

**Final
Site-Specific Field Sampling Plan,
Site-Specific Safety and Health Plan, and Site-Specific
Unexploded Ordnance Safety Plan Attachments,
Former Rifle/Machine Gun Range, Parcel 104Q**

**Fort McClellan
Calhoun County, Alabama**

**Task Order CK10
Contract No. DACA21-96-D-0018
IT Project No. 796887**

March 2002

**Final
Site-Specific Field Sampling Plan Attachment
Former Rifle/Machine Gun Range, Parcel 104Q**

**Fort McClellan
Calhoun County, Alabama**

Prepared for:

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**Task Order CK10
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March 2002

Revision 0

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List of Acronyms

See Attachment 1, List of Abbreviations and Acronyms

Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK10, IT Corporation (IT) will conduct site investigation activities at Former Rifle/Machine Gun Range, Parcel 104Q, at Fort McClellan, Calhoun County, Alabama, to determine the presence or absence of potential site-specific chemicals (PSSC) at this site. The purpose of this site-specific field sampling plan (SFSP) is to provide technical guidance for sampling activities at Former Rifle/Machine Gun Range, Parcel 104Q.

Former Rifle/Machine Gun Range, Parcel 104Q, is located in the north-central area of the Main Post at FTMC, east of Goode Road. The *Final Environmental Baseline Survey* by Environmental Science and Engineering, Inc. documents this site as one of seven former rifle/machine gun ranges identified on northern Main Post. It is an 8-acre parcel believed to be a small arms range. It is approximately 250 feet wide and 1,500 feet in length; oriented from north/northeast to south/southwest, with the firing line area along the northern boundary.

In the U. S. Army Corps of Engineers (USACE) *Archives Search Report, Conclusions and Recommendations*, Former Rifle/Machine Gun Range, Parcel 104Q, is referred to as World War I Machine Gun Range. The report states this machine gun range was built during World War I and was abandoned sometime prior to World War II. Documentation indicates that only machine gun fire was conducted at this site. There is no indication that explosive ordnance was used on the range. Former Rifle/Machine Gun Range, Parcel 104Q, is located in the western portion of the Defendum Range Area. It is shown on Plates 3 (World War I Use), 4 (Inter War Use), and 10 (Cumulative Map of All Ranges) of the *Archives Search Report, Maps, Fort McClellan, Anniston, Alabama*. The orientation of the range is the same on all ASR plates.

During site walks conducted by IT personnel in December 2001, features consistent with use of the area as a small arms range were observed at Parcel 104Q. A series of partially eroded berms (approximately 3 feet high) transect the width of the parcel at intervals of approximately 75 feet throughout much of the central and southern portions of the parcel. Signs mounted on trees mark the endpoints of some of the berms. These berms appear to be the target areas. Several rectangular depressions (3 feet by 5 feet by 2 feet deep) are aligned roughly parallel to the inside boundary of the firing line area in the northern portion of the parcel. Similar depressions are also located in the southern portion of the parcel. Some of these are aligned with one of the berms and others are aligned with the western parcel boundary. A gravel area with a utility pole that

may have been used as a parking or a staging area for this or an adjacent range is located in the northwestern corner of the parcel. An abandoned jeep was found near the western boundary of the parcel.

IT will collect 22 surface soil samples, 22 subsurface soil samples, and two groundwater samples at this site. Potential contaminant sources at Former Rifle/Machine Gun Range, Parcel 104Q, are primarily metals and explosives. Chemical analyses of the samples collected during the field program will include nitroaromatic/nitramine explosives and metals; in addition, 10 percent of the samples will be analyzed for volatile organic compounds, semivolatile organic compounds, pesticides and herbicides. Results from these analyses will be compared to site-specific screening levels, ecological screening values, and background values to determine if PSSC are present at the site at concentrations that pose an unacceptable risk to human health or the environment.

The potential exists for the presence of unexploded ordnance (UXO) at Former Rifle/Machine Gun Range, Parcel 104Q, due to the proximity of parcels with histories as impact areas. Therefore, prior to initiating field activities at Former Rifle/Machine Gun Range, Parcel 104Q, IT will conduct UXO avoidance activities as outlined in Appendix E of the installation-wide sampling and analysis plan (SAP) and the attached site-specific UXO safety plan. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purpose of UXO avoidance.

This SFSP attachment to the SAP for Former Rifle/Machine Gun Range, Parcel 104Q, will be used in conjunction with the site-specific safety and health plan, the site-specific UXO safety plan, the installation-wide work plan, and the SAP. The SAP includes the installation-wide safety and health plan, monitoring well installation and maintenance plan, investigation-derived waste management plan, ordnance and explosives management plan, and quality assurance plan. Site-specific hazard analyses are included in the site-specific safety and health plan.

1.0 Project Description

1.1 Introduction

The U.S. Army is conducting studies of the environmental impact of suspected contaminants at Fort McClellan (FTMC) in Calhoun County, Alabama, under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE has contracted IT Corporation (IT) to provide environmental services for the site investigation (SI) at Former Rifle/Machine Gun Range, Parcel 104Q, under Task Order CK10, Contract Number DACA21-96-D-0018.

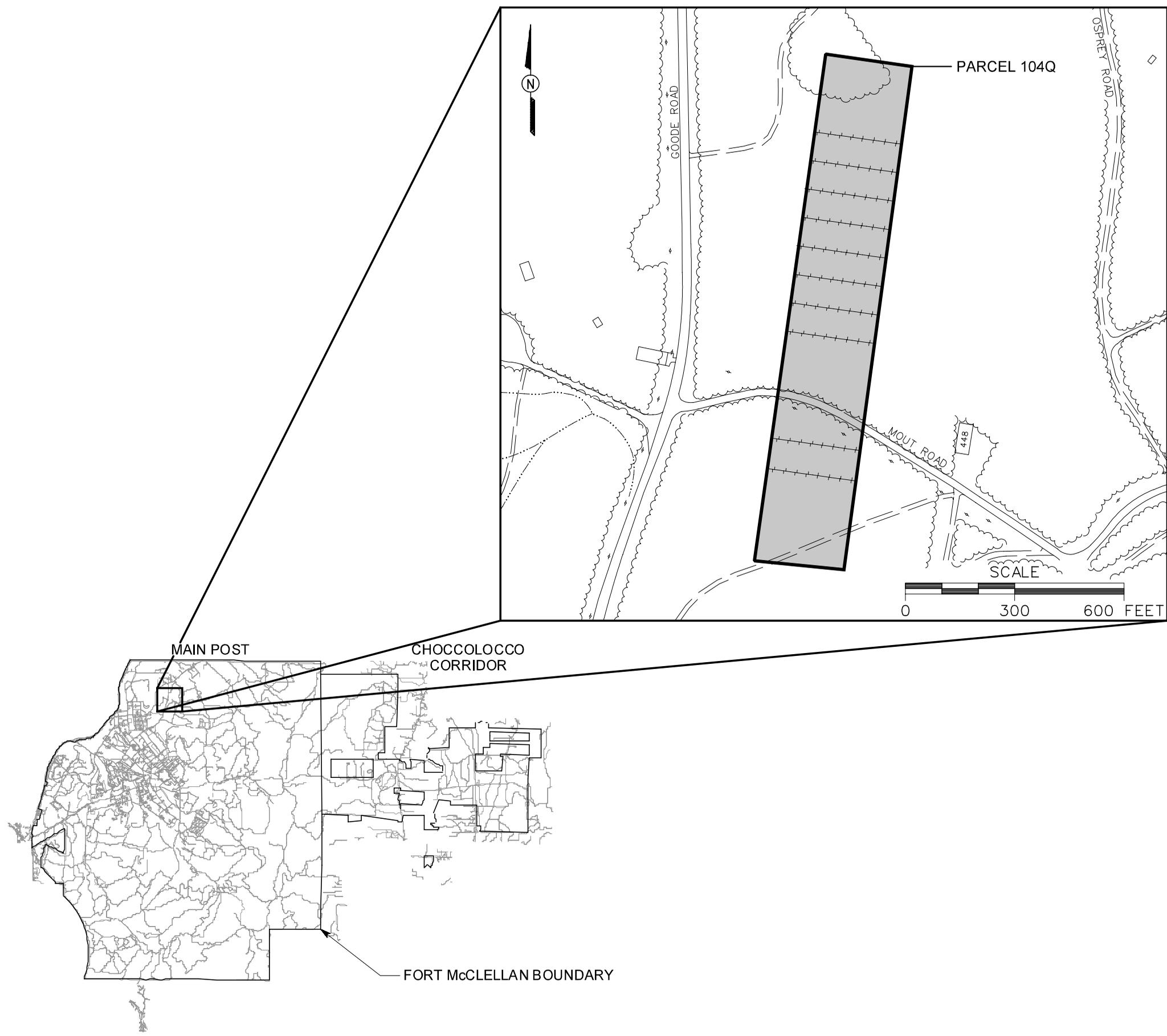
This site-specific field sampling plan (SFSP) is an attachment to the installation-wide sampling and analysis plan (SAP) for FTMC (IT, 2002a) and has been prepared to provide technical guidance for sample collection and analysis at Former Rifle/Machine Gun Range, Parcel 104Q. This SFSP will be used in conjunction with the site-specific safety and health plan (SSHP) and site-specific unexploded ordnance (UXO) safety plan developed for Former Rifle/Machine Gun Range, Parcel 104Q, and the installation-wide work plan (WP) (IT, 2002b) and SAP. The SAP includes the installation-wide safety and health plan, well installation and maintenance plan, investigation-derived waste management plan, ordnance and explosives management plan, and quality assurance plan (QAP). Site-specific hazard analyses are included in the SSHP.

1.2 Site Description

Former Rifle/Machine Gun Range, Parcel 104Q, is located in the north-central area of the Main Post at FTMC, east of Goode Road (Figure 1-1). The *Final Environmental Baseline Survey* (EBS) by Environmental Science and Engineering, Inc. (ESE, 1998) documents this site as one of seven former rifle/machine gun ranges identified on northern Main Post. It is an 8-acre parcel believed to be a small arms range. It is approximately 250 feet wide and 1,500 feet in length; oriented from north/northeast to south/southwest, with the firing line area along the northern boundary (Figure 1-2).

In the USACE *Archives Search Report, Conclusions and Recommendations* (USACE, 1999a), Former Rifle/Machine Gun Range, Parcel 104Q, is referred to as World War I Machine Gun Range. The report states this machine gun range was built during World War I and was abandoned sometime prior to World War II. Documentation indicates that only machine gun fire was conducted at this site. There is no indication that explosive ordnance was used on the range. Former Rifle/Machine Gun Range, Parcel 104Q (World War I Machine Gun Range), is located in the western portion of the Defendum Area ranges. It is shown on Plates 3 (World War I Use), 4

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 INITIATOR: K. HUNTER
 PROJ. MGR.: J. YACOUB
 DRAFT. CHCK. BY:
 ENGR. CHCK. BY: S. MORAN
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LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DRAINAGE / CREEK
- UTILITY POLE
- BERM

FIGURE 1-1
SITE LOCATION MAP
FORMER RIFLE/MACHINE GUN RANGE
PARCEL 104Q

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

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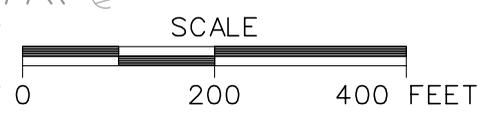


- LEGEND**
- UNIMPROVED ROADS AND PARKING
 - PAVED ROADS AND PARKING
 - BUILDING
 - TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
 - TREES / TREELINE
 - PARCEL BOUNDARY
 - FIRING LINE
 - SURFACE DRAINAGE / CREEK
 - UTILITY POLE
 - BERM
 - DEPRESSION FOXHOLES/TARGET BUNKERS

- TRAINING AIDS/PHYSICAL FEATURES OBSERVED**
- ① GRAVEL AREA WITH UTILITY POLE
 - ② ABANDONED VEHICLE
 - ③ FORMER DISTURBED AREA NOTED FROM AERIAL PHOTOGRAPHS

FIGURE 1-2
SITE MAP
FORMER RIFLE/MACHINE GUN RANGE
PARCEL 104Q

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



(Inter War Use), and 10 (Cumulative Map of All Ranges) of the *Archives Search Report, Maps, Fort McClellan, Anniston, Alabama* (USACE, 1999b). The orientation of the range is the same on all plates, as shown on the Range Location Map (Figure 1-3).

Available aerial photographs (1937 through 1998) were reviewed to identify any land-use activity at Former Rifle/Machine Gun Range, Parcel 104Q. In the 1937 photo, the parcel appears to be overgrown with virtually no disturbed areas (Figure 1-4). The 1940 photo shows that two roads have been cut across the southern portion of the parcel apparently serving as access roads to active ranges to the east of Parcel 104Q (Figure 1-5). In the 1954 photo, there are no additional visibly disturbed areas. The 1969 photo reveals increased use of one of the previously mentioned roads and increased use in the southern portion of the parcel probably the result of activity at an adjacent range, Parcel 89Q. In the 1982 photo, an area that extends into the western portion of the firing line area has been cleared of tree cover (Figure 1-6). This cleared area is larger and more clearly defined in the 1998 photo. The review of aerial photography (1937 through 1998) did not reveal positive evidence of an active range at Parcel 104Q, which likely supports the ASR documentation that use of this range ceased prior to World War II.

During site walks conducted by IT personnel in December 2001, features consistent with use of the area as a small arms range were observed at Parcel 104Q. A series of partially eroded berms (approximately 3 feet high) transect the width of the parcel at intervals of approximately 75 feet throughout much of the central and southern portions of the parcel. Signs mounted on trees mark the endpoints of some of the berms. These berms appear to be the target areas. Several rectangular depressions (3 feet by 5 feet by 2 feet deep) are aligned roughly parallel to the inside boundary of the firing line area in the northern portion of the parcel. Similar depressions are also located in the southern portion of the parcel. Some of these are aligned with one of the berms and others are aligned with the western parcel boundary. A gravel area with a utility pole that may have been used as a parking or a staging area for this or an adjacent range is located in the northwestern corner of the parcel. An abandoned jeep was found near the western boundary of the parcel (Figure 1-2).

Although no surface water was observed at the time of the site walk, it appears that drainage would be to the northwest from the range. Local shallow groundwater direction at the site is probably controlled by topography; therefore, groundwater direction in the residuum is likely to the northwest.

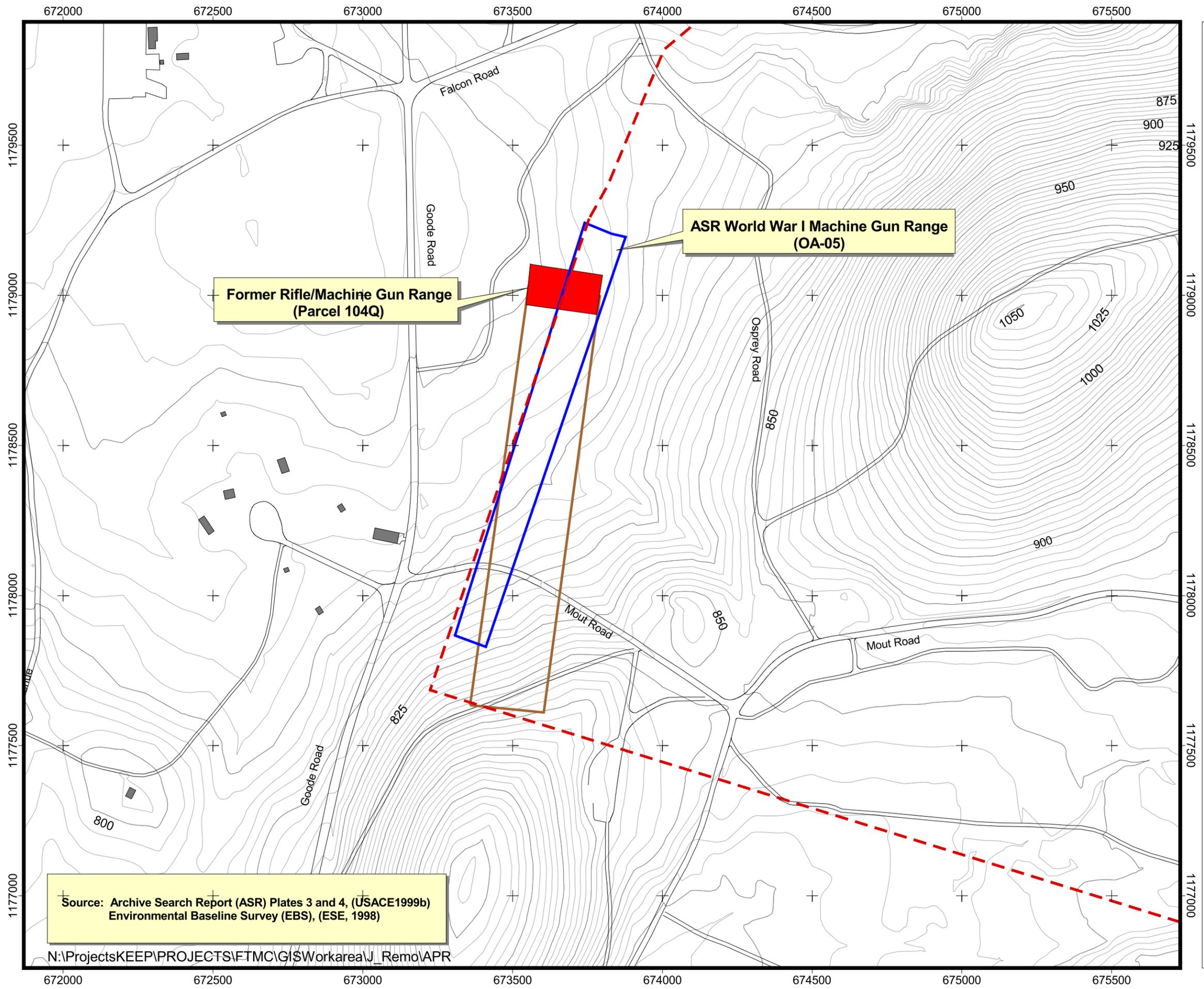


Figure 1-3

Range Location Map

Legend

-  EBS Firing Line
-  EBS Range Fan
-  ASR World War I Machine Gun Range (OA-05)
-  ASR Range Fan Defendum Area Rifle and Pistol Ranges
-  Streams
-  Roads
-  Topographic Contours 5-foot Interval
-  Buildings



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Mobile District



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Source: Archive Search Report (ASR) Plates 3 and 4, (USACE1999b) Environmental Baseline Survey (EBS), (ESE, 1998)

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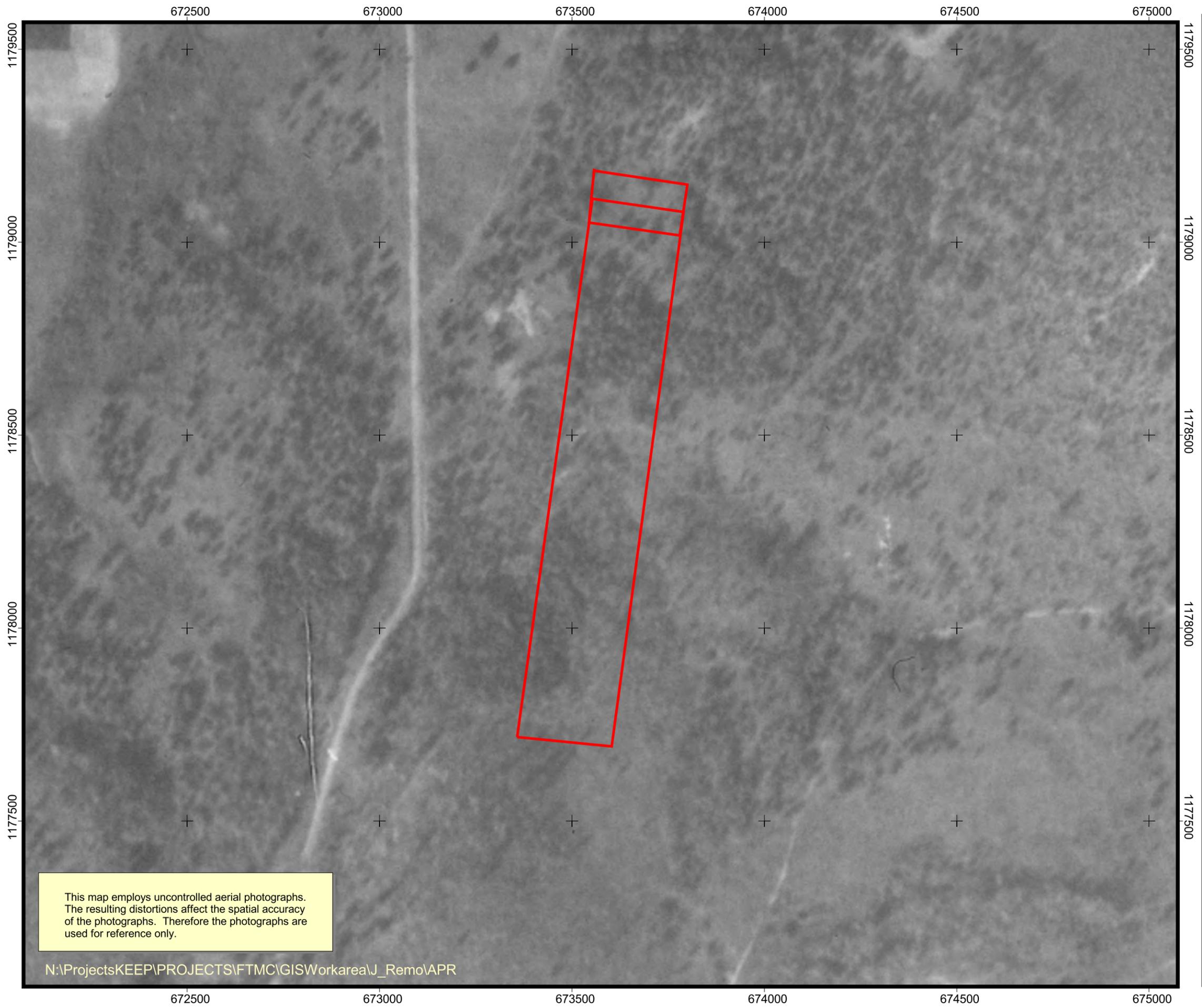


Figure 1-4

1937 Aerial Photograph Former Rifle/Machine Gun Range Parcel 104Q

Legend

-  EBS Range Fan and Firing Line, Former Rifle/Machine Gun Range Parcel 104Q



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This map employs uncontrolled aerial photographs. The resulting distortions affect the spatial accuracy of the photographs. Therefore the photographs are used for reference only.

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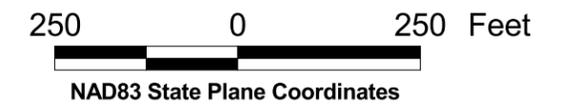


Figure 1-5

1940 Aerial Photograph Former Rifle/Machine Gun Range Parcel 104Q

Legend

-  EBS Range Fan and Firing Line, Former Rifle/Machine Gun Range Parcel 104Q



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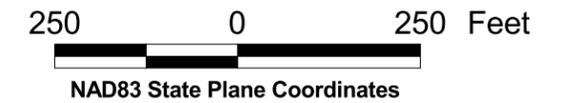


Figure 1-6

1982 Aerial Photograph Former Rifle/Machine Gun Range Parcel 104Q

Legend

-  EBS Range Fan and Firing Line, Former Rifle/Machine Gun Range Parcel 104Q



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Contract No. DACA21-96-D-0018

Soils at Former Rifle/Machine Gun Range, Parcel 104Q, fall into three mapping units: stony rough land, sandstone (Ss) in the southern portion of the range; Anniston gravelly clay loam, 10 to 15 percent slopes, severely eroded (AbD3) in the central portion of the range, and Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded (AbC3) in the northern portion of the range (U.S. Department of Agriculture [USDA], 1961).

The stony rough land, sandstone is a land type consisting of rough mountainous areas with many outcrops of sandstone and quartzite bedrock, loose rock fragments, and scattered patches of sandy soil material with slopes generally greater than 25 percent. The soil material is generally shallow over bedrock. Runoff is high, infiltration is slow, and the capacity for available moisture is low (USDA, 1961).

The Anniston Series consists of strongly acidic, deep, well-drained soils that have developed in old local alluvium on foot slopes and along the base of mountains. The parent material of the Anniston soils washed from the adjacent, higher lying Linker, Muskingum, Enders, and Montevallo soils, which developed from weathered sandstone, shale, and quartzite. Sandstone and quartzite gravel and cobbles, measuring up to 8 inches in diameter, are found throughout the soil. These mapping units contain many shallow gullies and a few deep ones. Infiltration is moderately low, and the capacity for supplying available moisture is low (USDA, 1961).

1.3 Scope of Work

The scope of work for activities associated with the SI at Former Rifle/Machine Gun Range, Parcel 104Q, as specified by the statement of work (USACE, 1999c), includes the following tasks:

- Develop the SFSP attachment.
- Develop the SSHP attachment.
- Develop the UXO safety plan attachment.
- Conduct a surface and near-surface UXO survey over all areas to be included in the sampling effort.
- Provide downhole UXO support for all intrusive drilling to determine buried downhole hazards.

- Collect 22 surface soil samples, 22 subsurface soil samples, and 2 groundwater samples to determine whether potential site-specific chemicals (PSSC) are present and to provide data useful for supporting any future planned corrective measures and closure activities.
- Analyze samples for the parameters listed in Section 4.5.

The potential exists for the presence of UXO at Former Rifle/Machine Gun Range, Parcel 104Q, due to the proximity of parcels with histories as impact areas. Therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at this site. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purpose of UXO avoidance. The site-specific UXO safety plan attachment addresses the manner in which the avoidance will be conducted.

At completion of the field activities and sample analyses, an SI summary report will be prepared to evaluate the absence or presence of PSSCs at this site and to recommend further actions, if appropriate. The SI summary report will be prepared in accordance with current U.S. Environmental Protection Agency (EPA), Region IV, and Alabama Department of Environmental Management (ADEM) guidelines.

2.0 Summary of Existing Environmental Studies

The EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with U.S. Department of Defense guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by the following seven criteria:

1. Areas where no storage, release, or disposal of hazardous substance or petroleum products has occurred (including no migration of these substances from adjacent areas).
2. Areas where only release or disposal of petroleum products has occurred.
3. Areas where release, disposal, and/or migration of hazardous substance has occurred, but at concentrations that do not require a removal or remedial response.
4. Areas where release, disposal, and/or migration of hazardous substance has occurred, and all removal or remedial actions to protect human health and the environment have been taken.
5. Areas where release, disposal, and/or migration of hazardous substance has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken.
6. Areas where release, disposal, and/or migration of hazardous substance has occurred, but required actions have not yet been implemented.
7. Areas that are not evaluated or require further evaluation.

For non-Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) environmental or safety issues, the parcel label includes the following components: a unique non-CERCLA issue number, the letter "Q" designating the parcel as a Community Environmental Response Facilitation Act (CERFA) Category 1 Qualified Parcel, and the code for the specific non-CERCLA issue(s) present (ESE, 1998). The non-CERCLA issue codes used are:

- A = Asbestos (in buildings)
- L = Lead-based paint (in buildings)
- P = Polychlorinated biphenyls
- R = Radon (in buildings)
- RD = Radionuclides/radiological issues
- X = UXO
- CWM = Chemical warfare material.

The EBS was conducted in accordance with the CERFA (CERFA-Public Law 102-426) protocols and U.S. Department of Defense policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, ADEM, EPA Region IV, and Calhoun County, as well as a database search of CERCLA-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historical maps and aerial photographs were reviewed to document historical land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

Former Rifle/Machine Gun Range, Parcel 104Q, was identified as a Category 1 CERFA site. CERFA sites are parcels where no known or recorded storage, release, or disposal (including migration) has occurred on site property, but are qualified "Q" because the site was an active range. Former Rifle/Machine Gun Range, Parcel 104Q, requires additional evaluation to determine the environmental condition of the parcel.

3.0 Site-Specific Data Quality Objectives

3.1 Overview

The data quality objective (DQO) process is followed to establish data requirements. This process ensures that the proper quantity and quality of data are generated to support the decision-making process associated with the action selection for Former Rifle/Machine Gun Range, Parcel 104Q. This section incorporates the components of the DQO process described in the publication EPA 600/R-96/005 *Guidance for the Data Quality Objectives Process* (EPA, 2000). The DQO process as applied to Former Rifle/Machine Gun Range, Parcel 104Q, is described in more detail in Section 3.4 of this SFSP. Table 3-1 provides a summary of the factors used to determine the appropriate quantity of samples and the procedures necessary to meet the objectives of the SI and establish a basis for future action at this site.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Chapter 4.0 in this SFSP and Chapter 5.0 of the QAP. Data will be reported in accordance with the definitive data requirements presented in Chapter 2 of the USACE Engineer Manual 200-1-6, *Chemical Quality Assurance for Hazardous, Toxic and Radioactive Waste (HTRW) Projects* (USACE, 1997), and evaluated by the stipulated requirements for the generation of definitive data (Section 7.2.2 of the QAP). Chemical data will be reported by the laboratory via hard-copy data packages using Contract Laboratory Program-like forms, along with electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

3.2 Data Users and Available Data

The available data related to the SI at Former Rifle/Machine Gun Range, Parcel 104Q, presented in Table 3-1, have been used to formulate a site-specific conceptual model. This conceptual model was developed to support the development of this SFSP, which is necessary to meet the objectives of these activities and to establish a basis for future action at the site. The data users for the data and information generated during field activities are primarily EPA, USACE, ADEM, FTMC, and other USACE supporting contractors. This SFSP, along with the necessary companion documents, has been designed to provide the regulatory agencies with sufficient detail to reach a determination as to the adequacy of the scope of work. The program has also been designed to provide the level of defensible data and information required to confirm or rule out the existence of residual chemical contamination in site media.

Table 3-1

**Summary of Data Quality Objectives
Former Rifle/Machine Gun Range, Parcel 104Q
Site Investigation
Fort McClellan, Calhoun County, Alabama**

Users	Available Data	Conceptual Site Model	Media of Concern	Data Uses and Objectives	Data Types	Analytical Level	Data Quantity
EPA, ADEM USACE, DOD FTMC, IT Corporation Other contractors, and possible future land users	None	<u>Contaminant Source</u> Former Rifle/Machine Gun Range Parcel 104Q (explosives and metals) <u>Migration Pathways</u> Infiltration and leaching to surface soil and subsurface soil, leaching to ground- water, dust emissions to ambient air, and biotransfer to venison <u>Potential Receptors</u> Residents (future) Recreational site user (current and future) Groundskeeper (future) Construction worker (future) <u>PSSC</u> metals, nitroexplosives, VOCs, SVOCs, herbicides, and pesticides	<u>Surface soil</u>	SI to confirm the presence or absence of contamination in the site media Definitive quality data for future decision- making	<u>Surface soil</u> All samples TAL metals and nitroaromatic and nitramine explosives; plus 10% of sample types for VOCs, SVOCs, chlorinated pesticides, chlorinated herbicides, and organophosphorous pesticides.	Definitive data in data packages (as defined in USACE EM200-1-6)	22 surface soil samples + QC
			<u>Subsurface soil</u>		<u>Subsurface Soil</u> All samples TAL metals and nitroaromatic and nitramine explosives; plus 10% of sample types for VOCs, SVOCs, chlorinated pesticides, chlorinated herbicides, and organophosphorous pesticides.	Definitive data in data packages (as defined in USACE EM200-1-6)	22 subsurface soil samples + QC
			<u>Groundwater</u>		<u>Groundwater</u> All samples TAL metals and nitroaromatic and nitramine explosives; plus 10% of sample types for VOCs, SVOCs, chlorinated pesticides, chlorinated herbicides, and organophosphorous pesticides.	Definitive data in data packages (as defined in USACE EM200-1-6)	2 groundwater samples + QC

ADEM - Alabama Department of Environmental Management.
 CESAS - Corps of Engineers South Atlantic Savannah.
 DOD - U.S. Department of Defense.
 EPA - U.S. Environmental Protection Agency.
 FTMC - Fort McClellan.
 USACE - U.S. Army Corps of Engineers.
 EM200-1-6 - USACE Engineer Manual, *Chemical Quality Assurance for HTRW Projects*, October, 1997.

SI - Site investigation.
 QC - Quality control.
 TAL - Target analyte list.
 TOC - Total organic carbon.
 PSSC - Potential site-specific chemical.
 VOC - Volatile Organic Compound.
 SVOC - Semivolatile Organic Compound.

3.3 Conceptual Site Exposure Model

The conceptual site exposure model (CSEM) provides the basis for identifying and evaluating potential risks and hazards to human health in the risk assessment. The CSEM includes receptors and potential exposure pathways appropriate to all plausible scenarios. The CSEM facilitates a consistent and comprehensive evaluation of human health through graphically presenting all possible exposure pathways, including sources, release and transport pathways, and exposure routes. In addition, the CSEM helps to ensure that potential pathways are not overlooked. The elements of a complete exposure pathway and CSEM are:

- Source (i.e., contaminated environmental) media
- Contaminant release mechanisms
- Contaminant transport pathways
- Receptors
- Exposure pathways.

Contaminant release mechanisms and transport pathways are not relevant for direct receptor contact with a contaminated source medium.

The site was formerly used as a rifle/machine gun range. Therefore, primary contaminant releases were probably limited to lead or other constituents that entered surface and possibly subsurface soil via bullets. Natural weathering of the spent ammunition could lead to other potential contaminant transport pathways including infiltration and leaching to subsurface soil and groundwater, dust emissions to ambient air, and biotransfer to deer through browsing.

Conditions on the site at the present time and conditions expected to occur in the future dictate the selection of receptors used to model current and future risks at the site. Most of Parcel 104Q is heavily vegetated with brush and woods. The site is not currently used for any activities at FTMC on a regular basis. There are no construction projects currently ongoing, nor are any areas used for residential purposes. Although access to FTMC is limited, it is possible that an individual could circumvent the perimeter fence on the base and the additional gate east of the Military Operations in Urban Terrain (MOUT) site and wander into the area. Based on these conditions, the recreational site user is the only receptor evaluated under the current scenario. Because the area supports habitat favorable for deer, the recreational site user may use the site for hunting purposes. The following receptors were considered for this site, but are not included under the current land-use scenario:

- **Groundskeeper.** The site is not currently maintained by a groundskeeper.
- **Construction Worker.** No development or construction is occurring at the site.
- **Resident.** The site is not currently used for residential purposes.

The proposed reuse of the site is industrial for the northern two-thirds of the parcel, and is passive recreation for the southern one-third of the parcel. Human receptors addressed in the future scenario of the CSEM include:

- **Groundskeeper.** The area may require upkeep by maintenance personnel.
- **Construction Worker.** Construction or demolition projects, or utility line maintenance may occur in the future.
- **Recreational Site User.** The site is surrounded with many acres of forests, providing a good area for recreational purposes.
- **Resident.** Although the site is expected to be utilized for industrial purposes and for passive recreation, the resident is considered to provide information for the project manager and regulators.

A summary of relevant contaminant release and transport mechanisms, source and exposure media, and receptors and exposure pathways for this site is provided in Table 3-1 and Figure 3-1.

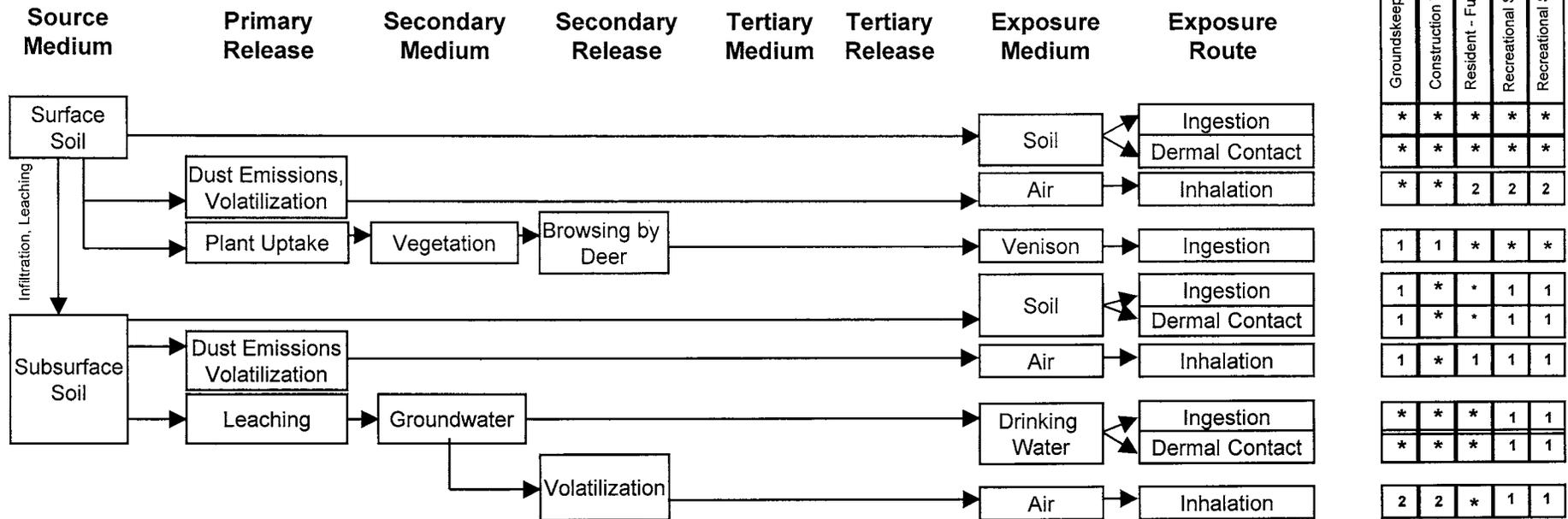
3.4 Decision-Making Process, Data Uses, and Needs

The seven-stage data quality objective decision making process is presented in detail in Chapter 3.0 of the QAP and will be followed during the SI at Former Rifle/Machine Gun Range, Parcel 104Q. Data uses and needs are summarized in Table 3-1.

3.4.1 Risk Evaluation

Confirmation of contamination at Former Rifle/Machine Gun Range, Parcel 104Q, will be based on using EPA definitive data to determine whether or not PSSCs are detected in site media. Detected site chemical concentrations will be compared to site-specific screening levels, ecological screening values, and background values to determine if PSSCs are present at the site at concentrations that pose an unacceptable risk to human health or the environment. Definitive data will be adequate for confirming the presence of site contamination and for supporting a feasibility study and risk assessment.

Figure 3-1
Human Health Conceptual Site Exposure Model
Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Alabama



* = Complete exposure pathway evaluated in the streamlined risk assessment.
 1 = Incomplete exposure pathway.
 2 = Although theoretically complete, this pathway is judged to be insignificant and is not evaluated in the streamlined risk assessment.

Assessment of potential ecological risk associated with sites or parcels (e.g., surface water and sediment sampling, specific ecological assessment methods, etc.) will be addressed in accordance with the procedures in Section 5.3 of the WP (IT, 2002b).

3.4.2 Data Types and Quality

Surface soil, subsurface soil, and groundwater will be sampled and analyzed to meet the objectives of the SI at Former Rifle/Machine Gun Range, Parcel 104Q. Quality assurance/quality control (QA/QC) samples will be collected for all sample types, as described in Chapter 4.0 of this SFSP. Samples will be analyzed by EPA-approved SW-846 Methods Update III, where available; comply with EPA definitive data requirements; and be reported using hard-copy data packages. In addition to meeting the quality needs of this SI, data analyzed at this level of quality are appropriate for all phases of site characterization, remedial investigation, and risk assessment.

3.4.3 Precision, Accuracy, and Completeness

Laboratory requirements of precision, accuracy, and completeness for this SI are defined in Section 3.3 and presented in Chapter 5.0 of the QAP (IT, 2002a).

4.0 Field Activities

4.1 UXO Survey Requirements and Utility Clearances

Former Rifle/Machine Gun Range, Parcel 104Q, is located in the proximity of parcels that fall within the “Possible Artillery Impact Area” shown on Plate 10 of the *Archives Search Report, Maps, Fort McClellan, Anniston, Alabama* (USACE, 1999b). Therefore, IT will conduct UXO avoidance activities, including surface sweeps and downhole surveys of soil borings. The site-specific UXO safety plan provides technical guidance for ordnance and explosives avoidance and construction activities for sample collection activities at Former Rifle/Machine Gun Range, Parcel 104Q. The site-specific UXO safety plan attachment has been written in conjunction with Appendix E of the SAP (IT, 2002a).

4.1.1 Surface UXO Survey

A UXO sweep will be conducted over areas that will be included in the sampling and surveying activities to identify UXO on or near the surface that may present a hazard to on-site workers during field activities. Low-sensitivity magnetometers will be used to locate surface and shallow-buried metal objects. UXO located on the surface will be identified and conspicuously marked for easy avoidance. Subsurface metallic anomalies will not be disturbed, but will also be marked for easy avoidance. UXO personnel requirements, procedures, and detailed descriptions of the geophysical equipment to be used are provided in Appendix E of the SAP (IT, 2002a).

4.1.2 Downhole UXO Survey

During the soil boring and downhole sampling activities, downhole UXO surveys will be performed to determine if buried metallic objects are present. UXO monitoring, as described in Appendix E of the SAP (IT, 2002a), will continue until undisturbed soil is encountered or the borehole has been advanced to 12 feet below ground surface (bgs), whichever is reached first.

4.1.3 Utility Clearances

After the UXO surface survey has cleared the area to be sampled and prior to performing any intrusive sampling, a utility clearance will be performed at locations where soil and groundwater samples will be collected, using the procedure outlined in Section 4.2 of the SAP (IT, 2002a). The site manager will mark the proposed locations with stakes, coordinate with the local utility companies to clear the proposed locations for utilities, and obtain digging permits. Once the

locations are approved (for both UXO and utility avoidance) for intrusive sampling, the stakes will be labeled as cleared.

4.2 Environmental Sampling

The environmental sampling program at the Former Rifle/Machine Gun Range, Parcel 104Q, includes the collection of surface soil, subsurface soil, and groundwater samples for chemical analysis. These samples will be collected and analyzed to provide data for characterizing the site to determine the environmental condition of the site and any further action to be conducted. Additionally, samples will be collected from environmental media in locations that will assist in the assessment of potential ecological impacts resulting from activities at the site.

4.2.1 Surface Soil Sampling

Surface soil samples will be collected from 22 locations at the Former Rifle/Machine Gun Range, Parcel 104Q.

4.2.1.1 Sample Locations and Rationale

The sampling rationale for each surface soil sample location is listed in Table 4-1. Proposed sampling locations are shown in Figure 4-1. Surface soil sample designations and required QA/QC sample requirements are summarized in Table 4-2. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field conditions.

4.2.1.2 Sample Collection

Surface soil samples will be collected from the upper 1 foot of soil by direct-push methodology as specified in Section 5.1.1.1 and Section 6.1.1.1 of the SAP (IT, 2002a). In areas where site access does not permit the use of a direct-push rig, the samples will be collected using a stainless-steel hand-auger as specified in Section 5.1.1.2 and Section 6.1.1.1 of the SAP (IT, 2002a). Collected soil samples will be screened using a photoionization detector (PID) in accordance with Section 6.8.3 of the SAP. Surface soil samples will be screened for information purposes only, not to aid in the selection of samples for analysis. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are discussed in Chapter 4.0, and listed in Table 4-1 of the QAP. Sample documentation and chain-of-custody (COC) will be recorded as specified in Chapter 6.0 of the SAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

Table 4-1

**Sample Locations and Rationale
Site Investigation, Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

(Page 1 of 2)

Sample Location	Sample Media	Sample Location Rationale
HR-104Q-GP01	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the northwest section of this parcel within the graveled portion of the firing line area, downslope of most of the parcel. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP02	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the northeast section of this parcel in the firing line area. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP03	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed to the south of the firing line in an area of rectangular depressions. This sample will be downslope of most of the depressions. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP04	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the north-central portion of the bermed area of the parcel, north of MOUT Road. This sample location will provide additional areal coverage for better definition of soils within the bermed area. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP05	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the northwestern portion of the bermed area of the parcel, north of MOUT Road at the foot of one of the berms. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP06	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the north-central portion of the bermed area of the parcel, north of MOUT Road at the foot of one of the berms. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP07	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the center of the bermed area of the parcel, north of MOUT Road. This sample location will provide additional areal coverage for better definition of soils within the bermed area. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP08	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the eastern side of the central portion of the bermed area of the parcel, north of MOUT Road at the foot of one of the berms. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP09	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the eastern-central portion of the bermed area of the parcel, north of MOUT Road at the foot of one of the berms. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP10	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the central portion of the bermed area of the parcel, north of MOUT Road at the foot of one of the berms. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP11	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the south-central portion of the bermed area, north of MOUT Road. This sample location will provide additional areal coverage for better definition of soils within the bermed area. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.

Table 4-1

**Sample Locations and Rationale
Site Investigation, Former Rifle/Machine Gun Range, Parcel 104Q
Fort McClellan, Calhoun County, Alabama**

(Page 2 of 2)

Sample Location	Sample Media	Sample Location Rationale
HR-104Q-GP12	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the south-central portion of the bermed area of the parcel, north of MOUT Road at the foot of one of the berms. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP13	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the southwestern portion of the bermed area of the parcel, north of MOUT Road at the foot of one of the berms. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP14	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the eastern side of the parcel, south of MOUT Road at the foot of one of the berms. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP15	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed near the western boundary of the parcel, south of MOUT Road downslope of an area of rectangular depressions. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP16	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in the center of the parcel, south of MOUT Road at the foot of one of the berms. This sample location is downslope of the disturbed area noted on aerial photographs. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP17	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed near the western boundary of the parcel approximately 150 feet north of the unimproved road, downslope of an area of rectangular depressions. This sample location is within the disturbed area noted on aerial photographs. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP18	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in a possible impact area approximately 150 feet south of the unimproved road, and south of the parcel boundary. This sample location is within the disturbed area noted on aerial photographs. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP19	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed in a possible impact area approximately 125 feet south of the unimproved road, and south of the parcel boundary. This sample location is within the disturbed area noted on aerial photographs. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-GP20	Surface soil and subsurface soil	Soil boring for surface soil and subsurface soil samples to be placed approximately 25 feet north of MOUT Road in the central portion of the parcel. Sample data will indicate if contaminant releases into the environment have occurred from former activities at this area of the site and if contaminated soil exists at this location. Soil samples will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-104Q-MW01	Surface soil, subsurface soil and groundwater	Soil boring for soil and groundwater samples to be placed near the abandoned jeep along the western boundary in the central section of the parcel. Sample data will indicate if contaminant releases have occurred from former activities at the site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat. The monitoring well location will be used to establish local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. The well will be completed so that the well screen intersects first water encountered.
HR-104Q-MW02	Surface soil, subsurface soil and groundwater	Soil boring for soil and groundwater samples to be placed approximately 75 feet south of the graveled area along the western parcel boundary in the northern portion of the site. This sample location will be downslope of the bermed area. Sample data will indicate if contaminant releases have occurred from former activities at the site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat. The monitoring well location will be used to establish local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. The well will be completed so that the well screen intersects first water encountered.

Table 4-2

**Surface and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Site Investigation,
Fomer Rifle/Machine Gun Range, Parcel 104Q-X
Fort McClellan, Calhoun County, Alabama**

Page 1 of 3

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Suite
			Field Duplicates	MS/MSD	
HR-104Q-GP01	HR-104Q-GP01-SS-QK0001-REG	0-1	HR-104Q-GP04-SS-QK0002-FD	HR-104Q-GP04-SS-QK0001-MS/MSD	VOCs, SVOCs, CI Herbicides, CI and Op Pesticides, TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP01-DS-QK0003-REG	2-4			
HR-104Q-GP02	HR-104Q-GP02-SS-QK0004-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP02-DS-QK0005-REG	2-4			
HR-104Q-GP03	HR-104Q-GP03-SS-QK0006-REG	0-1	HR-104Q-GP03-DS-QK0008-FD		VOCs, SVOCs, CI Herbicides, CI and Op Pesticides, TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP03-DS-QK0007-REG	2-4			
HR-104Q-GP04	HR-104Q-GP04-SS-QK0009-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP04-DS-QK1010-REG	2-4			
HR-104Q-GP05	HR-104Q-GP05-SS-QK0011-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP05-DS-QK0012-REG	2-4			
HR-104Q-GP06	HR-104Q-GP06-SS-QK0013-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP06-DS-QK0014-REG	2-4			
HR-104Q-GP07	HR-104Q-GP07-SS-QK0015-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP07-DS-QK0016-REG	2-4			
HR-104Q-GP08	HR-104Q-GP08-SS-QK0017-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP08-DS-QK0018-REG	2-4			
HR-104Q-GP09	HR-104Q-GP09-SS-QK0019-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP09-DS-QK0020-REG	2-4			

Table 4-2

**Surface and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Site Investigation,
Fomer Rifle/Machine Gun Range, Parcel 104Q-X
Fort McClellan, Calhoun County, Alabama**

Page 2 of 3

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Suite
			Field Duplicates	MS/MSD	
HR-104Q-GP10	HR-104Q-GP10-SS-QK0021-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP10-DS-QK0022-REG	2-4		HR-104Q-GP10-DS-QK0022-MS/MSD	
HR-104Q-GP11	HR-104Q-GP11-SS-QK0023-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP11-DS-QK0024-REG	2-4			
HR-104Q-GP12	HR-104Q-GP12-SS-QK0025-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP12-DS-QK0026-REG	2-4			
HR-104Q-GP13	HR-104Q-GP13-SS-QK0027-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP13-DS-QK0028-REG	2-4			
HR-104Q-GP14	HR-104Q-GP14-SS-QK0029-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP14-DS-QK0030-REG	2-4			
HR-104Q-GP15	HR-104Q-GP15-SS-QK0031-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP15-DS-QK0032-REG	2-4			
HR-104Q-GP16	HR-104Q-GP16-SS-QK0033-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP16-DS-QK0034-REG	2-4			
HR-104Q-GP17	HR-104Q-GP17-SS-QK0035-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP17-DS-QK0036-REG	2-4			
HR-104Q-GP18	HR-104Q-GP18-SS-QK0037-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP18-DS-QK0038-REG	2-4	HR-104Q-GP18-DS-QK0039-FD		

Table 4-2

**Surface and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Site Investigation,
Fomer Rifle/Machine Gun Range, Parcel 104Q-X
Fort McClellan, Calhoun County, Alabama**

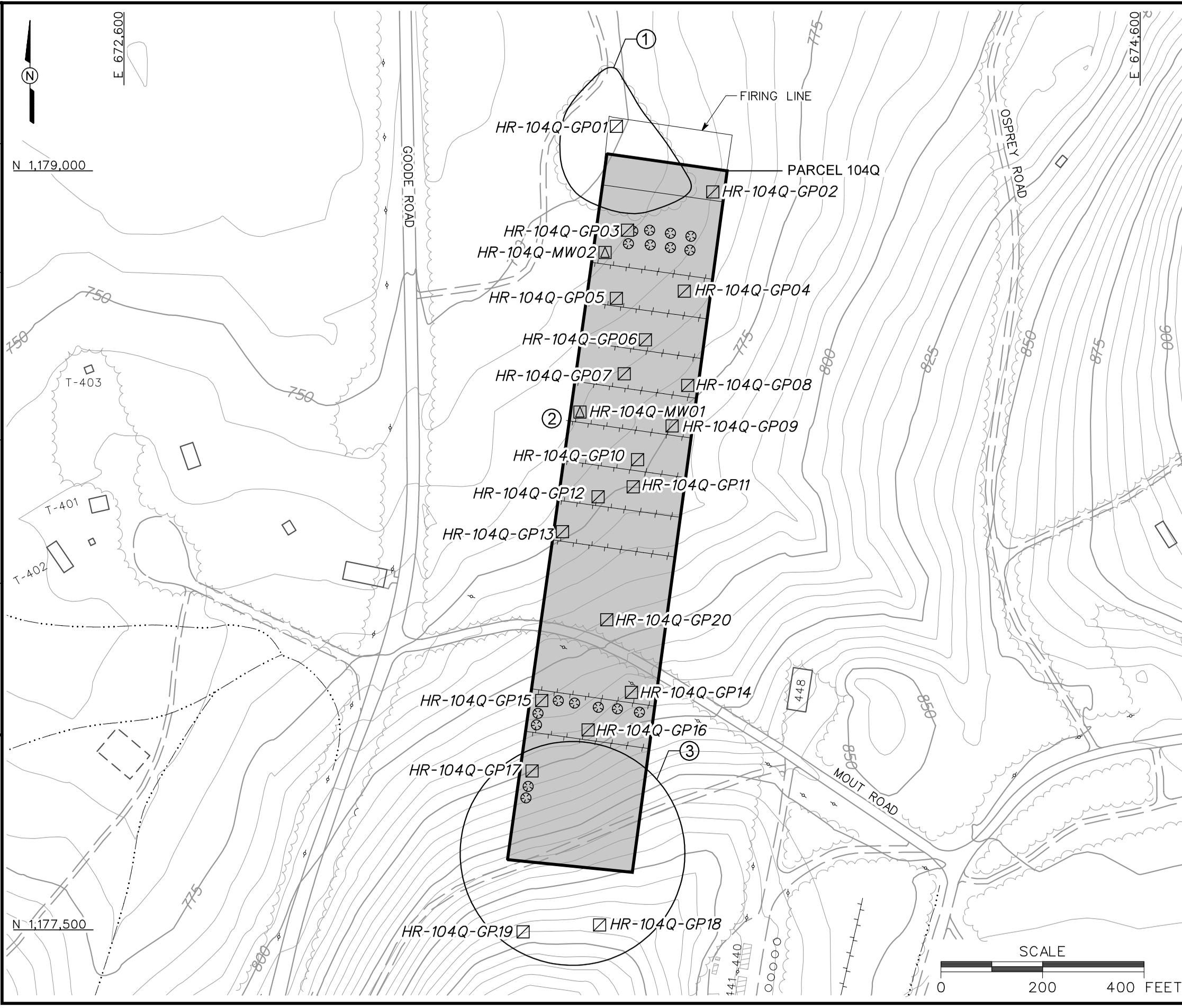
Page 3 of 3

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples		Analytical Suite
			Field Duplicates	MS/MSD	
HR-104Q-GP19	HR-104Q-GP19-SS-QK0040-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP19-DS-QK0041-REG	2-4			
HR-104Q-GP20	HR-104Q-GP20-SS-QK0042-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-GP20-DS-QK0043-REG	2-4			
HR-104Q-MW01	HR-104Q-MW01-SS-QK0044-REG	0-1	HR-104Q-MW01-SS-QK0045-FD		TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-MW01-DS-QK0046-REG	2-4			
HR-104Q-MW02	HR-104Q-MW02-SS-QK0047-REG	0-1			TAL Metals, Nitroaromatic and Nitramine Explosives
	HR-104Q-MW02-DS-QK0048-REG	2-4			

Cl and Op - Chlorinated and Organophosphorous
FD - Field duplicate.
MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.

REG - Field sample.
SVOCs - Semivolatile organic compounds.
TAL - Target analyte list.
TCL - Target compound list.
VOCs - Volatile organic compounds.

DWG. NO.: ...796887es.291
 PROJ. NO.: 796887
 INITIATOR: K. HUNTER
 PROJ. MGR.: J. YACOBUB
 DRAFT. CHK. BY:
 ENGR. CHK. BY: S. MORAN
 DATE LAST REV.:
 DRAWN BY:
 STARTING DATE: 01/08/02
 DRAWN BY: D. BOMAR
 03/26/02
 08:40:31 AM
 DBILLING
 c:\cadd\design\796887es.291



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- FIRING LINE
- SURFACE DRAINAGE / CREEK
- UTILITY POLE
- BERM
- DEPRESSION FOXHOLES/TARGET BUNKERS
- PROPOSED SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- PROPOSED GROUNDWATER, SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION

TRAINING AIDS/PHYSICAL FEATURES OBSERVED

- ① GRAVEL AREA WITH UTILITY POLE
- ② ABANDONED VEHICLE
- ③ FORMER DISTURBED AREA NOTED FROM AERIAL PHOTOGRAPHS

FIGURE 4-1
PROPOSED SAMPLE LOCATION MAP
FORMER RIFLE/MACHINE GUN RANGE
PARCEL 104Q

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



4.2.2 Subsurface Soil Sampling

Subsurface soil samples will be collected from 22 borings installed at Former Rifle/Machine Gun Range, Parcel 104Q.

4.2.2.1 Sample Locations and Rationale

Subsurface soil samples will be collected from the soil borings proposed on Figure 4-1. The sampling rationale for each subsurface soil sample location is listed in Table 4-1. Subsurface soil sample designations and QA/QC sample requirements are listed in Table 4-2. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field observations and utility clearance results.

4.2.2.2 Sample Collection

Subsurface soil samples will be collected from soil borings at a depth greater than 1 foot bgs in the unsaturated zone. The soil borings will be advanced and soil samples collected using the direct-push sampling procedures specified in Section 5.1.1.1 and Section 6.1.1.1 of the SAP (IT, 2002a). In areas where site access does not permit the use of a direct-push rig, the samples will be collected using a stainless-steel hand-auger as specified in Section 5.1.1.2 and Section 6.1.1.1 of the SAP (IT, 2002a).

Soil samples will be collected continuously for the first 4 feet or until either groundwater or refusal is reached. A detailed lithological log will be recorded by the on-site geologist for each borehole. At least one subsurface sample from each borehole will be selected for analysis. The collected subsurface soil samples will be field-screened using a PID in accordance with Section 6.8.3 of the SAP to measure samples exhibiting elevated readings exceeding background (readings in ambient air). Typically, the subsurface soil sample showing the highest reading (above background) will be selected and sent to the laboratory for analysis. If none of the samples indicates a reading exceeding background using the PID, the deepest interval from the soil boring will be sampled and submitted to the laboratory for analysis. Subsurface soil samples may be selected for analysis from any depth interval if the on-site geologist suspects PSSCs at the interval. Site conditions such as lithology may also determine the actual sample depth interval submitted for analysis. The depth of the boring may be extended beyond 4 feet bgs and more than one subsurface soil sample may be collected if field measurements and observations indicate a possible layer of PSSCs and/or additional sample data would provide insight to the existence of any PSSCs.

Sample documentation and COC will be recorded as specified in Chapter 6.0 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are discussed in Chapter 4.0 and listed in Table 4-1 of the QAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

4.2.3 Permanent Residuum Monitoring Wells

Two permanent residuum monitoring wells will be installed at the Former Rifle/Machine Gun Range, Parcel 104Q. The permanent residuum monitoring well locations are shown on Figure 4-1. The rationale for each monitoring well location is presented in Table 4-1. Monitoring wells will be installed using a truck-mounted hollow-stem auger drill rig. The monitoring well boreholes will be drilled to the top of bedrock, or until adequate groundwater is encountered to install a well with 10- to 20-feet of screen. The monitoring well casing will consist of new 2-inch inside-diameter (ID), Schedule 40, threaded, flush-joint polyvinyl chloride (PVC) pipe. Attached to the bottom of the well casing will be a section of new threaded, flush-joint, 0.010-inch continuous wrap polyvinyl chloride well screen, approximately 10 to 20 feet long.

At the discretion of the IT site manager, a sump (composed of new, 2-inch ID, Schedule 40, threaded, flush-joint PVC) may be attached to the bottom of the well screen. After the casing and screen materials are lowered into the boring, a filter pack will be installed around the well screen. In wells installed to depths of 20 feet or less, the filter pack material will be gravity filled. In wells installed to depths of 20 feet or more, the filter pack will be tremied into place. The filter pack will be installed from the bottom of the well to approximately 5 feet above the top of the well screen. The filter pack will consist of 20/40 silica sand. A fine sand (30/70 silica sand), approximately 5 feet thick may be placed above the filter pack. A bentonite seal, approximately 5 feet thick, will be placed above the filter pack (or fine sand, if used). The remaining annular space will be grouted with a bentonite-cement mixture, using approximately 7 to 8 gallons of water and approximately 5 pounds of bentonite per 94-pound bag of Type I or Type II Portland cement. The grout will be tremied into place from the top of the bentonite seal to ground surface. Monitoring wells will be completed with stick-up or flush-mount construction as determined by the site geologist based on the site conditions.

Soil samples for lithology will be collected starting at 5 feet bgs and at 5-foot intervals thereafter, to the total depth of the borehole. Lithologic samples will be collected and described to provide a detailed lithologic log. The samples will be collected in a 24-inch-long, 2-inch-or-larger-

diameter split-spoon sampler. The soil borings will be logged in accordance with American Standard for Testing and Materials Method D 2488 using the Unified Soil Classification System. The soil samples will be screened in the field for the presence of volatile organic compound contamination using a PID. The monitoring wells will be drilled, installed, and developed as specified in Section 5.1 and Appendix C of the SAP (IT, 2002a). The exact monitoring well locations will be determined in the field by the on-site geologist, based on actual field conditions. The monitoring wells will be allowed to equilibrate for 14 days after well development prior to collecting groundwater samples.

4.2.4 Groundwater Sampling

Groundwater samples will be collected from the two monitoring wells completed at the Former Rifle/Machine Gun Range, Parcel 104Q, as presented in Section 4.2.3.

4.2.4.1 Sample Locations and Rationale

Groundwater samples will be collected from the monitoring well locations shown on Figure 4-1. The groundwater sampling rationale is listed in Table 4-1. The groundwater sample designations, depths, and required QA/QC sample quantities are listed in Table 4-3.

4.2.4.2 Sample Collection

Prior to sampling monitoring wells, the static water levels will be measured from each of the monitoring wells installed at the site to define the groundwater flow in the residuum aquifer. Water level measurements will be performed as outlined in Section 5.5 of the SAP (IT, 2002a). Groundwater samples will be collected in accordance with the procedures outlined in Section 6.1.1.5 and Attachment 5 of the SAP. Low-flow groundwater sampling methodology, outlined in Attachment 5, Procedure No. FTMC-GW-001 of the SAP (IT, 2002a), may be used as deemed necessary by the IT site manager.

Sample documentation and COC will be recorded as specified in Chapter 6.0 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are discussed in Chapter 4.0 and listed in Table 4-1 of the QAP (IT, 2002a). The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

Table 4-3

**Groundwater Sample Designations and QA/QC Sample Quantities
Site Investigation, Former Rifle/Machine Gun Range 104Q-X
Fort McClellan, Calhoun County, Alabama**

Sample Location	Sample Designation	Sample Matrix	Sample Depth	QA/QC Samples		Analytical Suite
				Field Duplicates	MS/MSD	
HR-104Q-MW01	HR-104Q-MW01-GW-QK3001-REG	Groundwater	a	HR-104Q-MW01-GW-QK3002-FD		TCL VOCs, TCL SVOCs, TAL Metals, Nitroaromatic and Nitramine Explosives, CI and Op Pesticides, and CI Herbicides
HR-104Q-MW02	HR-104Q-MW02-GW-QK3003-REG	Groundwater	a		HR-104Q-MW02-GW-QK3003-MS/MSD	TAL Metals, Nitroaromatic and Nitramine Explosives

^aGroundwater samples will be collected from the approximate top 5 to 10 feet of the water column per Attachment 5 of the *Installation-Wide Sampling and Analysis Plan* (IT, 2002a).

CI and Op - Chlorinated and Organophosphorous.
 FD - Field duplicate.
 MS/MSD - Matrix spike/matrix spike duplicate.
 QA/QC - Quality assurance/quality control.
 REG - Field sample.

SVOCs - Semivolatile organic compounds.
 TAL - Target analyte list.
 TCL - Target compound list.
 TOC - Total organic carbon.
 VOCs - Volatile organic compounds.

4.3 Decontamination Requirements

Decontamination will be performed on sampling and non-sampling equipment to prevent cross-contamination between sampling locations. Decontamination of sampling equipment will be performed in accordance with the requirements presented in Section 6.5.1.1 of the SAP (IT, 2002a). Decontamination of non-sampling equipment will be performed in accordance with the requirements presented in Section 6.5.1.2 of the SAP.

4.4 Surveying of Sample Locations

Sampling locations will be marked with pin flags, stakes, and/or flagging and will be surveyed using either global positioning system (GPS) or conventional civil survey techniques, as necessary to obtain the required level of accuracy. Horizontal coordinates will be referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations will be referenced to the North American Vertical Datum of 1988.

Horizontal coordinates for soil sample locations will be recorded using a GPS to provide accuracy within 1 meter. Because of the need to use permanent monitoring wells to determine water levels, a higher level of accuracy is required. Monitoring wells will be surveyed to an accuracy of 0.1 foot for horizontal coordinates and 0.01 foot for elevations, using survey-grade GPS techniques and/or conventional civil survey techniques, as required. Procedures to be used for GPS surveying are described in Section 4.4.1.1 of the SAP. Conventional land survey requirements are presented in Section 4.4.1.2 of the SAP.

4.5 Analytical Program

Samples collected at locations specified in this section of this SFSP will be analyzed for a specific suite of chemicals and elements based on the history of site usage, as well as EPA, ADEM, FTMC, and USACE requirements. Target analyses for samples collected from Former Rifle/Machine Gun Range, Parcel 104Q, consist of the following list of analytical suites:

- Target analyte metals - Method 6010B/7000
- Nitroaromatic/nitramine explosives – Method 8330.

Approximately ten percent of the sample types will be analyzed for an expanded suite of parameters which includes:

- Target compound list volatile organic compounds - Method 5035/8260B

Table 4-4

**Analytical Samples
Site Investigation, Former Rifle/Machine Gun Range, Parcel 104Q-X
Fort McClellan, Alabama**

Parameters	Analysis Method	Sample Matrix	TAT Needed	Field Samples			QA/QC Samples ^a				EMAX
				No. of Sample Points	No. of Events	No. of Field Samples	Field Dups (10%)	MS/MSD (5%)	Trip Blank (1/ship)	Eq. Rinse (1/wk/matrix)	Total No. Analysis

Parcel 104Q-X: 2 groundwater and 44 soil matrix samples (22 surface and 22 subsurface soil samples)

All samples will be analyzed for the following parameters:

Nitroaromatic/Nitramine Explosives	8330	water	normal	2	1	2	1	1	0	1	6
TAL Metals	6010B/7000	water	normal	2	1	2	1	1	0	1	6
Nitroaromatic/Nitramine Explosives	8330	soil	normal	44	1	44	4	2	0	3	55
TAL Metals	6010B/7000	soil	normal	44	1	44	4	2	0	3	55

Approximately 10% of the sample types will be analyzed for the following parameters:

TCL VOCs	8260B	water	normal	1	1	1	1	0	1	1	4
TCL SVOCs	8270C	water	normal	1	1	1	1	0	0	1	3
Chlorinated Pesticides	8081A	water	normal	1	1	1	1	0	0	1	3
Organophosphorus Pesticides	8141A	water	normal	1	1	1	1	0	0	1	3
Chlorinated Herbicides	8151A	water	normal	1	1	1	1	0	0	1	3
TCL VOCs	8260B	soil	normal	4	1	4	1	1	0	1	8
TCL SVOCs	8270C	soil	normal	4	1	4	1	1	0	1	8
Chlorinated Pesticides	8081A	soil	normal	4	1	4	1	1	0	1	8
Organophosphorus Pesticides	8141A	soil	normal	4	1	4	1	1	0	1	8
Chlorinated Herbicides	8151A	soil	normal	4	1	4	1	1	0	1	8

Parcel 104Q-X Subtotal:

117	20	11	1	18	178
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^aField duplicate, QA split, and MS/MSD samples were calculated as a percentage of the field samples collected per site and were rounded to the nearest whole number.

Trip blank samples will be collected with water matrix samples for VOC analysis only. Assumed four field samples per day to estimate trip blanks. Equipment blanks will be collected once per event whenever sampling equipment is field decontaminated and re-used. They will be repeated weekly for sampling events that last more than 1 week. Assumed 20 field samples will be collected per week to estimate number of equipment blanks.

MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.
SVOCs - Semivolatile organic compounds.
TAL - Target analyte list.

TAT - Turn-around time.
TCL - Target compound list.
VOCs - Volatile organic compounds.

Ship samples to: EMAX Laboratories, Inc.
1835 205th Street
Torrance, CA 90501
Attn: Elizabeth McIntyre
Tel: 310-618-8889
Fax: 310-618-0818

- Target compound list semivolatile organic compounds - Method 8270C
- Chlorinated herbicides - Method 8151A
- Chlorinated pesticides - Method 8081A
- Organophosphorus pesticides - Method 8141A
- Target analyte metals – Method 6010B/7000
- Nitroaromatic/nitramine explosives – Method 8330.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Table 4-4 in this SFSP and Chapter 5.0 of the QAP. Data will be reported in accordance with definitive data requirements of Chapter 2 of the USACE Engineer Manual 200-1-6, *Chemical Quality Assurance For Hazardous, Toxic And Radioactive Waste (HTRW) Projects* (USACE, 1997), and evaluated by the stipulated requirements for the generation of definitive data (Section 7.2.2 of the QAP). Chemical data will be reported by the laboratory via hard-copy data packages using Contract Laboratory Program-like forms, along with electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

4.6 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping will follow the procedures specified in Sections 6.1.3 through 6.1.7 of the SAP (IT, 2002a). Completed analysis request/COC records will be secured and included with each shipment of coolers to:

Attn: Sample Receiving/Elizabeth McIntyre
EMAX Laboratories, Inc.
1835 205th Street
Torrance, California 90501
Telephone: (310) 618-8889.

4.7 Investigation-Derived Waste Management

Management and disposal of the investigation-derived wastes (IDW) will follow procedures and requirements described in Appendix D of the SAP (IT, 2002a). The IDW expected to be generated at Former Rifle/Machine Gun Range, Parcel 104Q, will include decontamination fluids, drill cuttings, purge water, and disposable personal protective equipment. Sampling of IDW to obtain analytical results for characterizing the waste for disposal will follow the procedures specified in Section 6.1.1.8 of the SAP (IT, 2002a).

4.8 Site-Specific Safety and Health

Health and safety requirements for this SI are provided in the SSHP attachment for Former Rifle/Machine Gun Range, Parcel 104Q. The SSHP attachment will be used in conjunction with the installation-wide safety and health plan, Appendix A of the SAP (IT, 2002a).

5.0 Project Schedule

The project schedule for the SI activities will be provided by the IT project manager to the Base Realignment and Closure Cleanup Team.

6.0 References

Environmental Science and Engineering, Inc. (ESE), 1998, *Final Environmental Baseline Survey, Fort McClellan, Alabama*, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, January.

IT Corporation (IT), 2002a, *Draft Revision 3, Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, Alabama*, February.

IT Corporation (IT), 2002b, *Draft Revision 2, Installation-Wide Work Plan, Fort McClellan, Calhoun County, Alabama*, February.

U.S. Army Corps of Engineers (USACE), 1999a, *Archives Search Report, Conclusions and Recommendations, Fort McClellan, Anniston, Alabama*, July.

U.S. Army Corps of Engineers (USACE), 1999b, *Archives Search Report, Maps, Fort McClellan, Anniston, Alabama*, July.

U.S. Army Corps of Engineers (USACE), 1999c, *Statement of Work for Task Order CK10, Remedial Investigations (RIs) at the Chemical Warfare Material Sites, RIs at the Fuel/Training Areas, RIs at the Print Plants/Motor Pools, RIs at the Ground Scars/Boiler Plants, RI at Range 24A, Site Investigations (SIs) at the Historic Ranges, and a Groundwater Investigation at Rideout Field at Fort McClellan, Alabama*, June.

U.S. Army Corps of Engineers (USACE), 1997, Engineer Manual 200-1-6, *Chemical Quality Assurance For Hazardous, Toxic and Radioactive Waste (HTRW) Projects*.

U.S. Department of Agriculture (USDA), 1961, *Soil Survey, Calhoun County, Alabama*, Soil Conservation Service, Series 1958, No. 9, September 1961.

U.S. Environmental Protection Agency (EPA), 2000, *Guidance for the Data Quality Objectives Process*, EPA 600/R-96/005, August.

ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid	BCT	BRAC Cleanup Team	Cl.	chlorinated
2,4,5-T	2,4,5-trichlorophenoxyacetic acid	BERA	baseline ecological risk assessment	CLP	Contract Laboratory Program
2,4,5-TP	silvex	BEHP	bis(2-ethylhexyl)phthalate	cm	centimeter
3D	3D International Environmental Group	BFB	bromofluorobenzene	CN	chloroacetophenone
AB	ambient blank	BFE	base flood elevation	CNB	chloroacetophenone, benzene, and carbon tetrachloride
AbB3	Anniston gravelly clay loam, 2 to 6 percent slopes, severely eroded	BG	Bacillus globigii	CNS	chloroacetophenone, chloropicrin, and chloroform
AbC3	Anniston gravelly clay loam, 6 to 10 percent slopes, severely eroded	bgs	below ground surface	CO	carbon monoxide
AbD3	Anniston and Allen gravelly clay loams, 10 to 15 percent slopes, eroded	BHC	betahexachlorocyclohexane	Co-60	cobalt-60
Abs	skin absorption	BHHRA	baseline human health risk assessment	CoA	Code of Alabama
ABS	dermal absorption factor	BIRTC	Branch Immaterial Replacement Training Center	COC	chain of custody; contaminant of concern
AC	hydrogen cyanide	bkg	background	COE	Corps of Engineers
ACAD	AutoCadd	bls	below land surface	Con	skin or eye contact
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded	BOD	biological oxygen demand	COPC	chemical(s) of potential concern
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded	Bp	soil-to-plant biotransfer factors	COPEC	chemical(s) of potential ecological concern
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded	BRAC	Base Realignment and Closure	CPSS	chemicals present in site samples
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded	Braun	Braun Intertec Corporation	CQCSM	Contract Quality Control System Manager
ACGIH	American Conference of Governmental Industrial Hygienists	BSAF	biota-to-sediment accumulation factors	CRDL	contract-required detection limit
AdE	Anniston and Allen stony loam, 10 to 25 percent slope	BSC	background screening criterion	CRL	certified reporting limit
ADEM	Alabama Department of Environmental Management	BTAG	Biological Technical Assistance Group	CRQL	contract-required quantitation limit
ADPH	Alabama Department of Public Health	BTEX	benzene, toluene, ethyl benzene, and xylenes	CRZ	contamination reduction zone
AEC	U.S. Army Environmental Center	BTOC	below top of casing	Cs-137	cesium-137
AEL	airborne exposure limit	BTV	background threshold value	CS	ortho-chlorobenzylidene-malononitrile
AET	adverse effect threshold	BW	biological warfare; body weight	CSEM	conceptual site exposure model
AF	soil-to-skin adherence factor	BZ	breathing zone; 3-quinuclidinyl benzilate	CSM	conceptual site model
AHA	ammunition holding area	C	ceiling limit value	CT	central tendency
AL	Alabama	Ca	carcinogen	ctr.	container
ALAD	-aminolevulinic acid dehydratase	CAB	chemical warfare agent breakdown products	CWA	chemical warfare agent
amb.	Amber	CAMU	corrective action management unit	CWM	chemical warfare material; clear, wide mouth
amsl	above mean sea level	CBR	chemical, biological and radiological	CX	dichloroformoxime
ANAD	Anniston Army Depot	CCAL	continuing calibration	'D'	duplicate; dilution
AOC	area of concern	CCB	continuing calibration blank	D&I	detection and identification
APEC	areas of potential ecological concern	CCV	continuing calibration verification	DAF	dilution-attenuation factor
APT	armor-piercing tracer	CD	compact disc	DANC	decontamination agent, non-corrosive
AR	analysis request	CDTF	Chemical Defense Training Facility	°C	degrees Celsius
ARAR	applicable or relevant and appropriate requirement	CEHNC	U.S. Army Engineering and Support Center, Huntsville	°F	degrees Fahrenheit
AREE	area requiring environmental evaluation	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	DCE	dichloroethene
ASP	Ammunition Supply Point	CERFA	Community Environmental Response Facilitation Act	DDD	dichlorodiphenyldichloroethane
ASR	Archives Search Report	CESAS	Corps of Engineers South Atlantic Savannah	DDE	dichlorodiphenyldichloroethane
AST	aboveground storage tank	CF	conversion factor	DDT	dichlorodiphenyltrichloroethane
ASTM	American Society for Testing and Materials	CFC	chlorofluorocarbon	DEH	Directorate of Engineering and Housing
AT	averaging time	CFDP	Center for Domestic Preparedness	DEP	depositional soil
ATSDR	Agency for Toxic Substances and Disease Registry	CFR	Code of Federal Regulations	DFTPP	decafluorotriphenylphosphine
ATV	all-terrain vehicle	CG	carbonyl chloride (phosgene)	DI	deionized
AWARE	Associated Water and Air Resources Engineers, Inc.	CGI	combustible gas indicator	DID	data item description
AWWSB	Anniston Water Works and Sewer Board	ch	inorganic clays of high plasticity	DIMP	di-isopropylmethylphosphonate
'B'	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)	CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine	DM	dry matter
BCF	blank correction factor; bioconcentration factor	CK	cyanogen chloride	DMBA	dimethylbenz(a)anthracene
		cl	inorganic clays of low to medium plasticity	DMMP	dimethylmethylphosphonate

List of Abbreviations and Acronyms (Continued)

DOD	U.S. Department of Defense	FD	field duplicate	GW	groundwater
DOJ	U.S. Department of Justice	FDA	U.S. Food and Drug Administration	gw	well-graded gravels; gravel-sand mixtures
DOT	U.S. Department of Transportation	FedEx	Federal Express, Inc.	HA	hand auger
DP	direct-push	FEMA	Federal Emergency Management Agency	HCl	hydrochloric acid
DPDO	Defense Property Disposal Office	FFCA	Federal Facilities Compliance Act	HD	distilled mustard
DPT	direct-push technology	FFE	field flame expedient	HDPE	high-density polyethylene
DQO	data quality objective	FFS	focused feasibility study	HEAST	Health Effects Assessment Summary Tables
DRMO	Defense Reutilization and Marketing Office	FI	fraction of exposure	Herb.	herbicides
DRO	diesel range organics	Fil	filtered	HHRA	human health risk assessment
DS	deep (subsurface) soil	Flt	filtered	HI	hazard index
DS2	Decontamination Solution Number 2	FMDC	Fort McClellan Development Commission	HPLC	high performance liquid chromatography
DWEL	drinking water equivalent level	FML	flexible membrane liner	HNO ₃	nitric acid
E&E	Ecology and Environment, Inc.	FMP 1300	Former Motor Pool 1300	HQ	hazard quotient
EB	equipment blank	FOMRA	Former Ordnance Motor Repair Area	HQ _{screen}	screening-level hazard quotient
EBS	environmental baseline survey	Foster Wheeler	Foster Wheeler Environmental Corporation	hr	hour
EC ₅₀	effects concentration for 50 percent of a population	Frtn	fraction	H&S	health and safety
ECBC	Edgewood Chemical/Biological Command	FS	field split; feasibility study	HSA	hollow-stem auger
ED	exposure duration	FSP	field sampling plan	HTRW	hazardous, toxic, and radioactive waste
EDD	electronic data deliverable	ft	feet	'I'	out of control, data rejected due to low recovery
EF	exposure frequency	ft/ft	feet per foot	IATA	International Air Transport Authority
EDQL	ecological data quality level	FTA	Fire Training Area	ICAL	initial calibration
EE/CA	engineering evaluation and cost analysis	FTMC	Fort McClellan	ICB	initial calibration blank
Elev.	elevation	FTRRA	FTMC Reuse & Redevelopment Authority	ICP	inductively-coupled plasma
EM	electromagnetic	g	gram	ICRP	International Commission on Radiological Protection
EMI	Environmental Management Inc.	g/m ³	gram per cubic meter	ICS	interference check sample
EM31	Geonics Limited EM31 Terrain Conductivity Meter	G-856	Geometrics, Inc. G-856 magnetometer	ID	inside diameter
EM61	Geonics Limited EM61 High-Resolution Metal Detector	G-858G	Geometrics, Inc. G-858G magnetic gradiometer	IDL	instrument detection limit
EOD	explosive ordnance disposal	GAF	gastrointestinal absorption factor	IDLH	immediately dangerous to life or health
EODT	explosive ordnance disposal team	gal	gallon	IDM	investigative-derived media
EPA	U.S. Environmental Protection Agency	gal/min	gallons per minute	IDW	investigation-derived waste
EPC	exposure point concentration	GB	sarin	IEUBK	Integrated Exposure Uptake Biokinetic
EPIC	Environmental Photographic Interpretation Center	gc	clay gravels; gravel-sand-clay mixtures	IF	ingestion factor; inhalation factor
EPRI	Electrical Power Research Institute	GC	gas chromatograph	ILCR	incremental lifetime cancer risk
ER	equipment rinsate	GCL	geosynthetic clay liner	IMPA	isopropylmethyl phosphonic acid
ERA	ecological risk assessment	GC/MS	gas chromatograph/mass spectrometer	IMR	Iron Mountain Road
ER-L	effects range-low	GCR	geosynthetic clay liner	in.	inch
ER-M	effects range-medium	GFAA	graphite furnace atomic absorption	Ing	ingestion
ESE	Environmental Science and Engineering, Inc.	GIS	Geographic Information System	Inh	inhalation
ESMP	Endangered Species Management Plan	gm	silty gravels; gravel-sand-silt mixtures	IP	ionization potential
ESN	Environmental Services Network, Inc.	gp	poorly graded gravels; gravel-sand mixtures	IPS	International Pipe Standard
ESV	ecological screening value	gpm	gallons per minute	IR	ingestion rate
ET	exposure time	GPR	ground-penetrating radar	IRDMIS	Installation Restoration Data Management Information System
EU	exposure unit	GPS	global positioning system	IRIS	Integrated Risk Information Service
Exp.	explosives	GS	ground scar	IRP	Installation Restoration Program
E-W	east to west	GSA	General Services Administration; Geologic Survey of Alabama	IS	internal standard
EZ	exclusion zone	GSBP	Ground Scar Boiler Plant	ISCP	Installation Spill Contingency Plan
FAR	Federal Acquisition Regulations	GSSI	Geophysical Survey Systems, Inc.	IT	IT Corporation
FB	field blank	GST	ground stain	ITEMS	IT Environmental Management System™

List of Abbreviations and Acronyms (Continued)

'J'	estimated concentration	MMBtu/hr	million Btu per hour	NRCC	National Research Council of Canada
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded	MOGAS	motor vehicle gasoline	NRHP	National Register of Historic Places
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded	MP	Military Police	ns	nanosecond
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes	MPA	methyl phosphonic acid	N-S	north to south
JPA	Joint Powers Authority	MPM	most probable munition	NS	not surveyed
K	conductivity	MQL	method quantitation limit	NSA	New South Associates, Inc.
K _{ow}	octonal-water partition coefficient	MR	molasses residue	nT	nanotesla
L	lewisite; liter	MRL	method reporting limit	nT/m	nanoteslas per meter
l	liter	MS	matrix spike	NTU	nephelometric turbidity unit
LBP	lead-based paint	mS/cm	millisiemens per centimeter	nv	not validated
LC	liquid chromatography	mS/m	millisiemens per meter	O ₂	oxygen
LCS	laboratory control sample	MSD	matrix spike duplicate	O&G	oil and grease
LC ₅₀	lethal concentration for 50 percent population tested	MTBE	methyl tertiary butyl ether	O&M	operation and maintenance
LD ₅₀	lethal dose for 50 percent population tested	msl	mean sea level	OB/OD	open burning/open detonation
LEL	lower explosive limit	MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded	OD	outside diameter
LOAEL	lowest-observed-advserse-effects-level	mV	millivolts	OE	ordnance and explosives
LT	less than the certified reporting limit	MW	monitoring well	oh	organic clays of medium to high plasticity
LUC	land-use control	MWI&P	Monitoring Well Installation and Management Plan	ol	organic silts and organic silty clays of low plasticity
LUCAP	land-use control assurance plan	Na	sodium	OP	organophosphorus
LUCIP	land-use control implementation plan	NA	not applicable; not available	ORP	oxidation-reduction potential
max	maximum	NAD	North American Datum	OSHA	Occupational Safety and Health Administration
MB	method blank	NAD83	North American Datum of 1983	OSWER	Office of Solid Waste and Emergency Response
MCL	maximum contaminant level	NAVD88	North American Vertical Datum of 1988	OVM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector
MCLG	maximum contaminant level goal	NAS	National Academy of Sciences	OVS	oil/water separator
MCPA	4-chloro-2-methylphenoxyacetic acid	NCEA	National Center for Environmental Assessment	oz	ounce
MCS	media cleanup standard	NCP	National Contingency Plan	PA	preliminary assessment
MD	matrix duplicate	NCRP	National Council on Radiation Protection and Measurements	PAH	polynuclear aromatic hydrocarbon
MDC	maximum detected concentration	ND	not detected	PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
MDCC	maximum detected constituent concentration	NE	no evidence; northeast	Parsons	Parsons Engineering Science, Inc.
MDL	method detection limit	ne	not evaluated	Pb	lead
mg	milligrams	NEW	net explosive weight	PBMS	performance-based measurement system
mg/kg	milligrams per kilogram	NFA	No Further Action	PC	permeability coefficient
mg/kg/day	milligram per kilogram per day	NG	National Guard	PCB	polychlorinated biphenyl
mg/kgbw/day	milligrams per kilogram of body weight per day	NGP	National Guardsperson	PCDD	polychlorinated dibenzo-p-dioxins
mg/L	milligrams per liter	ng/L	nanograms per liter	PCDF	polychlorinated dibenzofurans
mg/m ³	milligrams per cubic meter	NGVD	National Geodetic Vertical Datum	PCE	perchloroethene
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils	Ni	nickel	PCP	pentachlorophenol
MHz	megahertz	NIC	notice of intended change	PDS	Personnel Decontamination Station
µg/g	micrograms per gram	NIOSH	National Institute for Occupational Safety and Health	PEF	particulate emission factor
µg/kg	micrograms per kilogram	NIST	National Institute of Standards and Technology	PEL	permissible exposure limit
µg/L	micrograms per liter	NLM	National Library of Medicine	PES	potential explosive site
µmhos/cm	micromhos per centimeter	NPDES	National Pollutant Discharge Elimination System	Pest.	pesticides
min	minimum	NPW	net present worth	PETN	pentarey thritol tetranitrate
MINICAMS	miniature continuous air monitoring system	No.	number	PFT	portable flamethrower
ml	inorganic silts and very fine sands	NOAA	National Oceanic and Atmospheric Administration	PG	professional geologist
mL	milliliter	NOAEL	no-observed-adverse-effects-level	PID	photoionization detector
mm	millimeter	NR	not requested; not recorded; no risk	PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
MM	mounded material	NRC	National Research Council		

List of Abbreviations and Acronyms (Continued)

PM	project manager	RTK	real-time kinematic	STL	Severn-Trent Laboratories
POC	point of contact	SA	exposed skin surface area	STOLS	Surface Towed Ordnance Locator System®
POL	petroleum, oils, and lubricants	SAD	South Atlantic Division	Std. units	standard units
POW	prisoner of war	SAE	Society of Automotive Engineers	SU	standard unit
PP	peristaltic pump; Proposed Plan	SAIC	Science Applications International Corporation	SUXOS	senior UXO supervisor
ppb	parts per billion	SAP	installation-wide sampling and analysis plan	SVOC	semivolatile organic compound
PPE	personal protective equipment	sc	clayey sands; sand-clay mixtures	SW	surface water
ppm	parts per million	Sch.	Schedule	SW-846	U.S. EPA's <i>Test Methods for Evaluating Solid Waste: Physical/Chemical Methods</i>
PPMP	Print Plant Motor Pool	SCM	site conceptual model	SWMU	solid waste management unit
ppt	parts per thousand	SD	sediment	SWPP	storm water pollution prevention plan
PR	potential risk	SDG	sample delivery group	SZ	support zone
PRG	preliminary remediation goal	SDZ	safe distance zone; surface danger zone	TAL	target analyte list
PSSC	potential site-specific chemical	SEMS	Southern Environmental Management & Specialties, Inc.	TAT	turn around time
pt	peat or other highly organic silts	SF	cancer slope factor	TB	trip blank
PVC	polyvinyl chloride	SFSP	site-specific field sampling plan	TBC	to be considered
QA	quality assurance	SGF	standard grade fuels	TCA	trichloroethane
QA/QC	quality assurance/quality control	SHP	installation-wide safety and health plan	TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
QAM	quality assurance manual	SI	site investigation	TCDF	tetrachlorodibenzofurans
QAO	quality assurance officer	SINA	Special Interest Natural Area	TCE	trichloroethene
QAP	installation-wide quality assurance plan	SL	standing liquid	TCL	target compound list
QC	quality control	SLERA	screening-level ecological risk assessment	TCLP	toxicity characteristic leaching procedure
QST	QST Environmental, Inc.	sm	silty sands; sand-silt mixtures	TDEC	Tennessee Department of Environment and Conservation
qty	quantity	SM	Serratia marcescens	TDGCL	thiodiglycol
Qual	qualifier	SMDP	Scientific Management Decision Point	TDGCLA	thiodiglycol chloroacetic acid
'R'	rejected data; resample	s/n	signal-to-noise ratio	TERC	Total Environmental Restoration Contract
R&A	relevant and appropriate	SOP	standard operating procedure	THI	target hazard index
RA	remedial action	SOPQAM	U.S. EPA's <i>Standard Operating Procedure/Quality Assurance Manual</i>	TIC	tentatively identified compound
RAO	removal action objective	sp	poorly graded sands; gravelly sands	TLV	threshold limit value
RBC	risk-based concentration	SP	submersible pump	TN	Tennessee
RCRA	Resource Conservation and Recovery Act	SPCC	system performance calibration compound	TNT	trinitrotoluene
RD	remedial design	SPCS	State Plane Coordinate System	TOC	top of casing; total organic carbon
RDX	cyclonite	SPM	sample planning module	TPH	total petroleum hydrocarbons
ReB3	Rarden silty clay loams	SQRT	screening quick reference tables	TR	target cancer risk
REG	regular field sample	Sr-90	strontium-90	TRADOC	U.S. Army Training and Doctrine Command
REL	recommended exposure limit	SRA	streamlined human health risk assessment	TRPH	total recoverable petroleum hydrocarbons
RFA	request for analysis	SRM	standard reference material	TSCA	Toxic Substances Control Act
RfC	reference concentration	Ss	stony rough land, sandstone series	TSDF	treatment, storage, and disposal facility
RfD	reference dose	SS	surface soil	TWA	time-weighted average
RGO	remedial goal option	SSC	site-specific chemical	UCL	upper confidence limit
RI	remedial investigation	SSHO	site safety and health officer	UCR	upper certified range
RL	reporting limit	SSHP	site-specific safety and health plan	'U'	not detected above reporting limit
RME	reasonable maximum exposure	SSL	soil screening level	UF	uncertainty factor
ROD	Record of Decision	SSSL	site-specific screening level	USACE	U.S. Army Corps of Engineers
RPD	relative percent difference	SSSSL	site-specific soil screening level	USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
RRF	relative response factor	STB	supertropical bleach	USAEC	U.S. Army Environmental Center
RSD	relative standard deviation	STC	source-term concentration	USAEHA	U.S. Army Environmental Hygiene Agency
RTC	Recruiting Training Center	STD	standard deviation	USACMLS	U.S. Army Chemical School
RTECS	Registry of Toxic Effects of Chemical Substances	STEL	short-term exposure limit	USAMPS	U.S. Army Military Police School

List of Abbreviations and Acronyms (Continued)

USATCES	U.S. Army Technical Center for Explosive Safety
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USC	United States Code
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UTL	upper tolerance level; upper tolerance limit
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO safety officer
V	vanadium
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
WAC	Women's Army Corps
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WRS	Wilcoxon rank sum
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd ³	cubic yards

T – Non-target compound analyzed for but not detected (non GC/MS methods)
U – Analysis in unconfirmed
Z – Non-target compound analyzed for and detected (non-GC/MS methods)

Qualifiers

J – The low-spike recovery is low
N – The high-spike recovery is low
R – Data is rejected

SAIC – Data Qualifiers, Codes and Footnotes, 1995 Remedial Investigation

N/A – Not analyzed

ND – Not detected

Boolean Codes

LT – Less than the certified reporting limit

Flagging Codes

9 – Non-demonstrated/validated method performed for USAEC

B – Analyte found in the method blank or QC blank

C – Analysis was confirmed

D – Duplicate analysis

I – Interfaces in sample make quantitation and/or identification to be suspicious

J – Value is estimated

K – Reported results are affected by interfaces or high background

N – Tentatively identified compound (match greater than 70%)

Q – Sample interference obscured peak of interest

R – Non-target compound analyzed for but not detected (GC/MS methods)

S – Non-target compound analyzed for and detected (GC/MS methods)