CLOSURE REPORT
FOR OPEN BURN
AND OPEN DETONATION UNIT

FORT MCCLELLAN, ALABAMA

Prepared for:

U.S. Army Corps of Engineers
Mobile, Alabama

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August 2002

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ACRONYMS

ADEM	Alabama Department of Environmental Management
ASTM	American Society for Testing and Materials
BGS	Below Ground Surface
BRAC	Base Realignment and Closure
CFR	Code of Federal Regulations
COC	Chemical of Concern
COPC	Contaminant of Potential Concern
DAF	Dilution-Attenuation Factor
DOT	Department of Transportation
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
GPS	Global Positioning System
HI	Hazard Index
HMX	Cyclotetramethylenetetranitramine
HNu	Photoionization Detector
ILCR	Incremental Life Time Cancer Risk
MDC	Maximum Detected Concentration
MSL	Mean Sea Level
NEW	Net Explosive Weight
NFA	No Further Action
OB	Open Burn
OD	Open Detonation
PETN	Pentaerythritol Tetranitrate
ppm	parts per million
PVC	Polyvinyl Chloride
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
RDX	Cyclotrimethylenetrinitramine
RME	Reasonable Maximum Exposure
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan

ACRONYMS (CONTINUED)

SRA	Streamlined Risk Assessment
SSDAF	Site-Specific Dilution-Attenuation Factor
SSSL	Site-Specific Screening Level
SSSSL	Site-Specific Soil Screening Level
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leaching Procedure
TCM	Transport Conceptual Model
TNT	Trinitrotoluene
UBR	Upper Background Range
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

Fort McClellan has operated as a U.S. Army training installation and consists of 45,679 acres centrally located in Calhoun County, Alabama, adjacent to the City of Anniston, and along Alabama Highway 21. The installation covers 71.4 square miles and includes two main parcels of government-owned land, the Main Post and Pelham Range. The open burn (OB) and open detonation (OD) activities, which are the subject of this Closure Report, are located on Pelham Range. Fort McClellan was placed on the Base Realignment and Closure (BRAC) list and has begun to transfer property to other entities. However, Pelham Range will continue to be used and owned by the U.S. Government, but licensed to the Alabama Army National Guard.

Pelham Range is located in a rural setting approximately 5 miles due west of the Main Post and 0.5 mile west of U.S. 431. The range consists of approximately 22,000 acres located north of and adjoining Anniston Army Depot. Pelham Range is utilized as a multi-purpose firing and training range. Firing ranges, training and maneuver areas, bivouac sites, and maintenance facilities are located on the range.

The Resource Conservation and Recovery Act (RCRA) interim status treatment unit has been identified on Pelham Range, centrally located within the Large Impact Area (Unit 2). Unit 2 includes OB and OD areas (Site 2A, Site 2B, and Site 2C). The OB and OD treatment unit has operated as a RCRA interim status permitted miscellaneous treatment unit since November 1988. The Part B permit application was submitted in November 1988; therefore, the unit is considered an interim status facility. In preparing this document for the treatment unit's closure, Fort McClellan personnel discovered an Environmental Assessment for a Demolition Training Area. The coordinates for that training area turned out to be the coordinates that personnel used in preparing the initial interim RCRA status permit (referred to as Unit 1 in the August 1999 Closure Plan). By comparing photos from the initial submission, Fort McClellan, COE, and contractor personnel determined that the location of the treatment unit was located inside the Large Impact Area (referred to as Unit 2). Alabama Department of Environmental Management (ADEM) advised Transition Force, U.S. Army Garrison to submit the change of location coordinates to update the interim permit prior to asking for permit closure. This revision to the permit was approved by ADEM in June 2002.

A study conducted by the U.S. Army (HQTRADOC 1995) determined that Fort McClellan's OB and OD unit (at Pelham Range) was not economical to operate due to the small quantities of munitions being treated. As a result of this determination, Fort McClellan is closing the unit in accordance with RCRA interim status regulations. This Closure Report is based on the Alabama interim status closure requirements for hazardous waste treatment units.

In the August 1999 Closure Plan approved by the ADEM, Fort McClellan planned to clean close the unit commensurate with the surrounding land use. The surrounding land consist of the Large Impact Area and Pelham Range, which will continue to be utilized for military training. Due to the potential presence of unexploded ordnance and training activities, the Large Impact Area at Pelham Range is off-limits to the public at all times. The primary goal of this closure report is to demonstrate compliance with the performance standards outlined in the August 1999 Closure Plan through sampling and analysis performed in July – September 2001, which is described in Sections 7.0 and 8.0, and then proceed with administrative clean closure based on ADEM's acceptance of this report.

Surface water, groundwater, drainage sediments, and subsurface and surface soils were sampled to confirm that the media associated with the three sites is free of contamination (i.e., levels below the closure performance standards). Three shallow monitoring wells were installed and sampled at each site. Surface soils were extensively field-screened for contamination by establishing a sampling grid over the general area of each site. The surface soil associated with pits and trenches at each site were also field screened. Surface and subsurface soil samples were submitted for laboratory analysis based on the results of the surface soil field screening (for positive and negative confirmation). Surface water and sediment samples were collected from the surface drainage features associated with one of the sites (Site 2A). Laboratory analysis consisted of Target Analyte List metals, volatile organic compounds, semivolatile organic compounds, and explosive constituent analysis as specified in the July 2001 Sampling and Analysis Plan.

The closure performance standards presented in the August 1999 Closure Plan were based on the streamlined risk assessment (SRA) developed for the installation's BRAC

requirements and presented in the Installation-Wide Work Plan (International Technology Corporation 2002). The SRA required comparison of sample results to available background concentrations and site-specific screening levels (SSSLs). The SRA includes SSSLs for all media and potential exposure scenarios. The performance standards and SRA are further detailed in this Closure Report.

Based on the results of the SRA and the future land use for Pelham Range, the closure performance standards for this unit have been met with no closure or post-closure activities required. This unit is recommended for administrative clean closure.

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1.0 FACILITY IDENTIFICATION

Fort McClellan has operated as a U.S. Army training installation and consists of 45,679 acres centrally located in Calhoun County, Alabama, adjacent to the City of Anniston, and along Alabama Highway 21. The installation covers 71.4 square miles and includes two main parcels of government-owned land, the Main Post and Pelham Range. The open burn (OB) and open detonation (OD) activities, which are the subject of this Closure Report, were located on Pelham Range. Fort McClellan was placed on the Base Realignment and Closure (BRAC) list and was closed in 1999 and has begun transfer of property to other entities. However, Pelham Range will continue to be used and owned by the U.S. Government, but licensed to the Alabama Army National Guard.

One Resource Conservation and Recovery Act (RCRA) interim status treatment unit has been identified on Pelham Range. The unit located inside the Large Impact Area (Unit 2) includes OB and OD areas (Site 2A, Site 2B, and Site 2C).

A study conducted by the U.S. Army (HQTRADOC 1995) determined that Fort McClellan's OB and OD unit (at Pelham Range) was not economical to operate due to the small quantities of munitions being treated. As a result of this determination, Fort McClellan is closing all units in accordance with RCRA interim status regulations. This Closure Report is based on the Alabama interim status closure requirements for hazardous waste treatment units.

In the August 1999 Closure Plan approved by the Alabama Department of Environmental Management (ADEM), Fort McClellan planned to close the unit commensurate with the surrounding land use. The surrounding land consist of the Large Impact Area and Pelham Range, which will continue to be utilized for military training. Due to the potential presence of unexploded ordnance (UXO) and training activities, the Large Impact Area at Pelham Range is off-limits to the public at all times. The primary goal of this closure report is to demonstrate compliance with the performance standards outlined in the August 1999 Closure Plan through sampling and analysis performed in July – September 2001, which is described in Sections 7.0 and 8.0, and then proceed with administrative clean closure based on ADEM's acceptance of this report.

A.	**Facility Name:**	Fort McClellan OB and OD RCRA interim status treatment unit on Pelham Range Fort McClellan, Alabama
B.	**U.S. Environmental Protection Agency (EPA) ID Number:**	AL 8213700000
C.	**Facility Address:**	Pelham Range U.S. 431 North Anniston, AL 36201
D.	**Mailing Address:**	U.S. Army Garrison Task Force Attn: ATZN-ENV 291 Jimmy Parks Boulevard Fort McClellan, AL 36205-5000
E.	**Contact Person:**	Mr. Ronald M. Levy Fort McClellan U.S. Army Garrison Task Force (256) 848-3539
F.	**Facility Operator:**	Fort McClellan, AL Pelham Range
G.	**Owner:**	Fort McClellan Real Property
H.	**Preparer of Closure Report:**	Prepared for Fort McClellan under contract to the U.S. Army Corps of Engineers (USACE), Mobile District by URS Corporation

I. Nature of Business:

Fort McClellan was a U.S. Army training installation centrally located in Calhoun County, Alabama, that included two main parcels of government-owned land, the Main Post and Pelham Range. The Main Post encompassed approximately 19,000 acres, which included a cantonment area, ranges, training areas, and bivouac sites. Pelham Range was used as a multi-purpose firing and training range that also included training and maneuver areas, bivouac sites, and maintenance facilities. OB and OD treatment activities were conducted at Pelham Range within the Large Impact Area. Fort McClellan was placed on the BRAC list and has begun transfer of property to other entities. However, Pelham Range and portions of the Main Post will remain under Department of Defense ownership, but will be licensed to the Alabama Army National Guard.

J. Environmental Permits:

The OB and OD treatment unit has operated as a RCRA interim status permitted miscellaneous treatment unit since November 1988. The Part B permit application was submitted in November 1988; therefore, the unit is considered an interim status facility. In preparing this document for the treatment unit's closure, Fort McClellan personnel discovered an Environmental Assessment for a Demolition Training Area. The coordinates for that training area turned out to be the coordinates that personnel used in preparing the initial interim RCRA status permit (referred to as Unit 1 in the August 1999 Closure Plan). By comparing photos from the initial submission, Fort McClellan, COE, and contractor personnel determined that the location of the treatment unit was located inside the Large Impact Area (referred to as Unit 2). ADEM advised Transition Force, U.S. Army Garrison to submit the change of location coordinates to update the interim permit prior to asking for permit closure. This revision to the permit was approved by ADEM in June 2002.

K. Certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those directly responsible for gathering the information is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Ronald M. Levy
BRAC Environmental Coordinator

9 August 2002
Date Signed

Michael J. Stiefermann, P.E.
URS Corporation

ALABAMA REGISTERED No. 20013 PROFESSIONAL ENGINEER MICHAEL L. STIEFERMANN

8/5/02
Date Signed

2.0 FACILITY DESCRIPTION

This section provides a general description of Fort McClellan, Alabama, and the facility that contains the unit, Pelham Range, in accordance with the interim status closure plan requirements in ADEM Chapter 335-14-6 and following the guidance in the *RCRA Closure Handbook*, 13 February 1997.

Information provided in this Closure Report is consistent with the 1988 Part B Permit Application, as amended. Other sources of information include the Fort McClellan Environmental Baseline Survey (Environmental Science & Engineering 1998) and the Final Environmental Impact Statement (Parsons Engineering and Science 1998).

2.1 Size and Location

Fort McClellan is a U.S. Army training installation centrally located in Calhoun County, Alabama, adjacent to the City of Anniston, and along Alabama Highway 21. The installation covers 71.4 square miles and includes two main parcels of government-owned land (see Figures A-1 and A-2 in Appendix A). The first parcel, the Main Post, adjoins the City of Anniston, and extends 6 miles to the northeast toward Jacksonville, Alabama, along the Choccolocco Mountain Range. The Main Post includes a cantonment area, ranges, training areas, and bivouac sites. The second parcel, Pelham Range, is located in a rural setting approximately 5 miles due west of the Main Post and 0.5 mile west of U.S. 431. Pelham Range also adjoins Anniston Army Depot to the south.

Pelham Range consists of approximately 22,000 acres and was utilized as a multi-purpose firing and training range. Ranges, training and maneuver areas, bivouac sites, and maintenance facilities are located on Pelham Range. OB and OD activities, which are the subject of this Closure Report, were conducted on Pelham Range at the locations depicted in Figure A-3. The unit is described in detail in Section 3 of this plan. There are no other regulated units on Pelham Range.

2.2 Topographic Map

A review of the Environmental Baseline Survey (Environmental Science & Engineering 1998) and Final Environmental Impact Statement (Parsons Engineering and Science 1998) reveals minimal environmental data specific to the RCRA interim status treatment unit delineated. However, some general data were available for Pelham Range in these sources. Pelham Range and all but the easternmost portion of Fort McClellan lie within the Valley and Ridge physiographic province of the Appalachian Highlands. Topographic relief at Pelham Range is approximately 445 ft. The minimum elevation is 500 ft above mean sea level (MSL), which occurs at the exit of Cane Creek from Pelham Range. The maximum elevation is 945 ft above MSL, near the southeastern boundary of Pelham Range. The northern portion contains broad rolling topography capped with isolated round knobs rising 75 to 90 ft above the surrounding terrain of Pelham Range. A large, relatively flat area called the Battle Drill Area is situated near the western boundary of Pelham Range. In addition, Calhoun County is not listed in ADEM 335-14-5 Appendix VI as political jurisdictions that must demonstrate compliance with seismic standards specified in ADEM 335-14-8-.02(5)(b)11(I) and (ii). Due to the size of Pelham Range, the following figures are included in Appendix A (from the August 1999 Closure Plan) to meet the requirements of ADEM 335-14-8-.02(19) for a topographic map:

- Figure A-4 – Topographic Map for Pelham Range. Topographic map for Pelham Range and surrounding area (20 ft contour intervals with a scale of 1:25,000). The boundary of Pelham Range constitutes the boundary for the facility.
- Figure A-5 – Topographic Map for Area Surrounding the Unit. Topographic map that shows a portion of the Eulaton, Alabama, U.S. Geological Survey 7.5-minute quadrangle (10 ft contour intervals with a scale of 1:24,000).
- Figure A-6 – Flood Insurance Rate Map.
- Figure A-7 – Wind Rose for Birmingham, Alabama.
- Figure A-8 – Regional Geologic Map of Pelham Range.
- Figure A-9 – Natural Resource and Environmental Constraints for Pelham Range. Depicts endangered species and wetland areas for Pelham Range.

2.2.1 Surface Water Drainage – Pelham Range

Cane Creek and its tributaries (Remount, South Branch, and Ingram Creeks), originate on the Fort McClellan Main Post. Cane Creek then flows westward across the center of Pelham Range (see figures in Appendix A) and drains almost all of Pelham Range. Cane Creek is greater than 0.5 mile north of the RCRA interim status treatment unit. All surface water drainage from Fort McClellan and Pelham Range ultimately empties into the Coosa River. In addition, flood zones up to 2,500 ft wide traverse the central portion of Pelham Range along Cane Creek (1–1.5 miles north of the unit). However, the RCRA interim status treatment unit is not located within 1,000 ft of the 100-year floodplain (Figure A-6). Other surface water features that are found on Pelham Range include Lake Contreras, Cane Creek Lake, Willet Springs, and Blue Hole (Figure A-4). Table 2-1 provides a listing of surface waters used for potable water by regional municipalities. Surface water features in close proximity to each site are discussed in Section 2.2.2.

Table 2-1

Surface Waters Used for Potable Water in General Vicinity

Local Water Works	Location	Approximate Distance from Unit (miles)
City of Anniston	Cold Water Springs – 8 miles west of Anniston	7
	Hillabee Reservoir – 8 miles southwest of Anniston	11
	2 wells in central Oxford	13
Calhoun County	3 springs (Seven Springs, Webster's Chapel Spring, and Read's Mill Spring) – 15 miles north of Anniston	14

2.2.2 Surface Water Drainage – RCRA Interim Status Treatment Unit

Site surface features, surface drainage pathways, and other pertinent information specific to the RCRA interim status treatment unit were determined during site delineation (site visits conducted on 20 November 1996, 12 December 1996, and 22–23 April 1997). The RCRA interim status treatment unit identified on Pelham Range includes Unit 2, which is centrally located within the Large Impact Area (see Figure A-3 in Appendix A). A complete physical description of the unit (size and location) and site delineation activities are provided in Section 3.1.1. However, surface drainage features noted for each site within the treatment unit during site delineation are discussed below.

Three treatment areas (Sites 2A, 2B, and 2C) are associated with the Large Impact Area (Unit 2). Well-defined surface drainage pathways border Site 2A to the north (intermittent stream) and west. The drainage pathways lead north approximately 0.7 mile to Cane Creek. Site 2A has low and sparse vegetation throughout the site. No definable drainage pathways are associated with Site 2B. However, general surface drainage flows from southeast to northwest over the unit. Site 2B has low and dense vegetation. Likewise, no definable surface drainage pathways are associated with Site 2C. General surface drainage for this site flows from east to west across the area. Sparce vegetation and undergrowth surround Site 2C. Sites 2A, 2B, and 2C are depicted in Figure A-10.

2.2.3 Wetland Areas

No wetlands are found in the Unit 2 area.

2.2.4 Location of Injection and Withdrawal Wells

Currently, there are no permitted non-community water wells on Pelham Range. All drinking water sources on Pelham Range are connected to the city water supply. The non-permitted water wells are sometimes used for dust control and pond level control. Table 2-2 provides a listing of the non-community water wells located on Pelham Range. Figure A-5 shows the approximate location of the non-community water wells on Pelham Range. No other withdrawal or injection wells are located on the range.

Table 2-2

Water Supply Wells on Pelham Range

Facility	Location	Distance from Unit 2 (miles)	Status	Comment
P8203	SOT site – administration	3.2/3.0	Inactive	Non-potable
8607	SOT	3.2/3.0	Inactive	Non-potable
8802	Rideout Hall	3.2/2.1	Inactive	Non-potable
PR8415	Range 57	4.1/4.7	Inactive	Non-potable
8405	UTES	3.9/4.3	Abandoned	Potable water well closed.

Source: Environmental Science & Engineering 1998.

A report provided by the Geological Survey of Alabama (Groundwater Availability in Calhoun County, Alabama, Special Map 228) indicates that no injection or withdrawal wells are within 1,000 ft of the perimeter of Pelham Range.

2.3 Regional Geologic and Hydrogeologic Conditions

A review of the Environmental Baseline Survey and Final Environmental Impact Statement revealed minimal environmental data specific to the OB and OD unit. However, some general data are available for Pelham Range. Science Applications International Corporation (SAIC) summarized the regional geologic and hydrogeologic conditions in the Fort McClellan area in a Site Investigation Report (SAIC 1993).

2.3.1 Regional Geology

Fort McClellan and Pelham Range lie within the Appalachian fold and thrust belt where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. Geologic contacts in this region generally strike parallel to the faults, and repetition of the lithologic units is common in vertical sequences. Geologic formations within Fort McClellan and Pelham Range vary in age from Precambrian to Mississippian as shown in Figure A-8 of Appendix A. On the eastern boundary of Fort McClellan, Talladega Slate crops out in a narrow band between the county line and the easternmost exposure of the Paleozoic rocks (SAIC 1993).

The Cambrian Shady Dolomite overlies the Weisner Formation east and south of Fort McClellan and consists of interlayered limestone and dolomite. The Cambrian Rome Formation is composed of red and green shale and siltstone with thinly interbedded light gray sandstone and calcareous layers. The Conasauga Formation comprises the uppermost Cambrian unit and occurs northwest and southwest of Fort McClellan. The Conasauga formation is composed of interbedded limestone and dolomite with interbedded shale (SAIC 1993).

Overlying the Conasauga Formation is the Knox Group, composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group carbonates

underlie a large portion of the Pelham Range area. The Knox Group is overlain by Ordovician limestone and shale formations, including the Newala and Longview Limestones, Lenoir Limestone, Athens Shale, Little Oak Limestone, and Chickamauga Limestone. The limestone units underlie Pelham Range and occur in a narrow, northeast-southwest trending, thrust-fault bounded area underlain by Ordovician carbonates in the western portion of Pelham Range. The Frog Mountain Sandstone, of Devonian Age, is composed of sandstone and quartzitic sandstone and locally occurs in the western portion of Pelham Range (SAIC 1993).

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of claystone with increasing amounts of calcareous chert toward the upper portion of the formation. These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian Age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone (SAIC 1993).

2.3.2 Regional Hydrogeology

The Environmental Baseline Survey and Final Environmental Impact Statement indicate that groundwater typically moves west-northwest toward the Coosa River, which is located approximately 5 miles west of Pelham Range and the RCRA interim status treatment unit. The depth to the water table at Pelham Range is reportedly between 0.4 and 73 ft below ground surface (BGS), with an average depth of 34 ft BGS.

The dolomites of Pelham Range typically provide adequate groundwater and yield springs at fractures or solution channels. The Pelham Faults enter the Range near Gate 6 (north) and along Brook Mountain and exit on the southwestern boundary. A wedge of Consuaga underlies 2.5 miles of Cane Creek at its eastern entrance to Pelham Range, and several large springs occur in this general vicinity, both on and off government property (SAIC 1993).

2.4 Weather and Climate Conditions

Fort McClellan and Pelham Range are situated in a temperate climate. Summers are hot and long, and winters are usually short and mild to moderately cold. The climate is influenced by frontal systems moving from northwest to southeast, and temperatures change rapidly from warm to cool due to the inflow of northern air. The average annual temperature is 63°F. Summer temperatures usually reach 90°F or higher about 70 days/year, but temperatures above 100°F are rare. Freezing temperatures are common but are usually of short duration. The first frost may arrive by late October. The average date of the first 32°F temperature is November 6, and the last is March 30. This provides a growing season of 221 days. Snowfall averages 0.5–1 in. On rare occasions, several inches of snow accumulate from a single storm.

The average rainfall is about 53 in. and is well distributed throughout the year. The more intense rains usually occur during the warmer months, and some flooding occurs nearly every year. Drought conditions are rare. Approximately 80% of the flood-producing storms are of the frontal type and occur in the winter and spring, lasting from 2 to 4 days each. Summer storms are usually thunderstorms with intense precipitation over small areas, and these sometimes result in serious local floods. Occasionally, several wet years or dry years occur in series. Annual rainfall records indicate no characteristic order or pattern.

Winds in the Fort McClellan and Pelham Range areas are seldom strong and frequently flow down the valley from the northeast. However, there is no truly persistent wind direction. Most of the time, only light breezes or calm prevail, except during passages of cyclonic disturbances, when destructive local wind storms develop, some into tornadoes, with winds of 100 miles/hour or more (Environmental Science & Engineering 1998). Figure A-7 is a wind rose of 1985–1989 wind conditions for the Birmingham, Alabama area (SAIC 1993). Northeast winds occur most frequently.

2.5 Threatened or Endangered Species

Two endangered and one threatened species have been identified to inhabit Pelham Range. The two endangered species that have been found on Pelham Range are:

- The gray bat (*Myotis grisescens*) and
- Tennessee yellow-eyed grass (*Xyris tennesseensis*).

The threatened species found on Pelham Range is:

- Mohr's barbara buttons (*Marshallia mohrii*).

Figure A-9 shows the location of Tennessee yellow-eyed grass and Mohr's barbara buttons on Pelham Range. The Tennessee yellow-eyed grass is found at Lloyd's Chapel and at the Willet Springs area. Lloyd's Chapel is located along the eastern boundary of Pelham Range approximately 5 miles east of the unit. Willet Springs is approximately 1.5 miles northeast of the unit. Mohr's barbara buttons are located approximately 1.5 miles west of Unit 2 near the western border of the Large Impact Area. These sensitive areas will not be affected by closure activities.

All surface waters on Pelham Range have been designated as potential habitat for the gray bat. Stream and intermittent streams on Pelham Range have been designated as either high, moderate, or low quality habitat. Cane Creek, which is located north of the unit and the Large Impact Area (Figure A-4), is considered a high quality habitat. Two tributaries of Cane Creek located south of Cane Creek and outside the western and eastern border of the Large Impact Area (Figure A-4) are considered moderate quality habitat. The tributary to Cane Creek, which is oriented north to south in the center of the Large Impact Area, has portions of moderate and low quality habitat. Approximately the first 2,000 ft of the northern portion of this stream is considered moderate quality habitat. The remaining portions of the stream and associated intermittent streams, which are in close proximity to Unit 2, are considered low quality habitat. These sensitive areas will not be affected by closure activities.

3.0 FACILITY DESIGN

This section provides a detailed description of the identified OB and OD treatment unit and its design and operation, a list of the wastes treated at the unit, and a summary of waste characteristics. During the active life of the unit from 1983 to 1996, the unit was used for waste treatment and was not used for storage or disposal of hazardous waste. Operational features cited in the permit application and standard procedures that limit the likelihood of media contamination include:

- Off-site storage of the Condition Code H ammunition prior to treatment;
- Transport of the Condition Code H ammunition to the treatment unit on the day of treatment;
- Complete waste destruction during the operational period, including re-treatment when required;
- Inspection of the surrounding area after each OB or OD event to ensure that untreated military munitions waste did not "kick out" in the treatment processes; and
- Limiting use of the treatment areas to periods with minimal winds and no precipitation.

A detailed description of the unit and wastes treated is provided in Sections 3.1 and 3.2.

3.1 Description of the Hazardous Waste Management Unit

3.1.1 Size and Dimensions

In an effort to obtain pertinent data and information on the RCRA interim status treatment activities at Pelham Range, the following site delineation activities were performed:

- Available data were collected from November 1996 to present, including environmental studies, permit application, maps, historical records, and aerial photographs;
- Site visits to Unit 2, Site 2A were performed on 20 November 1996 and 22–23 April 1997;

- Personnel interviews were conducted between November 1996 and April 1997 with environmental staff, past and present Explosive Ordnance Disposal (EOD) personnel, and Range Control; and
- A site visit to Unit 2, Sites 2B and 2C was performed on 22–23 April 1997.

As mentioned previously, site delineation identified one RCRA interim status treatment unit on Pelham Range. Unit 2 is centrally located within the Large Impact Area (Figure A-3). Unit 2 (Figure A-10) includes the area most recently used for OD (Site 2A) and an area identified by EOD personnel that was utilized for OB and OD (Site 2B). Unit 2 also includes an area that was visually identified during site delineation due to the presence of demolition pits and a trench (Site 2C). Unit 2 is located in Township 15 South and Range 6 East at latitude 33° 42′ 50″ and longitude 85° 58′ 21″. Approximate dates of operation are:

- 1983–1991 – Site 2B and/or Site 2C
- 1991–1997 – Site 2A

Site Description for Unit 2: OB and OD Unit Inside the Large Impact Area of Pelham Range

Three areas within the Large Impact Area were identified as OB and OD sites during site delineation. The areas from west to east include an OD area (Site 2A), OB and OD area near an unnamed crossroads (Site 2B), and an old target area in the Large Impact Area (Site 2C). Each site is discussed in detail below. Figure A-10 in Appendix A shows the locations of the OB and/or OD sites within the Large Impact Area.

Site 2A—EOD personnel indicated that Site 2A was used only for OD. The perimeter of the area (0.3 acre) and pit locations were delineated by Global Positioning System (GPS) survey during the 22–23 April 1997 site visit (Figure A-11). Nine of the pits shown in Figure A-11 were located by obtaining a GPS point on the northern perimeter of each pit, and six of the pits were delineated by walking around the perimeter and obtaining GPS points at regular intervals. The pits range from 4 to 20 ft in diameter and are 2 to 8 ft deep.

Figure A-11 also shows the location and orientation of photographs 1–5 for Site 2A. Figure A-12 provides photographs of Site 2A. Photographs 1–4 were taken from the southeast border of the site facing the northwest and provide a view of the entire site. Photograph 5 provides a view of a typical OD pit (Number 15).

Site 2B—The unit was used for OB and/or OD based on the permit application and interviews with EOD personnel. Surface debris, including 55-gal drums, ammunition boxes, small arms cartridges, pieces of wood crates, spent rocket motors, and miscellaneous metal fragments, were observed in the area during the 22–23 April 1997 site visit. However, the debris was removed during routine operation and maintenance activities for this area. The size of Site 2B is approximately 0.6 acre as determined by a GPS survey conducted during the 22–23 April 1997 site visit (Figure A-13). Seven pits were also delineated by GPS and range from 10 to 30 ft in diameter and are 3 to 10 ft deep. However, pits visually located in the southwest corner could not be accessed safely due to tall vegetation in this area at the time of the site visit. This area was cleared and delineated in more detail prior to sampling and closure activities (refer to Figure 7-2 for an updated site map).

Figure A-13 also shows the location and orientation of photographs 6–9 for Site 2B. Figure A-14 provides photographs of Site 2B. Photograph 6 shows pit B3 with water and debris present. Photographs 7–9 were taken from the access road facing the east side of the site and showing typical terrain.

Site 2C—Site 2C is a third area located within the Large Impact Area east of site 2B. The size of the area was determined to be approximately 0.2 acre by a GPS survey conducted during the 22–23 April 1997 site visit (Figure A-15). The site includes four demolition pits and a trench. The pits range from 15 to 30 ft in diameter and are 3 to 8 ft deep. Standing water was present in all the pits during the April 1997 site visit. The trench is approximately 40 ft long by 6 ft wide by 2 ft deep and did not contain any water. Ammunition cases, spent illumination cartridges, small arms cartridges, and spent mortar shells were also observed in the area. This site appears to be near an old target area. Several old targets and a large number of impact craters are visible around this location.

Figure A-15 also shows the location and orientation of photographs 10–13 for Site 2C. Figure A-16 provides photographs of Site 2C. Photograph 10 shows pit A4 and surrounding terrain. Photograph 11 shows a typical impact craters in this area. EOD personnel were able to distinguish between demolition pits and impact centers by size and the terrain immediately surrounding the pit (refer to Figure A-12, photograph 5, for a picture of a typical demolition pit). Photograph 12 shows a view of the trench located at Site 2C. Photograph 13 provides a view of pit A3 and surrounding terrain.

3.1.2 Design Capacity or Throughput

The OB and OD treatment unit operated under RCRA interim status since November 1988. Based on the permit application for Fort McClellan, the following parameters were permitted:

- Maximum permitted quantity per burn was 360 lb of munitions [total weight, not net explosive weight (NEW)].
- A maximum of 40 lb NEW (including initiating materials) could be destroyed per detonation.
- The permit application states that the destruction process (OB or OD) occurred five to six times annually.

General procedures for OD were to place the munitions on the ground, prime them with explosives and an initiator, and then detonate (treatment) the Code H munitions. After completion of the treatment event, the area was searched for any unexploded munitions and re-treatment occurred, if necessary. When conducting OB as described in the permit application, the EOD unit would place the Code H munitions in either a 55-gal drum, demolition pit, trench, ground, or other surface (not specified in the permit application or procedures) and pour fuel (i.e., gasoline and/or diesel fuel) over the waste. A donor charge was then used to initiate the burn (treatment). After the hazardous waste was treated and allowed to cool for 24 hours, re-treatment of any waste found untreated would occur.

3.1.3 Ancillary Equipment and Structures

No ancillary equipment or structures were used during either OB or OD treatment events. OD operations occurred directly on the ground surface, while OB operations were conducted on the ground or other surfaces, in demolition pits, in trenches, or in 55-gal drums.

No support buildings were used during treatment operations. After initiation of the detonation chain (OD) or the burn (OB), EOD personnel evacuated to a safe distance from the unit as prescribed in the Part B permit application. From this location they were able to provide direct visual oversight of the treatment events.

3.1.4 Types of Containment Systems

OD operations did not require containment systems. Site delineation activities revealed that OB was occasionally performed in drums, trenches, or demolition pits with no secondary containment. Additionally, OB was performed on the ground surface or other surfaces (old truck bed) without primary or secondary containment.

3.1.5 Drawings of Treatment Unit

Figures A-10 and A-16 show the layout of the OB and OD unit.

3.2 Types and Quantities of Hazardous Wastes

This section provides a summary of the wastes managed at the RCRA interim status treatment unit and discuss contaminants that may be present at the unit.

3.2.1 Hazardous Waste Management Unit

The areas delineated as Unit 2, Site 2A, Site 2B, and Site 2C are the only facilities addressed by this Closure Report.

3.2.2 Hazardous Waste Handled

The permit application prepared for the unit indicated that Class 1.4 (formerly Class C small arms) munitions and Classes 1.1, 1.2, or 1.3 munitions (formerly Class A and B) were allowed to be treated by OB or OD at the OB or OD unit. The thermal treatment process selected (OB or OD) was dependent on whether the munitions items principally contained propellants or pyrotechnics and explosively-inert materials or contained high explosives, respectively. Diesel fuel and scrap wood or dunnage were used to initiate OB treatment operations, and high explosive donor charges [e.g., C-4 or trinitrotoluene (TNT)] were typically used to initiate OD treatment operations. Waste military munitions (formerly Condition Code H munitions items) were generated as a result of their being rejected by munitions inspectors during routine munitions inspection and maintenance operations. Once designated as such they were managed as a RCRA hazardous waste. Examples of unserviceable waste military munitions include those deteriorated or damaged or those whose shelf lives had expired. All wastes treated at the OB and OD unit came from the Fort McClellan ammunition supply point. Table 3-1 provides the primary chemical compositions and the applicable hazardous waste codes for the typical wastes treated there.

The major inert components of military munitions, including inert projectiles and shell casings, are metals and metal alloys (i.e., steel, aluminum, tin, and lead). Other inert components may include paper or plastic (e.g., the containers housing simulators and mines). The majority of the gross weight of a munitions item comes from the metal components. Energetic materials usually constitute less than half of the gross weight.

The energetic materials associated with military munitions constitute the reactive or explosive component of the items. The majority of munitions items are as classified RCRA reactive, hazardous waste code D003, as defined in 40 Code of Federal Regulations (CFR) 261.23. Some of these energetic compounds may also be hazardous due to their toxic constituents, such as nitrobenzene, which is listed in Table 1 of 40 CFR 264 as a toxicity characteristic contaminant, and lead azide (detonating compound for high explosives), lead thiocyanate (small arms primer), and barium nitrate (pyrotechnic compound). Four general

Table 3-1

Chemical Compositions of Typical Explosives Associated with OB and OD Operations

Explosive	Chemical Formula	Primary Hazardous Waste Code	Secondary Hazardous Waste Code
Primary Explosives			
Dizodinitrophenol	$C_6H_2N_4O_5$	D003	
Lead azide	N_6Pb (71% Pb)	D003	D008
Lead mononitroresorcinate	$C_6H_3O_2Pb$ (57.5% Pb)	D003	D008
Lead styphnate	$C_6HN_3O_8Pb$	D003	D008
Potassium dinitroxane	$C_6H_2N_4O_6K$	D003	
Tetracene	$C_{18}H_{12}$	D003	
Fuels			
Antimony sulfide	Sb_2S_5	D003	
Calcium silicide	$CaSi_2$	D003	D001
D003	$Pb(SCN)_2$ (64.5% Pb)	D003	D008
Oxidizers			
Ammonium perchlorate	NH_4ClO_4	D003	
Barium nitrate	BaN_2O_6	D003	D005
Potassium chlorate	$KclO_3$	D003	
Aliphatic Nitrate Esters			
1,1,1-Trimethylolethane trinitrate	$C_5H_9O_9N_3$	D003	
1,2,4-Butanetriol trinitrate	$C_4H_7N_3O_9$	D003	
Diethyleneglycol dinitrate	$C_4H_8N_2O_7$	D003	
Nitrocellulose	$C_{12}H_{16}(ONO_2)_4O_6$	D003	
Nitroglycerin	$C_3H_5N_3O_9$	D003	D001
Nitrostarch	$C_6H_8N_4O_2$	D003	
Pentaerythritol tetranitrate (PETN)	$C_5H_8N_4)_{12}$	D003	
Triethylene glycodinitrate	$C_6H_{12}O_4N_2O_4$	D003	
Nitramines			
2,4,6-Trinitrophenylmethylnitramine (tetryl)	$C_7H_5N_5O_5$	D003	
Cyclotetramethylenetetranitramine (HMX)	$C_4H_8N_8O_3$	D003	
Cyclotrimethylenetrinitramine (RDX)	$C_3H_6N_6O_6$	D003	
Nitroguanidine	$CH_4N_4O_2$	D003	
Nitroaromatics			
2,4,6-Trinitrotoluene (TNT)	$C_7H_5N_3O_6$	D003	
Hexanitrostilbenzene	$C_{12}H_2N_6O_{12}$	D003	
Ammonium nitrate	NH_4NO_3	D003	
Black Powder	$K(Na)NO_3$	D003	
Primary and Secondary Explosives			
Various compositions, including compositions A, B and C; ednatols, tetrytols, pentolite; tritonal; picratol; amatol; plastic bonded explosives; mil; high blast explosive; and military dynamite	Mixtures of the above chemicals	D003	P081, if the nitroglycerin is the sole active ingredient (e.g., detonation cord)
Propellants			
Mixtures of nitrocellulose, nitroglycerin, and nitroguanidine (designated as M-series propellants – single, double, and triple base)	Varies	D003	
Pyrotechnics			
Combinations of oxidizers, fuels and binding agents. Typical compositions included: • Oxidizers such as peroxides and perchlorates; • Fuels such as aluminum and magnesium; and • Binding agents such as resins, plastics, and color intensifiers.	Varies	Toxicity Characteristic Leaching Procedure (TCLP) metals possible due to color intensifiers and oxidizers (e.g., barium chlorate and barium chromate were both used and may indicate as toxic metals)	
Burn Products and Initiators			
Diesel and Motor Gasoline	Varies	D001	

classes of energetic materials, including propellants, pyrotechnic compositions, priming compositions, and high explosives, are discussed in Sections 3.2.2.1, 3.2.2.2, 3.2.2.3, and 3.2.2.4, respectively. Propellants, pyrotechnic compositions, and primers react by burning, producing large quantities of hot gasses and light. High explosive reactions are characterized by detonations.

3.2.2.1 Propellants

Propellant mixtures are typically classified as single-, double- or triple-based. They are designed to produce large quantities of hot gases and burn at a much slower rate than high explosives. Single-based propellants are composed mainly of nitrocellulose, double-based propellants are mixtures of nitrocellulose and nitroglycerin, and triple-based propellants are mixtures of nitrocellulose, nitroglycerin and nitroguanidine. These propellants are used in small arms and projectile ammunition, as well as the solid fuels of rockets and missiles. A number of miscellaneous chemical compounds are added to the propellant charge to control deflagration (i.e., burning) characteristics or to promote stability during storage. These additives include various nitrated organic compounds, petrolatum, metals, and metal salts. The additives incorporated into the propellant fuels generally account for 3% of the mixture and are oxidized during the deflagration reaction. For this reason, they are of minor consequence relative to their impact on the environment. All components of military propellants are in solid form and contain no free liquids.

3.2.2.2 Pyrotechnic Compositions

Pyrotechnic compositions are mixtures of fuel and oxidizing compounds that are designed to emit smoke and/or light. The fuels are usually metal powders, such as aluminum, manganese, titanium, or zirconium powder. Oxidizers may consist of metal nitrates, ammonium, metal perchlorates, chlorates, and peroxides. Secondary constituents also present in pyrotechnic mixtures are various binders, ignition agents, retardants, and colorants. A variety of chemical compounds are present in these additives. Typical minor components include black powder, chlorinated organics, waxes, sugar, asphalt, polyvinyl chloride, and vegetable oils. Military pyrotechnic compositions contain no free liquids. Thermal treatment of these compositions

generates gaseous combustion products and solid particulates. Examples of military munitions in this category include signal flares, smoke grenades, and other illumination devices.

3.2.2.3 Priming Compositions

Priming compositions are mixtures that are very sensitive to shock or friction and are used to provide a source of ignition for pyrotechnics, propellants, or explosives. Primers are a mixture of fuel, oxidizer, and explosive compounds. Typical fuels are antimony sulfide and lead thiocyanate; oxidizers include barium nitrate and potassium nitrate. The primary explosives are lead azide and lead styphnate.

3.2.2.4 High Explosives

High explosives are typically nitrated organic materials that generate large quantities of gaseous reaction products as a result of detonation. The most common high explosives are TNT, cyclotrimethylenetrinitramine (RDX), trinitrophenylmethylnitramine, cyclotetramethylenetetranitramine (HMX), and various combinations of these compounds. These are used in a variety of applications, including warheads, mines, grenades, fuses, boosters, artillery rounds, and similar military explosives. High explosive ordnance may have waxes or aluminum powder as additives. All constituents are in solid form.

3.2.3 EPA Hazardous Waste Codes

Table 3-1 summarized the primary explosives, initiators and other products potentially treated at the OB and OD unit, as well as their corresponding hazardous waste codes. The two hazardous waste codes found most often in explosives are D003 (characteristic reactive) and D008 (TCLP lead). In some cases, additional waste codes may apply due to initiators or other chemical added to the munitions. Typical examples of this are barium chromate, barium nitrate, and barium chlorate (D005) used in pyrotechnics to create a red color affect. Diesel fuel and gasoline (D001) are used as burn products and initiators. 1,2,3-Propanetriol, trinitrate (P081), and various compositions are used for primary and secondary explosives.

3.2.4 Quantities

Waste inventory/treatment records for the OB and OD unit are not available. However, the maximum, one-time explosive limit for OD was 40 lb NEW as stated in the 1988 Part B permit application. Treatment at the unit is reported to have involved primarily Class 1.4 (formerly Class C small arms) munitions and occasionally Classes 1.1, 1.2, or 1.3 ammunition (formerly Classes A and B). OB is described in the permit application as typically involving 360 lb total weight of small arms ammunition, diesel fuel, and scrap wood or dunnage per burn event. Approximately five to six OB or OD events were performed per year. Operations ceased at the OB/OD treatment unit in late 1996.

Based on these figures, the maximum quantity of munitions treated during the 9-year life of the interim status unit would have been approximately 1,440 lb NEW by OD and 6,480 lb NEW by OB. It is assumed that six treatment events occurred per year for 9 years, at the maximum allowable NEW for OB or OD, with four of the events completed as OD and two completed as OB per year.

3.2.5 Physical State

All wastes treated at the OB and OD treatment unit were solids. Except for the diesel fuel used to initiate the OB, no liquids were ever used or treated at the facility.

4.0 ESTIMATE AND MANAGEMENT OF MAXIMUM INVENTORY DURING CLOSURE

4.1 Maximum Inventory of Hazardous Wastes

4.1.1 Permitted Waste Capacity

Information on the permitted capacity and throughput based on the interim status permit are provided in Section 3.1.2. No wastes were stored on-site.

4.1.2 Contaminated Containment System

No containment system is associated with the unit, and no containment system will be necessary for closure of the unit.

4.1.3 Waste Generated During Closure

No waste was generated by the characterization activities described in this report. Management of wastes generated during sampling activities is discussed in Section 7.

4.1.4 Waste Generation Areas

This section is not applicable.

4.2 Management of Existing Inventory

4.2.1 On-Site Management

Waste munitions are not stored at the unit. Therefore, no on-site management is required. However, as part of the site investigation, a thorough EOD surface sweep of each area was conducted. When UXO was found during investigation and/or sampling activity, the Range Control Office was contacted and appropriate action(s) were taken.

4.2.2 Off-Site Management

Waste munitions are not stored at the unit. Therefore, off-site shipment, treatment, or disposal will not be conducted during closure.

4.3 Changes in Maximum Inventory

There will be no change in maximum inventory because hazardous wastes have never been stored at the unit. Since hazardous waste has never been stored at the unit, there is no inventory to increase or reduce.

4.3.1 Maximum Inventory Increase

This section is not applicable.

4.3.2 Maximum Inventory Reduction

This section is not applicable.

5.0 EQUIPMENT AND STRUCTURES DECONTAMINATION PROCEDURES

This section is not applicable. The unit does not contain any equipment or structures.

5.1 Identification of All Areas Requiring Decontamination

This section is not applicable.

5.2 Decontamination Procedures

This section is not applicable.

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6.0 CONFIRMATION SAMPLING PLAN FOR CONTAINMENT STRUCTURES, BUILDINGS, AND EQUIPMENT

This section is not applicable. No structures, buildings, or equipment are associated with the OB and OD treatment unit.

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7.0 REPORT OF SAMPLING AND ANALYSIS OF ENVIRONMENTAL MEDIA

This section reports an overview of the activities of the site characterization study performed at the three sites associated with the OB/OD unit located within the Large Impact Area at Fort McClellan, Pelham Range, Alabama, from 27 July through 19 September 2001. This study was conducted at the request of USACE Mobile District pursuant to Contract DACA01-95-D-0015 to attempt to demonstrate compliance with the closure performance standards for achieving administrative clean closure of the RCRA interim status OB/OD treatment unit within Pelham Range.

Results of the site characterization were used to determine whether administrative clean closure of RCRA interim status could be recommended for the OB/OD treatment unit. Section 8 of this report compares the closure performance standards and results of characterization. The site investigation activities followed the required site-specific project plans to include a Site Safety and Health Plan (URS 2001) and Sampling and Analysis Plan (SAP) (URS 2001).

7.1 Site Characterization Overview

Site characterization activities were conducted from 27 July through 19 September 2001. Groundwater monitoring well sampling was conducted on 16 through 19 September 2001, and surveying activities were conducted throughout the course of the site characterization.

The site characterization study was comprised of the following subtasks:

- Field screen surface soils within Sites 2A, 2B, and 2C to determine surface and subsurface soil sampling locations for laboratory analysis;
- Field screen surface soils within detonation craters located within Sites 2A, 2B, and 2C to determine surface soil sampling locations;
- Surface and subsurface soil sampling within Sites 2A, 2B, and 2C to determine the nature and extent of contamination (if any);

- Surface soil sampling within existing detonation craters within Sites 2A, 2B, and 2C to determine the nature and extent of contamination (if any);
- Sediment and surface water sampling adjacent to Site 2A;
- Install three piezometers to determine groundwater flow and direction;
- Install nine groundwater monitoring wells, three in each of the sites to determine the impact, if any, of past OB/OD activities on groundwater quality; and
- Surveying to develop a topographic map of each unit, and identify the locations of the piezometers, wells, sampling points, and other significant features of the sites.

Field activities were conducted in accordance with the SAP. Actual locations of the piezometers, wells, and sampling locations, however, may vary from those presented in the SAP due to reevaluation of actual site conditions.

All work was completed by URS and its subcontractors with support from Fort McClellan and USACE personnel. URS's UXO Escort Team provided support and performed all UXO associated activities (escort, anomaly avoidance, and vegetation clearance). Geotek Drilling Company of Knoxville, Tennessee, provided piezometer and monitoring well drilling and installation. Severn Trent Laboratories of Savannah, Georgia, completed chemical analyses. The site survey was conducted by Sain and Associates.

7.2 Field Program

This section describes the site characterization activities conducted and methods used to assess the presence of contamination at the three sites within Pelham Range.

7.2.1 UXO Sweep

In order to ensure the safety of the field crew, all entry requests to the site were coordinated with the Fort McClellan Health and Safety personnel and Range Control. URS's UXO-qualified personnel accompanied the field crew at all times. UXO personnel conducted vegetation clearing, surface magnetometer sweeps of all study areas, access routes and egress routes prior to deployment of the field crew to the site, and down-hole magnetometer support

during all drilling activities. Additionally, UXO personnel conducted soil sampling activities in areas where UXO was discovered. As a result of years of training activities involving the Large Impact Area on Pelham Range, numerous UXO were discovered on the surface and subsurface within the study area.

7.2.2 Soil Sampling

The scope of the soil sampling effort was to identify any contamination within each of the three sites at the surface and subsurface to a depth of 10 ft as a result of OB/OD activities. The sampling effort consisted of first field screening the surface soils within each unit to locate the highest elevated RDX, TNT, volatile organic compound (VOC), and Target Analyte List (TAL) metal concentrations to determine the sampling locations for laboratory analysis.

7.2.2.1 Grid Node Surface Soils

A 25-ft grid was surveyed over each of the three sites. Surface soil samples were collected from 0 to 1 ft BGS at each grid node within each unit and field screened for RDX and TNT utilizing Strategic Diagnostic Inc. EnSys test kits, TAL metals (Severn Trent Laboratories), and VOCs utilizing a photoionization detector (HNu) equipped with a 10.2-eV lamp. All surface soil samples were collected utilizing decontaminated stainless steel hand augers. Elevated field screening results were defined as (1) detectable levels greater than 1 part per million (ppm) for explosives, (2) metal concentrations above established background concentrations for Pelham Range, and (3) detectable levels greater than 1 ppm of total organic vapor. Grid node sampling locations for each area are shown in Figures 7-1 through 7-3. The field screening data were evaluated in the field to the criteria identified above. Ten grid nodes with the highest elevated results were chosen for surface and subsurface sampling locations within each area. The 10 elevated surface and subsurface soil grid node sampling locations for laboratory analysis are also shown in Figures 7-1 through 7-3. The field screening data indicated explosives and TAL metal elements in the surface soils above the screening criteria in each of the three sites. No VOCs were detected above 1 ppm.

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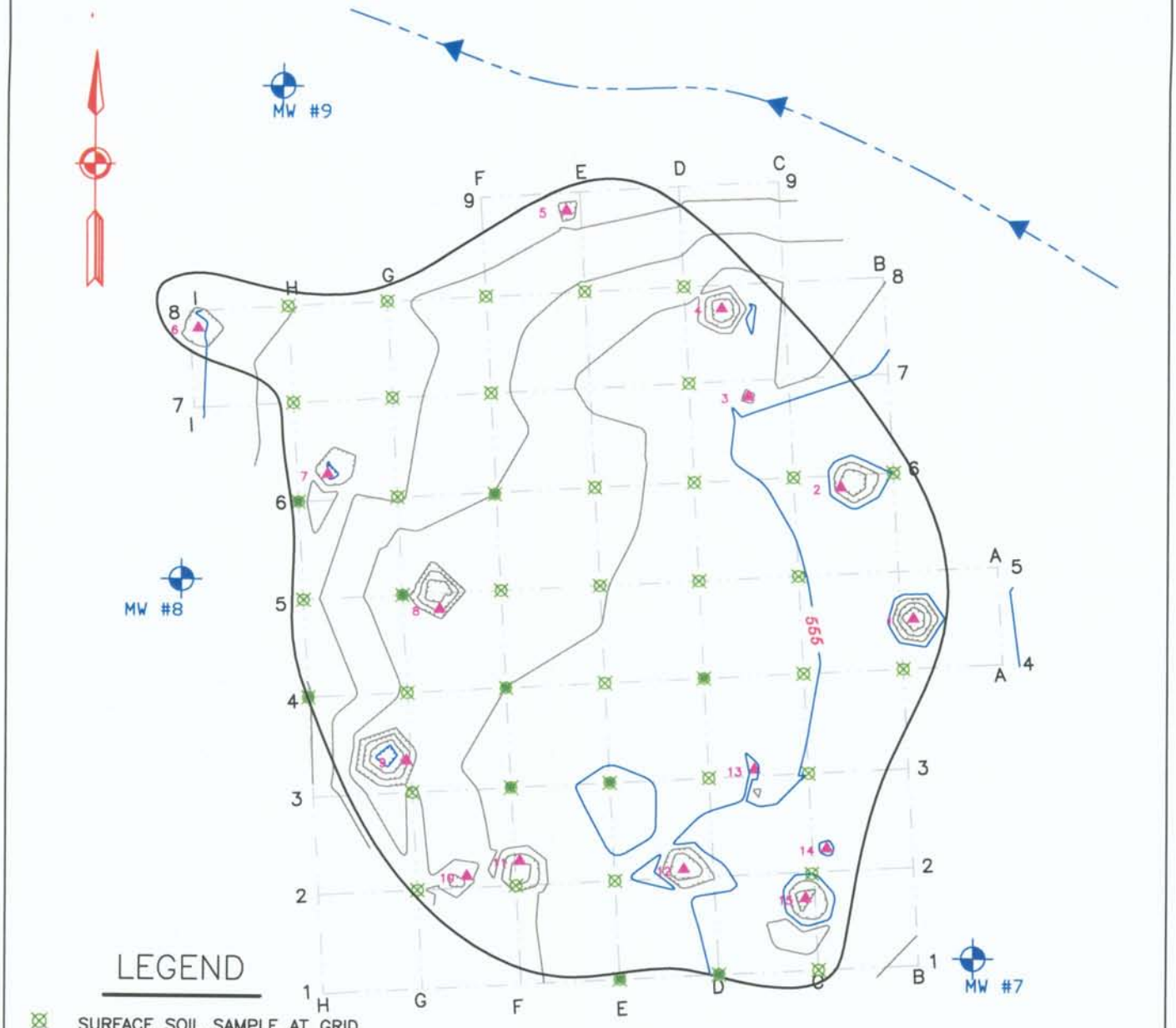


LEGEND

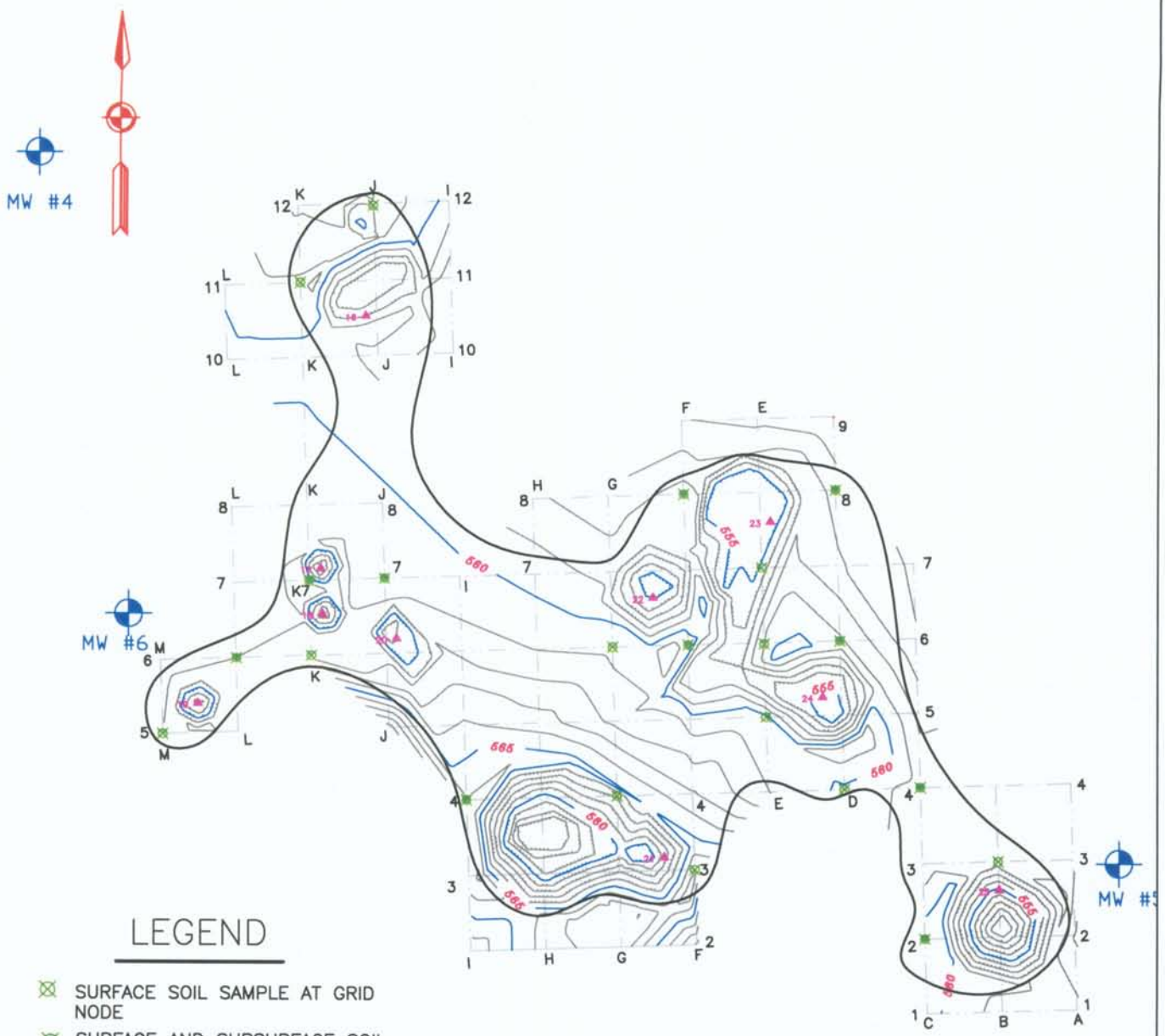
- SURFACE SOIL SAMPLE AT GRID NODE
- SURFACE SOIL AND SUBSURFACE SAMPLE FOR LAB. ANALYSIS
- # SURFACE SOIL SAMPLE INSIDE OF CRATER. (ONLY ONE LOCATION SHOWN)
- MONITORING WELL
- DELINEATED OD BOUNDARY
- DETONATION CRATER
- INTERMITTENT STREAM W/FLOW DIRECTION

REV	DESCRIPTION	DATE	APPROVED
REVISIONS			

URS
1093 Commerce Park Drive, Oak Ridge, TN.

SOIL SAMPLING LOCATIONS – AREA 2A OPEN BURN/OPEN DETONATION UNIT FORT McCLELLAN, ALABAMA

DRAWN BY: WEM	DATE: 12/7/01	PROJECT NO. 655750	DWG NO. FIGURE 7–1	REV 0
CHECKED BY: C.WESH	DATE: 3/28/02	SCALE NTS	N:\655xxx\655730\4001\FT_MC_Sample 2001.dwg	



LEGEND

- SURFACE SOIL SAMPLE AT GRID NODE
- SURFACE AND SUBSURFACE SOIL SAMPLE FOR LAB. ANALYSIS
- # ▲ SURFACE SOIL SAMPLE INSIDE OF CRATER. (ONLY ONE LOCATION SHOWN)
- MONITORING WELL
- DELINEATED OD BOUNDARY
- DETONATION CRATER

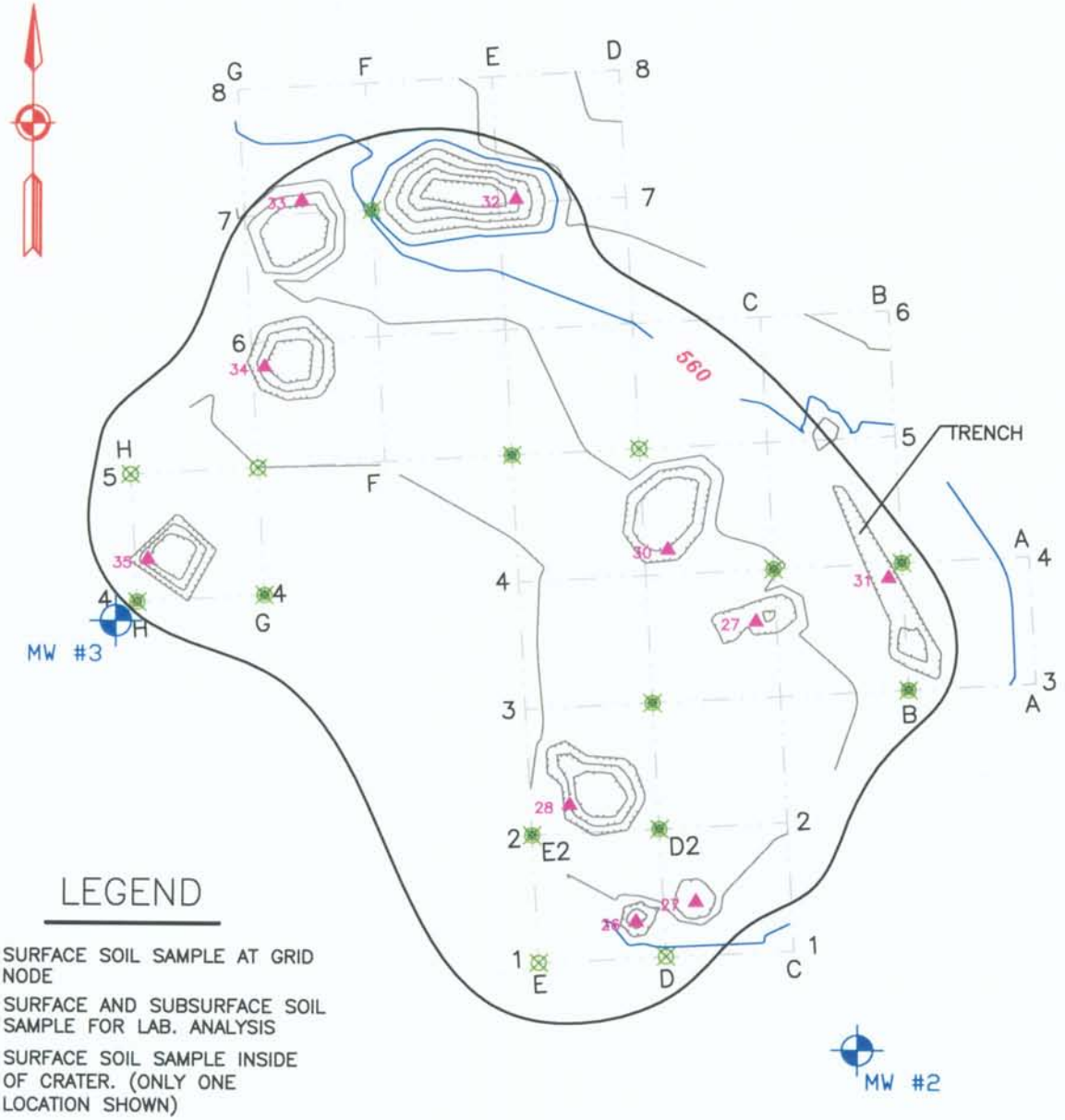
REV	DESCRIPTION	DATE	APPROVED
REVISIONS			

URS

1093 Commerce Park Drive, Oak Ridge, TN.

SOIL SAMPLING LOCATIONS – AREA 2B OPEN BURN/OPEN DETONATION UNITS FORT McCLELLAN, ALABAMA

DRAWN BY: WEM	DATE: 12/6/01	PROJECT NO. 655750	DWG NO. FIGURE 7–2	REV 0
CHECKED BY: C.WESH	DATE: 3/28/02	SCALE NTS	N:\655xxx\655730\4001\FT_M_Sample 2001.dwg	



LEGEND

- SURFACE SOIL SAMPLE AT GRID NODE
- SURFACE AND SUBSURFACE SOIL SAMPLE FOR LAB. ANALYSIS
- # SURFACE SOIL SAMPLE INSIDE OF CRATER. (ONLY ONE LOCATION SHOWN)
- MONITORING WELL
- DELINEATED OD BOUNDARY
- DETONATION CRATER

REV	DESCRIPTION	DATE	APPROVED
REVISIONS			

URS

1093 Commerce Park Drive, Oak Ridge, TN.

SOIL SAMPLING LOCATIONS – AREA 2C OPEN BURN/OPEN DETONATION UNIT FORT McCLELLAN, ALABAMA

DRAWN BY: EM	DATE: 12/6/01	PROJECT NO. 655750	DWG NO. FIGURE 7–3 / REV 0
CHECKED BY:	DATE:	SCALE	N:\655xxx\655730\4001\FT_MC_Sample 2001.dwg

7.2.2.2 OD Craters and OB Trench

Surface soils within OD craters greater than 5 ft in diameter in each of the sites were field screened for the same parameters as defined for grid node surface soils. Five surface soil sampling locations within each crater were collected and field screened. The field screening sampling location with the highest field screening levels from each crater was chosen for sample collection for laboratory analysis. A total of 15 craters in Site 2A, 10 craters in Site 2B, and 9 craters in Site 2C were field screened and samples collected for laboratory analysis. Crater locations with surface soil sampling locations for laboratory analysis are shown in Figures 7-1 through 7-3.

One potential trench is located in Site 2C. Five surface soil samples were collected and field screened for the same parameters as defined for grid node surface soils. The trench and the sampling location for laboratory analysis are shown on Figure 7-3.

7.2.3 Surface and Subsurface Soil Samples for Laboratory Analysis

Surface (grid node, craters, and trench) and subsurface soil sample locations were determined after evaluation of the field screening data. Ten surface and subsurface soil samples were collected within each of the three sites from grid nodes that exhibit elevated explosives, TAL metals, and VOCs determined from the field screening data. One surface soil sample was collected from within each crater (greater than 5 ft diameter) and the trench located in Site 2C. Soil samples collected for laboratory analysis were submitted to Severn Trent Laboratories in Savannah, Georgia, and analyzed for VOCs by EPA Method 8260, semivolatile organic compounds (SVOCs) by EPA Method 8270, TAL metals by EPA Method 6010/7470/7471, and explosives/nitroglycerin/PETN by EPA Method 8330 and 8332.

7.2.3.1 Surface Soil Samples

Surface samples at grid node locations were collected utilizing decontaminated stainless steel hand augers or decontaminated 3-in. diameter stainless steel split spoons. Samples were collected from a depth of 0–1 ft BGS. All samples for VOC analysis were collected at the

1-ft interval utilizing an Encore sampler. VOC samples were collected first. Upon completion of collection of VOC samples, the remaining sample was thoroughly homogenized and placed into laboratory jars for analysis.

7.2.3.2 Subsurface Soil Samples

Subsurface soil sampling was conducted at the same grid node locations as the surface soil locations. Subsurface soil samples were collected from a depth of 1–10 ft BGS utilizing decontaminated 3-in. diameter split spoons advanced at 1-ft intervals. Each 1-ft interval was field screened with a HNu to determine VOC concentration. The interval with the highest VOC concentration was sent to the laboratory for VOC analysis. No VOCs were detected in any of the subsurface sampling intervals at any of the three sites. All VOC samples for laboratory analysis were collected from the 9–10 ft interval utilizing an Encore sampler. Upon completion of collecting the VOC sample, the collected soil from 1–10 ft was thoroughly homogenized and placed in laboratory supplied jars for analysis.

7.2.3.3 OD Craters and OB Trench

One surface soil sample was collected from within each OD crater greater than 5 ft in diameter and the trench at the field screening location that exhibited the highest field screening levels. Samples were collected from a 0–1 ft interval utilizing decontaminated stainless steel hand augers. All samples for VOC analysis were collected at the 1-ft interval utilizing an Encore sampler. VOC samples were collected first. Upon completion of VOC collection, the remaining sample was thoroughly homogenized and placed into laboratory jars for analysis.

7.2.3.4 Sediment and Surface Water

Sediment sampling was proposed from two drainageways associated with Site 2A. One was an intermittent stream located adjacent to the northern boundary of Site 2A flowing from east to west (Figure 7-4), and the second was a drainageway or swale located along the southwest of Site 2A flowing from northwest to southeast. Three sediment sampling locations were proposed within each drainageway. Upon initiating the site characterization it was

determined that the southwestern drainageway no longer existed. The berms of the drainageway appeared to have been regraded and no longer diverting water as observed in 1996. Therefore, no sediment samples were collected. A total of three sediment samples were collected from the intermittent stream at locations upgradient, adjacent to, and downgradient of Site 2A. Samples were collected with decontaminated stainless trowels and analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, TAL metals by EPA Method 6010/7470/7471, and explosives/nitroglycerin/PETN by EPA Method 8330 and 8832. All samples for VOC analysis were collected at the 1-ft interval utilizing an Encore sampler. VOC samples were collected first. Upon completion of VOC collection, the remaining sample was thoroughly homogenized and placed into laboratory jars for analysis.

Two surface water samples were proposed to be collected from the intermittent stream from locations upgradient and downgradient of Site 2A. The intermittent stream did not contain water during the site characterization, and only one surface water sample was collected from the intermittent stream. The surface water sample was collected downgradient of Site 2A within a pool of standing water where the intermittent stream bifurcates with another intermittent stream located approximately 600 ft from the boundary of Site 2A. The sample was collected utilizing a decontaminated Teflon ladle and analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, TAL metals by EPA Method 6010/7470/7471, and explosives/nitroglycerin/PETN by EPA Method 8330 and 8832.

Sediment and surface water sampling locations are shown on Figure 7-4.

7.2.4 Groundwater Investigation

The groundwater investigation for this study consisted of the installation of piezometers to determine groundwater flow direction and installation of groundwater monitoring wells to obtain baseline groundwater quality data.

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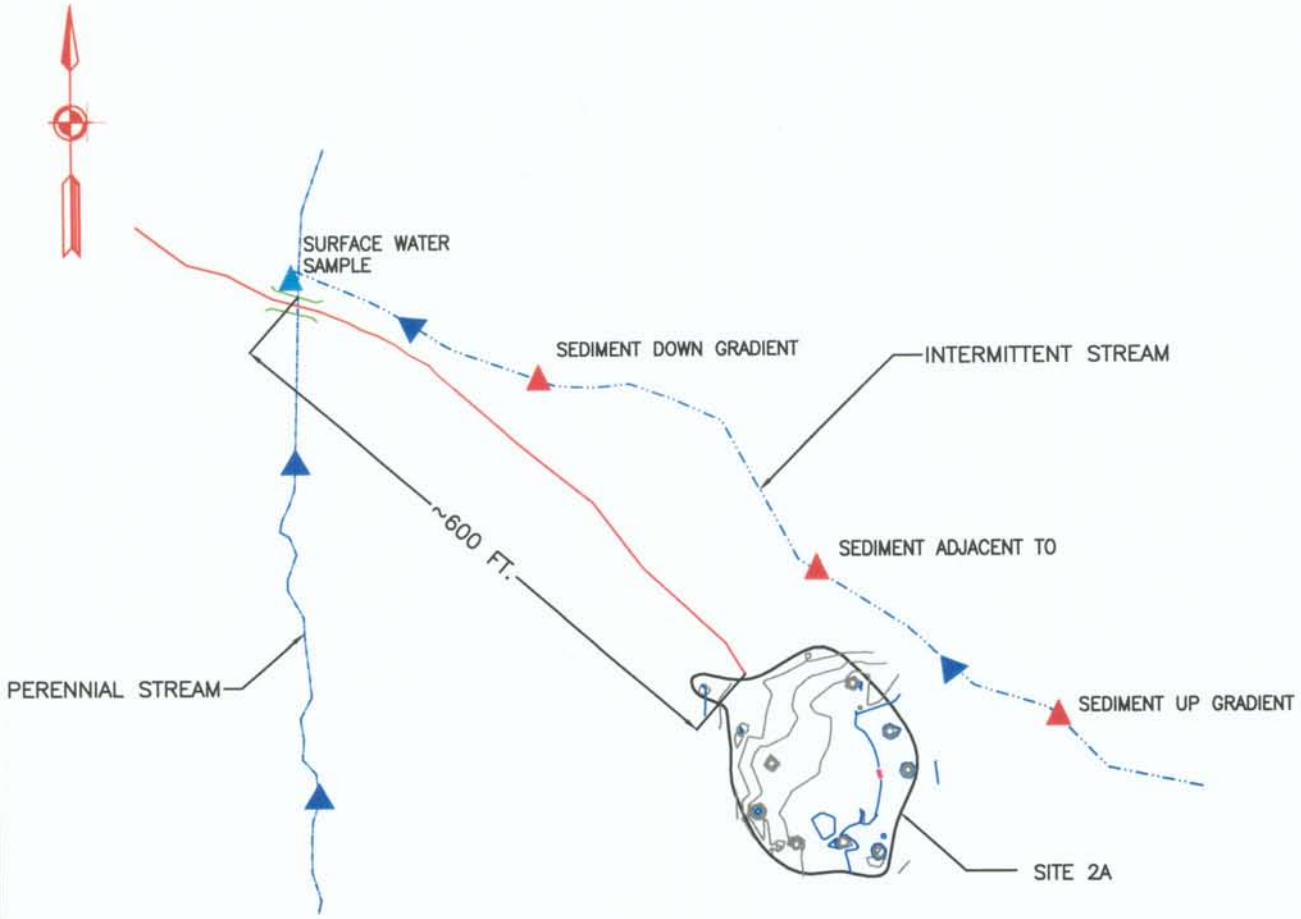

LEGEND

- SURFACE WATER SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION
- SERFACE WATER FLOW DIRECTION

REV	DESCRIPTION	DATE	APPROVED

REVISIONS

URS

1093 Commerce Park Drive, Oak Ridge, TN.

SEDIMENT AND SURFACE WATER SAMPLE LOCATIONS

DRAWN BY: WEM	DATE: 3-27-02	PROJECT NO. 655750	DWG NO. FIGURE 7-4	REV 0
CHECKED BY: C.WESH	DATE: 3-28-02	SCALE NTS	N:\655xxx\655730\4001\FIG_4(3-27-02).dwg	

7.2.4.1 Piezometer Installation

Geotek Drilling Company installed three temporary piezometers (PZ-1, PZ-2, and PZ-3) within the boundaries of three sites. The locations of the piezometers were determined in the field with the objective of determining groundwater direction through the three sites. The piezometers were drilled using 8-in.-outer diameter augers. All downhole drilling equipment was properly cleaned prior to use. Each piezometer was constructed of 2-in.-inner diameter, Schedule 40, flush joint threaded polyvinyl chloride (PVC) riser and a 10 ft length of 0.010-in. slotted screen. The screen was installed across the water table aquifer representing the first groundwater encountered. PZ-1 through PZ-3 were installed to a depth of 30 to 35 ft BGS. Groundwater was encountered at approximately 19 to 22 ft BGS. A filter pack of 20/30 sand was installed adjacent to the screen extending 1 to 3 ft above the screen. A 3 ft thick bentonite seal was installed above the filter pack to create a surface seal preventing surface water from entering the well. Each piezometer location was surveyed by a licensed surveyor using an arbitrary datum of 100 ft.

The piezometers were installed to determine the groundwater flow direction prior to installation of the permanent monitoring well network for each area. Depth to groundwater was measured from the top of the surveyed PVC casing with a clean, electric water level indicator over a 2-day time period after the last piezometer was installed. Upon determining groundwater flow direction, it was determined the piezometer locations could be used as monitoring well locations. The three piezometers were converted into monitoring wells by removing the PVC casing and screen, and overdrilling the bentonite seal and filter pack. Upon the completion of overdrilling the monitoring wells were installed as per the SAP. Figure 7-5 shows the piezometer locations with the associated water table elevation data collected on 19 August 2001.

7.2.4.2 Groundwater Monitoring Well Installation

Nine permanent groundwater monitoring wells (MW-1 through MW-9) were installed at the three sites between 17 August and 1 September 2001. The locations of the groundwater monitoring wells were determined by the on-site geologists based on the information obtained from the piezometers. Three monitoring wells (one upgradient and two

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PA-1
MW4
80. 04

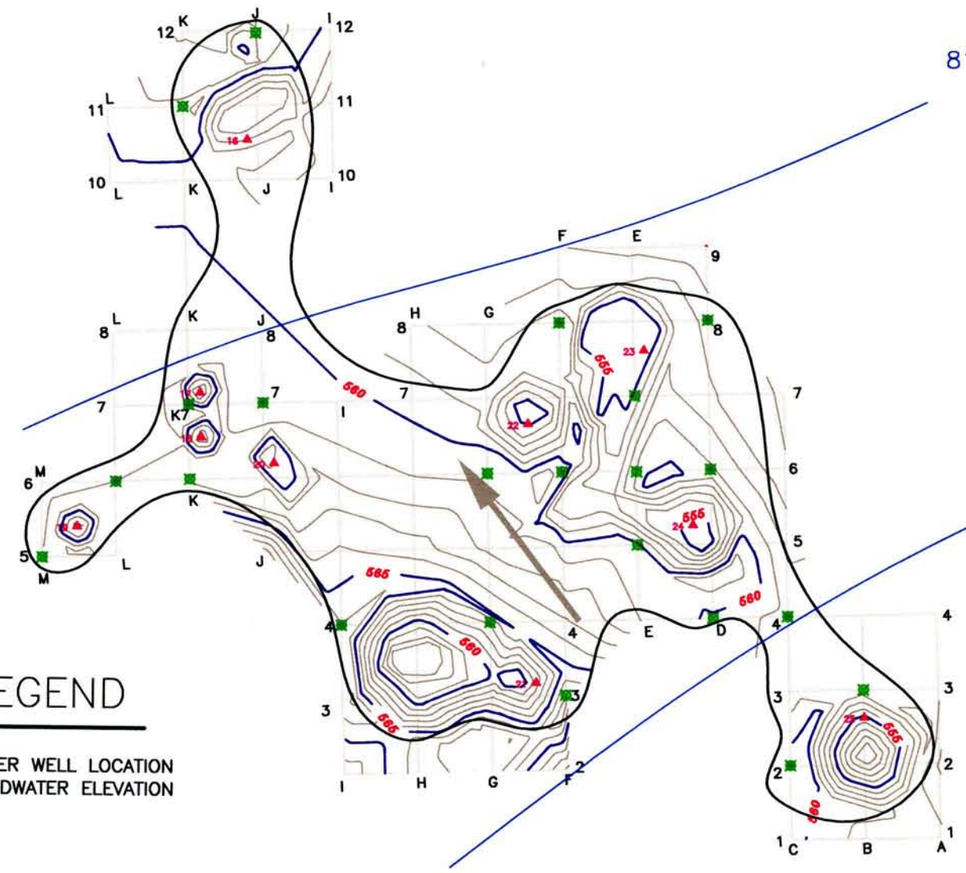
PA-2
MW-2
80. 15

PA-3
MW-2
83. 69

81

82

83



LEGEND

PA #
000.00 — PIEZOMETER WELL LOCATION W/GROUNDWATER ELEVATION

GROUNDWATER FLOW DIRECTION

REV	DESCRIPTION OF REVISION	BY	DATE

URS
1093 Commerce Park Drive, Oak Ridge, Tennessee

SCALE	DRAWN BY: EM	DATE: 3-28-02
NT.	CHECKED BY: C.WESH	DATE: 3-29-02

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FIGURE 7-5
GROUNDWATER FLOW CONTOURS
FROM PIEZOMETERS
FORT McCLELLAN, ALABAMA

PROJECT NUMBER
655750

DRAWING NUMBER

downgradient) were installed at each of the sites within the water table aquifer. In Site 2A, monitoring well MW-7 was installed upgradient of the site, and wells MW-8 and MW-9 were installed downgradient of the site. In Site 2B, monitoring well MW-5 was installed upgradient of the site, and wells MW-4 and MW-6 were installed downgradient of the site. In Site 2C, monitoring well MW-2 was installed upgradient of the area, and wells MW-1 and MW-3 were installed downgradient of the area. The well network at each site was adequate to evaluate the potential impact of OB/OD operations on groundwater quality for each area. Monitoring well locations with associated groundwater elevation data are shown in Figure 7-6.

The groundwater monitoring wells were installed using a Mobile B57 all-terrain drill rig utilizing hollow stem augers. The auger was of continuous flight design with an outside diameter of 8 in. Split spoon samples were collected continuously at 1-ft intervals to 10 ft for UXO surveying and at 2-ft intervals to the bottom of the monitoring well borehole as per American Society for Testing and Materials (ASTM) D 1586 for visual soil classification. No split spoon sampling was performed from the piezometers. All downhole equipment was properly cleaned with a steam cleaner prior to use and between monitoring well locations. All drill cuttings were containerized in properly labeled, Department of Transportation (DOT)-approved 55-gal drums and stored on-site. Upon review of the field screening data from the soil sampling effort, it was determined to place the soil cuttings in craters adjacent to the wells located within each site.

Wells were designed and constructed per the requirements of EPA Office of Solid Waste and Emergency Response 9550.1, "RCRA Groundwater Monitoring Technical Enforcement Guidance Document Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites," and ASTM D 5092-90, "Design and Installation of Ground Water Monitoring Wells in Aquifers," and as specified in the SAP. Monitoring well logs and as-builts are presented in Appendix B.

Each monitoring well is constructed of 2-in.-inside diameter, Schedule 40, flush joint threaded PVC screen and casing. No solvents or glue were used in the fabrication of the well screens and riser pipes, including the end cap for the well screen. Well screens are 10 ft long

with continuous, 0.001-in. slots. The screens extend approximately 8 ft into the water table aquifer.

After placement of the well screen and casing, a filter pack of clean 20/40 silica sand was tremied continuously between the annulus of the well casing and the augers, while the augers were slowly withdrawn from the boring. The filter pack was installed such that the sand remained partially within the lead auger for the installation of a uniform filter pack with no formation material collapsing adjacent to the screen. Potable water collected from the base was used to tremie the sand. The sand was installed a minimum of 1 ft above the top of the well screen. A 3 ft thick bentonite seal was installed above the filter pack and allowed to hydrate for a minimum of 24 hours before the well's surface pad was constructed.

Surface completion consists of a 5.5 in. thick and 3 ft square concrete pad. The base of the protective pad was set 1.5 in. below the natural ground surface, and each pad was finished so that the pad surface slopes to drain away from the well casing. The PVC well casings are protected from damage by a lockable steel protective casing set into the concrete pad. Four 4-in.-diameter black steel protective pipes were set in concrete backfilled holes around the perimeter of each concrete pad. The pipes were set 1.5 ft into the ground and extend 4 ft above the ground. Protective pipes were primed with a rust enamel primer and painted with two coats of Occupational Safety and Health Administration Safety Yellow enamel.

A brass USACE survey disk was placed on each pad and stamped with the well number and the surveyed ground reference. Metal identification plates were permanently attached to the well casings.

Figure 7-6 shows the monitoring well locations at the OD unit.

7.2.4.3 Monitoring Well Development

A surge block and submersible pump were used to develop the wells and all equipment was properly cleaned prior to use. In each case, the wells were developed for a minimum of 3 hours. A Grundfus Redi-Flo system and/or Whaler was used for pumping until the

Groundwater Elevation Data September 16-18, 2001					
Monitoring Well ID	Latitude	Longitude	TOC EL. Data	Depth to Water (ft)	Groundwater Elevation (ft)
MW-1	33°42' 52.430392" N	85°58' 22.149292" W	559.02	20.06	538.96
MW-2	33°42' 49.235283" N	85°58' 19.254541" W	565.00	25.25	539.75
MW-3	33°42' 50.061106" N	85°58' 20.979751" W	560.13	10.1	550.03
MW-4	33°42' 51.551189" N	85°58' 27.114149" W	562.50	25.8	536.70
MW-5	33°42' 49.252642" N	85°58' 22.813959" W	561.64	18.67	542.97
MW-6	33°42' 50.063030" N	85°58' 26.703300" W	563.41	19.26	544.15
MW-7	33°42' 52.793583" N	85°58' 27.800906" W	559.22	19.38	539.84
MW-8	33°42' 53.730530" N	85°58' 30.167034" W	551.95	9.65	542.30
MW-9	33°42' 54.963855" N	85°58' 29.872507" W	553.19	13.4	539.79

MW #9
539.79

MW #8
542.30

MW #7
539.84

MW #4
536.70

MW #6
544.15

MW #1
538.96

MW #3
550.03

MW #5
542.30

MW #2
539.75

LEGEND

MW #
000.00 — MONITORING WELL LOCATION W/GROUNDWATER ELEVATION

GROUNDWATER FLOW DIRECTION

REV	DESCRIPTION OF REVISION	BY	DATE

URS
1093 Commerce Park Drive, Oak Ridge, Tennessee

SCALE	DRAWN BY: EM	DATE: 12-13-01
NT.	CHECKED BY: CAW	DATE: 3-28-02

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FIGURE 7-6
GROUNDWATER FLOW CONTOURS
OPEN BURN/OPEN DETONATION UNIT
FORT McCLELLAN, ALABAMA

PROJECT NUMBER
655750

DRAWING NUMBER

groundwater was clear and free of sediment and drilling fluids, and water quality parameters (pH, temperature, conductivity, and turbidity) had stabilized. Water quality parameters were measured using a Horiba U-10 meter. Well development logs are provided in Appendix B. All well development water was containerized in properly labeled, DOT-approved 55-gal drums and stored on-site to await disposal based on the results of subsequent groundwater sampling.

7.2.4.4 Groundwater Sampling

Groundwater samples were collected on 16 through 19 September 2001 from monitoring wells MW-1 through MW-9. This schedule allowed the wells to stabilize after development (Section 7.2.4.3) for 1–3 weeks prior to sampling. Prior to groundwater sampling, the water level in each well was measured with a clean, electric water level indicator from a reference point at the top of the PVC casing. The volume of water in the well casing was calculated to determine the minimum volume of water to be purged. Each well was purged and sampled using a decontaminated Redi-Flo system with dedicated Teflon tubing using a micro-purge technique. A minimum of three well volumes were purged at a flow rate less than 0.5 gal/min, and water quality data consisting of specific conductance, pH, temperature, and turbidity were measured using a Horiba U-10 meter. Groundwater sampling was not initiated until three well volumes were removed and water quality parameters stabilized. Monitoring well MW-1 was purged dry at a flow rate of 0.4 gal/min. The well was allowed to recharge overnight and was sampled with a disposable Teflon bailer. Specific data for each well are provided on purge water data logs in Appendix B.

Groundwater samples were collected immediately following well purging. All groundwater samples were submitted to Severn Trent Laboratories in Savannah, Georgia. Groundwater samples were analyzed for VOCs by EPA Method 8260, SVOCs by EPA Method 8270, TAL metals by EPA 6010/7000+, and explosives/nitroglycerin/PETN by EPA Methods 8330 and modified 8330. Quality assurance (QA) samples were also taken from each monitoring well. A duplicate was collected from monitoring well MW-9 and labeled MW-9A, and a rinsate blank was collected from the decontaminated Redi-Flo system and labeled RB091601. Trip blanks were provided by the laboratories and were placed in each shipping cooler containing VOC samples. Trip blanks permit evaluation of contamination generated from sample containers or occurring during

shipping. Trip blanks were analyzed for VOCs by EPA Method 8260. The duplicate and rinsate sample was analyzed for the same parameters as each monitoring well sample. Samples were collected in laboratory supplied bottles and labeled. The label contained the sample identification number, date and time of collection, source of sample, preservative used (if any), analysis required, and the collector's initials. The samples were immediately placed into laboratory-supplied coolers containing ice and stored at 4°C or less. A chain of custody form was initiated in the field and filled out at the time the samples were collected. At the end of the sampling day, the coolers were repacked with ice, and the chain of custody was signed and placed inside the cooler. Coolers were sealed with strapping tape and custody seals and sent to the laboratories via Federal Express priority overnight delivery.

7.2.5 Quality Control Sampling

QA samples (split, spike, and duplicates) were collected from each of the media. Split samples are single samples split into portions and are used to assess the overall precision of the sampling and analysis program. Matrix spike samples were prepared by the laboratories by adding a known amount of reference chemical to one of a pair of split samples. These were used to assess the appropriateness of the method to the matrix. Duplicate samples were collected by taking two separate samples at the same location at the same time.

Additional QA samples included equipment blanks, temperature blanks, and trip blanks. Equipment blanks, consisting of laboratory-grade deionized water that was rinsed over decontaminated sampling equipment, were collected at a frequency of 10% of the total number of samples the site characterization and submitted to Savannah Laboratories for VOCs, SVOCs, pesticides/polychlorinated biphenyls, and TAL metals utilizing the appropriate EPA methodology. Trip blanks were provided by the laboratories and were placed in each shipping cooler containing VOC samples. Trip blanks permit evaluation of contamination generated from sample containers or occurring during shipping. Trip blanks were analyzed for VOCs by EPA Method 8260. Temperature blanks were provided in all shipping containers.

7.2.6 Equipment Decontamination Procedures

Before sampling activities were initiated, after each sample collection, and after sampling activities were completed, all nondisposable soil sampling equipment and aquifer testing equipment were decontaminated in the field. The equipment was scrubbed using a non-phosphate, laboratory-grade detergent (Alconox) solution, rinsed with potable and laboratory-grade, organic-free water, rinsed with isopropanol, and allowed to air dry. After the equipment had air dried, it was rinsed thoroughly with laboratory-grade, organic-free water again and air dried. If there was not an immediate need for the decontaminated equipment, it was then wrapped in aluminum foil. Well purging and development equipment were decontaminated by washing with laboratory-grade, organic-free water.

Upon arriving at the unit, between each borehole, and prior to demobilizing the equipment from the range, all drilling equipment was steam cleaned at a temporary decontamination pad. The decontamination pad was constructed within the unit by placing two 8 mil plastic sheets over a wooden frame. All generated decontamination fluids were contained and transferred by a sump-pump into properly labeled 55-gal drums. These were stored at the site pending analytical results. Hand-held sampling equipment, such as bowls and spoons, were decontaminated in 5-gal buckets. Buckets were placed on plastic sheeting to contain spills. Buckets containing decontamination fluids were periodically emptied into the larger decontamination pad.

Equipment blanks were collected at the end of each sampling day and submitted to the laboratory to provide a baseline to determine the thoroughness of the decontamination procedure.

7.2.7 Investigation-Derived Waste

All other wastes generated during this study (i.e., latex gloves, paper towels, disposable Teflon bailers, string, plastic, aluminum foil) were disposed of as municipal solid waste at Fort McClellan.

7.2.8 Surveying

The site layout, including topography, sampling locations, and permanent features, was surveyed by an Alabama licensed survey company. Elevations of survey points were referenced to MSL relative to a National Geodetic Vertical Datum of 1929. The horizontal locations of the wells were determined to the nearest 1 ft. The ground surface elevation and the top of the casing elevation were determined to the nearest 0.01 ft.