



Date: June 30, 2011

Project No.: 133363

TRANSMITTAL LETTER:

To: Mr. Aaron Williams

Address: US Army Corps of Engineers - Tulsa

CESWT-PP-M

1645 South 101st East Ave

Tulsa, Oklahoma 74128

Re: Final Proposed Plan for South Test Area/Bomb Test Area, LHAAP-001-R and Ground
Signal Test Area, LHAAP-003-R
Longhorn Army Ammunition Plant

Contract No. W912QR-04-D-0027/DS02

For: Review As Requested Approval Corrections Submittal Other

| <i>Item No:</i> | <i>No. of Copies</i> | <i>Date:</i> | <i>Document Title</i> |
|-----------------|----------------------|--------------|--|
| 1 | 2 | June 2011 | Final Proposed Plan for South Test/Bomb Test Area, LHAAP-001-R and Ground Signal Test Area, LHAAP-003-R, Longhorn Army Ammunition Plant, Karnack, Texas |
| | | | |

Aaron,

Enclosed are two copies of the above-named document. Copies have been distributed as indicated below. Please call with any questions or comments.

Sincerely:

John Elliott
Project Manager

CC: Distribution List:

Mr. J. Lambert – USACE, Tulsa (sent to A. Williams for distribution)

Ms. M. Plitnik – USAEC

Ms. Rose Zeiler – BRAC-LHAAP

Mr. S. Tzhone – EPA Region 6 (2)

Ms. F. Duke – TCEQ, Austin (2)

Mr. D. Vodak – TCEQ, Tyler

Mr. P. Bruckwicki – U.S. Fish and Wildlife Service



DEPARTMENT OF THE ARMY
LONGHORN ARMY AMMUNITION PLANT
POST OFFICE BOX 220
RATCLIFF, AR 72951

June 30, 2011

DAIM-ODB-LO

Mr. Stephen Tzhone
US Environmental Protection Agency
Superfund Division (6SF-AT)
1445 Ross Avenue
Dallas, TX 75202-2733

Re: Final Proposed Plan for South Test Area/Bomb Test Area, LHAAP-001-R and
Ground Signal Test Area, LHAAP-003-R
Longhorn Army Ammunition Plant, Karnack, Texas, June 2011

Dear Mr. Tzhone,

The above referenced document is being transmitted to you for your records.

The point of contact for this action is the undersigned. I ask that John Elliott, Shaw's Project Manager, be copied on any communications related to the project. I may be contacted at 479-635-0110, or by email at rose.zeiler@us.army.mil.

Sincerely,

A handwritten signature in cursive script that reads "Rose M. Zeiler".

Rose M. Zeiler, Ph.D.
Longhorn AAP Site Manager

Copies furnished:

F. Duke, TCEQ, Austin, TX
D. Vodak, TCEQ, Tyler, TX
P. Bruckwicki, Caddo Lake NWR, TX
J. Lambert, USACE, Tulsa District, OK
A. Williams, USACE, Tulsa District, OK
M. Plitnik, USAEC, TX
J. Elliott, Shaw – Houston, TX (for project files)



DEPARTMENT OF THE ARMY
LONGHORN ARMY AMMUNITION PLANT
POST OFFICE BOX 220
RATCLIFF, AR 72951

June 30, 2011

DAIM-ODB-LO

Ms. Fay Duke (MC-136)
SSDAT/Superfund Section
Remediation Division
Texas Commission on Environmental Quality
12100 Park 35 Circle, Bldg D
Austin, TX 78753

Re: Final Proposed Plan for South Test Area/Bomb Test Area, LHAAP-001-R and
Ground Signal Test Area, LHAAP-003-R
Longhorn Army Ammunition Plant, Karnack, Texas, June 2011
SUP 126

Dear Ms. Duke,

The above-referenced document is being transmitted to you for your records.

The point of contact for this action is the undersigned. I ask that John Elliott, Shaw's Project Manager be copied on any communications related to the project. I may be contacted at 479-635-0110, or by email at rose.zeiler@us.army.mil.

Sincerely,

A handwritten signature in cursive script that reads "Rose M. Zeiler".

Rose M. Zeiler, Ph.D.
Longhorn AAP Site Manager

Copies furnished:
S. Tzhone, USEPA Region 6, Dallas, TX
D. Vodak, TCEQ, Tyler, TX
P. Bruckwicki, Caddo Lake NWR, TX
J. Lambert, USACE, Tulsa District, OK
A. Williams, USACE, Tulsa District, OK
M. Plitnik, USAEC, TX
J. Elliott, Shaw, Houston, TX (for project files)

FINAL
PROPOSED PLAN
FOR SOUTH TEST AREA/BOMB TEST AREA,
LHAAP-001-R AND GROUND SIGNAL TEST
AREA, LHAAP-003-R

ISSUED BY: U.S. ARMY



**Longhorn Army Ammunition Plant
Karnack, Texas**

June 2011

**THE U.S ARMY ANNOUNCES
PROPOSED PLAN FOR LHAAP-001-R
and LHAAP-003-R**

In this Proposed Plan the U.S. Army documents a removal action of munitions and explosives of concern (MEC) conducted in 2008 under Army's removal authority and presents its proposal for limited groundwater monitoring at the Munitions Response Sites (MRS) LHAAP-001-R, South Test Area/Bomb Test Area and LHAAP-003-R, Ground Signal Test Area at Longhorn Army Ammunition Plant (LHAAP) in addition to the land use controls (LUCs) already in place as a result of the 2008 removal action. Those LUCs were identified in an Action Memorandum signed by the U.S. Army in 2007 and include restrictions against intrusive activities including digging; signage at the perimeter of the sites; and education programs for future refuge visitors, staff, and volunteers (EODT Technology, Inc. [EODT], 2009).

Throughout the proposed plan for these two MRS, the term munitions constituents (MC), refers to the data gap constituent of white phosphorous (WP) and the emerging contaminant perchlorate. The U.S. Army, regulators, and project stakeholders met in 2005 for technical planning meetings and agreed that metals and explosives were addressed with the No Further Action (NFA) Record of Decisions (RODs) signed in 1998 for Installation Restoration Program Sites LHAAP-27 and -54 which are co-located with LHAAP-001-R and LHAAP-003-R, respectively.

The primary purpose of the Proposed Plan is to facilitate public involvement in the remedy selection process. The Proposed Plan provides the public with basic background information about MRS LHAAP-001-R and LHAAP-003-R,

Dates to remember:
MARK YOUR CALENDER

PUBLIC COMMENT PERIOD:
July 13, 2011 to August 13, 2011
The U.S. Army will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING: The U.S. Army will hold a public meeting to explain the Proposed Plan for LHAAP-001-R and LHAAP-003-R. Oral and written comments will be accepted at the meeting. The meeting will be held on July 21, 2011 from 6:00 p.m. to 7:30 p.m. at Karnack Community Center.

For more information, see the Administrative Record at the following location:

Marshall Public Library,
300 S. Alamo
Marshall, Texas 75670
Business Hours: Monday – Thursday (10:00 a.m. – 8:00 p.m.) Friday – Saturday (10:00 a.m. – 5:00 p.m.)

For further information on LHAAP-001-R and LHAAP-003-R, please contact:

Dr. Rose M. Zeiler
Site Manager
Longhorn Army Ammunition Plant
P.O. Box 220
Ratcliff, Arkansas, 72951
Direct No.: 479.635.0110
E-mail address: rose.zeiler@us.army.mil

documents the 2008 removal action, confirms the LUCs included with the removal action and recommends that limited groundwater monitoring for perchlorate be conducted to verify protection of human health and the environment.

The U.S. Army is issuing this Proposed Plan for public review, comment, and participation to fulfill part of its public participation responsibilities under Sections 117(a), 113(k)(2)(B), and 121(f)(1)(G) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986, and under Section 300.430(f)(2) of the National Oil

and Hazardous Substances Pollution Contingency Plan (NCP). This Proposed Plan summarizes information that can be found in greater detail in the Site Inspection (SI) Report, the Engineering Evaluation/Cost Analysis (EE/CA), the Action Memorandum, the MC Data Summary Report, the Munitions and Explosives of Concern (MEC) Removal Action Report, the Installation-Wide Baseline Ecological Risk Assessment (BERA), and other supporting documents that are contained in the Administrative Record for LHAAP-001-R and LHAAP-003-R. The project management team, including the U.S. Army, U.S. Environmental Protection Agency (USEPA), and the Texas Commission on Environmental Quality (TCEQ), encourages the public to review these documents to gain a more comprehensive understanding of the environmental conditions at LHAAP-001-R and LHAAP-003-R, and also to review and comment on the recommendation for limited groundwater monitoring for perchlorate in association with the LUCs presented in this Proposed Plan.

The U.S. Army, the lead agency for environmental response actions at LHAAP, is acting in partnership with USEPA Region 6 and TCEQ. As the lead agency, the U.S. Army is charged with planning and implementing remedial actions at LHAAP. Regulatory agencies assist the U.S. Army by providing technical support, project review, project comment, and oversight in accordance with the Federal Superfund law and the Longhorn AAP Federal Facilities Agreement.

SITE BACKGROUND

LHAAP is located in central-east Texas in the northeastern corner of Harrison County (**Figure 1**). The installation occupies nearly 8,416 acres between State

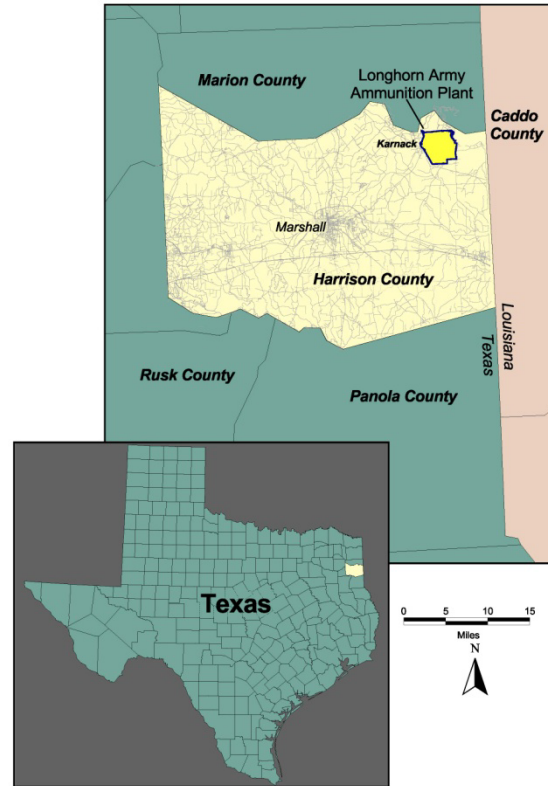


Figure 1 Location of the Longhorn Army Ammunition Plant Harrison County, Texas

Highway 43 at Karnack, Texas, and the western shore of Caddo Lake. The nearest cities are Marshall, Texas, approximately 14 miles to the southwest, and Shreveport, Louisiana, approximately 40 miles to the southeast.

Caddo Lake, a large freshwater lake situated on the Texas-Louisiana border, bounds LHAAP to the north and east.

The U.S. Army has transferred approximately 7,000 acres to the U.S. Fish and Wildlife Service (USFWS) for management as the Caddo Lake National Wildlife Refuge. The property transfer process is continuing as restoration is implemented at individual sites.

Due to releases of chemicals from operation and maintenance activities at the former facility, LHAAP was placed on the National Priorities List (NPL) on August 9,

1990. Activities to remediate contamination associated with the listing of LHAAP as a NPL site began in 1990. After being listed on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into a CERCLA Section 120 Federal Facility Agreement (FFA) for remedial activities at LHAAP. The FFA became effective December 30, 1991.

LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property.

The two MRS discussed in this Proposed Plan have been identified to have potential environmental concerns.

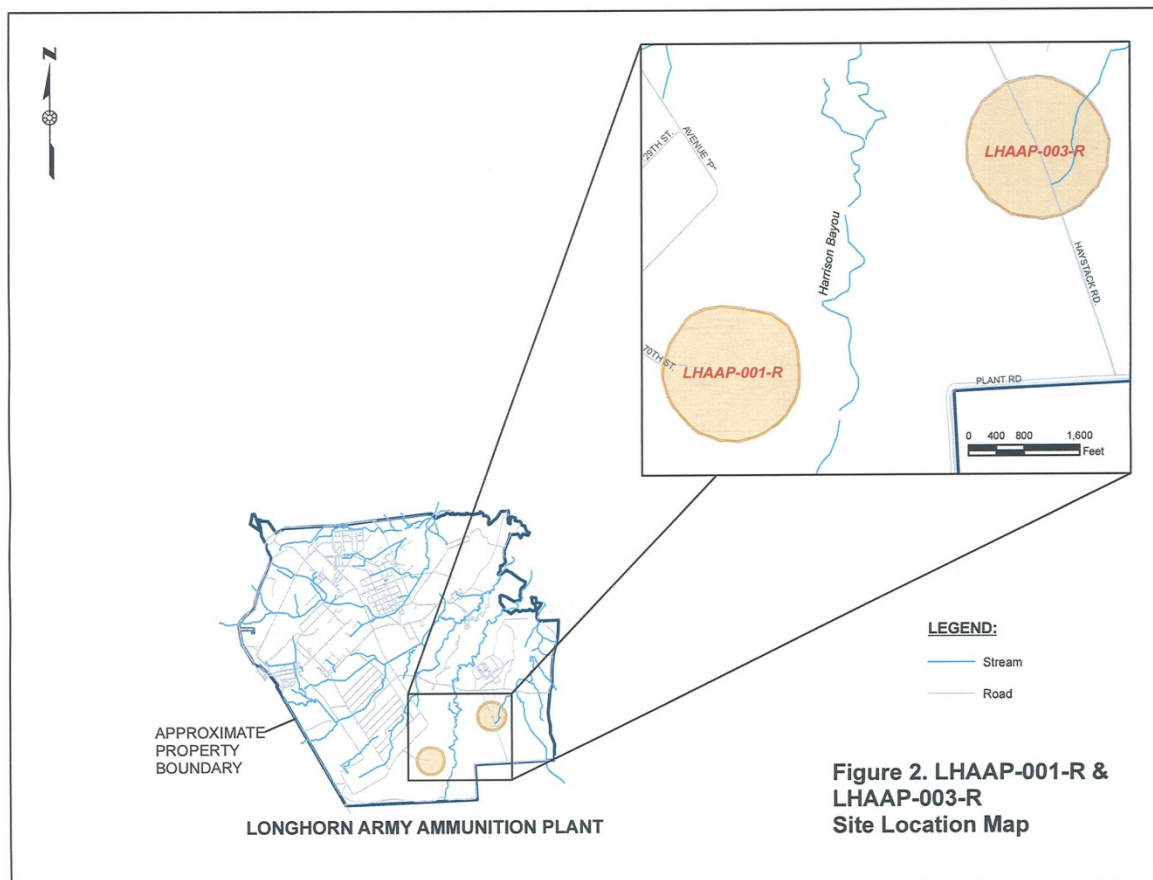
A site description, site characteristics, and a summary of site risks are provided below

separately for each MRS, followed by a recommendation for the sites.

LHAAP-001-R

LHAAP-001-R, known as Site 27, South Test Area/Bomb Test Area is approximately 79 acres located southeast of Avenue P and the magazine area at the end of 70th Street, near the southern boundary of LHAAP (**Figure 2**).

The site was identified in the U.S. Army Closed, Transferring, and Transferred Range/Site Inventory as 6.75 acres in size; however, a 1981 aerial photograph, historical records, a site visit, and a teleconference on 17 May and 18 May 2005 between U.S. Army Corps of Engineers (USACE) and U.S. Army Environmental Center (USAEC) indicated the site should be 79 acres including Demolition Sub Areas 1, 2, and 3.



The South Test Area/Bomb Test Area is co-located with the Installation Restoration Program (IRP) site LHAAP-27 for which a NFA ROD under CERCLA for Hazardous, Toxic, and Radioactive Waste (HTRW) was signed with regulatory concurrence in January 1998 (USACE, 1998).

The LHAAP-001-R site was constructed in 1954 and used by Universal Match Corporation for testing M120A1 photoflash bombs produced at the facility until about 1956. The bombs were tested by exploding them in the air over an elevated, semi-elliptical earthen test pad. Bombs awaiting testing were stored in three earth-covered concrete bunkers. The bombs tested were 150-pound M120/M120A photoflash bombs filled with photoflash powder and containing a black powder booster charge and a timed nose fuze.

During the late 1950s, illuminating signal devices were also demilitarized within pits excavated in the vicinity of the test pad at the site also known as the suspected Open Burn/Open Detonation (OB/OD) area. During the early 1960s, leaking production items such as XM40E5 "button bombs" may have been demilitarized by detonation in the South Test Area/Bomb Test Area (LHAAP-001-R) or the Ground Signal Test Area (LHAAP-003-R). The XM40E5 was a small (approximately 1- by 1.25-inch) anti-intrusion mine also referred to as a "Gravel" Mine, which exploded on impact. Leaking WP munitions were supposedly disposed of in this area although no primary source documentation concerning this effort was located. Occasional leaking WP munitions were burned at the site as a demilitarization activity. Other sources indicate that possibly 3- to 4- pound canisters of WP were demilitarized in the

vicinity of the test pad. The 1984 LHAAP Contamination Survey (Environmental Protection Systems, Inc. [EPS], 1984) stated the area has been relatively inactive since the early 1960s and no disposal or testing activities were carried out in this area.

The South Test Area/Bomb Test Area was identified as a MEC area of concern based on the visual confirmation of MEC. Because of the potential presence of WP and to address the WP data gap, the South Test Area/Bomb Test Area was also identified as a WP area of concern.

LHAAP-001-R SITE CHARACTERISTICS

The surface features at LHAAP-001-R include a deteriorated asphalt and gravel road running from the entrance to the test pad. Concrete bunkers and the site of the demolished former observation building are located alongside the road about halfway between the entrance and the test pad. A circular, 50-foot wide fire lane with a 2,000-foot diameter is centered at the test pad. Since the observation building has been demolished, the site is currently overgrown with brush and small trees. Formerly cleared areas in the vicinity of the test pad and alongside the access road are also overgrown with vegetation. The topography slopes gently to the east and surface water runoff from the hillside flows generally to the southeast and into Harrison Bayou. Groundwater at the site was encountered between 7 and 9 feet below ground surface (bgs). Groundwater is topographically controlled with a general flow direction to the east toward the floodplain of Harrison Bayou.

LHAAP-001-R is co-located with the IRP site LHAAP-27. Between 1982 and 1996 several investigations were conducted in a

phased approach to determine the nature and extent of contamination at LHAAP-27. Media investigated included soil, groundwater, surface water and sediment (USACE, 1997).

Perchlorate was identified as an emerging contaminant and perchlorate data for environmental media were collected after the ROD was signed. Twenty six (26) soil samples (13 surface and 13 subsurface soil samples) were collected and analyzed for perchlorate from 13 soil borings across the site. Perchlorate was detected in only one of the 26 soil samples at a concentration well below the TCEQ soil medium-specific concentration (MSC) for industrial use based on the State of Texas groundwater protection (GWP-Ind) value of 7,200 micrograms per liter ($\mu\text{g/L}$).

During three consecutive quarterly groundwater sampling events (April 2000 through February 2001), sixteen groundwater samples were collected from six existing shallow monitoring wells to determine whether perchlorate was present in the underlying groundwater as a result of past historical activities. The six monitoring wells are located in areas with the highest potential for impact from site activities and in the direction of flow across the site from west to east toward Harrison Bayou. Perchlorate was detected in two of the four wells during the first quarter sampling event, with a maximum concentration below the groundwater MSC for industrial use (GW-Ind) value of $72 \mu\text{g/L}$. The initial detections of perchlorate in groundwater were not confirmed in subsequent sampling. During the second and third quarter sampling events, no perchlorate was detected in any of the samples (STEP, 2005).

In October 2009, USEPA collected additional groundwater samples from the

existing six monitoring wells to confirm groundwater conditions at the site. Perchlorate was detected in three wells with only one of the three above the GW-Ind value of $72 \mu\text{g/L}$ at a concentration of $76 \mu\text{g/L}$. The USEPA's perchlorate detection of $76 \mu\text{g/L}$ was an estimate from a diluted sample. The U.S. Army collected split samples at the same time that the USEPA collected samples from the six monitoring wells. Perchlorate was detected in two wells for the Army split samples, with a maximum concentration below the GW-Ind value of $72 \mu\text{g/L}$ (Shaw, 2011).

In March 2003, USFWS conducted an investigation at the former LHAAP facility to determine contaminant levels in soil and sediment (USFWS, 2003). Soil samples were collected from five locations within LHAAP-001-R. Soil analytical results indicated that metals and semivolatile organic compounds were detected at low concentrations, but not above screening levels. Perchlorate was not detected above the reporting limit.

Between 2002 and 2004, a MMRP SI was conducted for LHAAP-001-R to determine the presence or absence of MEC and/or MC at the site which may have remained from activities conducted by the Department of Defense (DOD) during operations of the MRS. The SI verified MEC presence at the site ($e^2\text{M}$, 2005).

The SI identified a data gap in earlier soil sampling, in that, although demilitarization activities including open pit burning and explosive detonation were conducted at the site, no analysis for the munitions constituent WP was performed at the site. The SI recommended that further investigation be conducted to address the identified data gap.

In 2007, an EE/CA was conducted to facilitate completion of a non-time critical removal action of MEC at the site (CAPE, 2007a). Field activities conducted during the EE/CA characterized MEC and addressed the WP data gap at the site. Twenty-one (21) MEC and Material Potentially Presenting Explosive Hazard (MPPEH) items were recovered at the surface or within the top 6 inches of the soil. The items were clustered within an area suspected of the use of OB/OD activities. The OB/OD area is approximately 14 acres in size.

Based on the heaviest MPPEH concentrations or historical detonations, soil samples were collected within LHAAP-001-R to determine if evidence of WP existed in areas where MC were most likely to exist. One soil sample was collected near the center of the OB/OD area. A second soil sample was collected in a scarred area identified as the photo flash cartridge disposal area in the historical review. Both areas are near locations where MPPEH items were recovered during the field investigations. In addition, pre- and post-detonation samples were collected in association with explosive demolition of MPPEH recovered during the field activities. Soil samples were collected from 0 to 6-inches bgs. Analytical results indicated that WP and explosives were not identified at concentrations above detection limits in any soil samples at the site. In addition, there was no indication of the presence of WP or explosives in any of the pre- or post-detonation samples.

The EE/CA recommended surface and subsurface removal of MEC items with LUCs to reduce the risk within LHAAP-001-R (CAPE, 2007b). The surface removal was for the entire site, whereas the subsurface removal was for the suspected OB/OD area.

Between August and November 2008, a MEC removal action was conducted and LUCs were developed (EODT, 2009). Surface clearance of approximately 65 acres and subsurface clearance to the depth of detection in the approximately 14-acre OB/OD Area was performed at LHAAP-001-R. A total of 384 MEC/MPPEH items and 14 inert items were located and destroyed and a total of 22,139 pounds of munitions debris (MD) and 1,876 pounds of cultural debris (CD) were removed during the course of surface and subsurface clearance. In addition, LUCs were developed that included restrictions against intrusive activities including digging; signage at the perimeter of the site; and an education program for future refuge visitors, staff, and volunteers (EODT, 2009). The Land Use Control Plan for LHAAP-001-R is Appendix I of the removal action work plan (EODT, 2008).

SUMMARY OF LHAAP-001-R SITE RISKS

The reasonably anticipated future use of this site is industrial/recreational as part of the Caddo Lake National Wildlife Refuge. This anticipated future use is based on a Memorandum of Agreement (MOA) (U.S. Army, 2004) between the USFWS and the U.S. Army. The MOA documents the transfer process of LHAAP acreage to USFWS to become the Caddo Lake National Wildlife Refuge. Presently the Caddo Lake National Wildlife Refuge occupies approximately 7,000 acres of the former installation. The property must be kept as a National Wildlife Refuge unless there is an act of Congress which removes the parcel, or the land is exchanged in accordance with the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge System Act Amendments of 1974.

Human Health Risks

As part of the EE/CA, a streamlined risk evaluation was conducted for MEC at LHAAP-001-R to address risks to human safety related to the presence of potential explosive hazards. During the EE/CA investigation activities, no WP was identified at detectable concentrations in any soil samples collected and there was no indication of the presence of MC in any pre- or post-detonation samples. Therefore, there is no risk associated with WP.

Additional sampling conducted by the USEPA in 2009 resulted in a detection of perchlorate at a concentration of 76 µg/L, slightly above the GW-Ind of 72 µg/L in one well. The result was an estimate from a diluted sample. The U.S. Army's split sample for the same well indicated that perchlorate was detected at a concentration of 50 µg/L, below the GW-Ind. The U.S. Army result is consistent with previous detected levels for the site and therefore there was no need to evaluate risk associated with perchlorate because there was no exceedance of the GW-Ind.

The risk factors associated with MEC items were categorized into three classes: MEC factors, site characteristics factors, and human factors. MEC factors are related to the type of MEC, the sensitivity, the quantity (density) and the depth. Site characteristic factors include the accessibility and stability of areas where MEC items are located. Human factors are related to the population density and population activities.

During the EE/CA field activities, the MEC items that were recovered at LHAAP-001-R were mostly clustered in the former OB/OD area. Taking all risk factors into consideration, the baseline

risk assessment indicated moderate MEC risk to human health for LHAAP-001-R.

The surface MEC removal action located and removed MEC items thereby reducing the risk to the future land user. The subsurface removal action located, excavated and removed MEC or MPPEH items to a depth consistent with the expected future land use and with the significant refuge activities (hunting, fishing, wildlife observation, wildlife photography, wildlife education, and wildlife interpretation), all of which are non-intrusive. The subsurface removal provided an effective solution for reducing risk of exposure by reducing the potential for any direct contact with MEC or MPPEH.

Consistent with the recommendations of the EE/CA and the Action Memorandum (U.S. Army, 2007), LUCs were identified, designed, and implemented for the site to promote ongoing protection of human safety against potential explosive hazards that might remain in the subsurface.

Texas Administrative Code requires that the LUCs identified in the Action Memorandum for the protection of human health and safety be filed in the county records. Additionally, monitoring in the form of Five-Year Reviews will serve to ensure that the LUCs are specified, implemented, monitored, reported on, and enforced. The reviews will also serve to document that the use of the site remains consistent with the industrial/recreational use scenario evaluated in the risk assessment.

Ecological Risk

The ecological risk for LHAAP-001-R was addressed in the installation-wide BERA (Shaw, 2007). For the BERA, the entire installation was divided into three large sub-areas (i.e., the Industrial Sub-

Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation. The individual sites at LHAAP were grouped into one of these sub-areas, which were delineated based on commonalities of historic use, habitat type, and spatial proximity to each other. Conclusions for individual sites and the potential for detected chemicals to adversely affect the environment were made in the context of the overall conclusions of the sub-area in which the site falls. Site LHAAP-001-R lies within the Low Impact Sub-Area, and the BERA concluded that no unacceptable risk was present in the Low Impact Sub-Area (Shaw, 2007).

Summary results from the BERA (Shaw, 2007) indicated that perchlorate was not selected as a final constituent of potential ecological concern because all estimated receptor ecological effects quotient were less than 1 and there was no evidence of a perchlorate source area. In addition, during the EE/CA, no WP or explosives were identified in any soil samples and there was no indication of the presence of explosives in any pre or post-detonation samples confirming the determination of no risk to the environment for LHAAP-001-R.

LHAAP-003-R

LHAAP-003-R, known as Site 54, the Ground Signal Test Area encompasses approximately 80 acres and is located in the southeastern portion of LHAAP (**Figure 2**).

LHAAP-003-R was used intermittently starting in April 1963 for aerial and on-ground testing and destruction of a variety of devices, including pyrotechnic signal devices, red phosphorus smoke wedges, infrared flares, illuminating 60 and 81 millimeters (mm) mortar shells,

illuminating 40 to 155 mm cartridges, button bombs, and various types of explosive simulators. The site was also used intermittently over a 20-year period for testing and burn-out of rocket motors from Nike-Hercules, Pershing, and Sergeant missiles. Around 1970, a Sergeant rocket motor reportedly exploded in an excavated pit near the center of the site, however, later MEC clearance to depth in the area found no rocket motor. Debris was reportedly placed in the resulting crater and backfilled. From late 1988 through 1991, the site was also used for burn-out of rocket motors in Pershing missiles destroyed in accordance with the Intermediate-Range Nuclear Forces Treaty between the U.S. and the former Soviet Union. Occasionally, leaking WP munitions were burned at the site as a demilitarization activity.

The Ground Signal Test Area was identified as a MEC area of concern based on the reported presence of MEC. Because of the potential presence of WP and to address the WP data gap, the Ground Signal Test Area was also identified as a WP area of concern.

LHAAP-003-R SITE CHARACTERISTICS

Surface features at LHAAP-003-R include an asphalt road (Haystack Road) that intersects Long Point Road just east of its intersection with Avenue Q. The site is currently undeveloped and has become overgrown with woody vegetation.

The site is located within the watersheds of Saunders Branch and Harrison Bayou. Both Saunders Branch and Harrison Bayou flow into Caddo Lake. Surface water runoff from the site is towards drainage ditches located alongside the circular dirt road forming the outer margin

of the site. The ditches converge to the northeast and the southwest directing surface water to Saunders Branch and Harrison Bayou, respectively.

The depth to groundwater at the site averages about 15 feet bgs with some seasonal fluctuations. The regional groundwater flow direction is to the north-northeast toward Caddo Lake; however, during periods of high precipitation the groundwater flow direction in the southwestern portion of the site diverts to the northwest towards Harrison Bayou.

LHAAP-003-R is co-located with the IRP site LHAAP-54. Between 1982 and 1996 several investigations were conducted in a phased approach to determine the nature and extent of contamination at LHAAP-54. Media investigated included soil, groundwater, surface water and sediment. Based on the results of the investigations and the risk assessment conducted for the site, a NFA ROD under CERCLA for HTRW was signed with regulatory concurrence in January 1998 (USACE, 1998).

Perchlorate was identified as an emerging contaminant and perchlorate data for environmental media was collected after the ROD was signed. Between May 2000 and June 2001, during four quarterly sampling events, twelve groundwater samples were collected from three existing shallow monitoring wells and three geoprobe points to determine whether perchlorate was present in the underlying groundwater as a result of past historical activities (STEP, 2005). The monitoring wells and geoprobe points are located adjacent to the three surface water features that drain the entire Ground Signal Test Area. Because the shallow groundwater flow pattern reflects surface topography, groundwater samples from these wells represent groundwater from

the entire site. Perchlorate was detected during the first quarter sampling event at a maximum concentration that was well below the GW-Ind value of 72 µg/L. During the second quarter sampling event, perchlorate was not detected in any of the water samples. Perchlorate was detected during the third quarter sampling event in one well at a concentration that was well below the GW-Ind value and not at all during the fourth quarter event.

In October 2009, USEPA collected additional groundwater samples from the existing four monitoring wells to confirm groundwater conditions at the site. Perchlorate was detected in only one well at a concentration that was well below the GW-Ind value of 72 µg/L. The U.S. Army collected split samples at the same time that the USEPA collected samples from the four monitoring wells. Perchlorate was detected in one well for the U.S. Army split samples at a concentration well below the GW-Ind value of 72 µg/L.

In March 2003, USFWS conducted an investigation at the former LHAAP facility to determine contaminant levels in soil and sediment (USFWS, 2003). Soil samples were collected from two locations within the Ground Signal Test Area. These two locations are along the surface drainage that flows toward Saunders Branch on the east side of the site. Soil analytical results indicated that metals were detected at low concentrations confirming previous findings. Perchlorate was not detected.

Between 2002 and 2004, a MMRP SI was conducted for LHAAP-003-R to determine the presence or absence of MEC and/or MC at the site which may have remained from activities conducted by the DOD during operations of the MRS. The SI verified MEC presence at

the site (e²M, 2005). Possible source areas for MEC and MC identified during the SI included: testing areas associated with the various suspected ordnance types; a confirmed mortar impact area on site with numerous unidentified ordnance item shapes on the surface and outside the mortar berm; a site reportedly used for the testing and burn-out of Pershing and Sergeant rocket motors; and areas associated with past demilitarization activities. In addition, a Sergeant rocket motor reportedly exploded at the site around 1970 and debris was reportedly placed in the resulting crater and backfilled. It was also reported that occasionally WP munitions were burned at the site. It appears that most of the items tested at this location were statically fired and observed for adequate illumination and burn time and were not launched by a weapons system.

The SI identified a data gap in earlier soil sampling, in that, although demilitarization activities were conducted at the site and occasionally demolition and burning of WP munitions were performed, no analysis for the munitions constituent WP was performed at the site. The SI recommended that further investigation be conducted to address the identified data gap.

In 2007, an EE/CA was conducted to facilitate completion of a non-time critical removal action of MEC at the site (CAPE, 2007a). Field activities conducted during the EE/CA characterized MEC and addressed the WP data gap at the site. Fourteen (14) MEC and MPPEH items were recovered at the surface or within the top 6 inches of the soil. The items were clustered within the former Mortar Test Area.

Based on the heaviest MPPEH concentrations or historical detonations,

soil samples were collected within LHAAP-003-R to determine if evidence of WP existed in areas where MC were most likely to exist. One soil sample was collected within the area identified as the mortar firing range. A second soil sample was collected in a scarred area identified as the Rocket Motor Area in the historical review. In addition, pre- and post-detonation samples were collected in association with explosive demolition of MPPEH recovered during the field activities. Soil samples were collected from 0 to 6-inches bgs. Analytical results indicated that WP and explosives were not identified at concentrations above detection limits in any soil samples at the site. In addition, there was no indication of the presence of WP or explosives in any of the pre- or post-detonation samples.

The EE/CA recommended surface clearance of MEC items with LUCs to reduce the risk within LHAAP-003-R.

Between August and November 2008, MEC removal action was conducted and LUCs were developed (EODT, 2009). Surface clearance was performed at LHAAP-003-R. A total of 12 MEC/MPPEH items and one inert item were located and destroyed and 6,880 pounds of MD and 5,981 pounds of CD were removed during the course of surface clearance. In addition, LUCs were designed that include restrictions against intrusive activities including digging; signage at the perimeter of the site; and education programs for future refuge visitors, staff, and volunteers (EODT, 2009). The Land Use Control Plan for LHAAP-003-R is Appendix I of the removal action work plan (EODT, 2008).

SUMMARY OF LHAAP-003-R SITE RISKS

The reasonably anticipated future use of this site is industrial/recreational as part of the Caddo Lake National Wildlife Refuge. This anticipated future use is based on a MOA (U.S. Army, 2004) between the USFWS and the U.S. Army. The MOA documents the transfer process of LHAAP acreage to USFWS to become the Caddo Lake National Wildlife Refuge. Presently the Caddo Lake National Wildlife Refuge occupies approximately 7,000 acres of the former installation. The property must be kept as a National Wildlife Refuge unless there is an act of Congress which removes the parcel, or the land is exchanged in accordance with the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge System Act Amendments of 1974.

Human Health Risks

As part of the EE/CA, a streamlined risk evaluation was conducted for MEC at LHAAP-003-R to address risks to human safety related to the presence of potential explosive hazards. During the EE/CA investigation activities, no WP was identified at detectable concentrations in any soil samples collected and there was no indication of the presence of MC in any pre or post-detonation samples. Therefore, there is no risk associated with WP.

The additional groundwater sampling conducted by the USEPA and U.S. Army in 2009 indicated that perchlorate was detected in one well at a concentration well below the GW-Ind, and therefore there was no need to evaluate risk associated with perchlorate.

The risk factors associated with MEC items were categorized into three classes: MEC factors, site characteristics factors, and human factors. MEC factors are related to the type of MEC, the sensitivity, the quantity (density) and the depth. Site characteristic factors include the accessibility and stability of areas where MEC items are located. Human factors are related to the population density and population activities.

During the EE/CA field activities, MEC items that were recovered at LHAAP-003-R were mostly clustered in the former Mortar Test Area. Taking all risk factors into consideration, the baseline risk assessment indicated low MEC risk to human health for LHAAP-003-R. The surface MEC removal action located and removed MEC items thereby reducing the risk to the future land user.

Consistent with the recommendations of the EE/CA and the Action Memorandum (U.S. Army, 2007), LUCs were identified, designed, and implemented for the site to promote ongoing protection of human safety against potential explosive hazards that may remain at the site in the subsurface.

Texas Administrative Code requires that the LUCs identified in the Action Memorandum for the protection of human health and safety be filed in the county. Additionally, monitoring in the form of Five-Year Reviews will serve to confirm that the LUCs are specified, implemented, monitored, reported on, and enforced. The reviews will also serve to document that the use of the site remains consistent with the industrial/recreational use scenario evaluated in the risk assessment.

Ecological Risk

The ecological risk for LHAAP-003-R was addressed in the installation-wide BERA (Shaw, 2007). For the BERA, the entire installation was divided into three large sub-areas (i.e., the Industrial Sub-Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation. The individual sites at LHAAP were grouped into one of these sub-areas, which were delineated based on commonalities of historic use, habitat type, and spatial proximity to each other. The conclusions for individual sites and the potential for detected chemicals to adversely affect the environment were made in the context of the overall conclusions of the sub-area in which the site falls. Site LHAAP-003-R lies within the Low Impact Sub-Area, and the BERA concluded that no unacceptable risk was present in the Low Impact Sub-Area (Shaw, 2007).

In addition, during the EE/CA, no WP or explosives were identified in any soil samples and there was no indication of the presence of WP or explosives in any pre or post-detonation samples confirming the determination of no risk to the environment for LHAAP-003-R.

RECOMMENDATION

In addition to the LUCs already in place as a result of the 2008 removal action, limited groundwater monitoring for perchlorate is proposed for both LHAAP-001-R and LHAAP-003-R. The purpose of the additional monitoring is to confirm perchlorate levels in groundwater are below the GW-Ind. Furthermore, implementation, maintenance, inspection, reporting and enforcement of the LUCs will continue to promote the ongoing protection of human safety against explosive hazards that may have remained at the sites in the subsurface.

The details of the LUCs are presented in the Land Use Control Plan provided in the Final Work Plan for the MEC Removal Action at the Former Longhorn Army Ammunition Plant, LHAAP-001-R (Site 27) and LHAAP-003-R (Site 54) (EODT, 2008).

Because there are no unacceptable risks and groundwater monitoring and the appropriate LUCs have been implemented, no remediation alternatives or Remedial Action Objectives are required. If after three rounds of groundwater sampling at LHAAP-001-R and one round of groundwater sampling at LHAAP-003-R the results that are evaluated on or before the first five year review indicate detections at levels below the GW-Ind value of 72 µg/L for perchlorate, groundwater monitoring will cease and the wells will be plugged and abandoned.

The LUCs for these two sites include restrictions for intrusive activities including digging, posting unexploded ordnance (UXO) warning signs around the perimeter of the MRS, continuing the existing UXO education programs provided to authorized workers (i.e., USFWS's staff) and refuge visitors, and only allowing future public uses that are consistent with the "big six" activities (i.e., hunting, fishing, wildlife observation, wildlife photography, wildlife education, and wildlife interpretation). The LUCs will accompany all transfer documents and will be recorded in the Harrison County Courthouse. Five-Year Reviews will be performed to document that LUCs remain protective of human health and safety for MRS LHAAP-001-R and LHAAP-003-R.

COMMUNITY PARTICIPATION

The U.S. Army, USEPA, and TCEQ provide information regarding LHAAP-001-R and LHAAP-003-R through public meetings and the Administrative Record file for the facility. The public is encouraged to gain a more comprehensive understanding of the sites.

The dates for the public comment period, the date, location, and time of the public meeting, and the locations of the Administrative Record files are provided on the front page of this Proposed Plan.

Any significant changes to the Proposed Plan, as presented in this document, will be identified and explained in the ROD.

Primary Reference Documents for LHAAP-001-R and LHAAP-003-R

CAPE, 2007a, *Final Engineering Evaluation/Cost Analysis, Longhorn Army Ammunition Plant, Karnack, Texas*, Final, October.

CAPE, 2007b, *Final Engineering Evaluation/Cost Analysis Action Memorandum Revision 1, Longhorn Army Ammunition Plant, Karnack, Texas*, Signed by Thomas Lederle, BRAC Division, ACSIM, United States Army, 5 December.

engineering-environmental Management (e²M), 2005, *Final Site Inspection Report, Military Munitions Response Program, Longhorn Army Ammunition Plant, Texas*, Final, June.

Environmental Protection Systems, Inc. (EPS), 1984, *Longhorn Army Ammunition Plant Contamination Survey*, June.

EODT Technology, Inc., (EODT), 2008, *Final Work Plan for the MEC Removal Action at the Former Longhorn Army Ammunition Plant, LHAAP-001-R (Site 27) and LHAAP-003-R (Site 54), Karnack, Texas*, July

EODT Technology, Inc., (EODT), 2009, *Final Site Specific Final Report for the MEC Removal Action at the Former Longhorn Army Ammunition Plant, LHAAP-001-R (Site 27) and LHAAP-003-R (Site 54), Karnack, Texas*, September.

Shaw Environmental, Inc. (Shaw), 2007, *Installation-Wide Baseline Ecological Risk Assessment, Volume 1: Step 3 Report, Longhorn Army Ammunition Plant, Karnack, Texas*, Houston, Texas, November.

Shaw, 2011, *Munitions Constituents Data Summary Report, South Test Area/Bomb Test Area, LHAAP-001-R and Ground Signal Test Area, LHAAP-003-R, Longhorn Army Ammunition Plant, Karnack, Texas*, Houston, Texas, June.

Solutions to Environmental Problems (STEP), 2005, *Plant-wide Perchlorate Investigation, Longhorn Army Ammunition Plant, Karnack, Texas*, April.

U.S. Army, 2004, *Memorandum of Agreement Between the Department of the Army and the Department of the Interior for the Interagency Transfer of Lands at the Longhorn Army Ammunition Plant for the Caddo Lake National Wildlife Refuge, Harrison County, Texas*, signed by the Department of the Interior on April 27, 2004 and the Army on April 29, 2004.

U.S. Army, 2007, *Action Memorandum for Three Munitions Response Sites: South Test Area/Bomb Test Area, Static Test Area, and Ground Signal Test Area, Longhorn Army Ammunition Plant, Karnack, Texas*, August. Signed 5 December 2007 by Thomas E. Lederle.

U.S. Army Corps of Engineers (USACE), Tulsa District, 1997, *Remedial Investigation Report, Group 1 Sites (Sites 11, 1, XX, 27), Longhorn Army Ammunition Plant, Karnack, Texas*, Volumes I and II, May.

(USACE, Tulsa District, 1998, *Record of Decision at Group 1 Sites (Sites 11, 1, XX, 27), Longhorn Army Ammunition Plant, Karnack, Texas*, January.

U.S. Fish and Wildlife Service (USFWS), 2003, *Contaminant Investigation of Northern, Central, and Eastern Portions of Caddo Lake National Wildlife Refuge, Texas*, November.

GLOSSARY OF TERMS

Administrative Record — The body of reports, official correspondence, and other documents that establish the official record of the analysis, cleanup, and final closure of a CERCLA site.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) — This law authorizes the Federal Government to respond directly to releases (or threatened releases) of hazardous substances that may be a danger to public health, welfare, or the environment. The U.S. Army currently has the lead responsibility for these activities.

Environmental Media — A major environmental category that surrounds or contacts humans, animals, plants, and other organisms (e.g., surface water, ground water, soil, or air) and through which chemicals or pollutants move.

Exposure — Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lung, digestive tract, etc.) and available for absorption.

Groundwater — Underground water that fills pores in soil or openings in rocks to the point of saturation.

Proposed Plan — A report for public comment highlighting the key factors that form the basis for the selection of the preferred remediation alternative.

Remedial Action — The actual construction or implementation phase of a Superfund site cleanup that follows remedial design.

Risk Assessment - An Analysis of the potential adverse health effects (current and future) caused by hazardous substances at a site in the absence of any actions to control or mitigate these releases (i.e. under no assumption of no action). The assessment contributes to decisions regarding appropriate response alternatives.

ACRONYMS and ABBREVIATIONS

| | |
|---------|---|
| bgs | below ground surface |
| BERA | Baseline Ecological Risk Assessment |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CD | cultural debris |
| DOD | Department of Defense |
| EE/CA | Engineering Evaluation/Cost Analysis |
| FFA | Federal Facility Agreement |
| GW-Ind | groundwater MSC for industrial use |
| GWP-Ind | soil MSC for industrial use based on groundwater protection |
| HTRW | hazardous, toxic, and radioactive waste |
| IRP | Installation Restoration Program |
| LHAAP | Longhorn Army Ammunition Plant |
| LUC | Land Use Control |
| MC | munitions constituents |
| MD | munitions debris |
| MEC | munitions and explosives of concern |
| µg/L | micrograms per liter |
| mm | millimeters |
| MMRP | Military Munitions Response Program |
| MOA | Memorandum of Agreement |
| MPPEH | material potentially presenting explosive hazard |
| MRS | Munitions Response Sites |
| MSC | medium-specific concentrations |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NFA | no further action |
| NPL | National Priorities List |
| OB/OD | Open Burn/Open Detonation |
| ROD | Record of Decision |
| SI | site inspection |
| TCEQ | Texas Commission on Environmental Quality |
| USACE | U.S. Army Corps of Engineers |
| USAEC | U.S. Army Environmental Center |
| USEPA | U.S. Environmental Protection Agency |
| USFWS | U.S. Fish and Wildlife Service |
| UXO | unexploded ordnance |
| WP | white phosphorus |

