



**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 18, 2018, 6:00-7:15 PM Central Daylight Time (CDT)**

Meeting Participants:

Army BRAC:	Rose M. Zeiler
USACE:	Aaron Williams
USAEC:	Nicholas Smith
USGS:	Kent Betcher
Bhate:	Kim Nemmers
APTIM:	William (Bill) Foss
USEPA Region 6:	Rich Mayer
TCEQ:	April Palmie
RAB:	Present: Judy VanDeventer, Tom Walker, Nigel R. Shivers, and Richard Le Tourneau Absent: Paul Fortune; Carol Fortune; Charles Dixon; Terry Britt; and John Pollard, Jr.
Public:	Laura-Ashley Overdyke (Executive Director of the Caddo Lake Institute)

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. Judy VanDeventer noted that Mr. Terry Britt was in Canada. Ms. Zeiler noted that Paul and Carol Fortune had notified her that they would not be able to attend the meeting.

Ms. Zeiler pointed out the three sites not included in the Bhate contract, which are LHAAP-18/24, LHAAP-29, and LHAAP-47. Ms. Zeiler noted that these sites are in a different color on the LHAAP map.

Ms. Zeiler noted that no new persons were present but asked for suggestions to get more RAB members. Mr. Nigel Shivers stated that it is difficult to get more volunteers. Ms. Laura-Ashley Overdyke suggested having an information table at the next community event and offered to man the table. Ms. Zeiler stated that the Army would send information to support that if the date for the next event could be provided. Ms. Overdyke stated that she would want an application for the RAB membership and some information about how to get involved in the RAB. Mr. Bill Foss stated that the master naturalists get credit for volunteering and suggested reaching out to the local chapter.



Open Items

Ms. Zeiler noted that the RAB Meeting minutes had been sent out in August 2018. Ms. VanDeventer made a motion to approve the July 2018 RAB Meeting minutes. Mr. Tom Walker seconded the motion.

Defense Environmental Restoration

Overview of Waste Management

Ms. Zeiler explained that the first presentation on waste management at LHAAP was developed in response to interest expressed during the previous RAB meeting. Ms. Kim Nemmers stated that the slides are meant to help with the discussion and hopefully more clearly present how waste is managed at LHAAP. Ms. Nemmers explained that the waste typically generated at LHAAP is investigation derived waste, which is typically the soil generated from cuttings from borings or from installation of wells. Ms. Nemmers stated that groundwater extracted from monitoring activities is the second main waste generated at LHAAP. Ms. Nemmers also stated that other waste generated from LHAAP includes excavated soils and a dried cake from the metals precipitation system at the Groundwater Treatment Plant (GWTP). Mr. Walker asked if the naturally occurring metals are considered during waste management. Ms. Nemmers confirmed that metals are analyzed for in the filter cake and that the Interim Record of Decision (IROD) for LHAAP-18/24 requires treatment for metals even though the current levels of metals in groundwater at the site is consistent with background concentrations. Ms. Zeiler stated that soils are not always analyzed for nutrient metals because these metals are not used in hazardous waste determination. Mr. Rich Mayer stated that the concern is for metals that are hazardous.

Ms. Nemmers then explained the terms often used in waste management. Ms. Nemmers stated that a disposal facility means a permitted facility or part of a permitted facility where waste will be placed based upon the facility's permit. Ms. Nemmers stated that a manifest is the document used to take waste from cradle to grave because it is signed by the generator, signed by the transporter, and signed by the disposal facility and then copies are provided to each of these participants. If the waste is non-hazardous, then another document like a bill of lading can be used instead. However, Ms. Nemmers noted that the non-hazardous waste process provides the same documentation with the only exception being that a copy of the bill of lading or manifest doesn't need to be sent to the U.S. Environmental Protection Agency (USEPA). Ms. Zeiler clarified that Ms. Nemmers was discussing waste that goes offsite only. Ms. Nemmers explained that the generator for LHAAP is the Army. Ms. Nemmers stated that most of the waste generated is special waste, which means that the waste requires special handling, but is not considered hazardous.

Ms. Nemmers explained what a solid waste was and that nothing can be considered special waste or hazardous waste until it is determined to be a solid waste. Ms. Nemmers stated that the reason for that is some material can be reused or recycled in place of being a waste. Ms.



Nemmers stated that the USEPA defines solid waste as a garbage, refuse, sludge, or other discarded material. Hazardous waste breaks down per the Federal regulations as either listed waste, meaning we know the process that generated the waste; or characteristic waste, which is most typical for environmental waste. Ms. Nemmers explained that the waste gets tested and is classified as characteristically hazardous waste if the waste has a high flash point or is reactive, toxic, or ignitable. Ms. Nemmers explained that environmental waste is most often hazardous based upon toxicity of the soils. Mr. Mayer asked if hazardous waste was generated at LHAAP. Ms. Zeiler explained that the drying bed sludge was considered hazardous due to the process generating the metals but then the mixture rule was applied to allow for the waste stream to be non-hazardous, special waste.

Ms. Nemmers explained that toxicity is most often the reason for environmental waste to be considered hazardous waste because it is based upon a specific compound, such as lead, exceeding an established criteria. Ms. Nemmers explained the process for determining if a waste is hazardous using the flow chart in the slides and how there are several ways of excluding a waste from being classified as hazardous. Ms. Zeiler clarified that even though a waste may not be considered hazardous based upon being a listed hazardous waste, the waste could be classified as hazardous due to high lead or TCE. Ms. Nemmers explained that the waste is tested by an offsite laboratory to determine if the waste is hazardous. Ms. Nemmers clarified that the waste can be classified by generator knowledge but that is often a very specific situation whereby the source of the waste is known though testing is usually completed regardless.

The documentation is provided by the Contractor (Bhate) for Army review and/or sent to the disposal facility to prepare a waste profile. Then the Army will sign the waste profile documenting that the information about the waste is correct. Mr. Mayer asked if the receiving facility will test the waste. Ms. Nemmers stated that the receiving facility typically pushes the testing back onto the contractor based upon so many yards or tons of material received. Ms. Zeiler explained that annual recertification of waste is also required. Mr. Foss stated that typically a sample is required every 1,000 yards or a similar volume, but that sampling at the landfill is usually focused on free liquids present in the waste in case the facility needs to solidify the waste.

Ms. Nemmers then discussed the slide showing the USEPA waste classifications and the Texas Commission on Environmental Quality (TCEQ) waste classifications. Ms. Nemmers stated that the waste is non-hazardous when it is considered Class 1, 2, or 3 under the TCEQ regulations. Ms. April Palmie explained that non-hazardous waste still has contamination present but at a much lower concentration than hazardous waste. Ms. Palmie stated that the waste is industrial waste and must be disposed of based upon the Class that the waste falls under. Mr. Walker asked if the "F" listing is based upon flammability. Ms. Zeiler stated that the drying bed filter cake waste used to be classified as "F" listed based on its source prior to use of the mixture



rule. Mr. Mayer stated that “F” does not necessarily mean flammability. Mr. Walker stated that he wondered if the letter code matched up with the characteristic to the right of the code on the slide. Ms. Palmie clarified that there was no relationship in that way but that the wastes that are listed have similarities. Ms. Nemmers stated that each listed waste is a very specific industry process that generated the waste.

Ms. Nemmers explained that waste generated during investigation of a site is typically placed into a drum that is then labeled “Pending Analysis” to know what the drum contains but that the waste is not classified. Ms. Nemmers explained that if the waste was determined to be hazardous then a date would be placed on the waste because Federal regulations require you to dispose of the waste within a certain period of time. Ms. Nemmers explained that waste water is either treated by the GWTP or transported and disposed offsite. Ms. Nemmers stated that drilling waste is tested and then either spread on the ground where it was generated or disposed offsite depending on the results of the analysis. Ms. Nemmers stated that excavated soil is sent off typically as Class 2 or Class 3 non-hazardous waste. Ms. Zeiler stated that perchlorate waste is classified as hazardous waste based on the ignitability characteristic and is not listed waste. Mr. Mayer stated that this classification rarely occurs to which Ms. Zeiler concurred. Mr. Shivers asked if the timeframe discussed was 90 days. Ms. Zeiler stated that the time is 90 days. Mr. Shivers asked where the waste is stored. Ms. Zeiler stated that waste is typically stored in a closed drum with a label on it. Ms. Nemmers stated that LHAAP does not produce very much hazardous waste and is considered a Conditionally Exempt Small Quantity Generator, otherwise additional requirements might apply to LHAAP.

LHAAP-03

Mr. Foss provided an update on LHAAP-03, which was discussed more completely at the previous RAB Meeting. Mr. Foss stated that LHAAP-03 is a very small soils site contaminated with lead and arsenic. The Record of Decision (ROD) was finalized, and the public notice was published a few days ago. Mr. Foss explained that the technical memorandum for soil sampling was issued and reviewed by the regulators. Those comments are being addressed. Mr. Foss explained that the hope was to move forward with the soil sampling within the next month or two. The soil data will then be used to prepare the remedial design. Mr. Foss explained the purpose of the sampling, which is to confirm the size of the excavation presented in the ROD.

LHAAP-16

Mr. Foss explained that bioremediation is planned for LHAAP-16, but first a series of wells need to be installed for both monitoring of the groundwater plume and injections for the bioremediation. Mr. Foss pointed out on the map where the low-lying area is at the site, which has made well installation difficult due to the recent rain events. Mr. Foss explained that the handout of slides presents what was hoped to be completed by now, but the presentation correctly lists the wells installed to date. Mr. Foss said that 17 wells were installed in April 2018 but the remainder were not installed due to the site being so wet. Mr. Foss stated that the



team remobilized in October 2018, but 5.5-inches of rain fell over the weekend prior to the mobilization. Mr. Foss stated that four wells were installed leaving six wells to be installed. Mr. Foss stated that the baseline sampling of the wells installed has been completed. Mr. Foss stated that once the other wells are installed, those wells will be sampled as part of the baseline sampling event also. Mr. Shivers asked what was being injected. Mr. Foss stated that vegetable oil and sodium lactate will be injected to allow for microbial growth. Ms. Zeiler stated that the lines shown are lines of injections. Mr. Foss clarified that some wells will be used for injections and others will be used to circulate the injectate. Mr. Shivers asked where the bugs are incubated. Mr. Foss explained that some of the bug are naturally occurring, but the bacteria is also used to inoculate. Ms. Zeiler explained that the aquifer is first treated to prepare the groundwater for the bacteria and then the bacteria are added to the aquifer. Mr. Foss explained that the bacteria needs a low dissolved oxygen level, which is tested prior to inoculating. Mr. Foss presented a photo of the track-rig being used at Site 16. Mr. Shivers asked the depth of the wells. Mr. Foss stated that the depth is 20 to 35 feet deep with one monitoring well about 50 to 55 feet deep. Ms. Zeiler stated that the work is being coordinated with Fish and Wildlife.

LHAAP-58

Ms. Nemmers provided an update on LHAAP-58, which has an eastern and western lobe. The eastern lobe had the remedy implemented several years ago, and the remedy is being monitored. Ms. Nemmers stated that the western plume received injections in March and April 2018. Ms. Nemmers explained that the focus is on the groundwater as the soil does not pose a threat to human health. The ROD for LHAAP-58 stated that natural attenuation would be implemented for the western lobe of the plume, which was evaluated for a couple of years. The evaluation determined that natural attenuation was not successfully remediating the plume and that active treatment was necessary to help reduce the plume. Ms. Nemmers explained that microbial analysis prior to the injections indicated that the bacteria necessary was naturally occurring. Ms. Nemmers presented the remedial action completed in March/April 2018 including the additional two monitoring wells installed. Ms. Nemmers explained that one of the monitoring wells installed was used to define the extent of the plume, which it did based upon laboratory analysis. Ms. Nemmers then presented the plume shapes prior to and following the 2018 groundwater treatment. Ms. Nemmers noted that bioremediation is still being observed within the eastern plume after 5 years, which is a good surprise. Ms. Nemmers also pointed out the significant decrease in the western lobe of the plume within a short period of time. Ms. Nemmers stated that the groundwater would continue to be monitored.

Overview of Sites

Ms. Nemmers explained that the work continues at LHAAP-16 as presented by Mr. Foss but the soil samples were able to be collected from LHAAP-17 in August 2017 to prepare the remedial design. Remedial action operations (RA-O) sampling continues for many sites. Ms. Nemmers



explained that some sites are sampled every 6 months and other sites are sampled every 3 months. Ms. Nemmers stated that the sites will have a lot of RA-O sampling as remedies are put in place or were in place and continue to be evaluated.

Ms. Nemmers explained the repairs to the fluidized bed reactor (FBR) at the GWTP, which treats the perchlorate. Ms. Nemmers stated that the nozzles and laterals were replaced. These parts are used to fluidize the granular activated carbon. The FBR was repaired in July 2018, and Ms. Nemmers stated that big improvements have been observed following the repairs.

Ms. Nemmers stated that surface water samples have been collected for both the third and fourth quarters due to the rainfall observed.

Ms. Nemmers stated that with sampling comes reporting of the data so many RA-O Reports are in process. Ms. Nemmers stated that technical memorandums are being prepared based upon data collected or planned to be collected. Ms. Nemmers stated that the Land Use Controls (LUCs) for the munitions response sites were the primary update for the LUC Management Plan Update. Ms. Nemmers stated that the remedial design for LHAAP-17 was in process.

Ms. Nemmers stated the goal going forward is to get the wells installed and the injections completed at LHAAP-16. Ms. Nemmers said the look ahead included a lot of groundwater sampling for performance remedy evaluations. Ms. Nemmers explained that the reports in the 3 month lookahead appears similar to the current documents because of the time to complete those documents.

Groundwater Treatment Plant

Ms. Nemmers explained the dip in the extraction and treatment in July and August 2018 was due primarily to the repairs to the FBR coupled with lower precipitation during that time. Ms. Nemmers also stated that the pumps for the extraction wells require maintenance which was behind due to the FBR repairs. However, Ms. Nemmers pointed out that the treatment system jumped back up with increased treatment volumes in September 2018.

Surface Water Sampling

Ms. Nemmers explained the surface water sampled from August 2018 was non-detect for perchlorate.

LHAAP-18/24 and LHAAP-29

Mr. Aaron Williams explained that a separate contractor, HDR, is responsible for developing the final remedy for LHAAP-18/24, LHAAP-29, and LHAAP-47. Mr. Williams explained that the Sites 29 and 18/24 are in the Proposed Plan (PP) stage and that LHAAP-47 already has a PP. For LHAAP-18/24, Mr. Williams explained that the PP is ahead of schedule and the public meeting for the PP will be in conjunction with the next RAB in January 2019. For Site 29, the PP is draft final and will have the public meeting in November or early December 2018.



Mr. Williams stated that Site 18/24 is a 34.5-acre area that was used for the treatment, storage, and disposal of solid and liquid explosive, pyrotechnic, and solvent waste by open burning/open detonation, incineration, and evaporation. Mr. Williams explained that interceptor collection trenches (ICTs) operate along with the GWTP as the interim remedy to control the plume until the permanent remedy is put into place. Mr. Williams stated that the sampling at Site 18/24 identified dense non-aqueous phase liquid (DNAPL) and dissolution of that DNAPL is considered a continuing source. Mr. Williams explained that there are two groundwater zones with one being the shallow zone and the other is the Wilcox Formation. Ms. Zeiler stated that contamination is present in both the shallow zone and the Wilcox Formation. Ms. VanDeventer asked if the Wilcox Formation had contamination. Ms. Zeiler confirmed that both zones do have contamination. Mr. Shivers asked if this is a problem. Ms. Zeiler stated that the problem is more that it moved. Ms. Zeiler explained that the layering of the soils makes it difficult to understand why and how the contamination moved. Mr. Mayer stated that LHAAP-18/24 is the worst site at LHAAP. Ms. Palmie stated that the burning ground was located in an area distant from the rest of the plant. Ms. Nemmers pointed out that this is the reason for the GWTP and interim remedy so this contamination is not a surprise. Ms. Zeiler explained that the selected remedy presented in the PP was a collaborative effort with regulators to aggressively treat the most contaminated areas at LHAAP-18/24 and identify areas where additional information will be collected to support the remedial design.

Mr. Williams summarized that volatile organic compounds (VOCs), perchlorate, and metals are present in both the shallow and Wilcox zones. Mr. Williams indicated that the draft PP will be submitted to the Regulators in October 2018. A total of six remedies were evaluated which are more fully detailed in the Feasibility Study (FS). The selected remedy is Alternative 5 which includes enhanced groundwater extraction and treatment, LUCs, enhanced in-situ bioremediation inside and outside the containment area in the shallow and Wilcox Formation, unsaturated soil excavation and off-site disposal, and thermal DNAPL removal. Mr. Williams then presented an overview of the other remedies considered which all included containment of the plume. Mr. Williams explained that the difference in Alternative 4 for LHAAP-18/24 was that surfactant was evaluated in place of thermal removal for the DNAPL. For Alternative 6, Zero-Valent Iron was considered in place of thermal DNAPL removal. Mr. Williams then explained that Alternative 5 was selected based upon best value considering cost and time for remedy implementation. Mr. Williams then showed a slide that visually depicts the implementation of Alternative 5 as presented in the FS that shows gridding for in-situ bioremediation and the areas of thermal treatment. Ms. Zeiler added that this depiction is just conceptual and that some changes from the FS are already planned based upon discussion with the regulators and costing.

Mr. Williams then presented the trinitrotoluene (TNT) production area, LHAAP-29, which produced 400 millions pounds of TNT between 1942 and 1945. Mr. Williams stated that the site was used for “soak-out” or solvent bath for rocket motors, which is the primary source for



the out-of-specification methylene chloride (MC) present in the intermediate aquifer. Mr. Williams stated that the MC in the intermediate aquifer is the primary area that requires treatment at the site. In addition, Mr. Williams explained the contaminants of concern (COCs) in soil are explosives and perchlorate and in shallow groundwater are VOCs, explosives, perchlorate, and metals. Mr. Williams explained that metals and other VOCs are also COCs in the intermediate aquifer. The transite TNT waste water line and vitrified clay cooling water lines have COCs that are explosives. Mr. Williams stated that all remedies evaluated for Site 29 included flushing and capping of those lines. Ms. Overdyke asked if testing beyond the shallow groundwater zone had been completed, to which Mr. Williams said “yes.” Mr. Williams stated that the PP was sent to the Regulators on the day of the October 2018 RAB Meeting and that once the PP is finalized it will be distributed for Public Comment and review.

Mr. Williams presented the preferred remedy consisting of excavation and off-site disposal and LUCs for soil; flush and plug lines; in-situ thermal desorption (ISTD) using either electrical resistance heating (ERH) or thermal conduction heating (TCH); monitored natural attenuation (MNA) and LUCs for intermediate zone groundwater; and MNA and LUCs for shallow zone groundwater. Mr. Williams then presented the other remedies considered including excavation and off-site disposal and LUCs, flushing and plugging of lines, in situ chemical oxidation (ISCO) of the intermediate zone for the MC, MNA and LUCs for the intermediate zone groundwater, and MNA and LUCs for the shallow groundwater that makes up Alternative 2. Alternative 3 is similar but considered groundwater extraction for the intermediate zone as opposed to ISCO. Mr. Williams explained that the MC was detected in the millions of milligrams per liter. Ms. Palmie pointed out the area is isolated and in a very small footprint.

Mr. Williams explained that if anyone wants more details there are documents in the Administrative Record with the information. For LHAAP-18/24, there is a Final Revised FS and for LHAAP-29 there is a Final FS and a Draft Final FS Addendum. Mr. Williams stated that the MC concentration and information is contained in the Draft Final FS Addendum for LHAAP-29. Ms. Zeiler state that ISCO was first selected in the Final FS for LHAAP-29 but that has been revised due to the cost associated with follow-on ISCO treatments that would be needed.

LHAAP-47

Mr. Williams then presented LHAAP-47, which already has a PP and is ready for the ROD. However, due to the time since the PP, additional investigation was completed to confirm previous data and re-evaluate monitoring wells that had been dry. Mr. Williams said that a post-screening investigation (PSI) is being completed. Mr. Williams stated that the direct push technology (DPT) results were presented during the previous RAB Meeting. Since then, additional wells were installed and a total of 25 wells were sampled in July 2018. Mr. Williams explained that results from the July 2018 groundwater sampling are presented during this October 2018 RAB Meeting. An additional 11 wells were sampled in September 2018 and those results will be presented at the next RAB Meeting. All of the wells are installed and sampled so



the next step is preparing the PSI Report. Mr. Williams also stated that surface water samples will be collected in the winter. Ms. Zeiler stated that a draft ROD had been prepared, but then the dispute resolution occurred and time passed. So, the Army made the decision to re-evaluate the site due to the amount of time that has passed to ensure that everything gets addressed. Ms. Zeiler confirmed with Mr. Williams that there were not any big surprises. Ms. Zeiler stated that many of the shallow wells remain dry which is believed to be because the process related activities are no longer generating water and that it was a perched system. Ms. Zeiler stated that there are nine new monitoring wells and a lot of DPT points were advanced. Mr. Williams stated that DPT results presented at the last RAB Meeting showed non-detect but a source area was known to be present. So, a new shallow well was installed to ensure that the area was not larger than envisioned. The new monitoring well to the west had 120,000 micrograms per liter ($\mu\text{g}/\text{L}$) of trichloroethylene (TCE), which was a little bit of a surprise because the previous detection had been 25,000 $\mu\text{g}/\text{L}$ of TCE. Mr. Williams also pointed out the area to the east where additional investigation was completed and did not result in any changes to the plan for the remedy. Mr. Williams explained that since TCE was detected in the eastern part of the site for the intermediate groundwater zone, new intermediate monitoring wells were installed which were sampled in September 2018. Mr. Williams stated the data from these new monitoring wells will be presented at the next RAB Meeting and will determine if there is a need to re-design the remedy for LHAAP-47. Ms. Zeiler explained that the ROD would not need to be revised because the remedy itself will remain in-situ bioremediation. Ms. Overdyke asked if the plume is further east than known. Mr. Williams confirmed the statement.

Other RAB Items Discussed

Ms. Zeiler discussed the Five-Year Review (FYR). Ms. VanDeventer stated that she and Paul (Fortune) had responded to the FYR interview form. Ms. Zeiler stated that the FYR is in Army and AEC review currently and will then be sent as draft to the Regulators in December 2018. Ms. Zeiler also asked for any topics of interest that could be presented at the next RAB Meetings.

Ms. Zeiler named the four parcels (Signal Test, Pistol Range, South Test/South Bomb and the Demolition Debris Landfill Areas) that are included in Environmental Condition of Property (ECP) VII document that is used for Fed-to-Fed transfers. The sites are on the schedule to be transferred to the U.S. Fish and Wildlife Service (USFWS) for incorporation into the refuge. Ms. Zeiler stated that the ECP has been through Army and legal review and is with USFWS and the regulators currently. Once the ECP is final, then the letter of offer is sent from the Army to the USFWS and that letter includes the Environmental Protection Provisions (EPPs) within the ECP as well as a land use survey and other information. The USEPA Reviews the ECP because of the LUCs as a requirement of the RODs. Ms. Zeiler stated that USFWS is also working on transfer of some water rights also that will result in a total of 85% transfer of water rights.



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 17, 2019**, with the **meeting starting at 5:00 pm CST** at the Karnack Community Center. The **PP meeting for LHAAP-18/24 is planned for 6:00 pm to 7:30 pm CST** on the same night following the January 2019 RAB Meeting. Ms. Zeiler explained that there will be a court reporter for the PP portion of the meeting. For LHAAP-29, the PP Meeting was selected as December 6 or November 29, 2018 (which is the 5th Thursday), at 6 pm to 7:30 pm CST.

Adjourn

Mr. Richard LeTourneau motioned to adjourn. Ms. VanDeventer seconded the motion. The Meeting adjourned at 7:21 pm CDT.

October 2018 Meeting Attachments and Handouts:

- Meeting Agenda
- Color Copy of Bhate Presentation Slides
- Groundwater Treatment Plant (GWTP) – Processed Groundwater Volumes Handout
- Surface Water Sampling Handout