Subject: Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting
Longhorn Army Ammunition Plant (LHAAP)
Location of Meeting: Karnack Community Center
Date of Meeting: 22 June 2023, 6:00 PM Central Standard Time (CST)

Meeting Participants:

Army BRAC:	Kyle Russell
USACE:	Aaron Williams, Chelsea Montoya
USAEC:	Lena Sierocinski, Michael Bowlby
Bhate:	Zachary Beck, Caitlin Ryan
APTIM:	Bill Foss
HDR, Inc.:	Gregory Kelly
MMG-TLI JV:	Jonathan Tatman
USEPA Region 6:	Brian Follin
USGS:	Chris Braun
RAB:	Present: Tom Walker, John Fortune, Richard LeTourneau, and Judy VanDeventer, and new RAB member Eugene Byrd Absent: Deon Hall, Sharon McAvoy, Nigel Shivers

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A color copy of the slide presentation and handouts (see list at end of meeting minutes) were provided for meeting attendees.

Welcome and Membership Update

Ms. Lena Sierocinski with USAEC introduced herself as the new RAB co-chair alongside Ms. Judy VanDeventer and welcomed everyone to the meeting, stating that all questions will be answered during the meeting or posted online if more insight is needed. Ms. Sierocinski stated that a site tour of the LHAAP will be held during the November RAB meeting and the time for that meeting will be adjusted in order to have the tour before sunset. Ms. Sierocinski discussed that new RAB member applications can be found on the LHAAP website. Ms. Sierocinski then asked if there were any members of the public interested in joining the RAB. No members were interested at the time. Ms. Sierocinski then addressed two new member applications that were received and subsequently sent to the current RAB members for review prior to the meeting. Ms. Sierocinski initiated a vote to induct the two new RAB applicants (Mr. Eugene Byrd and Ms. Margaret Rolland). The RAB members were asked to raise their hands to show a vote of “yes” for each member as their names were called. Both members were successfully initiated unanimously. New member, Mr. Eugene Byrd, was present and asked to join the RAB meeting as a member. Ms. Sierocinski then handed out RAB charters and discussed that the roles will be redone and changed in 2024.

Minutes (November 2023 RAB Meeting)

Ms. Sierocinski checked to make sure that all the RAB members were able to view the minutes from the previous RAB meeting in February, in which the members responded, "yes." No changes were made to the minutes, so the minutes were approved. Ms. VanDeventer then called the meeting to order, which Mr. John Fortune seconded.

Introductions

Ms. Sierocinski asked the environmental contractors to introduce themselves. Mr. Zachary Beck of Bhate Environmental Services Inc. (Bhate) was the first to introduce himself. He introduced the Poarch Creek Indians, Government Services, LLC (PCI)/Bhate Joint Venture (PBJV) and their larger role in the remediation occurring at LHAAP. Mr. Bill Foss of APTIM Federal Services (APTIM) introduced himself as a subcontractor working with PBJV. Mr. Gregory Kelly with HDR, Inc. (HDR) introduced himself and the three different sites HDR manages at LHAAP. Mr. Kelly pointed out that he is a geologist, and that he is primarily involved with LHAAP-47. Mr. Johnathan Tatman of MMG-TLI Joint Venture (MMG-TLI JV) introduced himself and explained that their contract involves LHAAP-17 to remove Munitions and Explosives of Concern (MEC) and chemical hazards. Kyle Russell was introduced as the new Base Realignment and Closure (BRAC) manager.

Groundwater Treatment Plant (GWTP) Update

Mr. Beck provided an overview of the GWTP, which currently treats groundwater from LHAAP-18/24 and recently started processing groundwater from LHAAP-17. He began with an update of the plant by presenting a handout depicting a graph of the amount of treated groundwater discharged each month. Mr. Beck said that the repairs were necessary after the freeze damage caused in February 2023. Then Mr. Beck explained that there was a shutdown in April 2023 due to a gap during the contract transitional period. The GWTP was not operable during this time and therefore nothing was discharged. The GWTP was brought back online 3 May 2023. It should be noted that the week before the RAB, severe weather traveled through northeastern Texas that caused multiple power outages and the GWTP was without power for a few days. Ms. VanDeventer asked Mr. Beck if there was any effect on the GWTP during this power outage. Mr. Beck explained that during this time period there was no discharge for approximately one week. He did say that this was a minor disruption.

Surface Water

Mr. Beck said that the surface water is sampled quarterly within Harrison Bayou and Goose Prairie Creek. He pointed everyone to the handout for the surface water sampling with the surface water results to date. Mr. Beck said that perchlorate is monitored quarterly at five locations to evaluate potential impacts to the surface water bodies.

LHAAP-04

Mr. Foss gave an update on LHAAP-04, saying that the site's sampling results have been very good with contaminants of concern below the screening criteria. He explained that the site was formerly a wastewater treatment plant, located next to the fire station. Waste was disposed of

here from the demolition of structures around LHAAP. There was a soil excavation at this site in 2009 to remove mercury and perchlorate impacted soil. Mr. Foss then showed a graph on the slides that showed the levels of perchlorate in the inner and outer boundaries on the site. He explained that the inner boundary showed a concentration that was five times greater than the outer boundary. Therefore, treatment was focused on the inner area. Treatment included pumping emulsified vegetable oil to stimulate bioremediation in order to help break down the perchlorate contaminant. He showed another graph that compared a timeline to the levels of perchlorate in the groundwater before and after the injection. Overall results showed that the bioremediation is working, and perchlorate levels are basically non-detect now. Mr. Foss went on to explain that the site is now being monitored to determine if the site contamination will rebound (contamination levels rise when all the emulsified vegetable oil has been consumed) after the reducing conditions caused by the excess in microbial activity have diminished. Mr. Foss said that this will occur three to five years after the last injection event, which occurred in November 2019. Mr. Foss went on the explain that the return of dissolved oxygen levels in the groundwater to baseline will provide the exact time for when this has occurred. Analyzing the perchlorate levels in the groundwater after this over a period of time will prove whether the perchlorate levels are rebounding or if the remediation was a success. The next sampling event will be in August 2023. Mr. Tom Walker, a RAB member, asked Mr. Foss if there was currently any "physical" remediation being done on-site. Mr. Foss responded by stating that currently, monitoring is the only remediation being done at this site. He stated that once the carbon from the emulsified vegetable oil has been completely diminished the dissolved oxygen levels will return to baseline conditions. Monitoring at LHAAP-04 will cease when the Five Year Review (FYR) Report determines monitoring at the site is no long necessary and upon the regulators' approval. Mr. Eugene Byrd then asked Mr. Foss if the bacteria in the soil were naturally occurring or if they were added during remediation. Mr. Foss responded by saying that no bacteria were added during the injections because perchlorate can be broken down by a wide variety of naturally occurring bacteria.

LHAAP-17

Mr. Tatman discussed the Time Critical Removal Action (TCRA) completed at LHAAP-17. Mr. Tatman explained that the Time Critical Removal Action was completed to reduce the impact of MEC at the site. He explained that between 1959 – 1980 the site was used as a burning ground and flashing area and that the waste material was left on-site after the burn. He explained that the waste residues were reportedly removed from the trenches [in 1984], and the site was allowed to revegetate. However, when the remedy from the ROD was implemented, it was found that MEC were still present. It was then determined that TCRA needed to be completed. He outlined the major work elements completed including a surface sweep, geophysical mapping activities, and the use of robotic machinery to filter and shift previously dug material known to contain MEC. Mr. Tatman explained that the soils were then sampled for perchlorate and explosives and either returned to the site or if they were above the protective cleanup level (PCL), transported for off-site disposal at a landfill. He stated that soil excavation in five areas was completed using remotely operated equipment, MEC items were removed, and explosive

contaminated soil was hauled off-site. The excavations were then backfilled with clean backfill. Mr. Tatman said that after the explosive contaminated soil was removed and known MEC disposed of, then the entire site underwent a surface sweep. After the surface sweep, 425 targets of interest were identified and excavated. Overall, 96 MEC items were confirmed and destroyed on-site via in-situ detonation, along with 2,500 cubic yards of contaminated soil hauled off-site. Mr. Tatman then introduced Mr. Beck to explain Bhate's role as a subcontractor for the groundwater extraction and monitoring for LHAAP-17.

Mr. Beck then presented the groundwater extraction system performance data. He explained that LHAAP-17 extraction system began operation on 5 August 2022. Mr. Beck explained that five monitoring wells are sampled monthly to monitor the system's performance. He said that as of March 2023, the horizontal extent of perchlorate groundwater contamination has decreased, since baseline groundwater sampling was conducted in April 2022. Mr. Beck said that in addition to the decreasing footprint of contamination, the highest concentration of perchlorate on-site has decreased from 120,000 parts per billion (ppb) in April 2022 to 65,900 ppb as of March 2023. Mr. Beck said the concentrations of perchlorate indicate that the groundwater extraction system is working as designed and reducing the impacted groundwater extent. Ms. VanDeventer asked Mr. Beck about the spike in February that was seen on the graph provided on the slides. Mr. Beck said that it did slightly come up, but this did not affect the overall trend of decreasing contamination.

LHAAP-18/24

Mr. Kelly, HDR, introduced sites LHAAP-18/24, LHAAP-29, and LHAAP-47. Mr. Kelly presented an overview of the selected remedy for LHAAP-18/24. Mr. Kelly explained that the 90 percent (%) Remedial Design (RD) for LHAAP-18/24 has been reviewed and is in the final design process. He went on to explain the selected remedies for the site which include: enhancement of the groundwater extraction and treatment system, enhanced in-situ bioremediation (EISB) in shallow zone and Wilcox formation groundwater both inside and outside the containment area, thermal treatment to remove dense non-aqueous phase liquid (DNAPL), maintenance of the unlined evaporative pond (UEP) cap, unsaturated soil excavation and off-site disposal, monitored natural attenuation (MNA), long-term monitoring (LTM), and land use controls (LUCs).

LHAAP-29

Mr. Kelly provided an overview of the selected remedy for LHAAP-29 which is to flush, inspect, and plug the transite trinitrotoluene (TNT) wastewater line and the vitrified clay cooling water lines, excavate and dispose of the wooden TNT wastewater line and impacted soil off-site, perform in-situ thermal desorption (ISTD) treatment of the intermediate groundwater zone (DNAPL) plume, MNA in the shallow groundwater zone plumes and for the intermediate groundwater plume following ISTD, and to institute LUCs for soil and groundwater. He said that this site is also in the 90 % RD phase and is in the final design process.

LHAAP-47

Mr. Kelly explained that LHAAP-47 was used to manufacture rocket motors, pyrotechnic, and

illumination devices. Mr. Kelly said that LHAAP-47 is in the Pre-Design Investigation (PDI) phase. Mr. Kelly said that the selected remedy for this site is soil excavation and off-site disposal, thermal treatment of groundwater, bioremediation, MNA, and LUCs to maintain the remedy and prohibit groundwater use. Mr. Kelly stated that the PDI field work was just recently completed in June 2023. The work consisted of measuring water levels in the existing wells and the installation of six new wells. He said that HDR was unable to install two of the shallow wells because two of the borings were dry in the shallow zone. So, they installed those wells at the first evidence of groundwater in the intermediate zone. There were 56 wells sampled on this site and they were analyzed for metals, perchlorate, and volatile organic compounds. These samples are currently being analyzed and the results will be sent to the agencies and the USACE to help gather information to create the RD and fill in data gaps. Mr. Kelly explained that there will be more attempts made to find an area where shallow wells can be installed. Mr. Walker asked Mr. Kelly about the purpose of the old wells near Building 45 East. Mr. Kelly explained the planned treatment for the site and showed a map on the next slide to give further details on placement of the wells and those wells that are downgradient from Building 45 East.

Mr. Eugene Byrd asked where the budget for the project could be found. Mr. Michael Bowlby answered the question by explaining that the USAEC catalogs all costs each year. He said that the budget is not posted publicly on the LHAAP website, but that he would be willing to ask if it could be provided. Mr. Bowlby then asked Mr. Byrd if he was interested in knowing the annual cost of the program or the total lifetime costs. Mr. Byrd clarified his interests by stating that he is actually interested in knowing how the costs are allocated for each of the different projects and how the remediations are prioritized. Mr. Bowlby explained there are feasibility studies for the projects that are posted on the website and that the projected costs are within those documents. Mr. Byrd asked about the committee's role and their impact on the determination of funding for each project. Mr. Bowlby explained that there has already been a budget created by the USACE and DoD. Ms. Sierocinski stepped in and added that as a RAB member, a large involvement in project planning is during the pre-design phase. There is a public meeting held to discuss each work plan for the sites. During this meeting, any concerns raised by the public for the plans will be addressed. Additionally, RAB members help voice their concerns for the community and hold the contractors and the Army accountable during their project duration, ensuring that goals are being met. Mr. Bowlby added that the Army wants to be transparent with the community they are working for and having the RAB is the best way they can do that and keep the community involved.

Next RAB Meeting Schedule and Closing Remarks

Ms. Sierocinski wrapped the meeting up by stating that there will be a FYR Report coming out in December 2023 that will assess the effectiveness of remedial activities to date at LHAAP. She went on to say that there will also be Preliminary Assessments and Site Inspections (PA/SI) for per-and polyfluoroalkyl substances (PFAS) at LHAAP. Ms. Sierocinski stated that a PA/SI report on the findings of PFAS at LHAAP will be out by the end of the Year 2023. After that, the Remedial Investigation will begin addressing the PFAS impacts identified in the PA/SI.

Ms. Sierocinski said that the next RAB meeting was proposed for 16 November 2023. Ms.

Sierocinski asked if the members would be able to start the next meeting early to be able to have the site tour while there is still daylight present. The suggested start time for the tour was 3:00 pm CST. Mr. Walker brought up that there may not be a time change in November. Ms. Sierocinski said the time will be adjusted as necessary. Ms. VanDeventer stated that there will need to be a head count of RAB members and members of the public that are able to attend before the next meeting to ensure the proper number of busses are reserved for the site tour. Ms. Sierocinski then stated that the RAB members are able to participate in the Five-Year Review by filling out a questionnaire that was sent out earlier this year.

Adjourn

Ms. VanDeventer made a motion to adjourn, which was seconded by Mr. Fortune. The meeting adjourned at 6:45 pm CST.

June 2023 Meeting Attachments and Handouts:

- Color copy of USACE presentation slides
- GWTP – Processed Groundwater Volumes Handout
- Surface Water Sampling Handout
- LHAAP-04 Perchlorate, Dissolved Oxygen, and Oxidation Reduction Potential (2019 to 2023)

U.S. ARMY

LONGHORN ARMY AMMUNITION PLANT (LHAAP)

Restoration Advisory Board Meeting	22 JUNE 2023

AGENDA

Welcome and Introduction

Open Items

- Ongoing Outreach/Website.
- RAB Administrative Items.
- Membership Update.
- Minutes (February 2023 RAB Meeting).

Defense Environmental Restoration Program (DERP) Update

- Groundwater Treatment Plant Update.
- LHAAP-04 Status.

AGENDA (CONTINUED)

Other Defense Environmental Restoration Program (DERP) Update

- LHAAP-17 Status.
- LHAAP-47 Pre-Design Investigation Update.

Next RAB Meeting Schedule and Closing Remarks

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 the Longhorn Army Ammunition Plant (LHAAP)

You are encouraged to:

- Attend Restoration Advisory Board (RAB) Meetings and/or become a member of the RAB.
- Visit the Longhorn environmental website, which is regularly updated, at http://longhornaap.com/.
- Make suggestions for improving communication – the Army welcomes and appreciates community feedback.

ADMINISTRATIVE ITEMS

Restoration Advisory Board (RAB) Membership Update

- Persons interested in being new members.
- Applications received at February 2023 RAB Meeting.

Minutes (February 2023 RAB Meeting)

LHAAP ENVIRONMENTAL CONTRACTORS

PCI/Bhate Joint Venture:

- LHAAP-04, LHAAP-12, LHAAP-16, LHAAP-19
  LHAAP-37, LHAAP-46, LHAAP-50, LHAAP-58, LHAAP-67, LHAAP-001-R-01, LAAP-003-R-01, and LHAAP-18/24 (interim remedy).

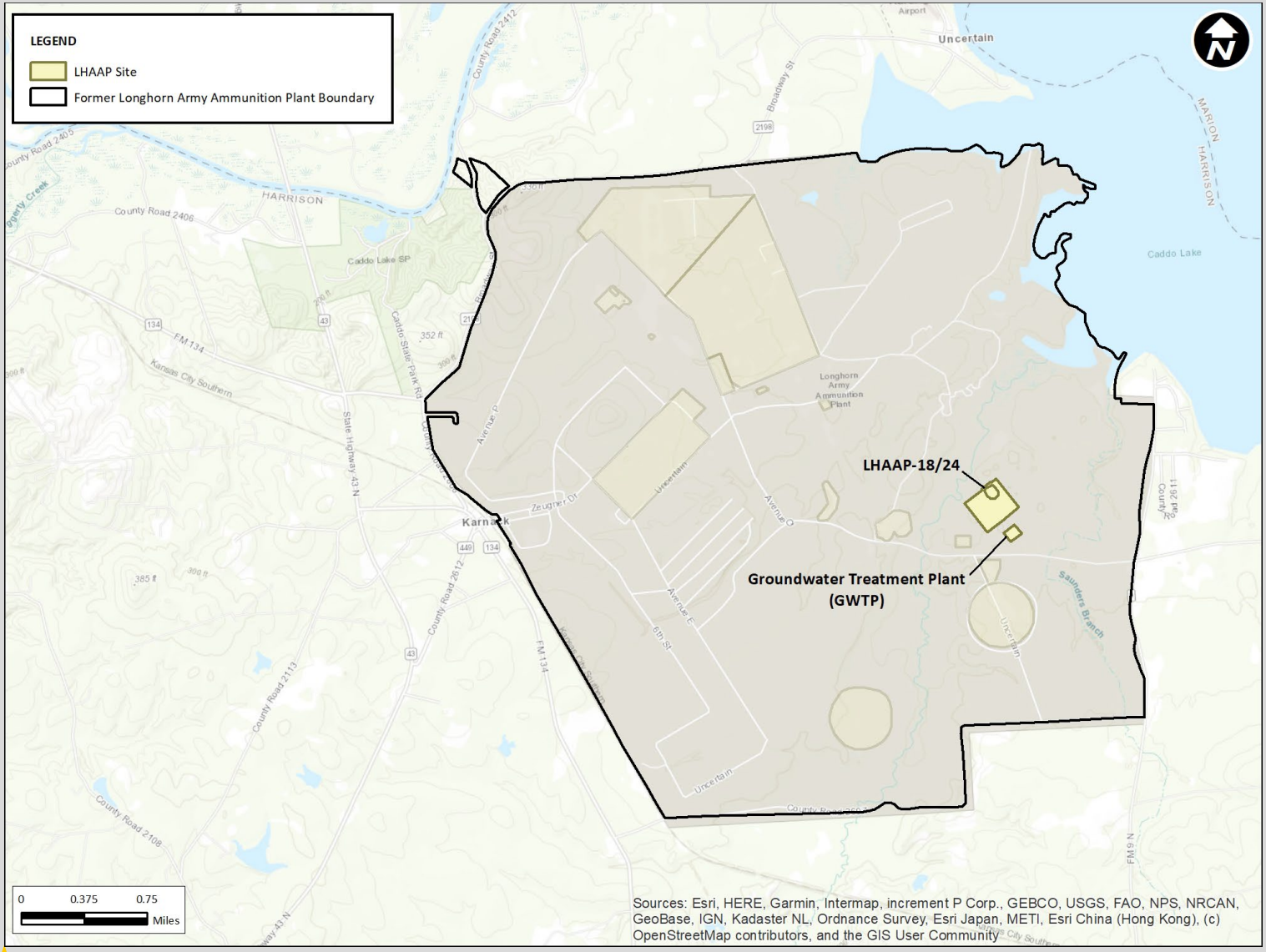
HDR:

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

MMG-TLI Joint Venture:

- LHAAP-17.

GWTP UPDATE

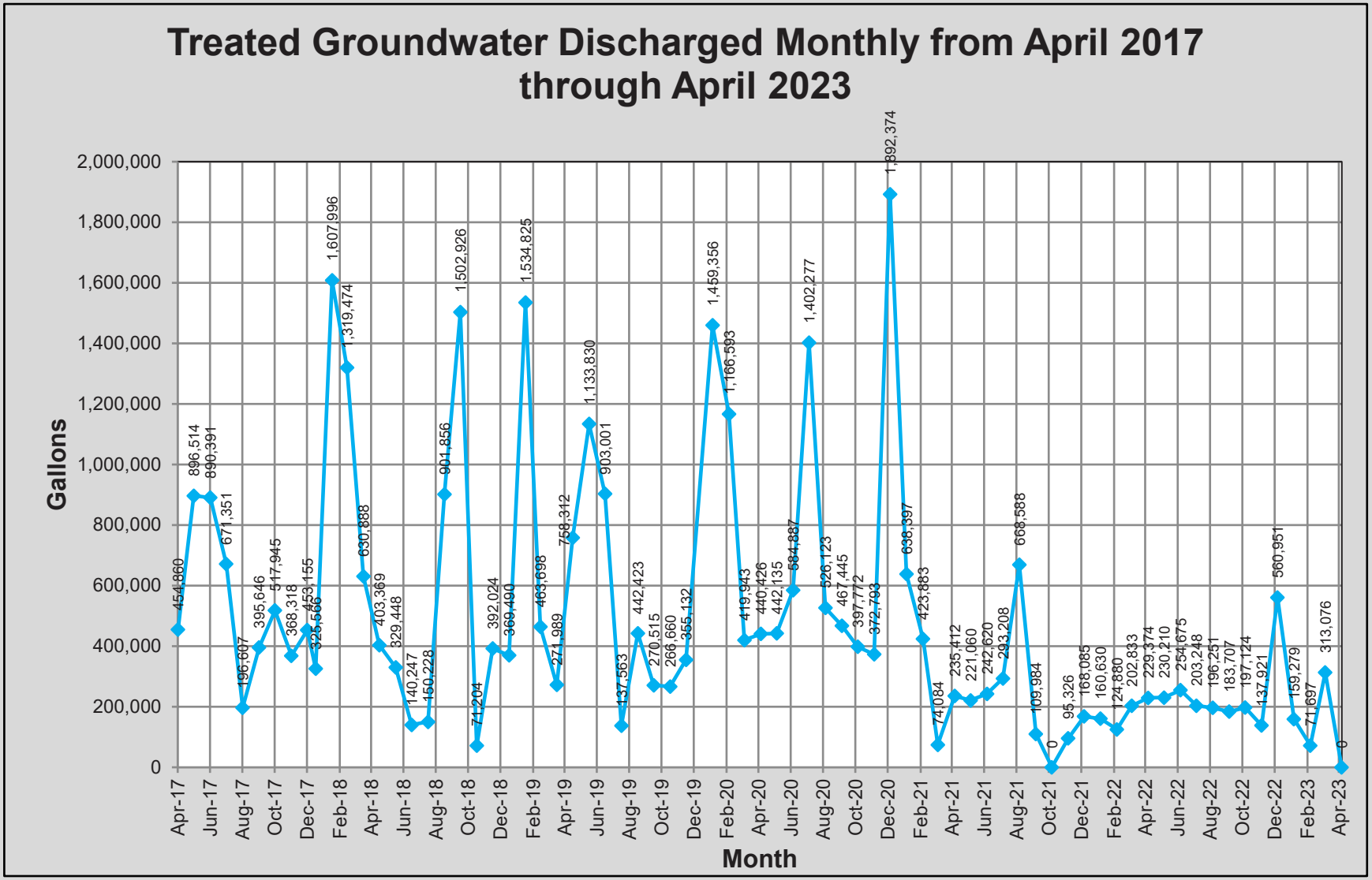

LEGEND
LHAAP Site
Former Longhorn Army Ammunition Plant Boundary
LHAAP-18/24
Groundwater Treatment Plant
(GWTP)
Caddo Lake
Caddo Lake SP
HARRISON
MARION
Karnack
Longhorn Army Ammunition Plant
Uncertain
Saunders Branch
0 0.375 0.75
Miles
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

GWTP UPDATE

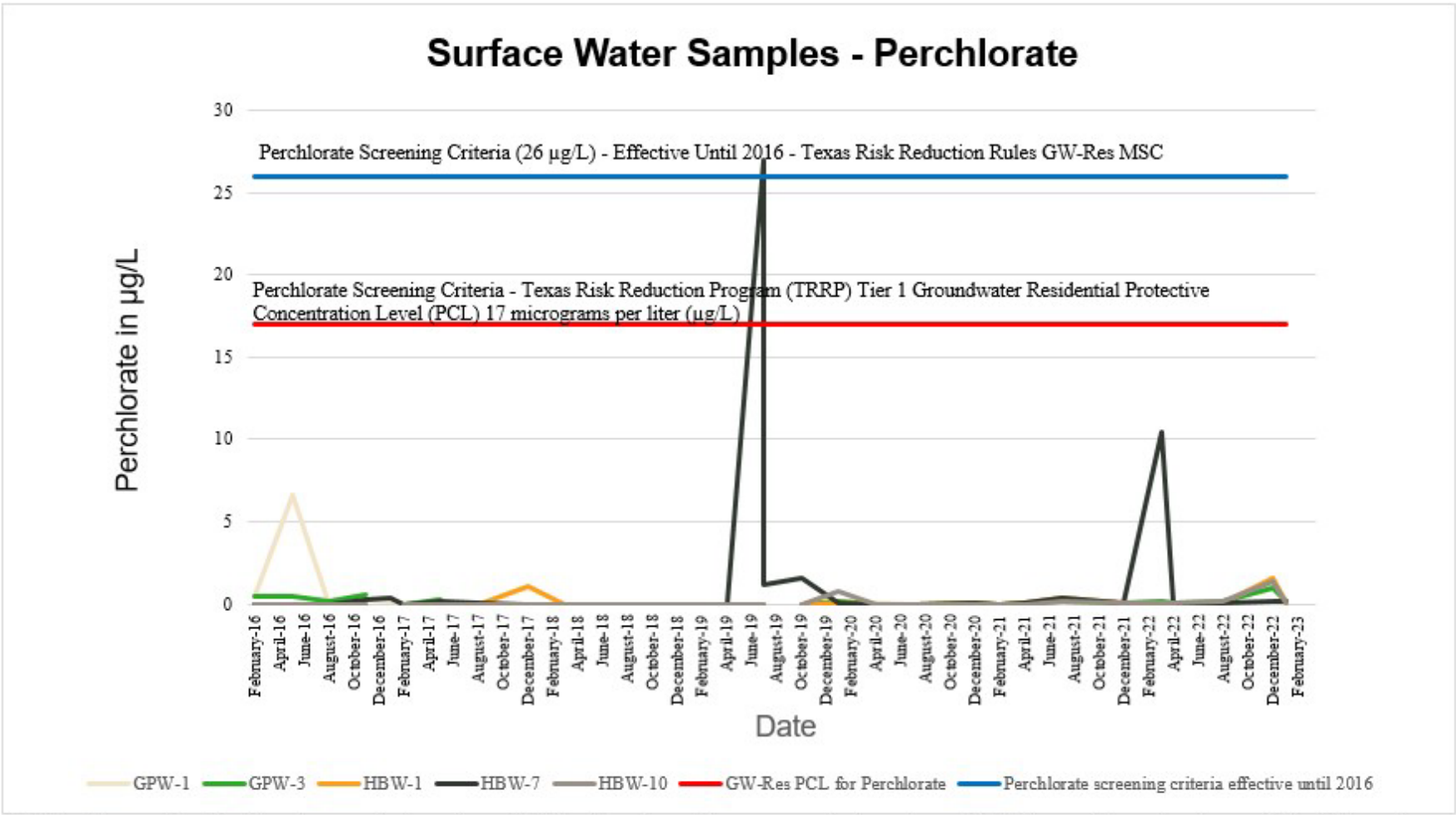
Groundwater Treatment Plant (GWTP) Operations (February – May 2023):

- February 2023 – Multiple repairs completed.
- March 2023 – GWTP operations suspended March 31, 2023.
- April 2023 – GWTP shutdown during contract transition.
- May 2023 – GWTP operations restarted May 3, 2023 after PCI/Bhate Joint Venture contract award.

GWTP DISCHARGE UPDATE

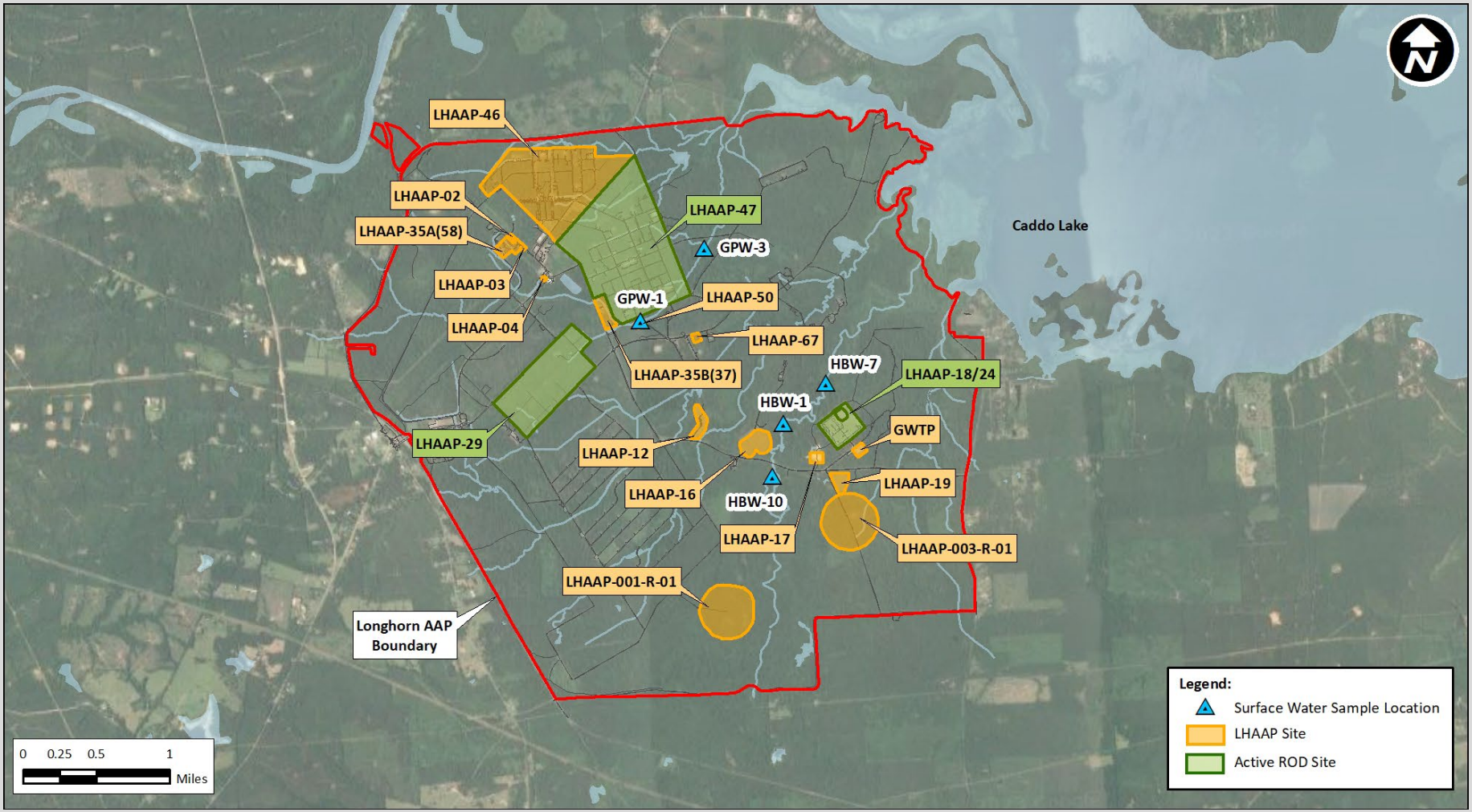


SURFACE WATER SAMPLE RESULTS



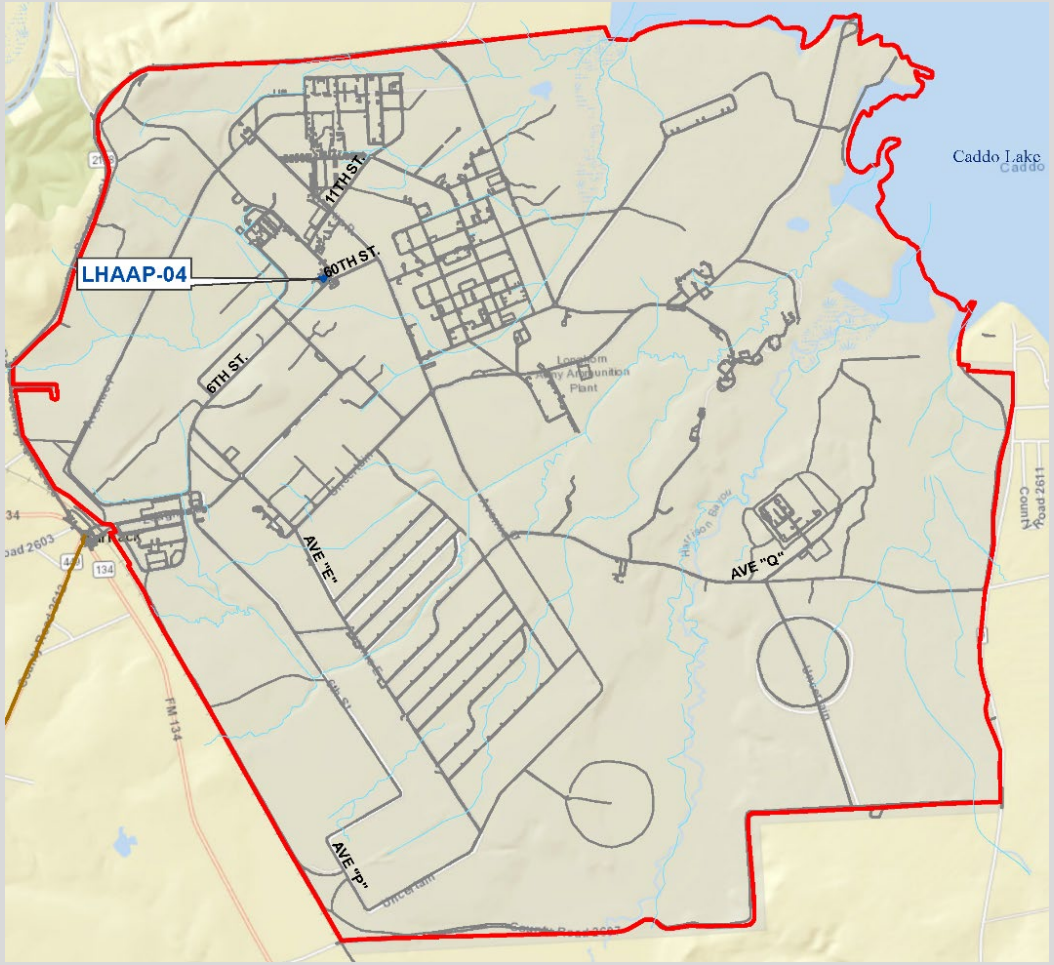
GPW – Goose Prairie Creek sample location; HBW – Harrison Bayou sample location. GW Res – Groundwater residential; µg/L – micrograms per liter

SURFACE WATER SAMPLE LOCATIONS



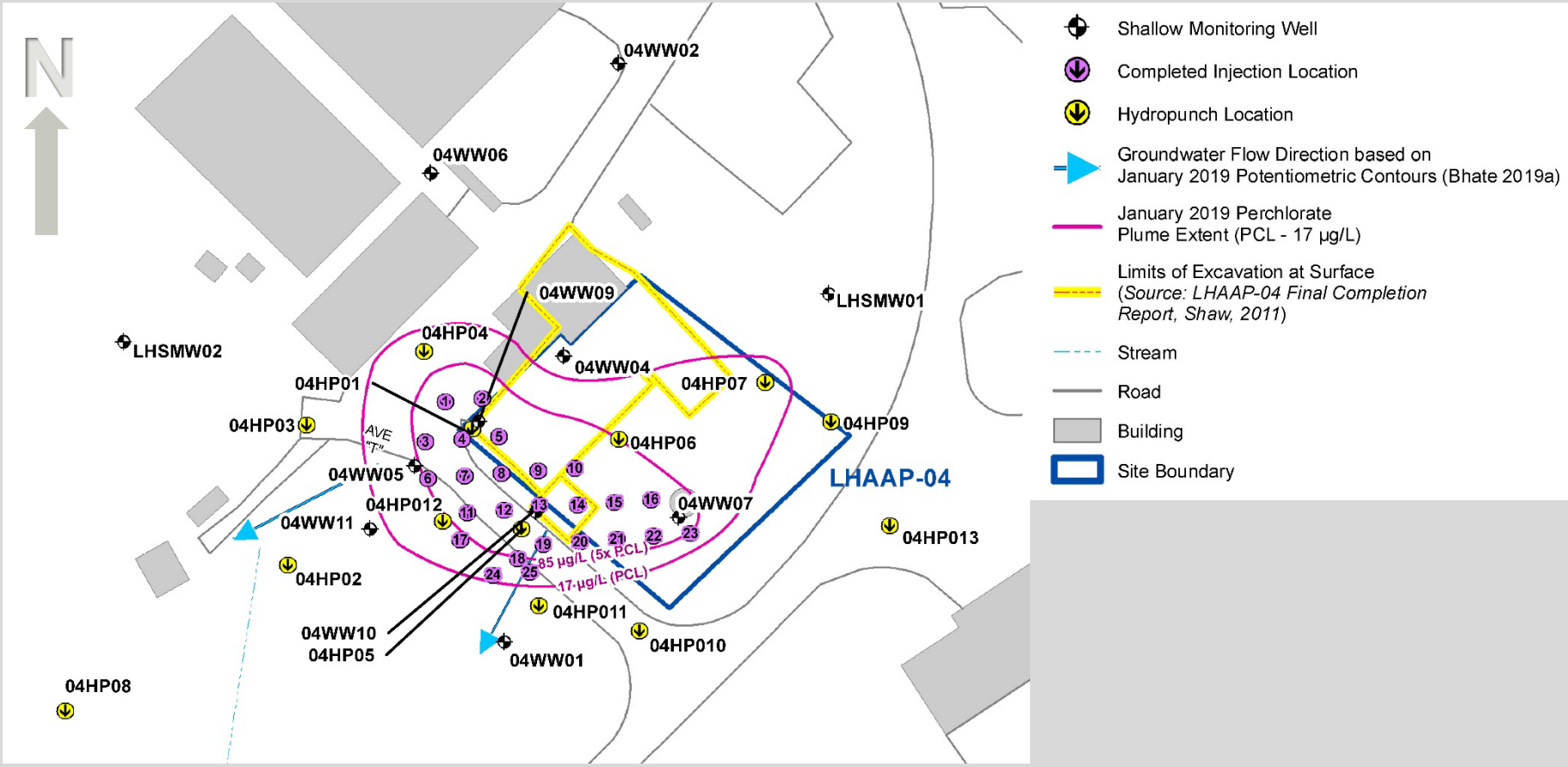
LHAAP-04 UPDATE

- Former Pilot Wastewater Treatment Plant, located near the former Fire Station.
- Demolition of structures and disposal of associated wastes in 1997.
- Soil contaminated with mercury and perchlorate excavated in 2009.
- In-Situ Bioremediation (ISB) and Land Use Controls (LUC) implemented for groundwater in November 2019.



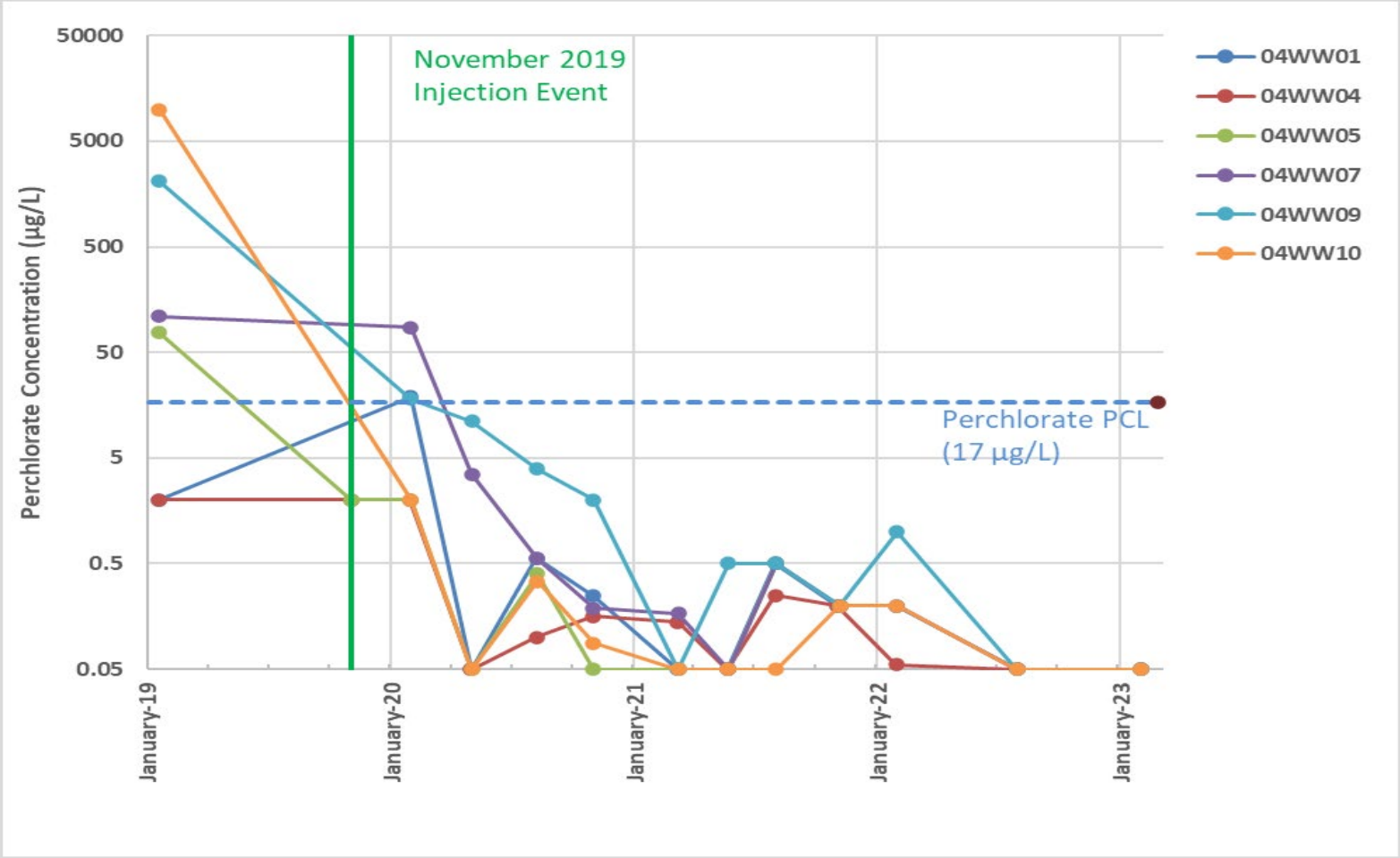
LHAAP-04 UPDATE

2019 Plume and Injection Locations

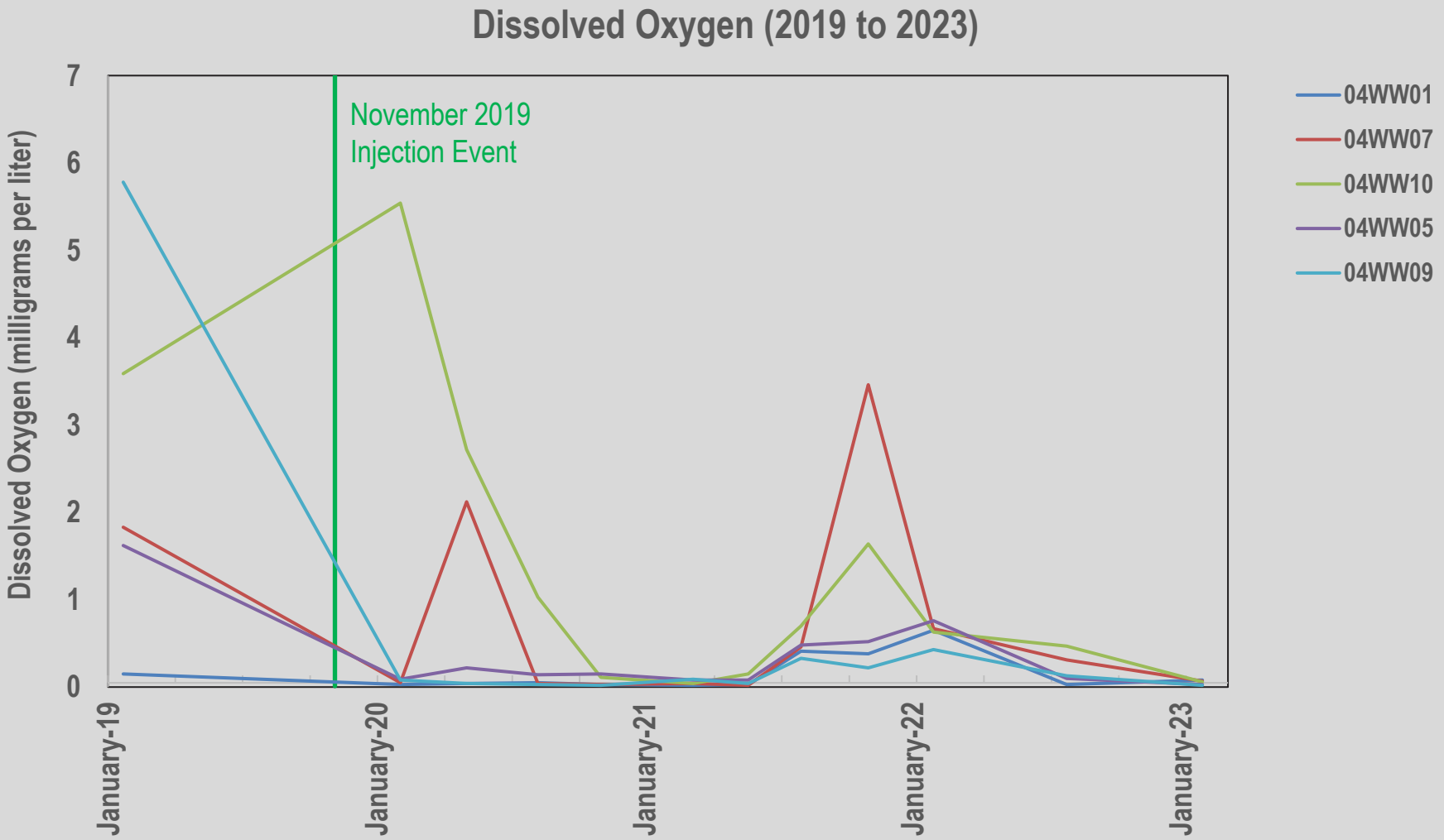


LHAAP-04 UPDATE

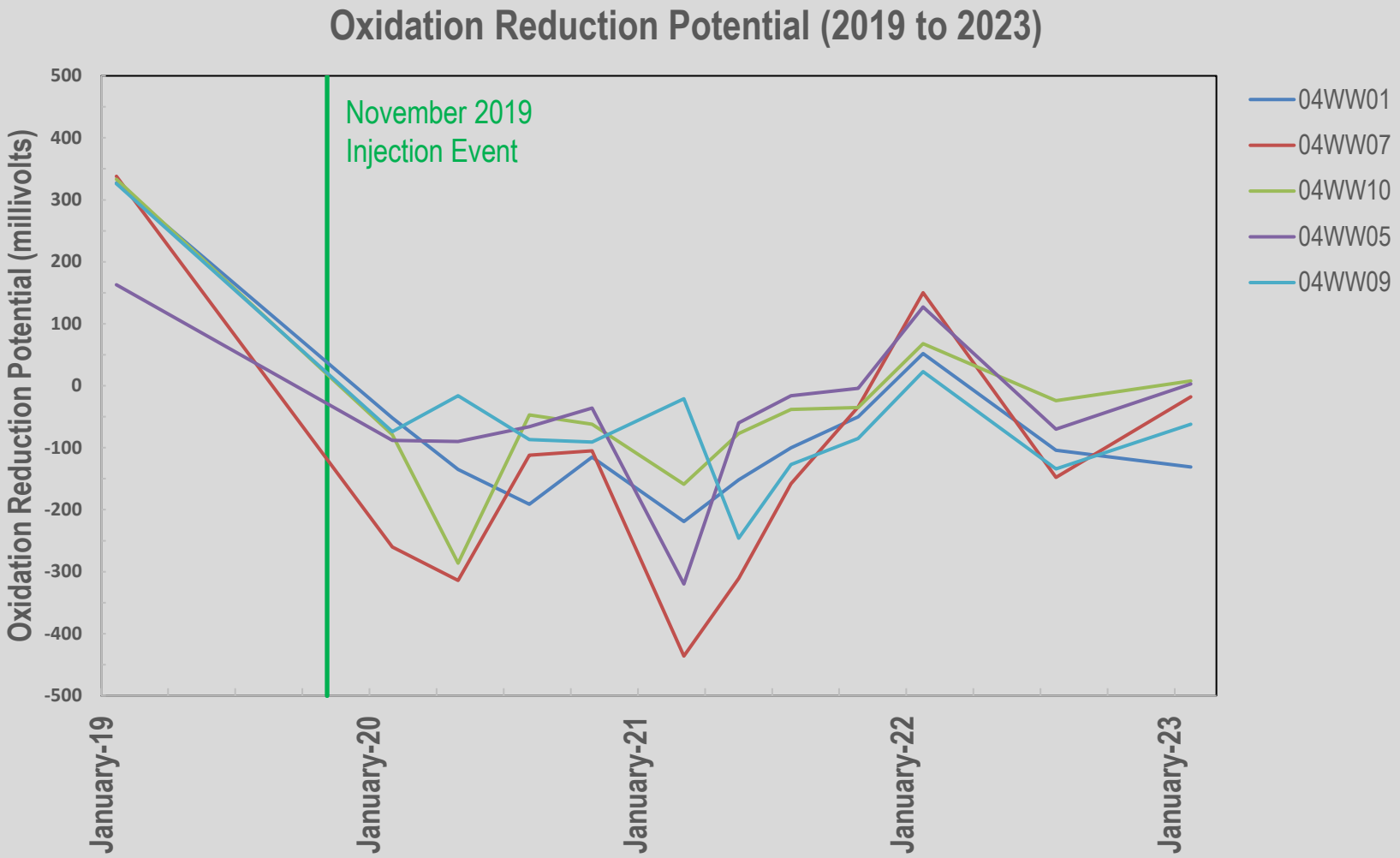
Perchlorate Concentration Trends (2019 to 2023)



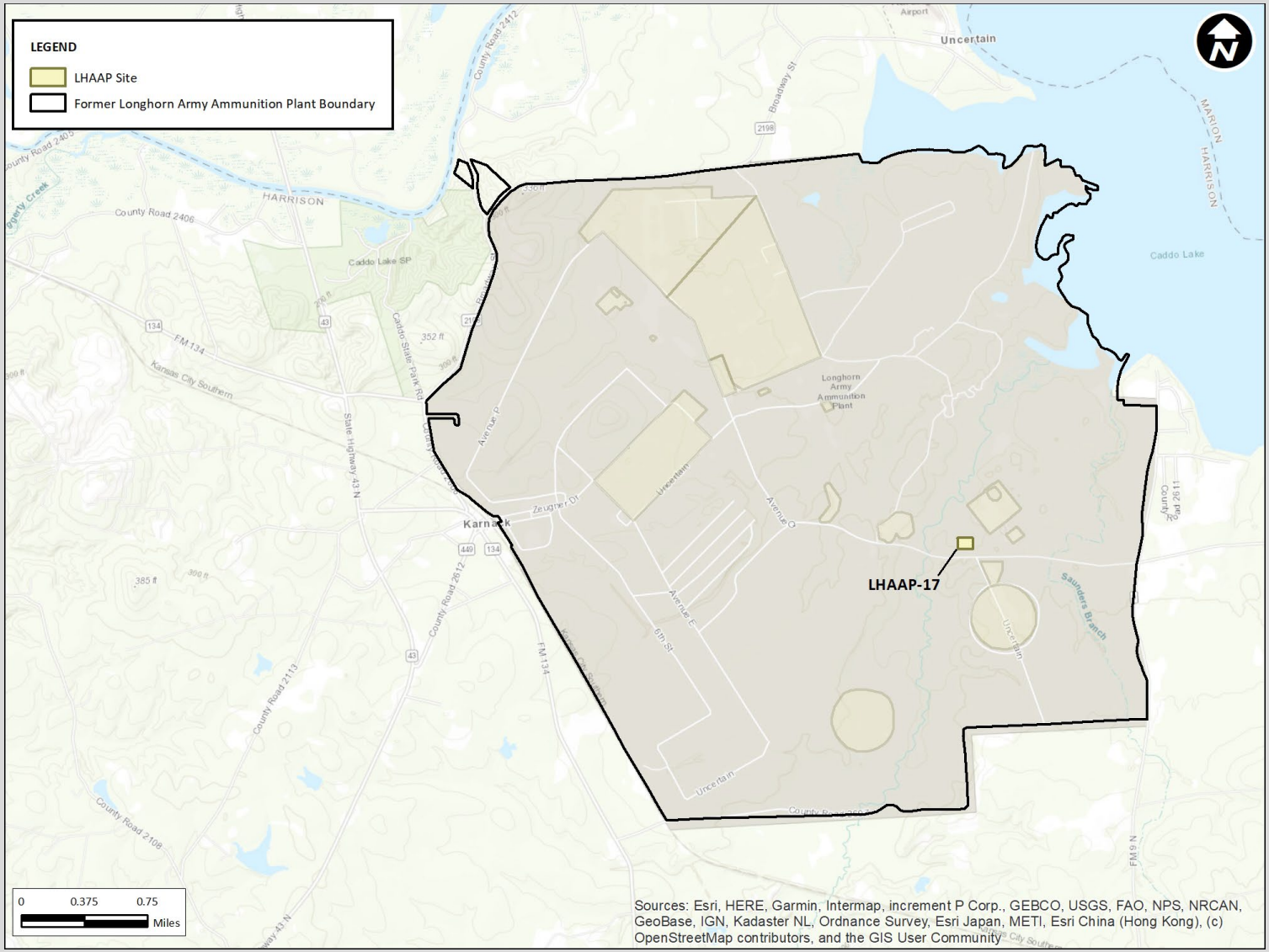
LHAAP-04 UPDATE



LHAAP-04 UPDATE



LHAAP-17 UPDATE



LHAAP-17 BACKGROUND

Background:

- Burning Ground No. 2/Flashing Area (LHAAP-17) was used as a burning ground from 1959 through 1980. Bulk trinitrotoluene (TNT) and photo flash powder were burned.
- The site was also used as a flashing area to decontaminate recoverable metal byproducts until 1980, when it became inactive.
- The waste residues were reportedly removed from the trenches in 1984, and the site was allowed to revegetate.
- The Record Of Decision included excavation and off-site disposal of soil, groundwater extraction, monitored natural attenuation (MNA), and land use controls (LUCs) to maintain the remedy and prohibit groundwater use.
- However, during excavation activities, a work stoppage occurred on September 30, 2019, due to the presence of munitions hazards not previously known to be present.
- Time Critical Removal Action (TCRA) determined appropriate.

LHAAP-17 STATUS

Time Critical Removal Action Status:

- Over 4,048 cubic yards of soil have been excavated and approximately 2,500 cubic yards of this material have been sifted and transported for off-site disposal.
- All excavations with validated confirmation samples are complete and backfilled.
- 96 Munitions and Explosives of Concern (MEC) items have been disposed of through on-site detonations.
- An estimated 41,000 pounds of Non-Munitions Related debris and 18,700 pounds of Munitions Debris have been inspected and transported off-site for recycling/disposal.

Groundwater Extraction Status:

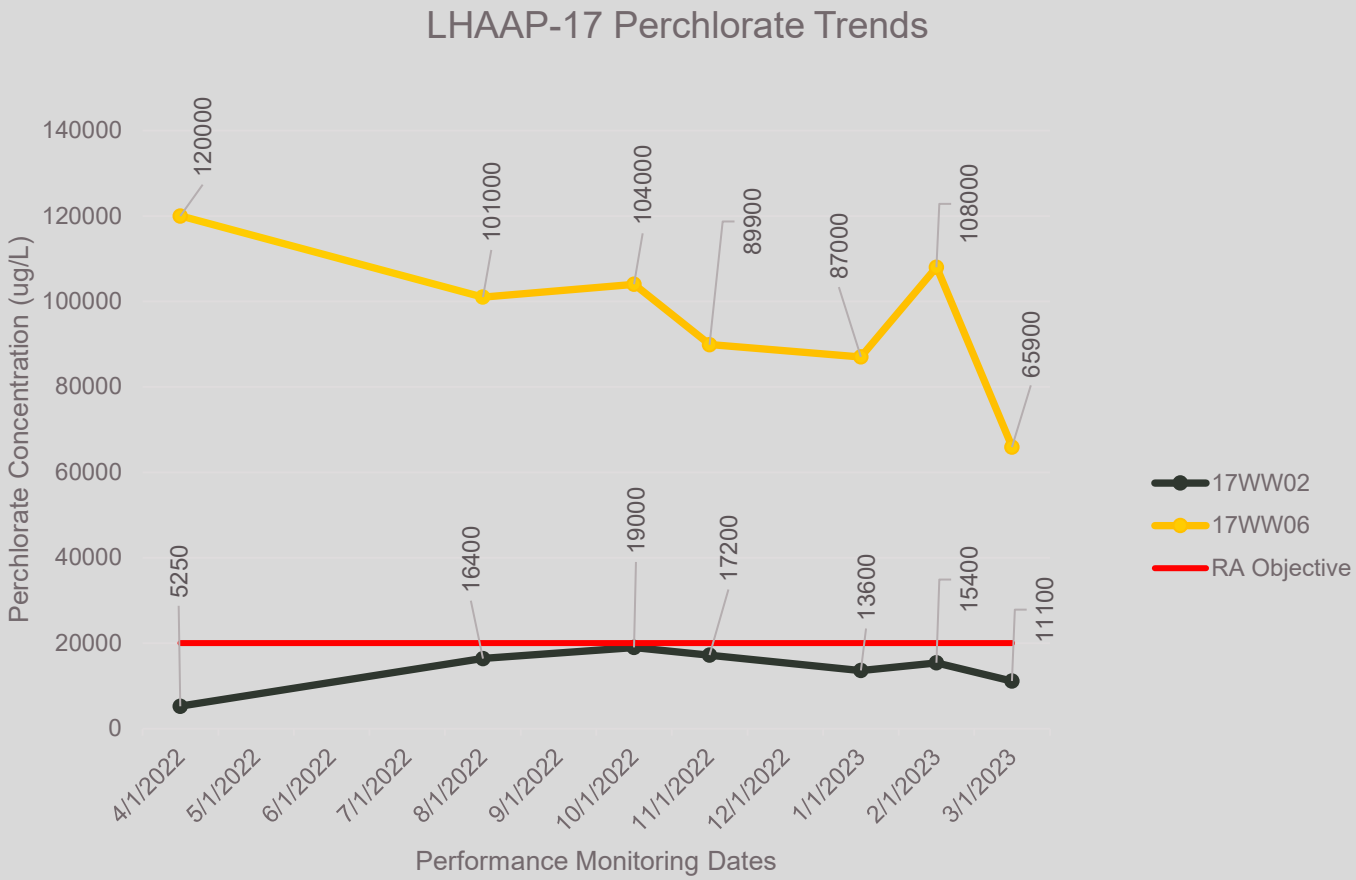
- Groundwater extraction system installation is complete and operating per the design.
- Performance monitoring ongoing.

LHAAP-17 PERFORMANCE MONITORING

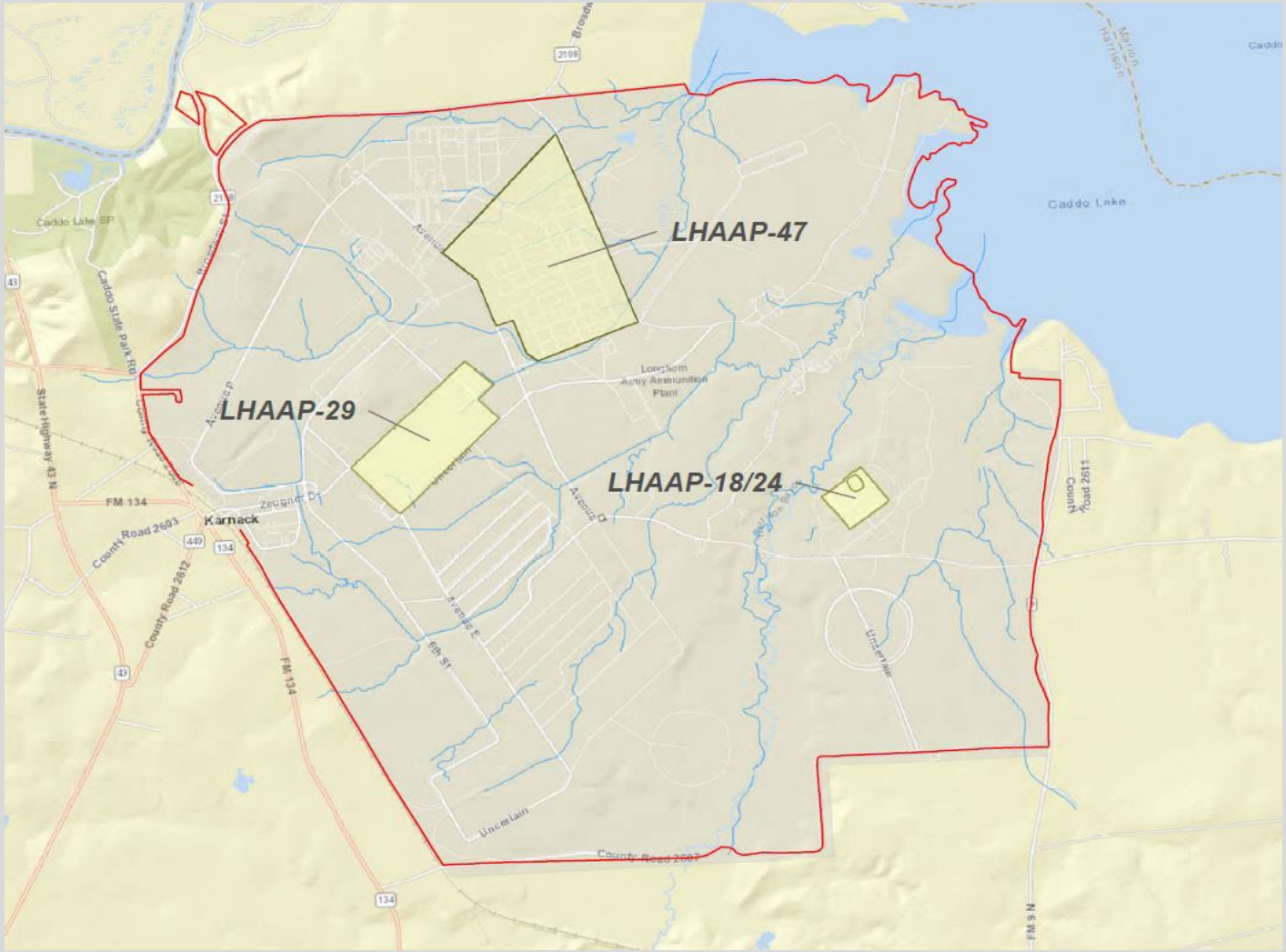
Performance Monitoring:

- The groundwater extraction remedial action objective is to reduce perchlorate concentrations sitewide below 20,000 micrograms per liter (µg/L) within 18 months. Site will transition to Monitored Natural Attenuation once this threshold is achieved.
- Performance monitoring was completed at 5 sampling locations monthly for 6 months (September 2022 – March 2023).
- All performance monitoring groundwater samples analyzed for perchlorate. Perchlorate concentrations have decreased across the site with the largest decrease noted at monitoring well 17WW06.
- As of March 2023, perchlorate remains above the remedial action goal (20,000 µg/L) at one well (17WW06).
- The next performance monitoring event scheduled for June 2023.

LHAAP-17 PERCHLORATE GROUNDWATER TRENDS



LHAAP-18/24, LHAAP-29, AND LHAAP-47 UPDATE



LHAAP-18/24 REMEDIAL DESIGN UPDATE

Selected Remedy

- Enhancement of the groundwater extraction and treatment system.
- Enhanced In-Situ Bioremediation (EISB) in Shallow Zone and Wilcox Formation groundwater both inside and outside the containment area.
- Thermal treatment to remove Dense Non-aqueous Phase Liquid (DNAPL).
- Maintenance of the Unlined Evaporative Pond (UEP) cap.
- Unsaturated soil excavation and off-site disposal.
- Monitored Natural Attenuation (MNA),
- Long-Term Monitoring (LTM),
- Land Use Controls.

90% Remedial Design Milestones

- 90% Remedial Design reviewed by Army and Regulators
- Final Design in Progress

LHAAP-29 REMEDIAL DESIGN UPDATE

Selected Remedy

- Flush, inspect, and plug the transite TNT wastewater line and the vitrified clay cooling water lines.
- Excavation and off-site disposal of the wooden TNT wastewater line and impacted soil.
- In-situ Thermal Desorption (ISTD) treatment of the intermediate groundwater zone dense non-aqueous phase liquid (DNAPL) plume.
- Monitored Natural Attenuation (MNA) in the shallow groundwater zone plumes and for the intermediate groundwater plume following ISTD.
- Land Use Controls for soil and groundwater.

90% Remedial Design Milestones

- 90% Remedial Design reviewed by Army and Regulators
- Final Design in Progress

LHAAP-47 UPDATE

Background:

LHAAP-47 was used to manufacture rocket motors, pyrotechnic and illumination devices.

Selected Remedy

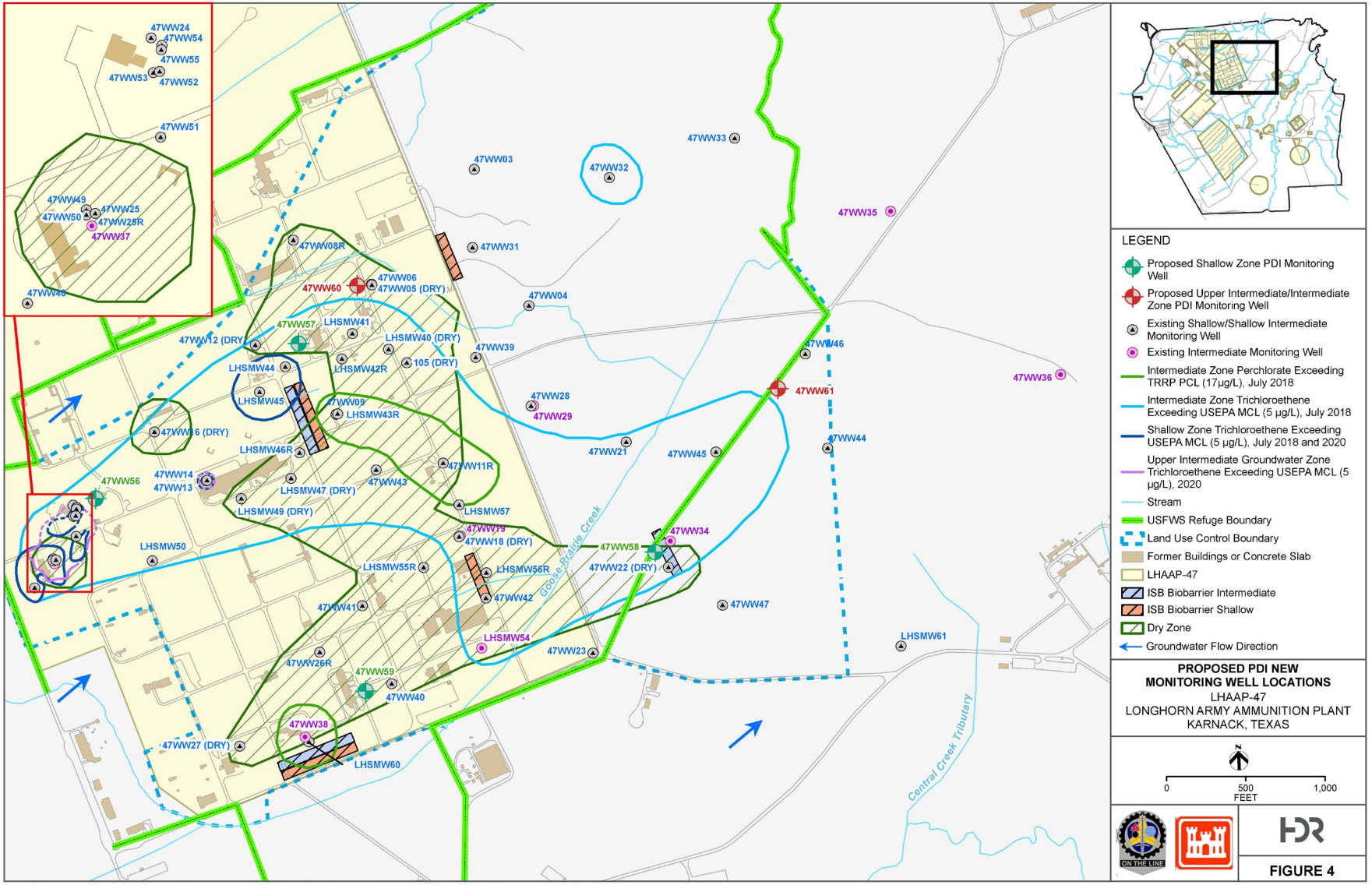
- Soil excavation and off-site disposal,
- Thermal treatment of groundwater,
- Bioremediation,
- Monitored Natural Attenuation, and
- Land Use Controls to maintain the remedy and prohibit groundwater use.

LHAAP-47 UPDATE

Pre-Design Investigation Field Work

- Measure water levels of wells located within the historical and current extent of groundwater contamination.
- Install and develop four Shallow Zone wells to a maximum depth of 38 feet below ground surface.
- Install and develop two Upper Intermediate Zone wells to a maximum depth of 45 feet below ground surface.
- Sample groundwater monitoring wells (up to 74 wells).
- Analyze groundwater samples for metals, perchlorate, and volatile organic compounds.
- Conduct pumping test to evaluate subsurface hydraulic properties.
- Survey new monitoring well locations and surface topography in planned active remediation areas.

LHAAP-47 UPDATE PDI WELL LOCATIONS



NEXT MEETING SCHEDULE AND CLOSING REMARKS

Schedule Next Restoration Advisory Board Meeting

- Thursday, November 16, 2023.

Other Items/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)

Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18
454,860	896,514	890,391	528,538	195,198	961,324	517,945	368,318	453,155	325,566	1,607,996	1,319,474

Apr-18	May-18	Jun-18	Jul - 18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19
630,888	403,369	329,448	140,247	150,228	901,856	1,502,926	71,204	392,024	369,490	1,534,825	463,698

Apr-19	May-19	Jun-19	Jul - 19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20
271,989	758,312	1,133,830	1,415,203	493,063	442,423	270,515	288,683	355,132	1,459,356	1,166,593	419,943

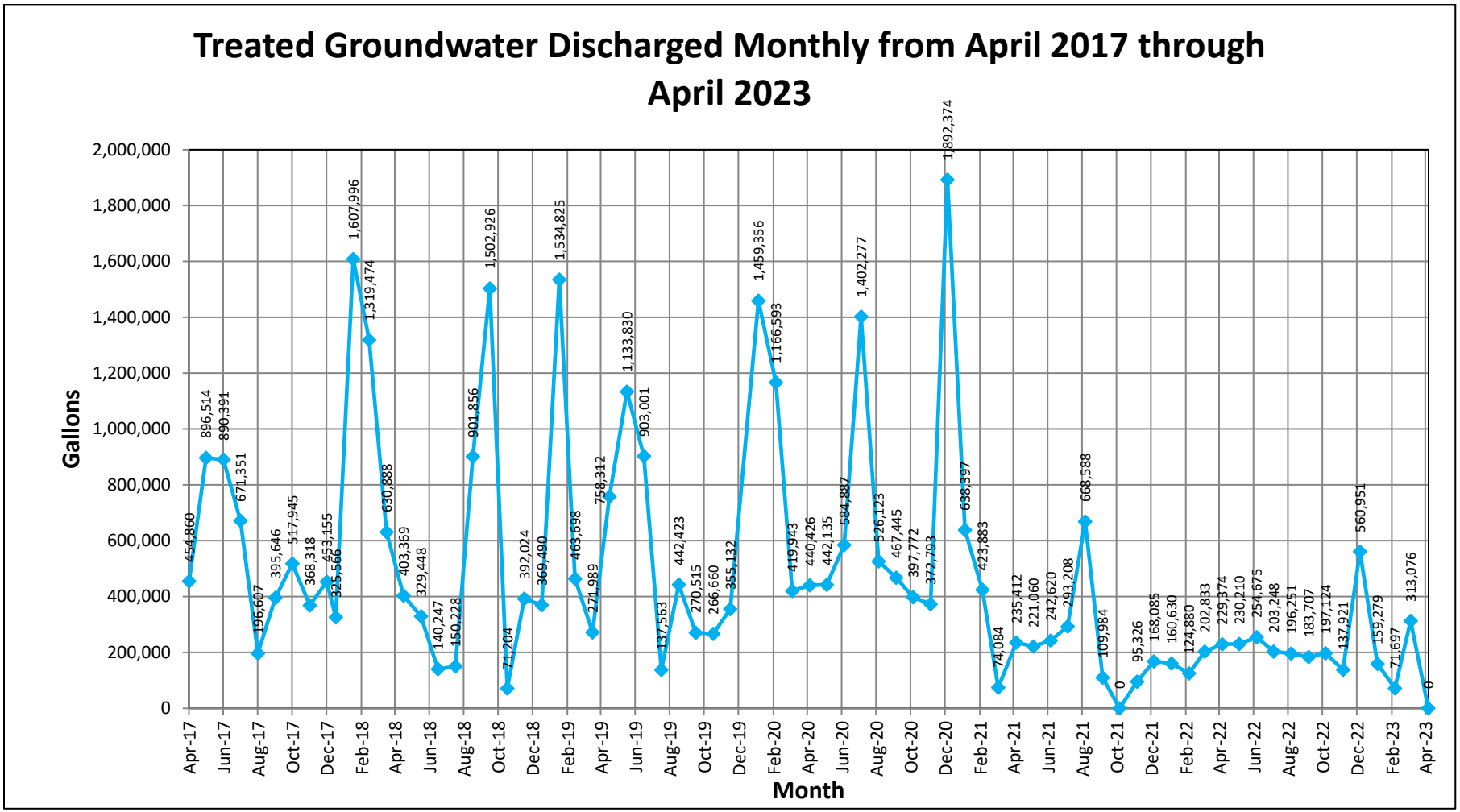
Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21
440,426	442,135	584,887	1,402,277	539,526	467,445	397,772	372,793	1,832,274	638,397	423,883	74,084

Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22
235,412	1,121,060	242,620	293,208	668,588	109,984	0	95,326	439,585	322,130	124,880	202,833

Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23
229,374	230,210	254,675	203,248	196,251	183,707	197,124	137,921	560,951	159,279	164,963	541,371

Apr-23
0

*Indicates Estimate



Notes:
No groundwater discharged in October 2021 due to a power disruption to the GWTP.
No groundwater discharged in April 2023 during contract transition.

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**
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
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
Oct-19	0	0	270,515	0	0
Nov-19	115,503	0	173,180	0	0
Dec-19	318,248	0	36,884	0	0
Jan-20	1,459,396	0	0	1,115,183	0

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**
Feb-20	1,166,593	0	0	741,954	0
Mar-20	419,943	0	0	0	0
Apr-20	440,426	0	0	0	0
May-20	442,135	0	0	0	0
June-20	584,887	0	0	0	0
July-20	1,402,277	0	0	984,393	0
Aug-20	216,197	0	323,359	0	0
Sep-20	0	0	467,445	0	0
Oct-20	0	0	397,772	0	0
Nov-20	0	0	372,793	0	0
Dec-20	1,832,274	0	60,199	1,571,432	0
Jan-21	638,397	0	0	383,318	0
Feb-21	423,883	0	0	259,875	0
Mar-21	74,084	0	0	74,084	0
Apr-21	235,412	0	0	0	0
May-21	1,121,060	0	0	900,000	0
Jun-21	242,620	0	0	0	0
Jul-21	293,208	0	0	243,675	0
Aug-21	668,588	0	0	561,527	0
Sep-21	0	0	109,984	0	0
Oct-21	0	0	0	0	0
Nov-21	0	0	95,326	0	0
Dec-21	271,500	0	168,085	271,500	0
Jan-22	161,500	0	160,630	161,500	0
Feb-22	0	0	124,880	0	0
Mar-22	190,898	0	11,935	0	0
Apr-22	229,374	0	0	0	0
May-22	230,210	0	0	0	0
June-22	254,675	0	0	0	0
July-22	0	0	203,248	0	0
Aug-22	34,115	0	162,136	0	0
Sept-22	83,312	0	100,395	0	0
Oct-22	0	0	197,124	0	0
Nov-22	0	0	137,921	0	0
Dec-22	560,951	0	0	514,515	0

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**
Jan-23	159,279	0	0	145,321	0
Feb-23	71,697	0	0	71,697	0
Mar-23	313,076	0	0	313,076	0
Apr-23	0	0	0	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)

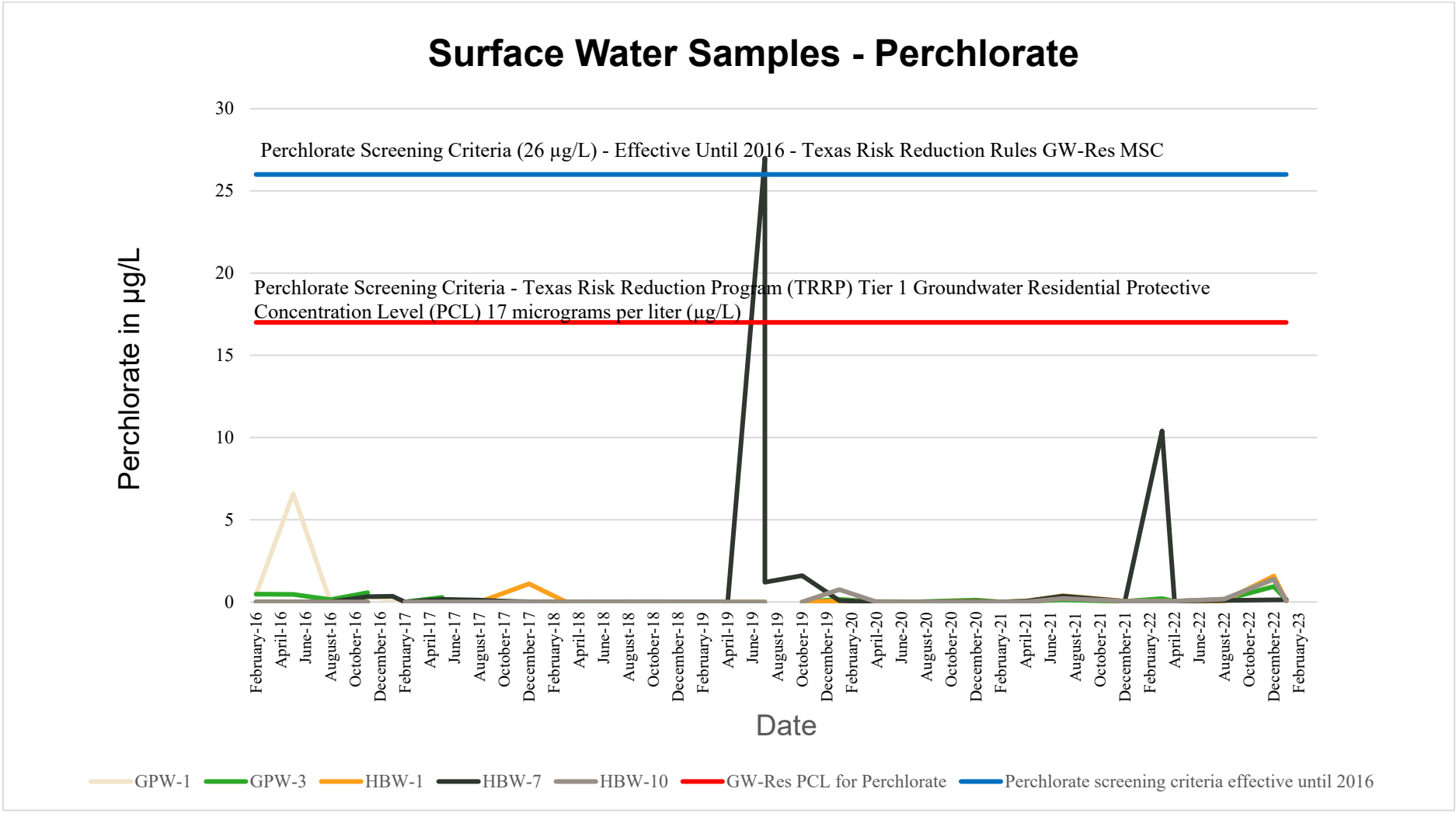
Quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd
Creek Sample ID	**Feb 2016**	**May 2016**	**Aug 2016**	**Nov 2016**	**Feb 2017**	**May 2017**	**Aug 2017**	**Dec 2017**	**Mar 2018**	**Jun 2018**	**Aug 2018**
GPW-1	0.447	6.59	<0.2 U	0.301 J	<1 U	0.263	Dry	<2.0 U	<2.0 U	Dry	<2.0 U
GPW-3	0.474	0.457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

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

Quarter	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st
Creek Sample ID	**Oct 2018**	**Jan 2019**	**Apr 2019**	**Jul 2019**	**Oct 2019**	**Jan 2020**	**Apr 2020**	**Jul 2020**	**Dec 2020**	**Feb 2021**
GPW-1	<2.0 U	<2.0 U	<2.0 U	<2.0 U	<2.0 U	0.163	0.0589 J	<0.05 U	0.110	<0.05 U
GPW-3	<2.0 U	<2.0 U	<2.0 U	<2.0 U	<2.0 U	0.156	0.0662 J	0.0326 J	0.108	<0.05 U
HBW-1	<2.0 U	<2.0 U	<2.0 U	<2.0 U	<2.0 U	0.0600 J	<0.05 U	<0.05 U	0.0374 J	<0.05 U
HBW-7	<2.0 U	<2.0 U	<2.0 U	27 (initial)/ 1.2 J (resample)	1.6 J	0.0761 J	<0.05 U	0.0318 J	0.0265 J	<0.05 U
HBW-10	<2.0 U	<2.0 U	<2.0 U	<2.0 U	<2.0 U	0.0782 J	<0.05 U	<0.05 U	<0.05 U	<0.05 U

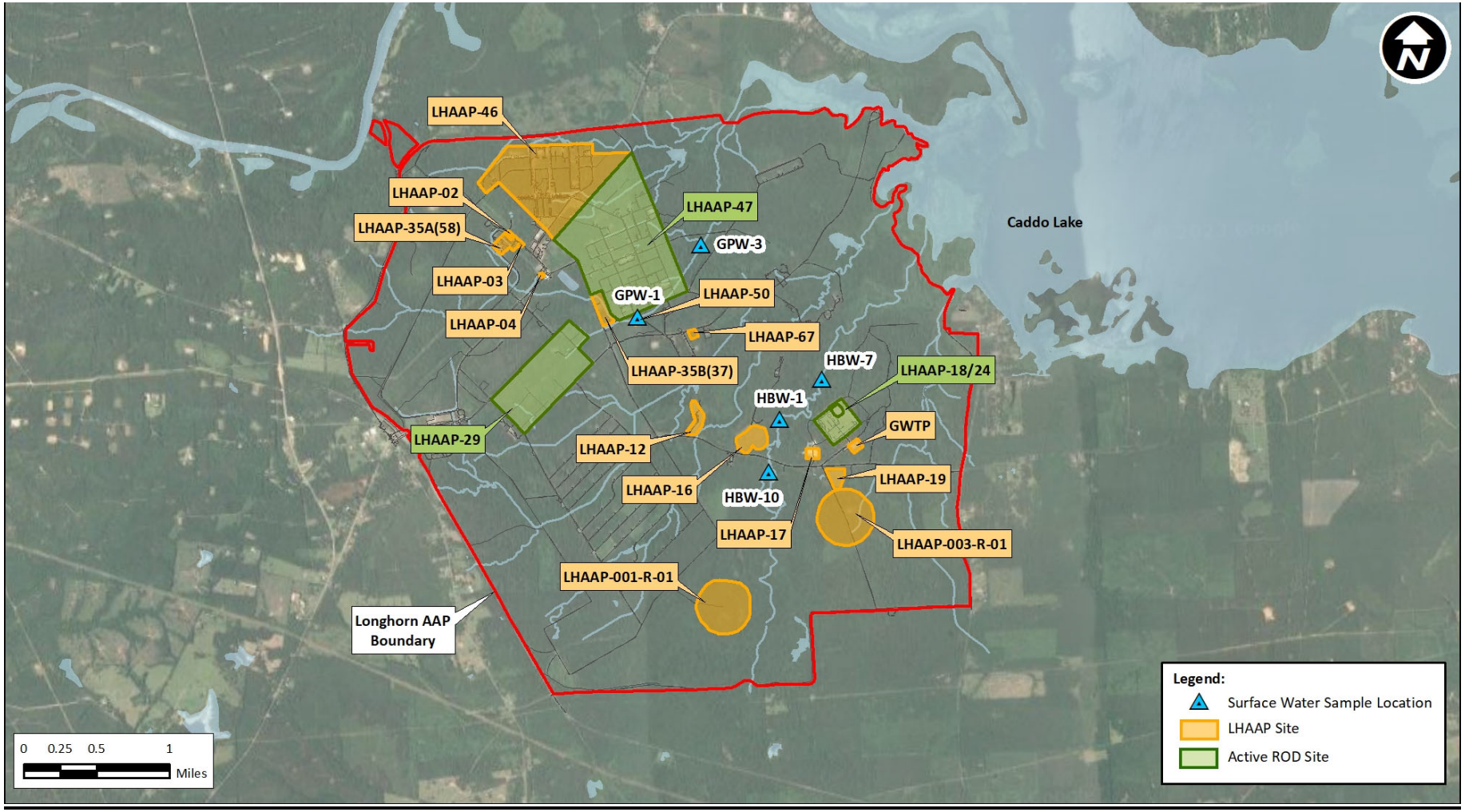
Quarter	2nd	3rd	4th	1st	2nd	3rd	4th	1st
Creek Sample ID	**Apr 2021**	**Jul 2021**	**Dec 2021**	**Mar 2022**	**Apr 2022**	**Aug 2022**	**Dec 2022**	**Jan 2023**
GPW-1	0.0268 J	0.154	0.0394 J	0.162	0.042 J	0.104	1.30	0.153
GPW-3	0.0321 J	0.122	0.0344 J	0.198	0.0384 J	0.132	0.938	0.137
HBW-1	0.0410 J	0.369	0.050 U	0.052 J	<0.05 U	0.0540 J	1.58	0.0568 J
HBW-7	0.0373 J	0.348	0.0359 J	10.4	0.0493 J	0.0880 J	0.125	0.133
HBW-10	<0.05 U	0.207	0.0464 J	<0.05 U	<0.05 U	0.171	1.39	0.0654J

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



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. GPW – Goose Prairie Creek sample location; HBW – Harrison Bayou sample location. GW Res – Groundwater residential; µg/L – micrograms per liter

Longhorn Army Ammuntion Plant Creek Sampling Locations



LHAAP-04 Perchlorate, Dissolved Oxygen, and Oxidation Reduction Potential (2019 to 2023)

			Location	04WW01										
			Sample Date	1/22/2019	2/4/2020	5/4/2020	8/10/2020	11/4/2020	3/10/2021	5/24/2021	8/4/2021	11/4/2021	2/1/2022	8/2/2022	2/3/2023
Analyte	**Units**	**PCL**		**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Perchlorate															
Perchlorate	µg/L	17		< 2	**19**	< 0.05	0.561 J	0.246 J	< 0.05	< 0.05	< 0.5	< 0.2	< 0.2	< 0.05	< 0.05
Field Parameters															
Dissolved Oxygen	mg/L	NV		0.15	0.03	0.04	0.05	0.03	0.02	0.03	0.41	0.38	0.65	0.03	0.08
Oxidation-Reduction Potential	mV	NV		327	-52	-135	-191	-115	-219	-152	-100	-50	52	-104	-131

			Location	04WW07										
			Sample Date	1/22/2019	2/4/2020	5/5/2020	8/11/2020	11/4/2020	3/11/2021	5/25/2021	8/5/2021	11/9/2021	2/2/2022	8/2/2022	2/3/2023
Analyte	**Units**	**PCL**		**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Perchlorate															
Perchlorate	µg/L	17		**110**	**86**	3.51	0.557 J	< 0.05	0.169	< 0.05	< 0.5	< 0.2	< 0.2	< 0.05	< 0.05
Field Parameters															
Dissolved Oxygen	mg/L	NV		1.83	0.05	2.12	0.04	0.03	0.04	0.02	0.46	3.46	0.67	0.31	0.07
Oxidation-Reduction Potential	mV	NV		338	-260	-314	-112	-105	-436	-311	-158	-34	150	-148	-18

			Location	04WW10										
			Sample Date	1/22/2019	2/4/2020	5/5/2020	8/11/2020	11/4/2020	3/11/2021	5/25/2021	8/5/2021	11/9/2021	2/2/2022	8/2/2022	2/3/2023
Analyte	**Units**	**PCL**		**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Perchlorate															
Perchlorate	µg/L	17		**10,000**	< 2	< 0.05	0.339 J+	0.0888 J	< 0.05	< 0.05	< 0.05	< 0.2	< 0.2	< 0.05	< 0.05
Field Parameters															
Dissolved Oxygen	mg/L	NV		3.59	5.54	2.72	1.03	0.11	0.04	0.15	0.7	1.64	0.63	0.47	0.06
Oxidation-Reduction Potential	mV	NV		333	-79	-286	-47	-62	-159	-77	-38	-35	68	-24	8

LHAAP-04 Perchlorate, Dissolved Oxygen, and Oxidation Reduction Potential (2019 to 2023)

			Location	04WW04										
			Sample Date	1/21/2019	2/3/2020	5/4/2020	8/10/2020	11/4/2020	3/10/2021	5/24/2021	8/4/2021	11/4/2021	2/1/2022	8/2/2022	2/3/2023
Analyte	**Units**	**PCL**		**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Perchlorate															
Perchlorate	µg/L	17		< 2	< 2	<0.05	< 0.1	0.158	0.139	< 0.05	< 0.25	< 0.2	0.055 J	< 0.05	<0.05
Field Parameters															
Dissolved Oxygen	mg/L	NV		0.15	0.06	1.5	0.05	0.45	0.08	0.44	0.45	0.48	0.49	0.03	0.04
Oxidation-Reduction Potential	mV	NV		-8	-26	-111	-45	127	-88	-44	28	25	151	-101	-84

			Location	04WW05										
			Sample Date	1/22/2019	2/4/2020	5/5/2020	8/11/2020	11/4/2020	3/11/2021	5/25/2021	8/5/2021	11/9/2021	2/2/2022	8/2/2022	2/3/2023
Analyte	**Units**	**PCL**		**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Perchlorate															
Perchlorate	µg/L	17		**78**	< 2	< 0.05	0.399 J	< 0.05	< 0.05	< 0.05	< 0.5	< 0.2	0.28	< 0.05	< 0.05
Field Parameters															
Dissolved Oxygen	mg/L	NV		1.62	0.09	0.22	0.14	0.15	0.08	0.08	0.48	0.52	0.76	0.1	0.03
Oxidation-Reduction Potential	mV	NV		163	-88	-90	-66	-36	-320	-60	-16	-4	127	-70	3

			Location	04WW09										
			Sample Date	1/22/2019	2/4/2020	5/5/2020	8/11/2020	11/4/2020	3/11/2021	5/25/2021	8/5/2021	11/9/2021	2/2/2022	8/2/2022	2/3/2023
Analyte	**Units**	**PCL**		**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Perchlorate															
Perchlorate	µg/L	17		**2,100**	**18**	11.1	3.92	2.02	< 0.05	< 0.5	< 0.5	< 0.2	< 1	< 0.05	< 0.05
Field Parameters															
Dissolved Oxygen	mg/L	NV		5.78	0.08	0.04	0.03	0.02	0.09	0.04	0.33	0.22	0.43	0.13	0.02
Oxidation-Reduction Potential	mV	NV		326	-74	-16	-87	-91	-21	-246	-127	-85	23	-134	-62

LHAAP-04 Perchlorate, Dissolved Oxygen, and Oxidation Reduction Potential (2019 to 2023)

Notes:

Blue highlighting indicates concentrations above the PCL.

< The analyte was not detected above the laboratory reporting limit shown.

J - Estimated: The concentration shown is estimated

J+ - The concentration shown is an estimate with a high bias

µg/L - micrograms per liter

mg/L - milligrams per liter

NV - No PCL value has been established for the analyte.

PCL - Texas Risk Reduction Program Tier 1 Groundwater Residential Protective Concentration Level.

mV - millivolts