

Final

**Closure Report
3X Scrap Removal**

**Training Area T-38
Former Technical Escort Reaction Area, Parcel 186(6)
Training Area T-24A
Former Chemical Munitions Disposal Area, Parcel 187(7)**

Fort McClellan, Calhoun County, Alabama

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1.0 Introduction

The U.S. Army has selected Fort McClellan (FTMC), located in Calhoun County, Alabama, for closure by the Base Realignment and Closure Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act (Public Law 101-510) established the process by which U.S. Department of Defense installations would be closed or realigned. The Base Realignment and Closure Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army has conducted environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE contracted Shaw Environmental, Inc. (Shaw) (formerly IT Corporation [IT]) to excavate, remove, and dispose of “3X” scrap material from Training Area T-38, Former Technical Escort Reaction Area, Parcel 186(6) and Training Area T-24A, Former Chemical Munitions Disposal Area, Parcel 187(7) at FTMC, Calhoun County, Alabama, under Contract Number DACA21-96-D-0018, Task Order CK10.

Definition of Decontamination Levels. According to *Toxic Chemical Agent Safety Standards*, (Department of the Army, 2002) the following definitions apply to solid materials or items:

- An item with a single X indicates that the item has been partially decontaminated of agent and that further decontamination is required before the item may be moved.
- An item with three Xs (XXX or 3X) indicates that the item has been surface decontaminated by locally approved procedures and air monitoring has verified that concentrations of agent are at an acceptable level.
- An item with five Xs (XXXXX or 5X) indicates an item has been decontaminated completely of the indicated agent and may be released for general use or sold to the general public.

1.1 Project Description

Training Area T-38, Parcel 186(6) was identified as an area to be investigated prior to property transfer. The site was classified as a Category 6 parcel in the final environmental baseline survey (Environmental Science and Engineering, Inc. [ESE], 1998). Category 6 parcels are areas where release, disposal, and/or migration of hazardous substances have occurred, but required actions have not been implemented. Training Area T-24A, Parcel 187(7) was identified as an area to be investigated prior to property transfer. The site was classified as a Category 7 parcel

in the environmental baseline survey (ESE, 1998). Category 7 parcels are areas that are not evaluated and/or that require further evaluation. The Army determined that 3X items consisting of ordnance and explosives (OE) scrap existed within two subsurface geophysical anomalies at T-38 and within six subsurface geophysical anomalies at T-24A. Furthermore, the Army determined that the probability of encountering chemical warfare materiel (CWM) while removing OE scrap is remote.

A site-specific work plan, consisting of a field sampling plan, a safety and health plan, an unexploded ordnance (UXO) safety plan, and a chemical agent monitoring plan was finalized in October 2003 (Shaw, 2003). An addendum to this work plan was submitted in July 2004 (Shaw, 2004a). The work plans were prepared to provide technical guidance for field activities at Training Areas T-38 and T-24A. The plans were used as an attachment to the installation-wide work plan (IT, 1998; 2002a) and the installation-wide sampling and analysis plan (IT, 2000; 2002b). The sampling and analysis plan includes the installation-wide safety and health plan and quality assurance plan.

Removal activities conducted at Training Areas T-38 and T-24A consisted of the following general activities:

- UXO construction support
- Chemical agent ambient air monitoring support
- Excavation and sorting activities
- Identification and treatment of recovered material
- Sorting and packaging of 3X scrap
- “Hot-boxing” and air monitoring of 3X scrap
- Transporting hot boxes of 3X scrap to off-site treatment facility
- Thermal treatment of 3X scrap to 5X
- Backfilling activities.

1.2 Site Descriptions and History

Training Area T-38, Parcel 186(6) is located in the north-central portion of the FTMC Main Post, and Training Area T-24A, Parcel 187(7) is located in the southeastern portion of the Main Post (Figure 1-1).

1.2.1 Training Area T-38, Former Technical Escort Reaction Area, Parcel 186(6)

Originally Training Area T-38, Parcel 186(6) occupied an approximately 6-acre fenced area (Figure 1-2). The area was expanded in 2002 because of groundwater contamination to approximately 150 acres encompassing most of Reservoir Ridge. T-38 was the Former

Technical Escort Reaction Area located east of Ruskin Avenue and the cantonment area on the Main Post. The fenced area in the northeastern portion of the parcel was referred to as the Toxic Agent (or Gas) Yard. The training area was reportedly used from 1961 to 1972 to train Army Technical Escort Unit (TEU) personnel in techniques of eliminating toxic hazards caused by mishaps to chemical munitions during transport.

The area also was used for storage of toxic agents and munitions. The storage facilities included four 1-ton containers of distilled mustard (HD). In addition, decontaminants were reportedly stored in at least two locations and were used for demonstration purposes. Extensive decontamination was reportedly conducted at the site for spills and for decontaminating training aids. The types of decontaminants used, quantities, and frequency of use are unknown but are assumed to include decontamination agent, noncorrosive; supertropical bleach; and Decontamination Solution No. 2. Artillery shell tapping, chemical warfare agent transfer training, and aerial smoke ball filling were also conducted at T-38. Shell tapping training was conducted on phosgene-filled mortars. Chemical agent transfer was conducted by pumping HD from 1-ton containers into drums. It is believed that the HD was transferred from the drums into 1-gallon cans for use in other training exercises (ESE, 1998). TEU disposed of these empty vials, bottles, artillery shells, excess decontaminant, fuming sulfuric acid (FS) (50 percent sulfur trioxide and 50 percent chlorosulfonic acid), smoke balls, metal cans, and various training wastes into two disposal pits located immediately south of the Toxic Gas Yard in the central portion of the site near the eastern fence.

Site elevation ranges from approximately 1,030 feet (ft) near the southwest part of the site to approximately 975 feet on the northeastern corner of the site, sloping radially to the north, northeast, and east. Cave Creek is located approximately 1,000 ft to the north of T-38 and flows to the west. The soil type at Training Area T-38 is classified as Anniston gravelly clay loam 10 to 15 percent slope, severely eroded (AbD3). The soil type is characterized by strongly acid, deep, well-drained soils that have developed in old local alluvium. The surface horizon is mainly very dark brown loam, and the subsoil is mainly dark red sandy clay loam. Sandstone and quartzite gravel and cobbles, as much as 8 inches in diameter, are on the surface and throughout the soil. These soils occur on uplands and foot slopes. Permeability is moderate, infiltration is moderately low, runoff is medium and rapid and the capacity for supplying available moisture is low. Natural fertility is low to moderate, and organic matter is low (U.S. Department of Agriculture, 1961).

The depth to groundwater in the residuum beneath the site was approximately 84 to 91 ft below land surface (bls) when last measured in April and June of 2003 (Shaw, 2004b). Depth to bedrock in the Shady Dolomite beneath the site averages approximately 140 ft bls (Shaw 2004b).

1.2.2 Training Area T-24A, Former Chemical Munitions Disposal Area, Parcel 187(7)

The Former Chemical Munitions Disposal Area, Parcel 187(7), is located on the Main Post south of Holloway Hill near the center of several overlapping ranges. Training Area T-24A, located within Range 24A, is an approximately 1.8-acre fenced parcel (Figure 1-3). This former chemical munitions disposal area was used from an unknown date in the 1960s until 1973. This area was once used as a rifle and machine gun range and contained an explosive ordnance disposal (EOD) site. Reportedly chemical warfare munitions filled with phosgene (carbonyl chloride or CG), 3-quinuclidinyl benzilate, sarin (GB), and HD were buried in pits at this site. This included two pits used for burning. Decontaminants reportedly used at this site were STB and Decontamination Solution No. 2. Additionally, this area may have experienced a large HD spill (Roy F. Weston, Inc., 1990). After each training exercise, the area was sprayed with STB (ESE, 1998). Each pit was filled with soil; reportedly, this occurred at closure in 1973. During the 1973 closure, soil samples were collected from 1 to 4 inches in depth and analyzed for CWM. HD, CG, 3-quinuclidinyl benzilate, and GB were not detected in the surface samples collected by the Army in 1973 (Science Applications International Corporation [SAIC], 1993).

The soils at the ranges near Training Area T-24A are composed of the Anniston and Allen Series soils. The Anniston and Allen Series of soils consist of strongly acid, deep, well-drained soils that have developed in old local alluvium. The parent material washed from adjacent, higher-lying Linker, Muskingum, Enders, and Montevallo soils, which developed from weathered sandstone, shale, and quartzite. These sites contain sandstone and quartzite gravel and cobbles measuring as much as 8 inches in diameter on the surface and throughout the soil. Infiltration and runoff are medium, permeability is moderate, and the capacity for available moisture is high. Organic matter is moderately low (U.S. Department of Agriculture, 1961).

The elevation at Training Area T-24A ranges from approximately 1,000 to 1,025 ft, with the ground surface sloping from the southeast to the northwest across the site. An intermittent stream flows north along a slight valley to South Branch of Cane Creek. Soils at the Ranges Near Training Area T-24 Alpha fall primarily in the Anniston and Allen stony loams, 10 to 25 percent slopes. Gravel and cobbles ranging from 3 to 8 inches in diameter are numerous. The surface soil is about 4 to 8 inches thick and consists of very dark brown to grayish brown stony loam. At around 10 inches in depth, this material typically grades into a dark-reddish brown

stony fine sandy clay loam. Runoff is generally rapid, permeability is moderate to rapid, and the capacity to hold available moisture is low to moderate (U.S. Department of Agriculture, 1961).

Highly weathered shale is encountered at around 4 ft bls but auger refusal on more competent bedrock generally occurs around 10 ft bls. Bedrock consists of gray to dark gray, weathered shale of the Nichols Formation of the Lower Cambrian Chilhowee Group. Groundwater is encountered in the residuum at 6 to 9 ft bls and in the deeper bedrock at around 24 ft bls. Groundwater flow in both aquifers is towards the northwest (Shaw, 2005).

2.0 Previous Investigations

Training Areas T-38 and T-24A were previously investigated for CWM, CWM breakdown products, and hazardous, toxic, and radioactive waste (HTRW). The investigations did not reveal the presence of CWM or CWM breakdown products in environmental media located at either site. The investigations are summarized below.

2.1 Training Area T-38, Former Technical Escort Reaction Area, Parcel 186(6)

Site Investigation, SAIC, 1993. The site investigation included limited geophysical surveys and soil samples collected from four locations suspected to be areas of prior site activity. The soil samples collected were screened for HD, nerve agent (VX), and GB using a miniature continuous air monitoring system (MINICAMS). Chemical agents were not detected in the screening samples. In addition, chemical agent degradation products were not detected in the laboratory (SAIC, 1993).

Remedial Investigation, SAIC, 1995. The remedial investigation (RI) included additional geophysical surveys, soil sampling, and the installation of monitoring wells and one soil boring into the disposal pit. Also, numerous shallow soil samples were screened using MINICAMS. Chemical agent was not detected in the soil samples collected; however, volatile organic compounds (VOC) were discovered in the groundwater (SAIC, 2000).

Engineering Evaluation/Cost Analysis, Parsons Engineering Science, Inc., 2002. Investigations were conducted at T-38 by Parsons Engineering Science, Inc. (Parsons) to address the presence or absence of CWM or other subsurface disposal. Parsons completed geophysical surveys, excavation of suspect anomalies, continuous air monitoring using MINICAMS, trenching, additional soil sampling, and laboratory analysis of the soils for GB, HD, and breakdown products (Parsons, 2002). Several geophysical grids were located in the suspected Toxic Gas Yard fenced area and the area of the reported disposal dump. A total of 25 anomalies were identified. Two large anomalies associated with the disposal sump (T38-12 and T38-13) were selected for trenching using a backhoe. Five trenches were excavated at T38-12 and four trenches at T38-13. Based on the findings of the trenching operations, the Army identified two trenches (T38-12 and T38-13) for 3X scrap removal (Figure 2-1). Table 2-1 presents the trench dimensions and their contents. Eleven soil samples were collected from the two excavation pits. Chemical agents were not detected during air monitoring, headspace screening, or laboratory analysis of the samples (Parsons, 2002). The *Final Chemical Warfare Materiel Engineering*

Evaluation/Cost Analysis (EE/CA), Fort McClellan, Alabama was submitted by Parsons to the USACE Huntsville Center in June 2002.

Supplemental Remedial Investigation, Shaw, 2000 to 2003. Shaw has completed supplemental HTRW RI activities over several phases at Training Area T-38, Parcel 186(6) from 2000 to 2003 (Shaw, 2004b). Shaw collected a total of 38 surface and depositional soil samples, 65 subsurface soil samples, 86 groundwater samples, 11 seep water samples, 4 surface water samples, and 4 sediment samples. In addition, 46 groundwater monitoring wells were installed to facilitate groundwater sample collection and to provide site-specific geologic and hydrogeologic characterization information. The most significant contamination in site media (12 chlorinated VOCs exceeded their respective human health site-specific screening levels) consisted of chlorinated decontaminants and chemical agents used during the training exercises. The horizontal extent of chlorinated VOCs was defined (Shaw, 2004b).

2.2 Training Area T-24A, Former Chemical Munitions Disposal Area, Parcel 187(7)

Site Investigation, SAIC, 1993. Four subsurface soil samples were collected in 1993; field screening and laboratory analysis did not detect GB, HD, or their breakdown products (SAIC, 1993).

Remedial Investigation, SAIC, 1995. The RI conducted in 1995 included geophysical surveys using a magnetometer, screening of surface soils using MINICAMS; test pits; well installation; and soil, surface water, and sediment sampling. Test trenches were excavated by TEU in one of the burn pits. Materials encountered in the pit included charred wood, nails, and gas can handles. Moderately weathered bedrock was encountered at depths of 4 to 6 ft bls. Excavation was discontinued after ordnance was encountered. Three soil samples were collected from the pit. Field screening of soils for CWM and laboratory analysis for CWM breakdown products did not indicate the presence of CWM in soils. Metals, VOCs, semivolatile organic compounds, and (possibly) explosives were detected in these soil samples. Occurrence of these compounds is consistent with former use as an EOD site. Field screening and laboratory analyses of surface water samples did not detect CWM compounds (HD and GB) or their breakdown products. The surface water samples contained metals. Groundwater samples contained benzene, phenol, pentachlorophenol, and trace metals (SAIC, 2000).

Engineering Evaluation/Cost Analysis, Parsons, 2002. Investigations conducted at T-24A to address the presence or absence of CWM or other subsurface disposal included

geophysical surveys; excavation of suspect anomalies; continuous air monitoring using MINICAMS; trenching; additional soil sampling; and laboratory analysis of the soils for GB, HD, and breakdown products (Parsons, 2002). The geophysical surveys occurred in two separate areas: a 100-by-100-ft grid located over the possible burial pit northwest of the fenced area, and the entire area within the 220-by-340-ft fenced area. Of the 33 anomalies identified, eight anomalies (T24-5, T24-8, T24-10, T24-15, T24-16, T24-23, T24-25, and T24-29) were selected for excavation trenching using a backhoe. Of these, six anomalies (T24-5, T24-8, T24-10, T24-15, T24-25, and T24-29) were identified by the Army for 3X scrap removal (Figure 2-2). Table 2-1 presents the trench dimensions and their reported contents. Eight soil samples were collected as part of the excavation completed by Parsons. Edgewood Chemical and Biological Center screened the samples for CG, GB, and HD prior to shipment to its analytical laboratory. The samples were analyzed for GB, HD, 1,4-thioxane, and 1,4-dithiane. The analytical results did not indicate any residual agents or degradation products (Parsons, 2002).

Supplemental Remedial Investigation, Shaw, 2000-2005. Shaw has completed several phases of an HTRW RI to further define the extent of VOCs in groundwater and lead in soil (outside of the 1.8-acre fenced area) at the Ranges Near Training Area T-24 Alpha (Parcels 88[7], 108[7], 112Q, 113Q-X, 123Q, 187[7], 213Q, and 214Q). A total of 61 monitoring wells were installed (57 by Shaw) and 132 groundwater samples collected. VOCs (primarily benzene, carbon tetrachloride, and chloroform) were detected in groundwater at concentrations exceeding site-specific screening levels (Shaw, 2005).

3.0 Removal Activities

In November 2003, a kickoff meeting was held at FTMC and attended by representatives of Shaw, QuickSilver Analytics, Inc. (QuickSilver), TEU, USACE, and FTMC. Project work plans were reviewed including site logistics, health and safety, UXO support, air monitoring support, contingency planning, and the required response actions by all parties during site operations. A representative from the FTMC transition force reviewed the standard operating procedure for responding to suspected CWM. Site visits were made to T-38 and T-24A to preview site layout, site access, work zones, excavation locations, equipment and vehicle locations, and evacuation routes.

QuickSilver provided two analytical support mobile laboratory vans: one van was outfitted with two MINICAMS for near real time (NRT) monitoring, and the second van was equipped for the analysis of depot area agent monitoring station (DAAMS) solid sorbent tubes using a gas chromatograph. TEU conducted the chemical agent air monitoring according to the standards described in the Chemical Agent Standard Analytical Reference Material Program.

Additionally, Shaw mobilized heavy equipment to perform the soil excavation and sorting activities at T-38 and T-24A, including a flat-deck Chieftain 1400 Powerscreen[®], a track excavator, L-150 rubber-tire loader, and a skid-steer T-190 Bobcat[®].

3.1 Chemical Agent Monitoring

Personnel health and safety air monitoring was performed for chemical agents by QuickSilver. Chemical agents monitored were HD, and lewisite, GB, and VX. Primary NRT air monitoring analysis for VX/GB was performed using a MINICAMS equipped with a flame photometric detector. NRT air monitoring analysis for HD and lewisite was performed using a MINICAMS equipped with a 10-minute HD/halogen selective detector and a 10-minute lewisite/halogen selective detector method.

Four DAAMS tube analytical methods were certified for confirmation of MINICAMS alarms. These methods analyzed VX, GB, HD, and lewisite. DAAMS samples were collected immediately downwind of the excavation and at three DAAMS stations spread out in a semicircular pattern approximately 25 meters downwind of and lateral to the excavation location. In addition, periodic direct reading low-level air monitoring occurred daily for phosgene and cyanogen chloride using Dräger[®] tubes and portable sampling pumps. Also, the worker breathing zone was periodically screened for gross organic volatiles at the excavation vicinity

using an organic vapor monitor. Appendix A contains air monitoring reports provided by QuickSilver.

3.2 Excavation and Screening

After the anomalies were located, surveyed, and staked, soil excavation began in Modified Level D personal protective equipment (PPE) (with escape/egress air supply pack) using the track excavator, loader, and Bobcat. The areas excavated are shown on Figures 3-1 and 3-2.

Excavation was conducted from the edge of the anomaly farthest from the screening plant and progressed vertically and horizontally toward the plant. Excavation ceased once the anomaly boundaries were reached or until no further evidence of 3X scrap was evident within the anomaly boundaries. As the soil and 3X material was excavated, it was placed to the side of the excavation and spread in an elongated stockpile, then inspected by UXO personnel.

After sufficient quantities were stockpiled and inspected, the excavated material was transported to the flat-deck Powerscreen for segregation of soil and 3X debris. The material was loaded onto the screen with the rubber-tire loader and screened initially over a 5-inch grizzly, which discharged objects (debris, rocks, etc.) greater than 5 inches. The material then traveled across a 10-foot vibrating screen, which discharged objects larger than 1½ inches. The final material discharged through the screen was 1½ inches in diameter and smaller. Material at the three discharge points was continually monitored and inspected by UXO personnel and reprocessed through the Powerscreen as needed. Final screened material was sorted into either a soil pile or a scrap pile. The scrap pile contained both 3X scrap and non-3X scrap. Miscellaneous scrap metal (i.e., material not suspected of being related to 3X items) was treated as 3X scrap. Soil segregated from the screening operation was transported by the loader and placed back into the excavation.

Additional excavation occurred in an area extending from the eastern wall of anomaly T38-12, located partly beneath Structure 4461 (Figure 3-1). Structure 4461, a pole barn, was torn down at the request of FTMC and USACE for ease of access for the added excavation. The excavation extended beyond the limits identified by Parsons because of the discovery of OE scrap, including empty aluminum FS smoke balls. The areal extent of the additional excavation was approximately 484 square ft.

3.3 Hot-Boxing of 3X Material

As the 3X scrap was removed from each of the discharge locations of the screening plant, it was cleaned of excess soil to minimize the weight prior to packaging in the U.S. Department of Transportation (DOT)-approved plastic-lined 1-cubic-yard fiber boxes (hot-boxes). After the

soils and debris were screened for Chemical Agent Contaminated Media (CACM), the 3X scrap was placed into the boxes. The hot-boxes were filled, sealed, and heated to a minimum temperature of 70 degrees Fahrenheit for a minimum of 4 hours to allow vapors in the box to volatilize. The headspace in the hot-boxes was sampled and analyzed for chemical agents using the MINICAMS prior to off-site transportation.

Once the box reached maximum capacity (by either weight or volume), the plastic liner was sealed and the box closed and banded shut. All boxes were closed and banded at the end of each workday to ensure security. These boxes were attached to a pallet for maneuverability and to support load-bearing strength of up to 2,000 pounds. Each box had a detailed inventory of the 3X scrap inside and the required certification. After screening for CACM, any recovered OE items were removed from the fiber box, demilitarized, and repackaged before off-site transportation.

3.4 Certification and Verification of 3X Scrap

The senior UXO supervisor provided certification that all items placed into the hot-boxes were free of explosive or similar hazards prior to off-site shipment. A detailed inventory was produced for each fiber box of OE-related scrap utilizing the Defense Department (DD) Form 1348-1A. Once inspected and certified as required, OE scrap was placed in the hot-boxes and banded for shipping.

3.5 Transportation and Disposal of 3X Scrap

Transportation. Transportation of the 3X scrap material was provided by Tri-State Motor Transit Company of Joplin, Missouri (a qualified and licensed DOT hazardous waste material hauler). The 1-cubic-yard fiber boxes were then shipped to an approved incinerator for final disposal of the 3X scrap. After the boxes were tested and confirmed agent free (through headspace analysis), they were loaded via forklift into a standard enclosed box trailer with an over-the-road capacity of 80,000 pounds. Shipping papers accompanied each load (Appendix B), including a nonhazardous manifest, an inventory of contents for each box (Appendix C), and a certification of OE scrap for each box (Appendix D). The boxes were shipped directly from FTMC to the disposal facility “signature secure”. Each shipping container was labeled “CONTAINS XXX MATERIAL, TO BE OPENED BY AUTHORIZED PERSONNEL ONLY.” Placards placed on the boxes and the truck indicated nonregulated waste.

Disposal. All 3X, OE, and metal scrap was subjected to thermal treatment at a thermal treatment facility (EBV Explosives Environmental Co. [EBV] of Joplin, Missouri). Incineration

was accomplished on February 26, 2004 and again on October 7, 2004, using a U.S. Environmental Protection Agency- and state-approved permitted emissions incinerator, appropriate engineering controls, and continuous monitoring to assure emissions were within source emission limits (allowable stack concentrations) per Army (2002) standards. The thermal treatment consisted of a minimum 1,000-degrees Fahrenheit treatment sustained for a minimum of 15 minutes. After completion of the thermal treatment, the disposal facility provided a certificate of disposal stating that the 3X scrap had been treated by incineration (Appendix B). The treated 3X scrap was reclassified as 5X material and disposed of as scrap metal.

3.6 Investigation-Derived Waste

Solid investigation-derived waste (IDW) consisted primarily of PPE and was collected and placed in a lined roll-off bin located at the Shaw FTMC office. Solid IDW was characterized using toxicity characteristic leaching procedure analysis. Based on the results, IDW was disposed of as nonhazardous waste at the Three Corners Landfill in Piedmont, Alabama.

Liquid IDW (decontamination fluids) was deemed nonhazardous and disposed of at the excavation area, because CWM was never identified in the soil or on the surface of 3 X materiel by TEU or QuickSilver.

3.7 Variances

Six variances to the site-specific field sampling plan were recorded during completion of the 3X scrap removal at T-24A and T-38. The variances allowed work to continue safely and did not alter the intent of the 3X scrap removal. The variances are summarized in Table 3-1 and the variance reports are included in Appendix E.

4.0 Results of Removal Activities

4.1 Identification and Treatment of Potential Hazards

Excavation of soil at anomaly T38-13 (begun in November 2003) revealed a sealed brown bottle containing an unknown liquid fill. Upon its discovery, work ceased, the area was evacuated, and a 450-ft exclusion zone was established around the item. The item did not appear to be CWM related and a variance to the work plan (Variance 1) was drafted to allow over-packing and hazard categorization of similar containers at the conclusion of excavation activities. Work resumed and a chemical agent identification set (CAIS) ampoule potentially containing chemical agent was discovered. Again, work ceased and a 450-ft exclusion zone was established. TEU was summoned, and the CAIS ampoule was placed in a steel transport container and secured on site with 24-hour security. The ampoule was determined to contain CWM by TEU using Raman spectroscopy. The spectroscope identified the contents of the vial as 5 percent HN mustard (2,2-dichlorotriethylamine), mustard gas (bis 2-chloroethyl sulfide), and lewisite (dichloro[2-chlorovinyl]arsine). Mobile laboratory analysis provided by QuickSilver determined that the liquid in the overpacked brown bottle was a mixture of 1,1,2,2-tetrachloroethane, assorted diesel series alkanes (diesel fuel), and diethyl phthalate (Appendix A).

In December 2003, TEU neutralized the CAIS ampoule at T38-13 using a self-contained, disposable system designed for treating the contents of single, intact CAIS ampoules or bottles. The CAIS ampoule was sealed inside a single chemical agent neutralization system along with a reagent bottle of solvents (chloroform, t-butyl alcohol, water, and activated carbon). The glass containers were breached and their contents mixed. The resulting reaction created a secondary waste acceptable to certified waste treatment, storage, and disposal facilities. The waste mixture was transported in a 20-gallon poly lab pack drum by Robbie D. Wood, Inc. of Dolomite, Alabama to a thermal incineration facility, Onyx Environmental Services, in Port Arthur, Texas (Appendix B). In addition, two other 20-gallon poly drums containing PPE, empty reagent containers, various expendable items, and decontamination fluids were transported and disposed of similarly.

Because of the discovery and identification of CWM at Training Area T-38, work ceased at anomaly T38-13 and was relocated to Training Area T-24A. In December 2003, an intact 155-millimeter (mm) projectile was discovered at anomaly T24-10. Again, work ceased, the area secured, and a 450-ft exclusion zone was established around the item. The Army 722nd Ordnance Company EOD unit from the Anniston Army Depot was summoned to use x-ray imaging to determine whether fillers were present in the 155-mm projectile. The results of the x-

rays taken of the 155-mm shell were inconclusive; therefore, TEU was summoned to inspect the item using an ANDREX SMART 300 HP x-ray set. TEU certified that the 155-mm projectile was empty/inert. In addition, twelve other recovered projectiles excavated were inspected and certified empty/inert.

From December 2003 through January 2004, anomalies T24-5, T24-8, T24-10, T24-15, T24-25, and T24-29 were excavated. A total of 53 items required x-ray, some repeatedly, to determine empty/inert status of their contents; these included 4.2-inch mortars, 105-mm and 155-mm projectiles, and two compressed gas cylinders (one cylinder recovered from anomaly T24-10 contained liquid). Tetra Tech, Inc./Foster Wheeler Environmental Corporation was summoned to explosively vent 19 OE items with potential explosive residue in their fuzes, burster tubes and/or burster caps. In addition, a table-mounted band saw was used to cut (remotely) all items in half for full viewing of filler cavities to complete OE demilitarization requirements.

Because of the discovery and identification of CWM at Training Area T-38, work was suspended until a new probability assessment could be performed by the Army that evaluated the risk of an accident involving CACM. FTMC concluded that the probability of encountering additional chemical agent at Training Area T-38 remained "remote" and again assumed the risk of conducting the remaining activities as a non-CWM site (Appendix F).

The Department of the Army issued a memorandum approving FTMC's request for an exception to the "Interim Guidance for Non-Stockpile Chemical Warfare Material Response Activities" (Appendix F). This allowed work to proceed and be managed as a hazardous and toxic waste response action. All work proceeded in Level B PPE and an on-site ambulance service was provided by Anniston Emergency Medical Services. The remaining work included the completion of the excavation and disposal of 3X material at the T-38 anomalies and the sampling, decommissioning, and disposal of the compressed gas cylinders previously discovered at T-24A.

In August 2004, the cylinder was drilled by Integrated Environmental Services, Inc. of Atlanta, Georgia, and a sample was analyzed on site by QuickSilver. The material present inside the cylinder was determined to be non-CWM (gasoline and diesel derivatives). Appendix A contains the analytical report summaries. The cylinder was cut in half and processed as 3X scrap. The cylinder's contents were overpacked in a five-gallon pail as HTRW for transport and disposal to EBV.

Work resumed in August 2004 at T-38 anomaly 13. Recovered items included several broken CAIS ampoules, unidentified empty bottles (many broken), 4.2-inch mortars, FS smoke balls, cement practice bombs, compressed gas cylinders, and non-OE scrap metal (Appendix C). Air monitoring did not detect the presence of chemical agent on any of the recovered items. Upon completion of work at T-38-13, excavation proceeded at anomaly T38-12. Similar items were recovered during screening operations, including another intact ampoule containing an unknown liquid and a bottle with a glass stopper. Hydrogen mustard (HN1) was detected during these sifting activities. Work was stopped, the site secured, and TEU was summoned. Raman spectroscopy was used to determine that the glass ampoule contained chloropicrin (lacrimator or tear gas) and the bottle contained chloroacetophenone (also a tearing agent). The ampoule and bottle were overpacked in 5-gallon pails containing bleach and charcoal and transported as HTRW to EBV for thermal destruction. Items recovered during sifting operations here included another glass bottle with a glass stopper containing charcoal and labeled as HN. The bottle did not remain intact during subsequent analysis by TEU and was neutralized in a bleach decontamination solution. No determination was made identifying the bottle's contents.

Anomaly T38-12 was excavated in late September 2004. Recovered items included unidentified bottles, CWM-related bottles and ampoules, 4.2-inch mortars, FS smoke balls, cement practice bombs, compressed gas cylinders, and non-OE scrap metal. These items were inert and/or empty. Additionally, Shaw UXO personnel established a 600-ft minimum separation distance (MSD) boundary around Training Area T-38 and used a metal band saw to demilitarize fifty-six 4.2-inch mortars and four metal cylinders. A total of 6,202 pounds of non-OE scrap metal and 3,292 pounds of cement bomb fragments were recovered at T38-12 and T38-13. Other recoveries included 100 empty 3.5-ounce HD bottles, 8 empty CAIS vials, 4 compressed gas cylinders, and miscellaneous glassware. Table 4-1 provides an inventory of all items recovered at T38-12 and T38-13.

Recovered items at T-24A anomalies included eighty-one 155-mm projectiles, fifty 105-mm projectiles, forty-nine 4.2-inch mortars, and nine empty CAIS ampoules. Table 4-2 provides an inventory of all items recovered at T-24A.

Recovered intact bottles were over-packed and stored on site until completion of excavation activities. Although these bottles were not suspected as CWM fillers, the bottles underwent hazard categorization on site by workers wearing Level B PPE. TEU and QuickSilver analyzed their contents and determined that they were all non-CWM. The bottles contained chemicals with characteristics similar to those found in laboratory cleaning solvents. The analytical data

from these bottles is located in Appendix A. The bottles were overpacked in DOT-approved containers as HTRW for transport to Joplin, Missouri for disposal at EBV.

4.2 Hot-Box Summary

A total of 16 hot-boxes weighing 16,018 pounds were shipped on February 25, 2004 from FTMC to Joplin, Missouri. An additional 15 hot-boxes weighing 6,566 pounds were shipped on October 6, 2004.

Fourteen hot-boxes totaling 5,482 pounds (6,462 pounds including the weight of the boxes) of non-OE scrap metal, inert OE scrap, potential CACM, cement practice bombs, and various bottles were removed from Training Area T-38 (Table 4-3). From Training Area T-24A, a total of 17 hot-boxes totaling 14,932 pounds (16,122 pounds gross) of 3X scrap materials were removed (Table 4-4).

Waste stream manifests are included as Appendix B. Appendix C contains an inventory sheet for each hot-box and Appendix D contains the DD Form 1348-1A transport certification and verification forms. Photographs documenting all removal activities are located in Appendix G.

5.0 Summary and Conclusion

5.1 Summary

Shaw has completed the removal of all buried 3X material (including various munitions and explosives of concern [MEC], scrap metal, and glassware) from the designated anomalies identified at Training Area T-38 (anomalies T38-12 and T38-13) and Training Area T-24A (anomalies T24-5, T24-8, T24-10, T24-15, T24-25, and T24-29). One instance of CWM was encountered during the removal activities: a CAIS vial was discovered at Training Area T-38 anomaly 13. The vial was determined to contain CWM composed of 5 percent HN mustard, mustard gas, and lewisite. The material was safely treated on site and all remaining contents transported to an off-site incinerator to be disposed as secondary waste.

A total of 2,184 cubic yards of soil, 3X materials, and MEC scrap were excavated and screened at T-38 and T-24A (Table 5-1). Only one anomaly, anomaly T38-12, required additional excavation. Excavated soil was removed, screened, and placed back into the pits. A total of 31 hot-boxes weighing over 22,500 pounds and representing hundreds of recovered 3X and MEC scrap items were packaged on site. The boxes were transported to a thermal treatment facility, where they were incinerated. After treatment, the 3X material was certified as 5X material suitable for circulation into the metal scrap market.

5.2 Conclusion

All 3X scrap, OE, and non-OE scrap metal identified in two anomalies at Training Areas T-38 and in six anomalies at T-24A (as reported in Parsons [2002]) have been removed from Fort McClellan.

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ATTACHMENT 1
LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2-ADNT	2-amino-4,6-dinitrotoluene	AT	averaging time	CCB	continuing calibration blank
4-ADNT	4-amino-2,6-dinitrotoluene	atm-m ³ /mol	atmospheres per cubic meter per mole	CCV	continuing calibration verification
2,4-D	2,4-dichlorophenoxyacetic acid	ATSDR	Agency for Toxic Substances and Disease Registry	CD	compact disc
2,4,5-T	2,4,5-trichlorophenoxyacetic acid	ATV	all-terrain vehicle	CDTF	Chemical Defense Training Facility
2,4,5-TP	2,4,5-trichlorophenoxypropionic acid	AUF	area use factor	CEHNC	U.S. Army Engineering and Support Center, Huntsville
3D	3D International Environmental Group	AWARE	Associated Water and Air Resources Engineers, Inc.	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
AB	ambient blank	AWQC	ambient water quality criteria	CERFA	Community Environmental Response Facilitation Act
AbB3	Anniston gravelly clay loam, 2 to 6 percent slopes, severely eroded	AWWSB	Anniston Water Works and Sewer Board	CESAS	Corps of Engineers South Atlantic Savannah
AbC3	Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded	'B'	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)	CF	conversion factor
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded	BAF	bioaccumulation factor	CFC	chlorofluorocarbon
ABLM	adult blood lead model	BBGR	Baby Bains Gap Road	CFDP	Center for Domestic Preparedness
Abs	skin absorption	BCF	blank correction factor; bioconcentration factor	CFR	Code of Federal Regulations
ABS	dermal absorption factor	BCT	BRAC Cleanup Team	CG	phosgene (carbonyl chloride)
AC	hydrogen cyanide	BERA	baseline ecological risk assessment	CGI	combustible gas indicator
ACAD	AutoCadd	BEHP	bis(2-ethylhexyl)phthalate	ch	inorganic clays of high plasticity
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded	BFB	bromofluorobenzene	CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded	BFE	base flood elevation	CIH	Certified Industrial Hygienist
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded	BG	Bacillus globigii	CK	cyanogen chloride
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded	BGR	Bains Gap Road	cl	inorganic clays of low to medium plasticity
ACGIH	American Conference of Governmental Industrial Hygienists	bgs	below ground surface	Cl	chlorinated
AdE	Anniston and Allen stony loam, 10 to 25 percent slope	BHC	hexachlorocyclohexane	CLP	Contract Laboratory Program
ADEM	Alabama Department of Environmental Management	BHHRA	baseline human health risk assessment	cm	centimeter
ADPH	Alabama Department of Public Health	BIRTC	Branch Immaterial Replacement Training Center	CN	chloroacetophenone
AEC	U.S. Army Environmental Center	bkg	background	CNB	chloroacetophenone, benzene, and carbon tetrachloride
AEDA	ammunition, explosives, and other dangerous articles	bls	below land surface	CNS	chloroacetophenone, chloropicrin, and chloroform
AEL	airborne exposure limit	BOD	biological oxygen demand	CO	carbon monoxide
AET	adverse effect threshold	Bp	soil-to-plant biotransfer factors	CO ₂	carbon dioxide
AF	soil-to-skin adherence factor	BRAC	Base Realignment and Closure	Co-60	cobalt-60
AHA	ammunition holding area	Braun	Braun Intertec Corporation	CoA	Code of Alabama
AL	Alabama	BSAF	biota-to-sediment accumulation factors	COC	chain of custody; chemical of concern
ALARNG	Alabama Army National Guard	BSC	background screening criterion	COE	Corps of Engineers
ALAD	δ-aminolevulinic acid dehydratase	BTAG	Biological Technical Assistance Group	Con	skin or eye contact
ALDOT	Alabama Department of Transportation	BTEX	benzene, toluene, ethyl benzene, and xylenes	COPC	chemical of potential concern
amb.	amber	BTOC	below top of casing	COPEC	constituent of potential ecological concern
amsl	above mean sea level	BTV	background threshold value	CPOM	coarse particulate organic matter
ANAD	Anniston Army Depot	BW	biological warfare; body weight	CPSS	chemicals present in site samples
AOC	area of concern	BZ	breathing zone; 3-quinuclidinyl benzilate	CQCSM	Contract Quality Control System Manager
AP	armor piercing	C	ceiling limit value	CRDL	contract-required detection limit
APEC	areas of potential ecological concern	Ca	carcinogen	CRL	certified reporting limit
APT	armor-piercing tracer	CaCO ₃	calcium carbonate	CRQL	contract-required quantitation limit
AR	analysis request	CAA	Clean Air Act	CRZ	contamination reduction zone
ARAR	applicable or relevant and appropriate requirement	CAB	chemical warfare agent breakdown products	Cs-137	cesium-137
AREE	area requiring environmental evaluation	CACM	Chemical Agent Contaminated Media	CS	ortho-chlorobenzylidene-malononitrile
AS/SVE	air sparging/soil vapor extraction	CAIS	chemical agent identification set	CSEM	conceptual site exposure model
ASP	Ammunition Supply Point	CAMU	corrective action management unit	CSM	conceptual site model
ASR	Archives Search Report	CBR	chemical, biological, and radiological	CT	central tendency
AST	aboveground storage tank	CCAL	continuing calibration	ctr.	container
ASTM	American Society for Testing and Materials			CWA	chemical warfare agent; Clean Water Act

List of Abbreviations and Acronyms (Continued)

CWM	chemical warfare material; clear, wide mouth	ECBC	Edgewood Chemical Biological Center	Fil	filtered
CX	dichloroformoxime	ED	exposure duration	Flt	filtered
'D'	duplicate; dilution	EDD	electronic data deliverable	FMDC	Fort McClellan Development Commission
D&I	detection and identification	EF	exposure frequency	FML	flexible membrane liner
DAAMS	depot area agent monitoring station	EDQL	ecological data quality level	f _{oc}	fraction organic carbon
DAF	dilution-attenuation factor	EE/CA	engineering evaluation and cost analysis	FOMRA	Former Ordnance Motor Repair Area
DANC	decontamination agent, non-corrosive	Eh	oxidation-reduction potential	FOST	Finding of Suitability to Transfer
°C	degrees Celsius	Elev.	elevation	Foster Wheeler	Foster Wheeler Environmental Corporation
°F	degrees Fahrenheit	EM	electromagnetic	FR	Federal Register
DCA	dichloroethane	EMI	Environmental Management Inc.	Frtn	fraction
DCE	dichloroethene	EM31	Geonics Limited EM31 Terrain Conductivity Meter	FS	field split; feasibility study; fuming sulfuric acid
DD	Defense Department	EM61	Geonics Limited EM61 High-Resolution Metal Detector	FSP	field sampling plan
DDD	dichlorodiphenyldichloroethane	EOD	explosive ordnance disposal	ft	feet
DDE	dichlorodiphenyldichloroethene	EODT	explosive ordnance disposal team	ft/day	feet per day
DDT	dichlorodiphenyltrichloroethane	EPA	U.S. Environmental Protection Agency	ft/ft	feet per foot
DEH	Directorate of Engineering and Housing	EPC	exposure point concentration	ft/yr	feet per year
DEHP	di(2-ethylhexyl)phthalate	EPIC	Environmental Photographic Interpretation Center	FTA	Fire Training Area
DEP	depositional soil	EPRI	Electrical Power Research Institute	FTMC	Fort McClellan
DFTPP	decafluorotriphenylphosphine	EPT	Ephemeroptera, Plecoptera, Trichoptera	FTRRA	FTMC Reuse & Redevelopment Authority
DI	deionized	ER	equipment rinsate	g	gram
DID	data item description	ERA	ecological risk assessment	g/m ³	gram per cubic meter
DIMP	di-isopropylmethylphosphonate	ER-L	effects range-low	G-856	Geometrics, Inc. G-856 magnetometer
DM	dry matter; adamsite	ER-M	effects range-medium	G-858G	Geometrics, Inc. G-858G magnetic gradiometer
DMBA	dimethylbenz(a)anthracene	ESE	Environmental Science and Engineering, Inc.	GAF	gastrointestinal absorption factor
DMMP	dimethylmethylphosphonate	ESL	ecological screening level	gal	gallon
DNAPL	dense nonaqueous-phase liquid	ESMP	Endangered Species Management Plan	gal/min	gallons per minute
DNT	dinitrotoluene	ESN	Environmental Services Network, Inc.	GB	sarin (isopropyl methylphosphonofluoridate)
DO	dissolved oxygen	ESV	ecological screening value	gc	clay gravels; gravel-sand-clay mixtures
DOD	U.S. Department of Defense	ET	exposure time	GC	gas chromatograph
DOJ	U.S. Department of Justice	EU	exposure unit	GCL	geosynthetic clay liner
DOT	U.S. Department of Transportation	Exp.	Explosives	GC/MS	gas chromatograph/mass spectrometer
DP	direct-push	EXTOXNET	Extension Toxicology Network	GCR	geosynthetic clay liner
DPDO	Defense Property Disposal Office	E-W	east to west	GFAA	graphite furnace atomic absorption
DPT	direct-push technology	EZ	exclusion zone	GIS	Geographic Information System
DQO	data quality objective	FAR	Federal Acquisition Regulations	gm	silty gravels; gravel-sand-silt mixtures
DRMO	Defense Reutilization and Marketing Office	FB	field blank	gp	poorly graded gravels; gravel-sand mixtures
DRO	diesel range organics	FBI	Family Biotic Index	gpm	gallons per minute
DS	deep (subsurface) soil	FD	field duplicate	GPR	ground-penetrating radar
DS2	Decontamination Solution Number 2	FDC	Former Decontamination Complex	GPS	global positioning system
DSERTS	Defense Site Environmental Restoration Tracking System	FDA	U.S. Food and Drug Administration	GRA	general response action
DWEL	drinking water equivalent level	Fe ⁺³	ferric iron	GS	ground scar
E&E	Ecology and Environment, Inc.	Fe ⁺²	ferrous iron	GSA	General Services Administration; Geologic Survey of Alabama
EB	equipment blank	FedEx	Federal Express, Inc.	GSBP	Ground Scar Boiler Plant
EBC	Eastern Bypass Corridor	FEMA	Federal Emergency Management Agency	GSSI	Geophysical Survey Systems, Inc.
EBS	environmental baseline survey	FFCA	Federal Facilities Compliance Act	GST	ground stain
EBV	EBV Explosives Environmental Co.	FFE	field flame expedient	GW	groundwater
EC ₂₀	effects concentration for 20 percent of a test population	FFS	focused feasibility study	gw	well-graded gravels; gravel-sand mixtures
EC ₅₀	effects concentration for 50 percent of a test population	FI	fraction of exposure	H&S	health and safety

List of Abbreviations and Acronyms (Continued)

HA	hand auger	IS	internal standard	mg/kgbw/day	milligrams per kilogram of body weight per day
HC	mixture of hexachloroethane, aluminum powder, and zinc oxide (smoke producer)	ISCP	Installation Spill Contingency Plan	mg/L	milligrams per liter
HCl	hydrochloric acid	IT	IT Corporation	mg/m ³	milligrams per cubic meter
HD	distilled mustard (bis-[dichloroethyl]sulfide)	ITEMS	IT Environmental Management System™	mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
HDPE	high-density polyethylene	'J'	estimated concentration	MHz	megahertz
HE	high explosive	JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded	µg/g	micrograms per gram
HEAST	Health Effects Assessment Summary Tables	JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded	µg/kg	micrograms per kilogram
Herb.	herbicides	JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes	µg/L	micrograms per liter
HHRA	human health risk assessment	JPA	Joint Powers Authority	µmhos/cm	micromhos per centimeter
HI	hazard index	K	conductivity	MEC	munitions and explosives of concern
HN	hydrogen mustard	K _d	soil-water distribution coefficient	MeV	mega electron volt
H ₂ O ₂	hydrogen peroxide	kg	kilogram	min	minimum
HPLC	high-performance liquid chromatography	KeV	kilo electron volt	MINICAMS	miniature continuous air monitoring system
HNO ₃	nitric acid	K _{oc}	organic carbon partitioning coefficient	ml	inorganic silts and very fine sands
HQ	hazard quotient	K _{ow}	octonal-water partition coefficient	mL	milliliter
HQ _{screen}	screening-level hazard quotient	KMnO ₄	potassium permanganate	mm	millimeter
hr	hour	L	liter; Lewisite (dichloro-[2-chloroethyl]sulfide)	MM	mounded material
HRC	hydrogen releasing compound	L/kg/day	liters per kilogram per day	MMBtu/hr	million Btu per hour
HSA	hollow-stem auger	l	liter	MNA	monitored natural attenuation
HSDB	Hazardous Substance Data Bank	LAW	light anti-tank weapon	MnO ₄ -	permanganate ion
HTRW	hazardous, toxic, and radioactive waste	lb	pound	MOA	Memorandum of Agreement
'I'	out of control, data rejected due to low recovery	LBP	lead-based paint	MOGAS	motor vehicle gasoline
IASPOW	Impact Area South of POW Training Facility	LC	liquid chromatography	MOUT	Military Operations in Urban Terrain
IATA	International Air Transport Authority	LCS	laboratory control sample	MP	Military Police
ICAL	initial calibration	LC ₅₀	lethal concentration for 50 percent population tested	MPA	methyl phosphonic acid
ICB	initial calibration blank	LD ₅₀	lethal dose for 50 percent population tested	MPC	maximum permissible concentration
ICP	inductively-coupled plasma	LEL	lower explosive limit	MPM	most probable munition
ICRP	International Commission on Radiological Protection	LOAEL	lowest-observed-adverse-effects-level	MQL	method quantitation limit
ICS	interference check sample	LOEC	lowest-observable-effect-concentration	MR	molasses residue
ID	inside diameter	LRA	land redevelopment authority	MRL	method reporting limit
IDL	instrument detection limit	LT	less than the certified reporting limit	MS	matrix spike
IDLH	immediately dangerous to life or health	LUC	land-use control	mS/cm	millisiemens per centimeter
IDM	investigative-derived media	LUCAP	land-use control assurance plan	mS/m	millisiemens per meter
IDW	investigation-derived waste	LUCIP	land-use control implementation plan	MSD	matrix spike duplicate; minimum separation distance
IEUBK	Integrated Exposure Uptake Biokinetic	max	maximum	MTBE	methyl tertiary butyl ether
IF	ingestion factor; inhalation factor	MB	method blank	msl	mean sea level
ILCR	incremental lifetime cancer risk	MCL	maximum contaminant level	MtD3	Montevillo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
IMPA	isopropylmethyl phosphonic acid	MCLG	maximum contaminant level goal	mV	millivolts
IMR	Iron Mountain Road	MCPA	4-chloro-2-methylphenoxyacetic acid	MW	monitoring well
in.	inch	MCPP	2-(2-methyl-4-chlorophenoxy)propionic acid	MWI&MP	Monitoring Well Installation and Management Plan
Ing	ingestion	MCS	media cleanup standard	Na	sodium
Inh	inhalation	MD	matrix duplicate	NA	not applicable; not available
IP	ionization potential	MDC	maximum detected concentration	NAD	North American Datum
IPS	International Pipe Standard	MDCC	maximum detected constituent concentration	NAD83	North American Datum of 1983
IR	ingestion rate	MDL	method detection limit	NaMnO ₄	sodium permanganate
IRDMIS	Installation Restoration Data Management Information System	mg	milligrams	NAVD88	North American Vertical Datum of 1988
IRIS	Integrated Risk Information Service	mg/kg	milligrams per kilogram	NAS	National Academy of Sciences
IRP	Installation Restoration Program	mg/kg/day	milligram per kilogram per day	NCEA	National Center for Environmental Assessment

List of Abbreviations and Acronyms (Continued)

NCP	National Contingency Plan	ORP	oxidation-reduction potential	pt	peat or other highly organic silts
NCRP	National Council on Radiation Protection and Measurements	OSHA	Occupational Safety and Health Administration	PVC	polyvinyl chloride
ND	not detected	OSWER	Office of Solid Waste and Emergency Response	QA	quality assurance
NE	no evidence; northeast	OVM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector	QA/QC	quality assurance/quality control
ne	not evaluated	OWS	oil/water separator	QAM	quality assurance manual
NEW	net explosive weight	oz	ounce	QAO	quality assurance officer
NFA	No Further Action	PA	preliminary assessment	QAP	installation-wide quality assurance plan
NG	National Guard	PAH	polynuclear aromatic hydrocarbon	QC	quality control
NGP	National Guardsperson	PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity	QST	QST Environmental, Inc.
ng/L	nanograms per liter	Parsons	Parsons Engineering Science, Inc.	qty	quantity
NGVD	National Geodetic Vertical Datum	Pb	lead	Qual	qualifier
Ni	nickel	PBMS	performance-based measurement system	QuickSilver	QuickSilver Analytics, Inc.
NIC	notice of intended change	PC	permeability coefficient	R	rejected data; resample; retardation factor
NIOSH	National Institute for Occupational Safety and Health	PCB	polychlorinated biphenyl	R&A	relevant and appropriate
NIST	National Institute of Standards and Technology	PCDD	polychlorinated dibenzo-p-dioxins	RA	remedial action
NLM	National Library of Medicine	PCDF	polychlorinated dibenzofurans	RAO	remedial action objective
NO ₃ ⁻	nitrate	PCE	perchloroethene	RBC	risk-based concentration; red blood cell
NOEC	no-observable-effect-concentration	PCP	pentachlorophenol	RBRG	risk-based remedial goal
NPDES	National Pollutant Discharge Elimination System	PDS	Personnel Decontamination Station	RCRA	Resource Conservation and Recovery Act
NPW	net present worth	PEF	particulate emission factor	RCWM	Recovered Chemical Warfare Material
No.	number	PEL	permissible exposure limit	RD	remedial design
NOAA	National Oceanic and Atmospheric Administration	PERA	preliminary ecological risk assessment	RDX	cyclotrimethylenetrinitramine
NOAEL	no-observed-adverse-effects-level	PERC	perchloroethene	ReB3	Rarden silty clay loams
NR	not requested; not recorded; no risk	PES	potential explosive site	REG	regular field sample
NRC	National Research Council	Pest.	pesticides	REL	recommended exposure limit
NRCC	National Research Council of Canada	PETN	pentaerythritoltetranitrate	RFA	request for analysis
NRHP	National Register of Historic Places	PFT	portable flamethrower	RfC	reference concentration
NRT	near real time	PG	professional geologist	RfD	reference dose
ns	nanosecond	PID	photoionization detector	RGO	remedial goal option
N-S	north to south	PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes	RI	remedial investigation
NS	not surveyed	PM	project manager	RL	reporting limit
NSA	New South Associates, Inc.	POC	point of contact	RME	reasonable maximum exposure
nT	nanotesla	POL	petroleum, oils, and lubricants	ROD	Record of Decision
nT/m	nanoteslas per meter	POTW	publicly owned treatment works	RPD	relative percent difference
NTU	nephelometric turbidity unit	POW	prisoner of war	RR	range residue
nv	not validated	PP	peristaltic pump; Proposed Plan	RRF	relative response factor
O ₂	oxygen	ppb	parts per billion	RRSE	Relative Risk Site Evaluation
O ₃	ozone	ppbv	parts per billion by volume	RSD	relative standard deviation
O&G	oil and grease	PPE	personal protective equipment	RTC	Recruiting Training Center
O&M	operation and maintenance	ppm	parts per million	RTECS	Registry of Toxic Effects of Chemical Substances
OB/OD	open burning/open detonation	PPMP	Print Plant Motor Pool	RTK	real-time kinematic
OD	outside diameter	ppt	parts per thousand	RWIMR	Ranges West of Iron Mountain Road
OE	ordnance and explosives	PR	potential risk	SA	exposed skin surface area
oh	organic clays of medium to high plasticity	PRA	preliminary risk assessment	SAD	South Atlantic Division
OH•	hydroxyl radical	PRG	preliminary remediation goal	SAE	Society of Automotive Engineers
ol	organic silts and organic silty clays of low plasticity	PS	chloropicrin	SAIC	Science Applications International Corporation
OP	organophosphorus	PSSC	potential site-specific chemical	SAP	installation-wide sampling and analysis plan
ORC	Oxygen Releasing Compound			SARA	Superfund Amendments and Reauthorization Act

List of Abbreviations and Acronyms (Continued)

sc	clayey sands; sand-clay mixtures	STOLS	Surface Towed Ordnance Locator System®	UF	uncertainty factor
Sch.	schedule	Std. units	standard units	URF	unit risk factor
SCM	site conceptual model	SU	standard unit	USACE	U.S. Army Corps of Engineers
SD	sediment	SUXOS	senior UXO supervisor	USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
SDG	sample delivery group	SVOC	semivolatile organic compound	USAEC	U.S. Army Environmental Center
SDWA	Safe Drinking Water Act	SW	surface water	USAEHA	U.S. Army Environmental Hygiene Agency
SDZ	safe distance zone; surface danger zone	SW-846	U.S. EPA's <i>Test Methods for Evaluating Solid Waste: Physical/Chemical Methods</i>	USACMLS	U.S. Army Chemical School
SEMS	Southern Environmental Management & Specialties, Inc.	SWMU	solid waste management unit	USAMPS	U.S. Army Military Police School
SF	cancer slope factor	SWPP	storm water pollution prevention plan	USATCES	U.S. Army Technical Center for Explosive Safety
SFSP	site-specific field sampling plan	SZ	support zone	USATEU	U.S. Army Technical Escort Unit
SGF	standard grade fuels	TAL	target analyte list	USATHAMA	U.S. Army Toxic and Hazardous Material Agency
Shaw	Shaw Environmental, Inc.	TAT	turn around time	USC	United States Code
SHP	installation-wide safety and health plan	TB	trip blank	USCS	Unified Soil Classification System
SI	site investigation	TBC	to be considered	USDA	U.S. Department of Agriculture
SINA	Special Interest Natural Area	TCA	trichloroethane	USEPA	U.S. Environmental Protection Agency
SL	standing liquid	TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin	USFWS	U.S. Fish and Wildlife Service
SLERA	screening-level ecological risk assessment	TCDF	tetrachlorodibenzofurans	USGS	U.S. Geological Survey
sm	silty sands; sand-silt mixtures	TCE	trichloroethene	UST	underground storage tank
SM	<i>Serratia marcescens</i>	TCL	target compound list	UTL	upper tolerance level; upper tolerance limit
SMDP	Scientific Management Decision Point	TCLP	toxicity characteristic leaching procedure	UXO	unexploded ordnance
s/n	signal-to-noise ratio	TDEC	Tennessee Department of Environment and Conservation	UXOQCS	UXO Quality Control Supervisor
SO ₄ ⁻²	sulfate	TDGCL	thiodiglycol	UXOSO	UXO safety officer
SOD	soil oxidant demand	TDGCLA	thiodiglycol chloroacetic acid	V	vanadium
SOP	standard operating procedure	TEA	triethylaluminum	VC	vinyl chloride
SOPQAM	U.S. EPA's <i>Standard Operating Procedure/Quality Assurance Manual</i>	Tetryl	trinitrophenylmethylnitramine	VOA	volatile organic analyte
sp	poorly graded sands; gravelly sands	TERC	Total Environmental Restoration Contract	VOC	volatile organic compound
SP	submersible pump	TEU	Technical Escort Unit	VOH	volatile organic hydrocarbon
SPCC	system performance calibration compound	THI	target hazard index	VQlfr	validation qualifier
SPCS	State Plane Coordinate System	TIC	tentatively identified compound	VQual	validation qualifier
SPM	sample planning module	TLV	threshold limit value	VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
SQRT	screening quick reference tables	TN	Tennessee	WAC	Women's Army Corps
Sr-90	strontium-90	TNB	trinitrobenzene	Weston	Roy F. Weston, Inc.
SRA	streamlined human health risk assessment	TNT	trinitrotoluene	WP	installation-wide work plan
SRI	supplemental remedial investigation	TOC	top of casing; total organic carbon	WRS	Wilcoxon rank sum
SRM	standard reference material	TPH	total petroleum hydrocarbons	WS	watershed
Ss	stony rough land, sandstone series	TR	target cancer risk	WSA	Watershed Screening Assessment
SS	surface soil	TRADOC	U.S. Army Training and Doctrine Command	WWI	World War I
SSC	site-specific chemical	TRPH	total recoverable petroleum hydrocarbons	WWII	World War II
SSHO	site safety and health officer	TRV	toxicity reference value	XRF	x-ray fluorescence
SSHP	site-specific safety and health plan	TSCA	Toxic Substances Control Act	yd ³	cubic yards
SSL	soil screening level	TSDF	treatment, storage, and disposal facility		
SSSL	site-specific screening level	TSS	total suspended solids		
SSSSL	site-specific soil screening level	TWA	time-weighted average		
STB	supertropical bleach	UCL	upper confidence limit		
STC	source-term concentration	UCR	upper certified range		
STD	standard deviation	'U'	not detected above reporting limit		
STEL	short-term exposure limit	UIC	underground injection control		
STL	Severn-Trent Laboratories				

TABLES

Table 2-1

**Anomalies Identified at T-38 and T-24A
3X Scrap Removal Closure Report
Fort McClellan, Calhoun County, Alabama**

Anomaly	Type	Trench Dimensions (LengthxWidthxDepth)	Trench Contents (Removed, except as noted)
T38-12	CS	Trench A: 20 x 3 x 4 (or 6)	55-gal CWM drum, partial
	S, OS	Trench B: 23 x 3 x ?	3 empty STB drums, aluminum FS smoke balls (removal status unknown)
	O	Trench C: 31 x 3 x ?	White residue, burlap (left in place)
	S	Trench D: 16 x 3 x 9.5	STB drums (left in place)
	n/a	Trench E: ~53 x ? x 3	none
T38-13	S, CS	Trench A: 21 x 3 x 4	8-gal (50 LB) STB drum, 55-gal CWM drum, 4.2-in mortar
	S, OS	Trench B: 23 x 3 x 3.5	Metal lid (left in place), crushed DS2 container (left in place), rusted STB drums (left in place), aluminum FS smoke balls
	S, OS, CS	Trench C: 31 x 3 x 6	Glass vial, aluminum spheres, FS smoke, 55-gal CWM drum, rusted STB drums (left in place), 4.2-in mortar
	CS, S	Trench D: 16 x 3 x 9.5	4.2-in mortar, glass vial, brown bottle, 55-gal CWM drum, rusted STB drums (left in place)
T24-5	CS	10 x 3 x 4	Empty 155mm projectile with shipping plug, banding, charred wood
T24-8	Investigated by USATEU in 1993.		
T24-10	Investigated by USATEU in 1993.		
T24-15	CS	20 x 3 x 6.5	Five 155mm and five 105mm projectiles, one 4.2-in. mortar, one 5-in. rocket with head, five 115mm rocket motors, concrete practice bombs
T24-25	CS		CWM drum, partial (left in place)
T24-29	CS	Trench A: 20 x 3 x 3	One 105mm projectile, car parts, scrap, trash, charred wood
		Trench B: 20 x 3 x 6	
		Trench C: 20 x 3 x 3	

Notes:

- CS - Chemical warfare materiel scrap.
- CWM - Chemical warfare materiel.
- DS2 - Decontamination solution number 2.
- FS - Fuming sulfuric acid.
- n/a - Not applicable.
- O - Other.
- OS - Ordnance scrap.
- S - Other metallic scrap.
- STB - Supertropical bleach.
- USATEU - US Army Technical Escort Unit.

Source:

Parsons, *Final Chemical Warfare Materiel, Engineering Evaluation/Cost Analysis, Fort McClellan, Alabama*, 2002.

NB: Inconsistencies exist in the source text (Section 7.3.2.3), Table 7-1, and Figure 7-1 regarding the dimensions of the trenches at T38-12.

Table 3-1

Variations to Final Site-Specific Work Plan
 3X Scrap Removal Closure Report
 Fort McClellan, Calhoun County, Alabama

(Page 1 of 2)

No.	Date	Description of Variance	Justification for Variance	Impact to Project
1	Nov. 14, 2003	The site-specific work plan did not provide procedures for handling unknown items that did not appear to be CWM.	Allowed Shaw to place items, such as liquid-filled containers, into an overpack drum for future disposition. The items or containers were not overpacked until after the SUXOS and the USAESCH both made determinations that the items did not appear to be CWM. Prior to disposal of any overpacked items, the contents were categorized using a HAZCAT test kit and, if appropriate, "hot-boxed" (i.e., placed in a container for 4 hours at 70°F and monitored with MINICAMS).	None.
2	Nov. 17, 2003	The site-specific work plan did not provide procedures for the use of Level B PPE to access depot area agent monitoring station (DAAMS) sampling equipment (i.e., the DAAMS pump) after a MINICAMS ring-off has occurred in the exclusion zone.	The following procedure were implemented: 1) Retrieve the DAAMS pump, 2) replace the DAAMS pump with a second unit to collect confirmation samples, and 3) retrieve this second pump for confirmation of the original sample.	None.
3	Feb. 5, 2004	The Final Site-Specific Work Plan, 3X Scrap Removal, October 2003 did not provide for the use of alternative methods of identifying inert OE material during excavation.	The verification that an OE item is positively inert was difficult in some cases and required the utilization of techniques other than visual inspection. Depending on the ordnance type, X-ray analysis was the only method available to determine if an item was hazardous (i.e., contained explosive fillers).	None.
4	Aug. 11, 2004	3X Variance No. 1 (dated November 14, 2003) stated that items or containers recovered will not be overpacked until after the Shaw SUXO and USAESCH have both made determinations that the recovered items do not appear to be CWM. Per telephone conversation on August 11, 2004, Wilson Walters of USAESCH stated to Ben Hodges, Jorge Sanchez, and Jeff Tarr (Shaw); Damon Young (USACE-Mobile); and Gary Harvey (FTMC), that their organization does not desire to be contacted unless recovered items are suspected to be CWM. Additionally, USAESCH stated that Shaw should manage non-suspect CWM items or containers as HTRW and overpack the items following HTRW protocol.	USAESCH stated in a telephone conversation on August 11, 2004 that their organization did not desire to be contacted by Shaw nor USACE-Mobile in the identification of unknown items unless recovered items are suspected to be CWM.	None.
5	Sep. 1, 2004	The Final Site-Specific Work Plan, Unexploded Ordnance Safety Plan, 3X Scrap Removal, October 2003 did not identify who was authorized to enter the site from the 450-foot exclusion zone, only that two (2) individuals were positioned at the 450-foot exclusion zone to prevent <i>unauthorized</i> personnel from entry.	Maintenance and repair of the Interim Holding Facility located inside the established 450-foot exclusion zone was needed. Technical Escort Unit requested Shaw remove vegetation to perform repairs to the air conditioner and electrical unit.	None.

Table 3-1

**Variations to Final Site-Specific Work Plan
3X Scrap Removal Closure Report
Fort McClellan, Calhoun County, Alabama**

(Page 2 of 2)

No.	Date	Description of Variance	Justification for Variance	Impact to Project
6	Sep. 23, 2004	4.2-inch chemical, M2 and M2A1 projectile ordnance was recovered from T-38-12 and T38-13 during 3X scrap removal activities. Some of the projectiles recovered had nose plugs installed to protect the threads and prevent foreign material from entering the burster tube cavity. The nose plugs also prevented visual inspection of the burster tube cavity. Therefore, a potential explosive hazard could not be eliminated through visual inspection.	Shaw policy states that remote demilitarization will be performed for all items recovered which cannot be visually certified. Because the burster tube cavity could not be inspected, a procedure was required to remotely demilitarize the 4.2-inch projectiles that had nose plugs.	None.

Notes:

- CWM - Chemical warfare materiel.
- DAAMS - Depot area agent monitoring station.
- FTMC - Fort McClellan.
- HTRW - Hazardous, toxic, and radioactive waste.
- MINICAMS - Miniature continuous air monitoring system.
- OE - Ordnance and explosives.
- USACE - U.S. Army Corps of Engineers.
- USAESCH - U.S. Army Engineering and Support Center, Huntsville.

Table 4-1

**T-38 Inventory of Recovered Items
3X Scrap Removal Closure Report
Fort McClellan, Calhoun County, Alabama**

Source Anomaly	Quantity or Weight	Item Recovered	Demilitarization Status
12	2	Cement practice bomb	N/A
	34	3.5-ounce M1 HD bottle	N/A
	41	Unidentified bottles	N/A
	8	CAIS vials	N/A
	17	CAIS tubes	N/A
	1	Glass funnel	N/A
	1	Glass syringe	N/A
	5	Soda bottle	N/A
	1	Zip-lock bag of broken glass	N/A
	20	4.2-inch mortar	Cut in half
	1	4.2-inch mortar tail	N/A
	16	4.2-inch mortar with nose plug	Cut in half
	2	Compressed gas cylinder	Cut in half
	200 lbs	Cement practice bomb fragments	N/A
	3,850 lbs	Non-OE scrap metal	N/A
13	66	3.5-ounce M1 HD bottle	N/A
	28	Unidentified bottle	N/A
	1	Soda bottle	N/A
	17	CAIS vials	N/A
	1	Zip-Lock bag of broken glass	N/A
	9	4.2-inch mortar	Cut in half
	10	4.2-inch mortar with nose plug	Cut in half
	2	Compressed gas cylinder	Cut in half
	696 lbs	Non-OE scrap metal	N/A
12 & 13	170 lbs	Empty aluminum FS ball	N/A

Notes: CAIS - Chemical agent identification set.
 FS - Fuming sulfuric acid (smoke agent).
 HD - Distilled mustard.
 lbs - Pounds.
 N/A - Not applicable.
 OE - Ordnance and explosives.

Table 4-2

**T-24A Inventory of Recovered Items
3X Scrap Removal Closure Report
Fort McClellan, Calhoun County, Alabama**

Source Anomaly	Quantity or Weight	Item Recovered	Demilitarization Status
5	1	105mm projectile	Cut in half
10	68	155mm projectile	Cut in half
	49	4.2-inch mortar	Cut in half
	8	M138 BZ bomb	Cut in half
	1	M55 rocket warhead	Cut in half
	46	105mm projectile	Cut in half
	1	155mm projectile nose	N/A
	2	155mm projectile tail	N/A
	14	105mm projectile tail	1 Cut in half
	1	5-inch rocket warhead	Cut in half
	7	M125 GB bomb	6 Cut in half
	7	3.5-ounce M1 HD bottle	N/A
	10	60-milliliter bottle	N/A
	3	105mm projectile body	N/A
	7	Compressed gas cylinder	6 Cut in half
	3	CAIS vial	N/A
	6	M55 rocket motor	3 Cut in half
370 lbs	Non-OE scrap metal	N/A	
15	13	155mm projectile	Cut in half
	2	105mm projectile	Cut in half
	30	M55 rocket motor	22 Cut in half
	7	5-inch rocket warhead	N/A
	5	M69 incendiary bomb	1 Cut in half
	6	CAIS vial	N/A
	1	3.5-ounce HD bottle	N/A
	11	50/60-milliliter bottle	N/A
	4	M125 GB bomb	1 Cut in half
	1	M138 BZ bomb	Cut in half
	1	E49R3 HD bomb	N/A
	300 lbs	Non-OE scrap metal	N/A
	3,092 lbs	Cement practice bomb fragments	N/A
29	1	105mm projectile	Cut in half
	2 lbs	Non-OE scrap metal	N/A
5, 10, 15, & 29	984 lbs	Non-OE scrap metal	N/A

Notes: BZ - 3-QuinulidinyI benzilate.
 CAIS - Chemical agent identification set.
 FS - Fuming sulfuric acid (smoke agent).
 GB - Sarin.
 HD - Distilled mustard.
 lbs - Pounds.
 mm - Millimeter.
 N/A - Not applicable.
 OE - Ordnance and explosives.

Table 4-3

**T-38 Hotbox Summary
3X Scrap Removal Closure Report
Fort McClellan, Calhoun County, Alabama**

Hotbox Number	Source Anomaly	Contents of Hotbox	Net Weight (pounds)	Gross Weight (pounds)
T38-001	13	Non-OE scrap metal	288	358
T38-002	13	Non-OE scrap metal	266	336
T38-003	12, 13	Non-OE scrap metal	284	354
T38-004	12	Non-OE scrap metal	300	370
T38-005	12	Non-OE scrap metal	312	382
T38-006	12	Non-OE scrap metal	370	440
T38-007	12	Non-OE scrap metal	474	544
T38-008	12	Non-OE scrap metal	416	486
T38-009	12	Non-OE scrap metal	612	682
T38-010	12	Non-OE scrap metal	894	964
T38-011	12	Non-OE scrap metal	270	340
T38-012	12, 13	Empty aluminum FS balls, cement practice bomb fragments	370	440
T38-013	12, 13	CAIS vials, miscellaneous bottles, glassware	80	150
T38-014	12, 13	Inert OE, gas cylinders, steel pipe	546	616
Total Weight			5,482	6,462

Gross weight includes weight of 1 cubic yard fiber box (70 pounds).

OE - Ordnance and explosives.

CAIS - Chemical agent identification set.

FS - Fuming sulfuric acid (smoke agent).

Table 4-4

**T-24A Hotbox Summary
3X Scrap Removal Closure Report
Fort McClellan, Calhoun County, Alabama**

Hotbox Number	Source Anomaly	Contents of Hotbox	Net Weight (pounds)	Gross Weight (pounds)
T24A-001	10, 15	Inert OE	1,376	1,446
T24A-002	5, 10	Inert OE, bottles	1,574	1,644
T24A-003	10	Inert OE	1,678	1,748
T24A-004	10, 29	Inert OE, bottles, gas cylinder, OE scrap, CAIS vials	1,214	1,284
T24A-005	10	Inert OE, OE scrap	240	310
T24A-006	10	Inert OE, gas cylinder	1,272	1,342
T24A-007	10, 15	Inert OE	1,526	1,596
T24A-008	15	Inert OE	578	648
T24A-009	15	Inert OE, CAIS vials, bottles	512	582
T24A-010	10, 15	Inert OE, OE scrap	546	616
T24A-011	10, 15	Inert OE, OE scrap	306	376
T24A-012	10	Gas cylinders (cut in half)	34	104
T24A-C-01	15	Cement practice bomb fragments	998	1,068
T24A-C-02	15	Cement practice bomb fragments	1,032	1,102
T24A-C-03	15	Cement practice bomb fragments	1,062	1,132
T24A-S-01/02	5, 8, 10, 15, 25, 29	Non-OE scrap metal	546	616
T24A-S-03/04	5, 8, 10, 15, 25, 29	Non-OE scrap metal	438	508
Total Weight			14,932	16,122

Gross weight includes weight of 1 cubic yard fiber box (70 pounds).

OE - Ordnance and explosives.

CAIS - Chemical agent identification set.

Table 5-1

**Excavation Volume Summary
3X Scrap Removal Closure Report
Fort McClellan, Calhoun County, Alabama**

Training Area	Anomaly Number	Surface Area (sq. ft.)	Average Depth (ft.)	Volume (cu. yds.)
T-38	12	1,772	8.7	571
	13	904	9	301
	Subtotal	2,676	9	872
T-24A	5	1,032	6	229
	8	777	8	230
	10	438	12	195
	15	615	15	342
	25	209	6	46
	29	1,455	5	269
	Subtotal	4,526	9	1,312
Total		7,202	9	2,184

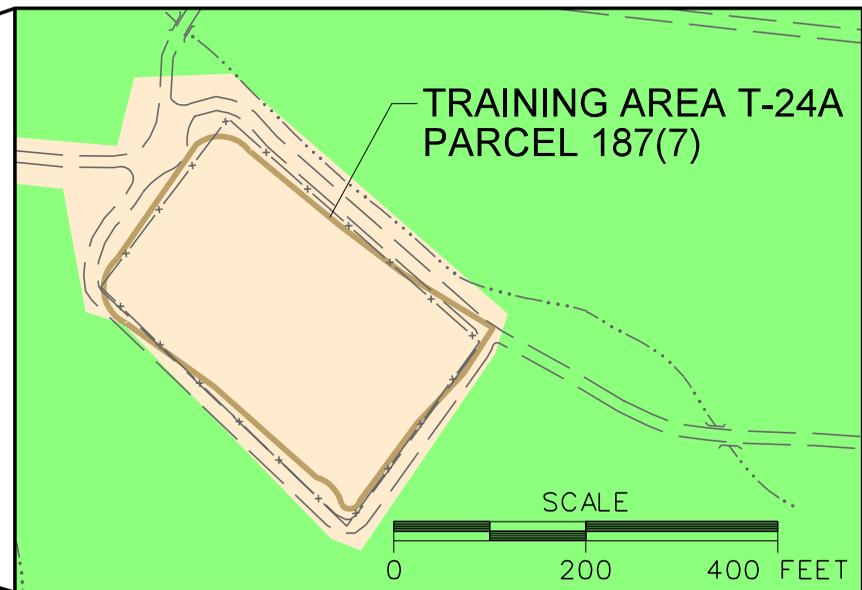
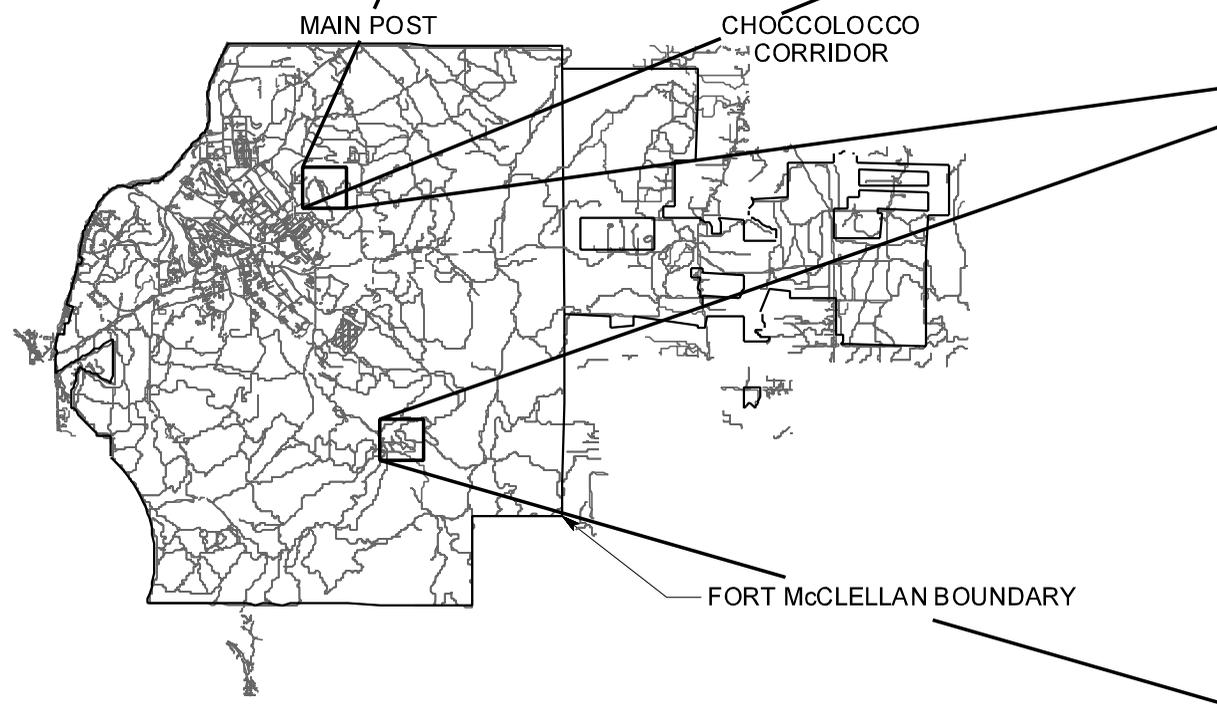
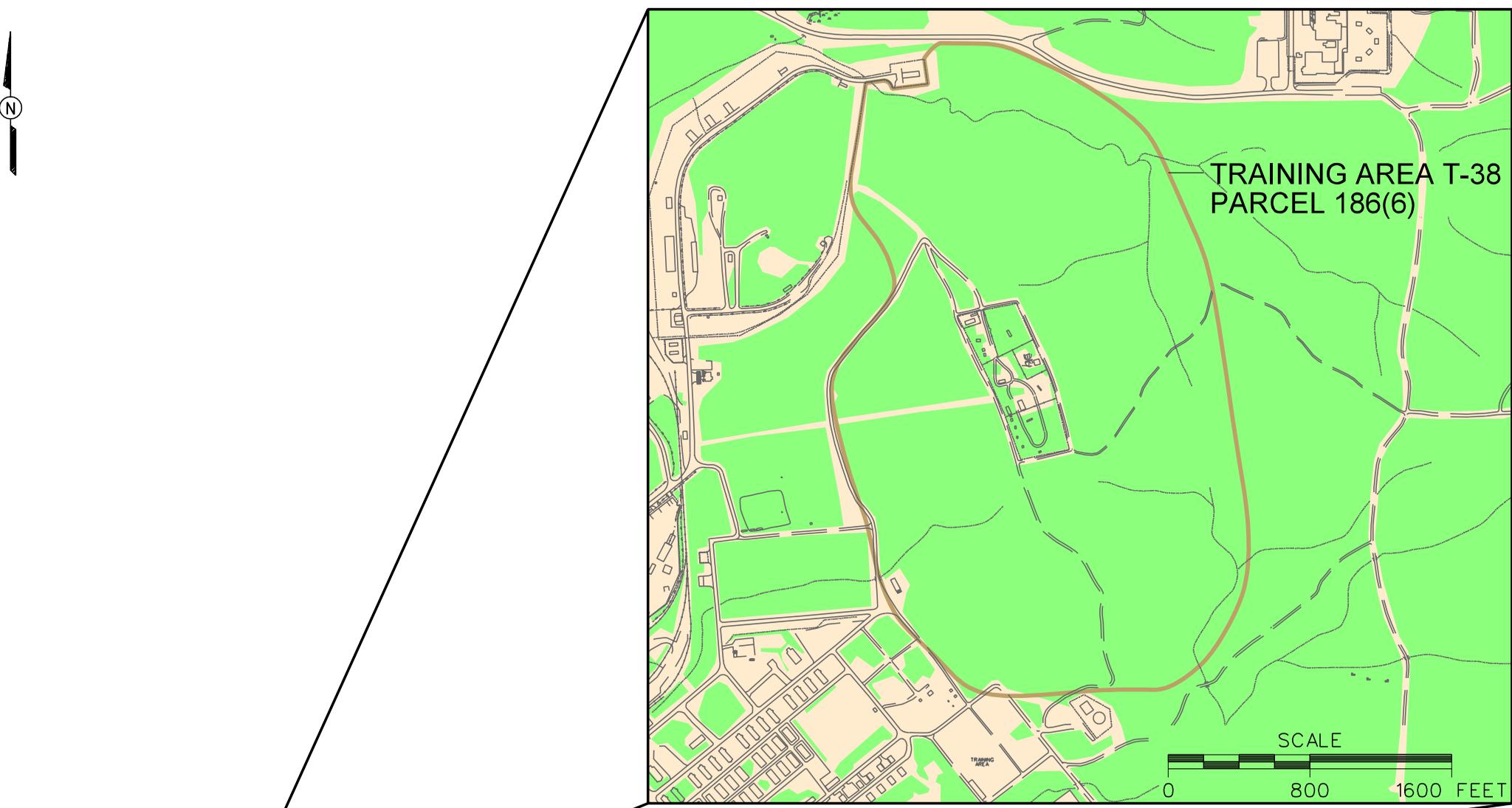
cu. yds. - Cubic yards.

ft. - Feet.

sq. ft. - Square feet.

FIGURES

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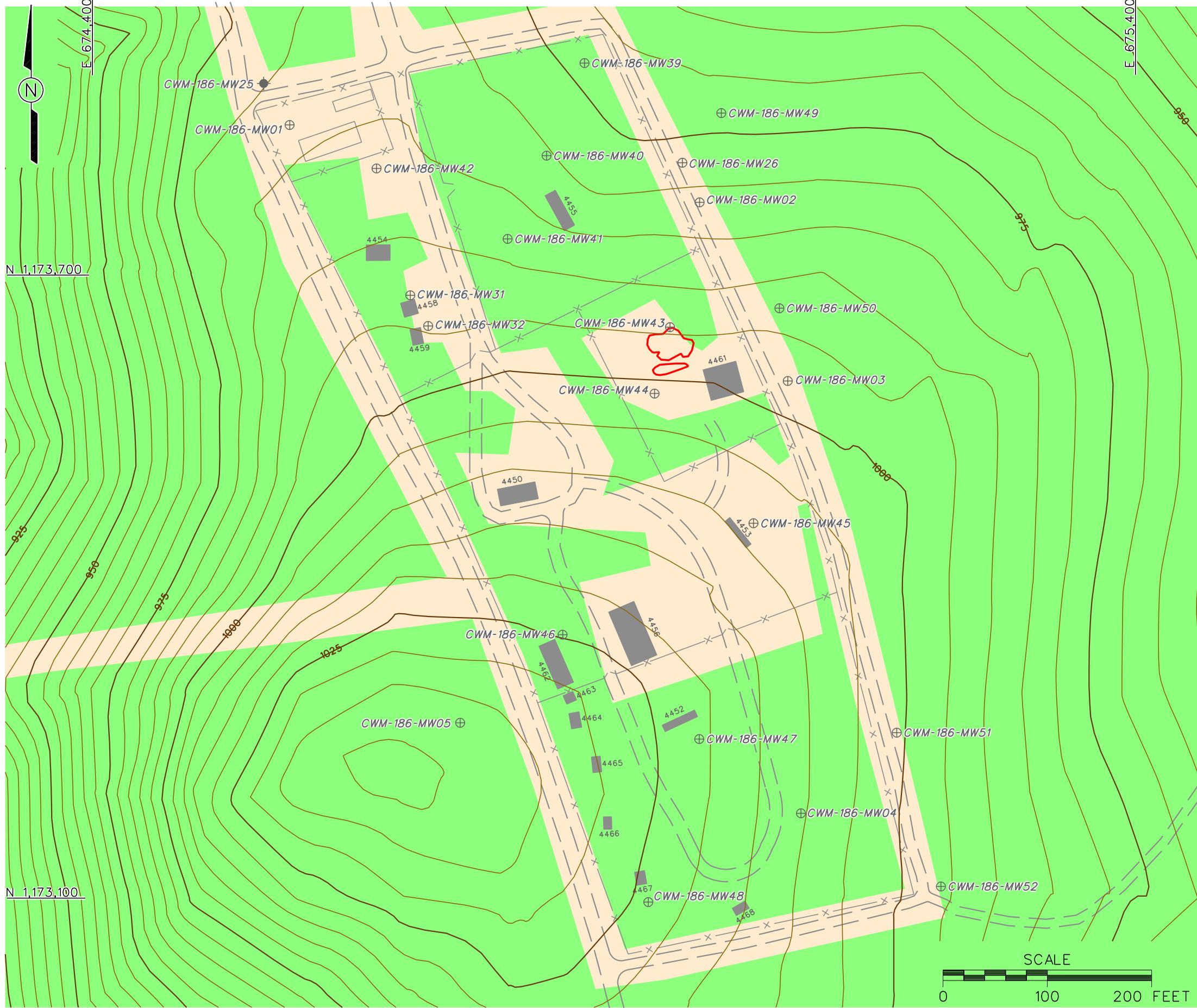
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- PAVED ROADS
- BUILDING
- PARCEL BOUNDARY
- WOODED
- SURFACE DRAINAGE / CREEK
- FENCE

FIGURE 1-1
AREA MAP
TRAINING AREA T-38
FORMER TECHNICAL ESCORT
REACTION AREA, PARCEL 186(6)
AND TRAINING AREA T-24A
FORMER CHEMICAL MUNITIONS
DISPOSAL AREA, PARCEL 187(7)

U. S. ARMY CORPS OF ENGINEERS
 MOBILE DISTRICT
 FORT McCLELLAN
 CALHOUN COUNTY, ALABAMA
 Contract No. DACA21-96-D-0018

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 PROJ. MGR.: J. YACOUB
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 ENGR. CHECK. BY: S. MORAN
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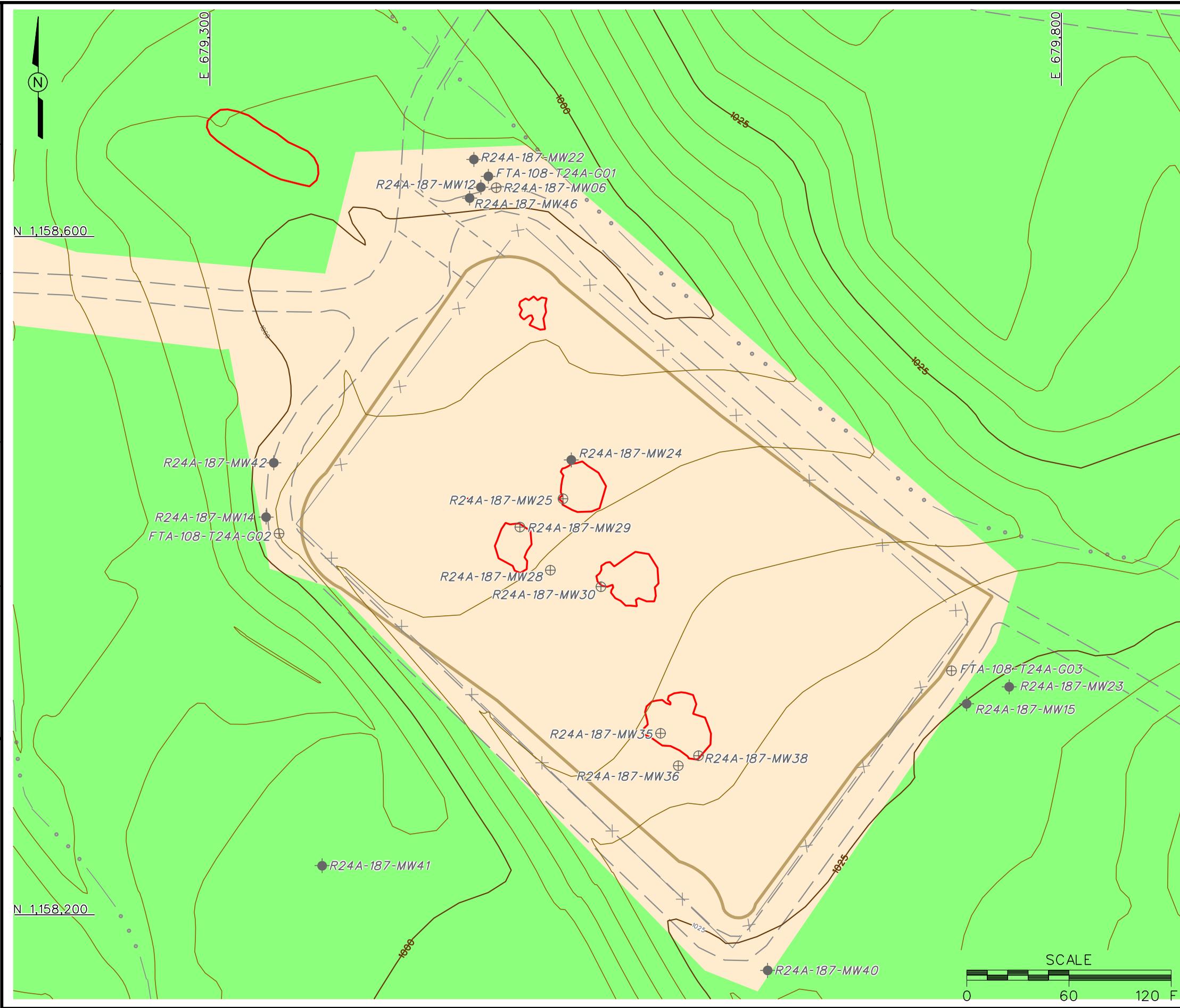
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 - PAVED ROADS
 - BUILDING / CONCRETE PAD / SHELTER
 - TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
 - WOODED
 - FENCE
 - DISPOSAL PITS
 - BEDROCK MONITORING WELL LOCATION
 - RESIDUUM MONITORING WELL LOCATION

FIGURE 1-2
SITE MAP
TRAINING AREA T-38
FORMER TECHNICAL ESCORT
REACTION AREA
PARCEL 186(6)

U. S. ARMY CORPS OF ENGINEERS
 MOBILE DISTRICT
 FORT McCLELLAN
 CALHOUN COUNTY, ALABAMA
 Contract No. DACA21-96-D-0018



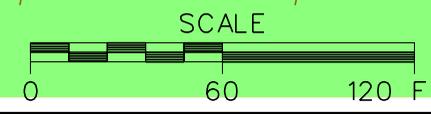
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- LEGEND**
- UNIMPROVED ROADS
 - PAVED ROADS
 - TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
 - PARCEL BOUNDARY
 - WOODED
 - SURFACE DRAINAGE / CREEK
 - FENCE
 - DISPOSAL PITS
 - BEDROCK MONITORING WELL LOCATION
 - RESIDUUM MONITORING WELL LOCATION

FIGURE 1-3
SITE MAP
 TRAINING AREA T-24A
 FORMER CHEMICAL MUNITIONS
 DISPOSAL AREA
 PARCEL 187(7)

U. S. ARMY CORPS OF ENGINEERS
 MOBILE DISTRICT
 FORT McCLELLAN
 CALHOUN COUNTY, ALABAMA
 Contract No. DACA21-96-D-0018



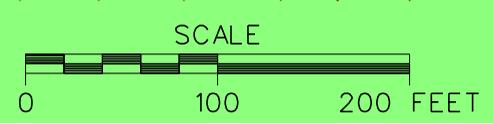
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 PROJ. MGR.: J. YACOUB
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 DATE LAST REV: 6/28/2005
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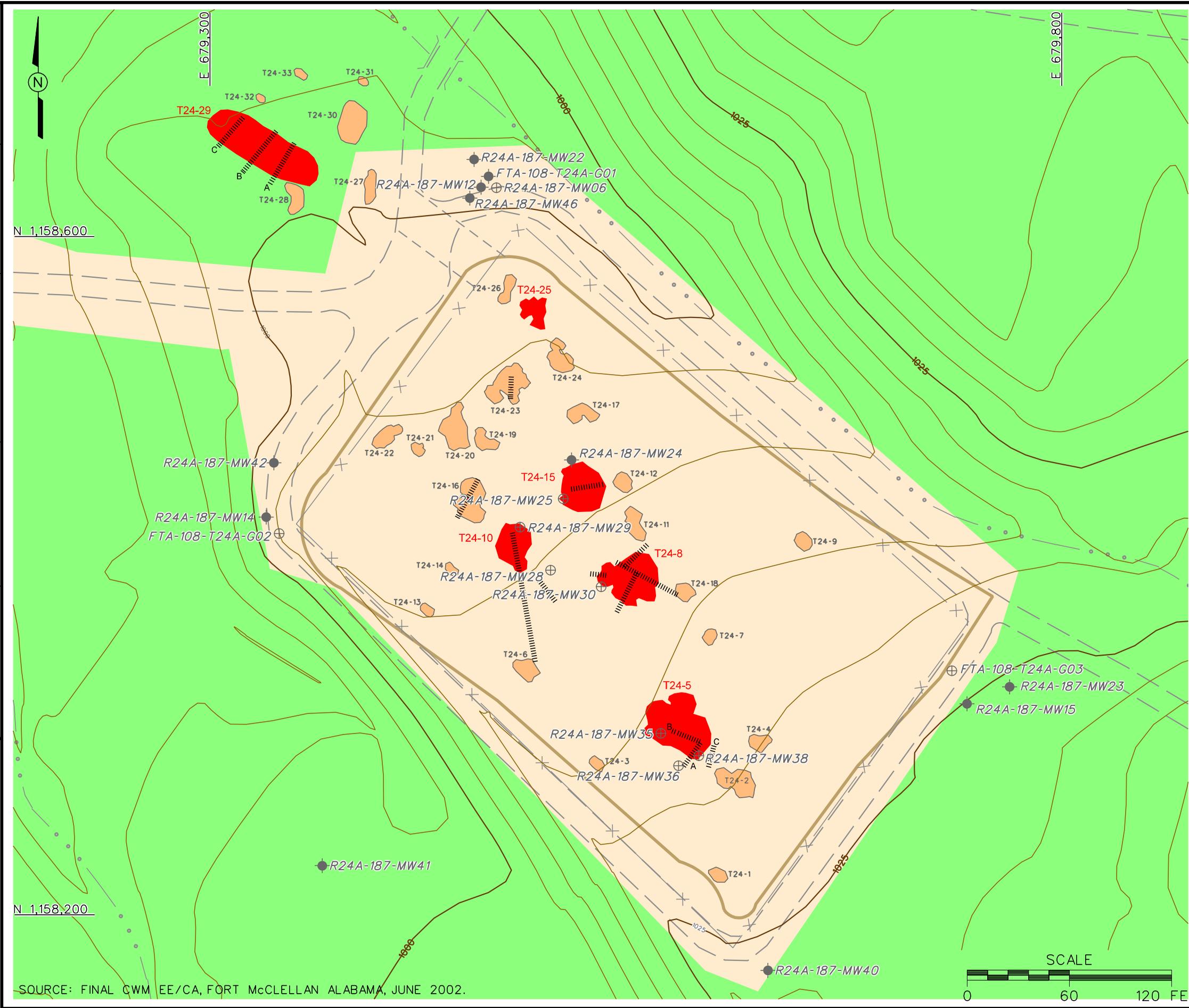
- LEGEND**
- UNIMPROVED ROADS
 - PAVED ROADS
 - BUILDING / CONCRETE PAD / SHELTER
 - TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
 - WOODED
 - FENCE
 - GEOPHYSICAL ANOMALY (PARSONS, 2002)
 - TRENCH (PARSONS, 2002)
 - ANOMALY IDENTIFIED FOR 3X SCRAP REMOVAL
 - BEDROCK MONITORING WELL LOCATION
 - RESIDUUM MONITORING WELL LOCATION

FIGURE 2-1
GEOPHYSICAL/TRENCHING MAP
TRAINING AREA T-38
FORMER TECHNICAL ESCORT
REACTION AREA
PARCEL 186(6)

U. S. ARMY CORPS OF ENGINEERS
 MOBILE DISTRICT
 FORT McCLELLAN
 CALHOUN COUNTY, ALABAMA
 Contract No. DACA21-96-D-0018



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 PROJ. MGR.: J. YACOUB
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 ENGR. CHECK. BY: S. MORAN
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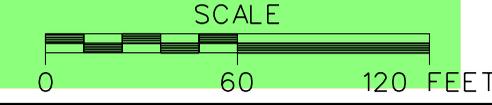


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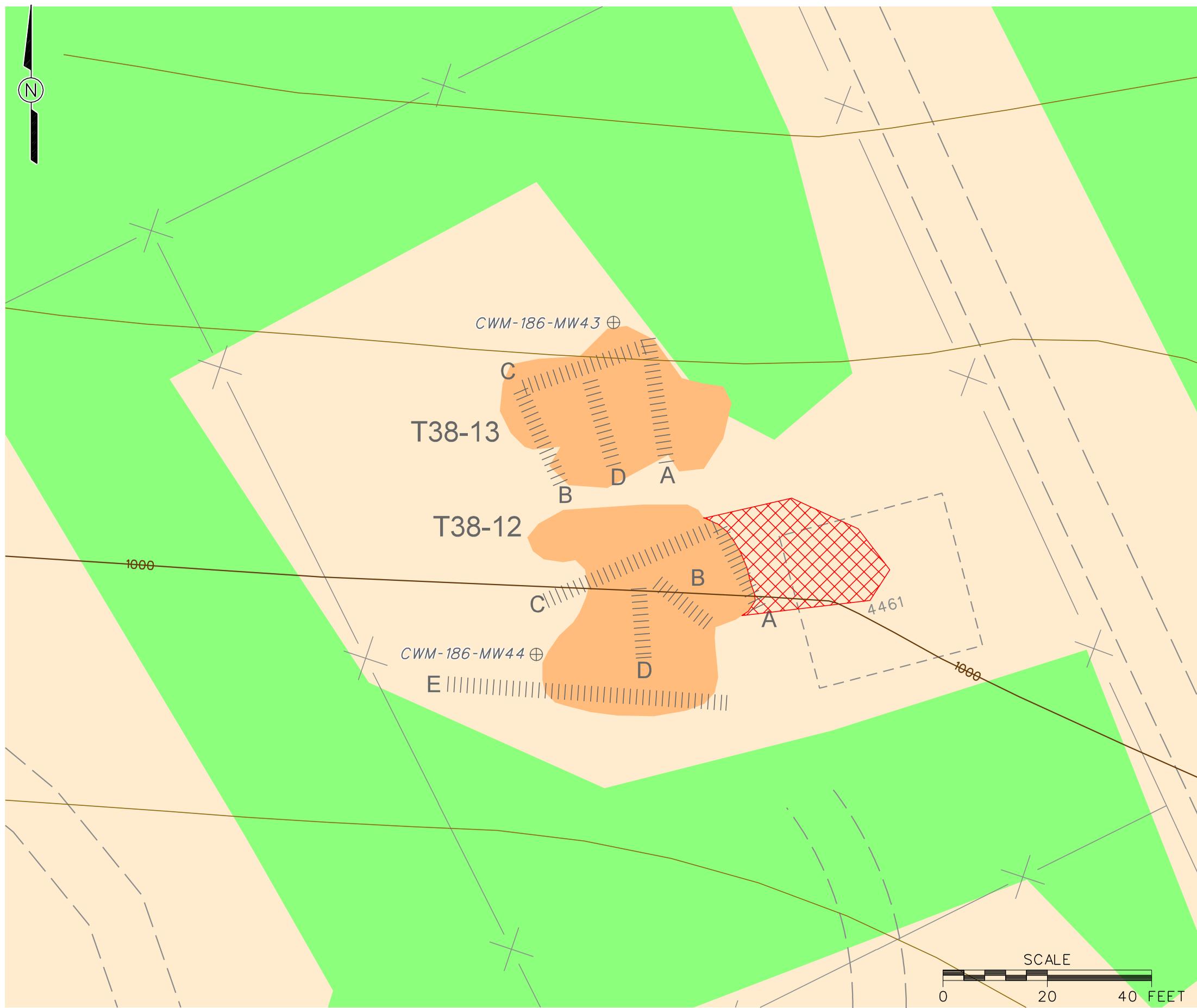
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- PAVED ROADS
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- PARCEL BOUNDARY
- WOODED
- SURFACE DRAINAGE / CREEK
- FENCE
- GEOPHYSICAL ANOMALY (PARSONS, 2002)
- TRENCH (PARSONS, 2002)
- ANOMALY IDENTIFIED FOR 3X SCRAP REMOVAL
- BEDROCK MONITORING WELL LOCATION
- RESIDUUM MONITORING WELL LOCATION

FIGURE 2-2
GEOPHYSICAL/TRENCHING MAP
TRAINING AREA T-24A
FORMER CHEMICAL MUNITIONS
DISPOSAL AREA
PARCEL 187(7)

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 MOBILE DISTRICT
 FORT McCLELLAN
 CALHOUN COUNTY, ALABAMA
 Contract No. DACA21-96-D-0018



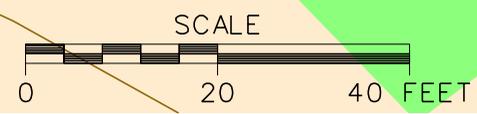
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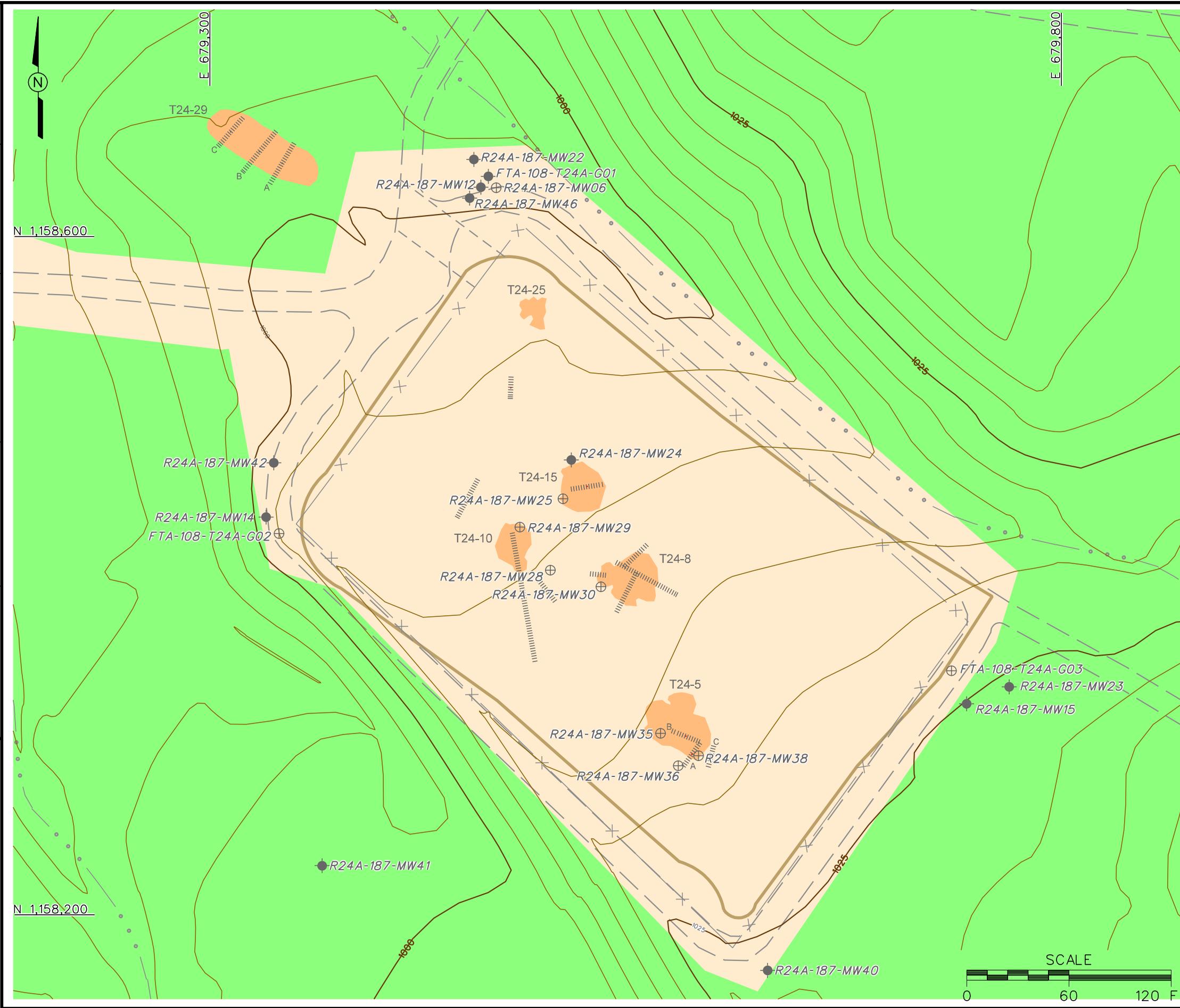
- LEGEND**
- UNIMPROVED ROADS
 - TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
 - WOODED
 - FORMER SHELTER LOCATION
 - FENCE
 - TRENCH (PARSONS, 2002)
 - EXCAVATED AREA
 - ADDITIONAL EXCAVATION AREA
 - RESIDUUM MONITORING WELL LOCATION

FIGURE 3-1
EXCAVATION MAP
TRAINING AREA T-38
FORMER TECHNICAL ESCORT
REACTION AREA
PARCEL 186(6)

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DWG. NO.: ... \796887es.873
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LEGEND	
	UNIMPROVED ROADS
	PAVED ROADS
	TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
	PARCEL BOUNDARY
	WOODED
	SURFACE DRAINAGE / CREEK
	FENCE
	TRENCH (PARSONS, 2002)
	EXCAVATED AREA
	BEDROCK MONITORING WELL LOCATION
	RESIDUUM MONITORING WELL LOCATION

FIGURE 3-2
EXCAVATION MAP
TRAINING AREA T-24A
FORMER CHEMICAL MUNITIONS
DISPOSAL AREA
PARCEL 187(7)

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 CALHOUN COUNTY, ALABAMA
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