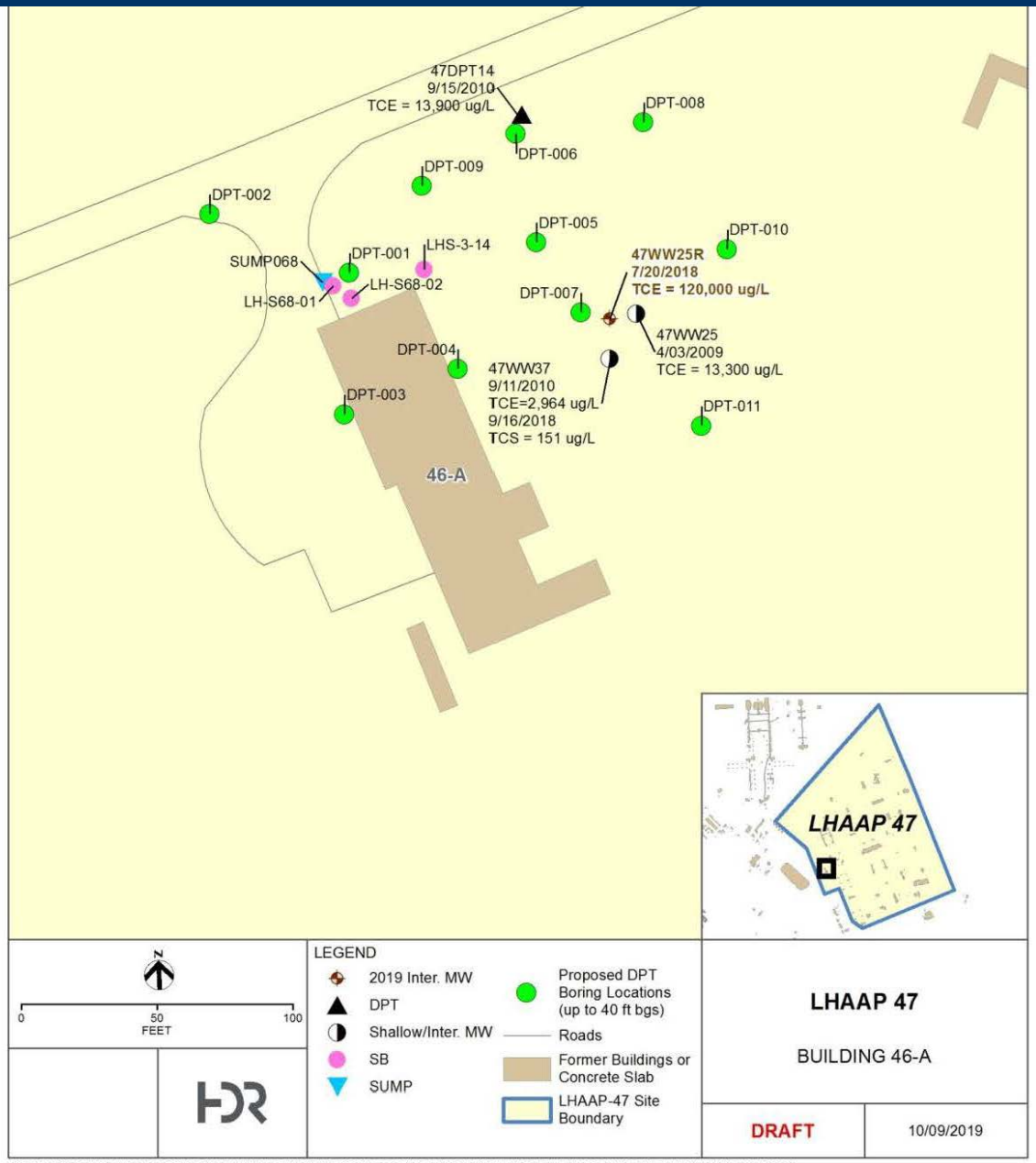
- **LHAAP-18/24**
  - **Draft Record of Decision submitted to the Regulators September 6, 2019**
- **LHAAP-29**
  - **Final Record of Decision signed September 19, 2019**
  - **Notice of Availability published in the Marshall News Messenger and Shreveport Times on October 13, 2019 and October 9, 2019 respectively. The ROD is available for public review at the Marshall Public Library.**
- **LHAAP-47**
  - **Draft PSI Work Plan Addendum No. 2 in Regulator review- Fieldwork to support the Record of Decision anticipated in early November 2019.**

LHAAP-47 Field Work Plan

- **Work Planned**
  - 11 Direct Push Technology (DPT) borings
  - 33 soil samples and 11 groundwater samples collected from DPT borings to identify source and extent
  - Collect groundwater samples from 3 existing wells for confirmation of results


LHAAP-47
LHAAP-46
LHAAP-51
LHAAP-05
LHAAP-35B (37)
LHAAP-32
LHAAP-29
LHAAP-50
LHAAP-08
LHAAP-09
LHAAP-67
LHAAP-48
LHAAP-35C (53)
Goose Prairie Creek
SW4 175.57'
SW3 179.67'
SW2 180.35'
SW1 184.97'
170.73'
172.64'
175.09'
175.32'
190.71'
188.92'
C-22 Monument Point 213.89'
47WW32 7/19/2018 TCE = 43.5 µg/L P = NA µg/L
47WW33
47WW31
47WW35
47WW36
47WW29
47WW46
47WW45 9/17/2018 TCE = 1840 µg/L
47WW44
47WW34 7/21/2018 TCE = 1710 µg/L
47WW47
47WW23
LHSMW42R 7/21/2018 TCE = 651 µg/L
LHSMW41 7/21/2018 TCE = 168 µg/L
47WW09 9/18/2018 TCE = 1690 µg/L P = 3.03 µg/L
LHSMW43R 7/19/2018 TCE = 1890 µg/L P = 59 µg/L
LHSMW46R 7/19/2018 TCE = 463 µg/L
47WW11R 7/19/2018 P = 824 µg/L
47WW37 9/16/2018 TCE = 151 µg/L
47WW14 7/20/2018 TCE = 203 µg/L
47WW43 9/17/2018 TCE = 462 J µg/L
47WW19 7/21/2018 TCE = 5.91 µg/L
LHSMW56R 7/21/2018 TCE = 7360 µg/L
47WW25R 7/20/2018 TCE = 120000 µg/L
47WW55R
47WW41
47WW42 9/18/2018 TCE = 2660 µg/L
47WW26R
47WW40
LHSMW54 7/21/2018 TCE = 71.2 µg/L
47WW38 9/16/2018 TCE = 1.07 J+ µg/L P = 266 µg/L
LHSMW60 7/20/2018 P = 33000 µg/L
50WW27
50WW06
LHSMW38
LHSMW08
LEGEND
LHAAP47 Surface Water Samples
C-22 Monument Point
Surface Water Samples (184.97' = elevation above mean sea level)
Nearby Ground Water Elevations (170.93' = elevation above mean see level)
Monitoring Well With Contaminant That Exceeds Cleanup Criteria
Sampled Shallow/Intermediate Monitoring Well
Shallow/Intermediate Monitoring Well (Not Sampled)
Intermediate Monitoring Well (Not Sampled)
Sampled Intermediate Monitoring Well
Sampled Intermediate (Upper) Monitoring Well
2010 Shallow Monitoring Well
2010 Shallow/Intermediate Monitoring Well
Goose Prairie Creek
Roads
Building
LHAAP-47
Site LHAAP
Groundwater Flow Direction
The coordinates for sample location SW2 were revisited April 25, 2019 due to irregular readings originally recorded.
SURFACE WATER SAMPLE LOCATIONS AND NEARBY MONITORING WELLS
LHAAP 47
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
N
0 500 1,000
FEET
DATA SOURCES:
Draft Final Post Screening Investigation Report, LHAAP-47, Longhorn Army Ammunition Plant, Karnack, Texas. (HDR, March 2019)
DISCLAIMER: Map information was compiled from the best available sources. No warranty is made for its accuracy or completeness.
HDR
FIGURE 2-1

LHAAP-47 Field Work Plan



Next RAB Meeting Schedule & Closing Remarks

- Schedule January 2020 RAB Meeting
- Other Issues/Remarks
- Thank you for coming

Groundwater Treatment Plant - Processed Groundwater Volumes

The amount of groundwater treated is determined by measuring the number of gallons of processed water discharged.

Processed Water Discharged 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	843,913	716,057

Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14
813,974	727,442	706,416	552,657	738,691	844,095	811,346	972,913	611,505	626,253	573,601	575,376

Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15
440,877	572,479	634,890	614,073	516,592	1,111,859	1,108,336	822,637	1,020,313	1,002,887	951,758	306,467

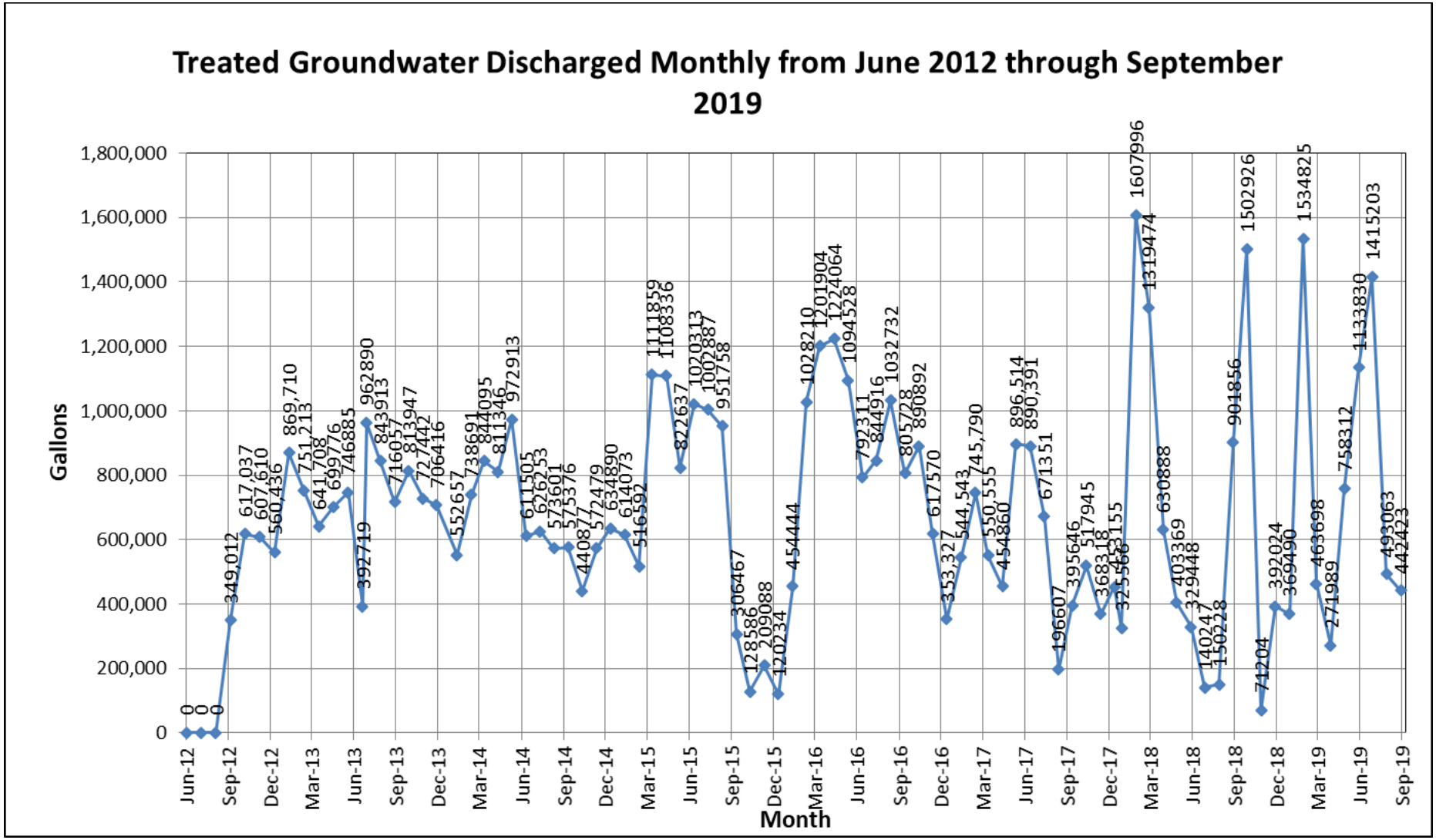
Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
128,586	209,088	120,234	454,444	1,028,210	1,201,904	1,224,064	1,094,528	792,311	844,916	1,032,732	805,728

Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17
890,892	617,570	353,327	544,543	745,790	550,555	454,860	896,514	890,391	528,538	195,198	961,324

Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul - 18	Aug-18	Sep-18
517,945	368,318	453,155	325,566	1,607,996	1,319,474	630,888	403,369	329,448	140,247	150,228	901,856

Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	June-19	Jul - 19	Aug-19	Sep-19
1,502,926	71,204	392,024	369,490	1,534,825	463,698	271,989	758,312	1,133,830	1,415,203	493,063	442,423

*Indicates Estimate


Treated Groundwater Discharged Monthly from June 2012 through September 2019
Gallons
Month
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Jun-12
Sep-12
Dec-12
Mar-13
Jun-13
Sep-13
Dec-13
Mar-14
Jun-14
Sep-14
Dec-14
Mar-15
Jun-15
Sep-15
Dec-15
Mar-16
Jun-16
Sep-16
Dec-16
Mar-17
Jun-17
Sep-17
Dec-17
Mar-18
Jun-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
0
0
0
349,012
617,037
607,610
560,436
869,710
751,213
641,708
699,776
746885
392719
962890
843913
716057
813947
72,7442
706416
552657
738691
844095
811346
972913
611505
626253
573601
575376
440877
572479
634890
614073
516592
1111859
1108336
822637
1020313
1002887
951758
306467
128586
209088
120234
454444
1028210
1201904
1224064
1094528
792311
844916
1032732
805728
890892
617570
353,327
544,543
745,790
550,555
454860
896,514
890,391
671351
196607
395646
517945
368318
323568
1607996
1319474
630888
403369
329448
140247
150228
901856
1502926
71204
392024
369490
1534825
463698
271989
758312
1133830
1415203
493063
442423

Water Discharge Location and Volume (Gallons)

Month	Total Combined to Harrison Bayou	LHAAP-18/24 Sprinklers	GWTP To INF Pond	INF Pond to Harrison Bayou	Contract Hauled Off-Site
Dec-16	0	236,688	0	0	0
Jan-17	0	0	0	0	0
Feb-17	0	0	0	0	14,355
Mar-17	127,242	0	0	0	14,400
Apr-17	113,038	0	236,821	0	0
May-17	0	0	534,155	0	0
Jun-17	958,404	0	294,550	490,574	0
Jul-17	0	0	528,538	0	0
Aug-17	0	0	195,197	0	0
Sep-17	651,434	0	309,980	651,434	0
Oct-17	0	0	517,945	0	0
Nov-17	0	0	368,318	0	0
Dec-17	560,350	0	453,155	560,350	0
Jan-18	325,566	0	253,177	325,566	0
Feb-18	1,607,996	0	62,017	1,430,634	0
Mar-18	1,319,474	0	0	870,816	0
Apr-18	630,888	0	0	630,888	0
May-18	403,369	0	0	403,369	0
Jun-18	193,669	0	135,779	0	0
Jul -18	0	0	140,247	0	0
Aug -18	49,409	0	100,819	0	0
Sep-18	585,397	0	316,459	524,484	0
Oct-18	1,409,106	0	93,820	1,016,285	0
Nov-18	71,204	0	0	0	0
Dec-18	392,024	0	0	0	0
Jan-19	369,490	0	0	369,490	0
Feb-19	1,534,825	0	0	1,326,485	0
Mar-19	463,698	0	0	83,250	0
Apr-19	271,989	0	0	0	0
May-19	758,312	0	0	253,817	0

Month	Total Combined to Harrison Bayou	LHAAP-18/24 Sprinklers	GWTP To INF Pond	INF Pond to Harrison Bayou	Contract Hauled Off-Site
Jun-19	1,133,830	0	0	847,918	0
Jul -19	1,415,203	0	0	903,001	0
Aug-19	374,629	0	118,434	0	0
Sep-19	0	0	442,423	0	0

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 sampling location is dry.

Surface Water Sample Data (in micrograms per liter)

Quarter	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st
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	2nd	3rd	4th	1st	2nd	3rd	3rd	4th	2nd	3rd	4th
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	1st	2nd	3rd	4th	2nd	3rd	3rd	3rd	4th	1st	2nd
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	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st
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	NS	1.65	0.735
GPW-3	dry	0.199J	0.673	dry	dry	1.31	0.261	dry	NS	1.74	0.754
HBW-1	dry	<0.1U	<0.2U	dry	dry	<0.1U	0.1U	dry	NS	<0.2U	<0.2U
HBW-7	dry	<0.1U	<0.2U	dry	dry	0.171J	0.1U	dry	NS	<0.2U	<0.2U
HBW-10	dry	<0.1U	<0.2U	dry	dry	<0.1U	0.1U	dry	NS	<0.2U	<0.2U

Quarter	2nd	3rd	4th	1st	2nd	3nd	4th	1st	2nd	3rd	4th
Creek Sample ID	**Jun 2013**	**Sept 2013**	**Dec 2013**	**Feb 2014**	**May 2014**	**Aug 2014**	**Nov 2014**	**Feb 2015**	**May 2015**	**Aug 2015**	**Nov 2015**
GPW-1	dry	<0.2 U	dry	0.766	dry	dry	0.244 J	0.311 J	0.156J	dry	0.142 J
GPW-3	dry	<0.2 U	dry	1.15	dry	dry	0.276 J	0.344 J	dry	dry	0.311 J
HBW-1	<0.2U	<0.2 U	dry	<0.2 U	dry	dry	<0.2 U	<0.2 U	dry	dry	<0.2 U
HBW-7	<0.2U	<0.2 U	dry	0.201 J	dry	dry	<0.2 U	0.124 J	dry	dry	<0.2 U
HBW-10	<0.2U	<0.2 U	dry	<0.2 U	dry	dry	<0.2 U	<0.2 U	dry	dry	<0.2 U

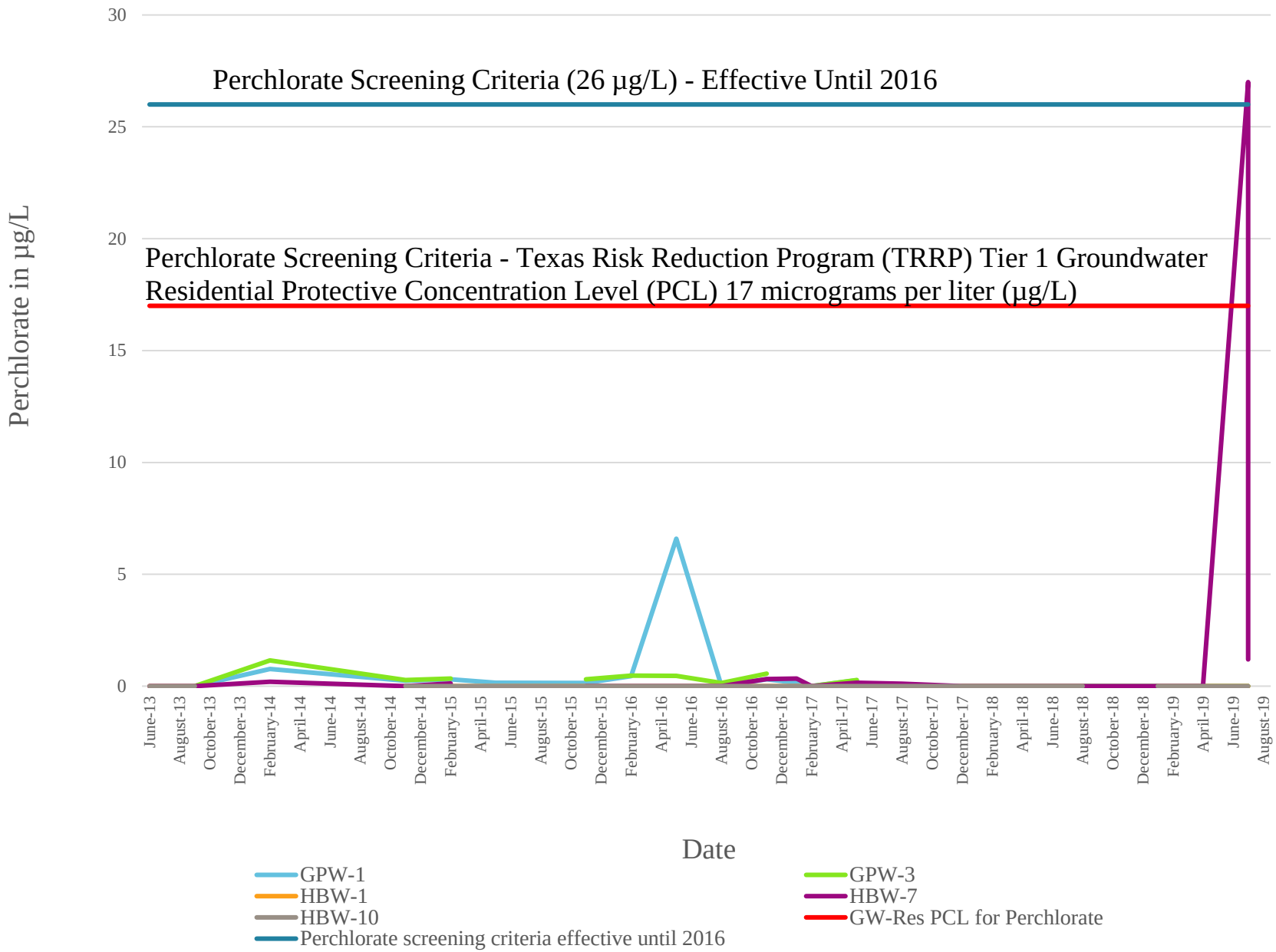
Quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd
Creek Sample ID	**Feb 2016**	**May 2016**	**Aug 2016**	**Nov 2016**	**Feb 2017**	**May 2017**	**Aug 2017**	**Dec 2017**	**Mar 2018**	**June 2018**	**August 2018**
GPW-1	0.447	6.59	<0.2 U	0.301 J	<1 U	0.263	dry	<4.0 U	<4.0 U	dry	<2.0 U
GPW-3	0.474	0.457	0.141	0.563	<1 U	0.274	dry	<4.0 U	<4.0 U	dry	<2.0 U
HBW-1	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	<0.2 U	1.1 J	<4.0 U	dry	<2.0 U
HBW-7	<0.2 U	<0.2 U	<0.2 U	0.318 J	<1 U	0.155	<0.2 U	<4.0 U	<4.0 U	dry	<2.0 U
HBW-10	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<1 U	<0.2 U	0.111J	<4.0 U	<4.0 U	dry	<2.0 U

NS – not sampled U – non-detect J – Estimated Dry – no surface water

Quarter	4th	1st	2nd	3rd
Creek Sample ID	**Oct 2018**	**Jan 2019**	**April 2019**	**July 2019**
GPW-1	<2.0 U	<2.0 U	<2.0 U	<2.0 U
GPW-3	<2.0 U	<2.0 U	<2.0 U	<2.0 U
HBW-1	<2.0 U	<2.0 U	<2.0 U	<2.0 U
HBW-7	<2.0 U	<2.0 U	<2.0 U	27 (initial))/ 1.2 J (re-sample)
HBW-10	<2.0 U	<2.0 U	<2.0 U	<2.0 U

NS – not sampled U – non-detect J – Estimated Dry – no surface water

Surface Water Samples - Perchlorate



Note: Surface water at HBW-7 had a detection of 27 µg/L from a sample collected on 11 July 2019. Surface water at HBW-7 was resampled 19 days later (30 July 2019) with a detection of 1.2 J µg/L.

Longhorn Army Ammuntion Plant Creek Sampling Locations