

Final

Remedial Investigation

**Site-Specific Field Sampling Plan,
Site-Specific Safety and Health Plan, and Site-Specific
Unexploded Ordnance Safety Plan Attachments
Range K, Former Agent Training Area,
Parcel 203(7)**

**Fort McClellan
Calhoun County, Alabama**

**Task Order CK05
Contract No. DACA21-96-D-0018
IT Project No. 774645**

March 2001

Revision 1

**Final
Remedial Investigation
Site-Specific Field Sampling Plan Attachment
Range K, Former Agent Training Area,
Parcel 203(7)**

**Fort McClellan
Calhoun County, Alabama**

Prepared for:

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**Task Order CK05
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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 CK05, IT Corporation (IT) will conduct a remedial investigation (RI) at the Former Agent Training Area, Range K, Parcel 203(7) (Pelham Range) at Fort McClellan, Calhoun County, Alabama. The RI will determine the nature and extent of contamination at the site resulting from U.S. Army training activities that occurred at the site. The purpose of this site-specific RI field sampling plan is to provide technical guidance for the sampling activities proposed at Range K.

Range K is a 2-acre former chemical agent training area located on Pelham Range, Fort McClellan. Range K was also reportedly used as a shell tapping area where rounds containing chemical warfare agents were opened and decontaminated.

IT was contracted to perform a relative risk investigation as the first step in identifying possible contamination at the site. As part of the relative risk investigation, field activities were conducted by IT from February through June 2000. Four groundwater monitoring wells were installed and sampled at Range K. Surface soil, subsurface soil, and groundwater samples were collected and analyzed for volatile organic compounds, semivolatile organic compounds, metals and nitroexplosives. The most significant findings were the detections of cis-1,2- and trans-1,2-dichloroethene totaling 5.0 milligrams per liter (parts per million) in the groundwater sample from monitor well RNG-203-MW01, and the vinyl chloride detection of 0.007 milligrams per liter in the groundwater sample from monitoring well RNG-203-MW04. Based on the sample results, IT is recommending that field work be conducted to determine the nature and extent of the contamination. IT proposes to install seven additional residuum groundwater monitoring wells and four bedrock wells. Two soil borings will also be completed within the fenced area of Range K. The additional data will aid in the development of the site hydrogeologic model as well as provide needed information for the completion of human health and ecological risk assessments.

IT will collect 15 groundwater samples, 9 surface soil samples, and 9 subsurface soil samples at this site. Potential contaminant sources at Range K, Parcel 203(7), include chemical warfare agent decontaminating agents, toxic agents, and munitions. Chemical analyses of the samples collected during the field program will include volatile organic compounds, semivolatile organic compounds, total metals, chemical warfare material (CWM) breakdown products, nitroexplosives, organophosphate pesticides, chlorinated pesticides, chlorinated herbicides, and

polychlorinated biphenyls. Results from these analyses will be compared to site-specific screening levels presented in the IT 2000 *Final Human Health and Ecological Screening Values and PAH Background Summary Report* and regulatory agency guidelines. Groundwater samples will also be analyzed for dissolved metals, total organic carbon, nitrate/nitrite, sulfate/sulfite, hardness, total dissolved solids, and total suspended solids to provide support data for potential remedial design alternatives.

Pelham Range is an active range, and the possibility of unexploded ordnance (UXO) exists at Range K. UXO surface sweeps and downhole surveys of soil borings will therefore be required to support field activities at Range K. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purpose of UXO avoidance.

This RI field sampling plan will be used in conjunction with the installation-wide sampling and analysis plan, the site-specific safety and health plan, and the site-specific UXO safety plan. The sampling and analysis plan includes the installation-wide safety and health plan, 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 and the site-specific UXO safety plan attachments.

At the completion of the RI field work, a feasibility study will be conducted. The feasibility study will identify, develop, screen, and evaluate remedial alternatives for contaminated media at the site as required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The feasibility study report will be prepared in accordance with the guidelines, criteria, and considerations set forth in the 1988 U.S. Environmental Protection Agency guidance document entitled *Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA, Interim Final*. The feasibility study will provide the Base Realignment and Closure Cleanup Team sufficient data to select a feasible and cost-effective remedial alternative that will protect human health and the environment.

1.0 Project Description

1.1 Introduction

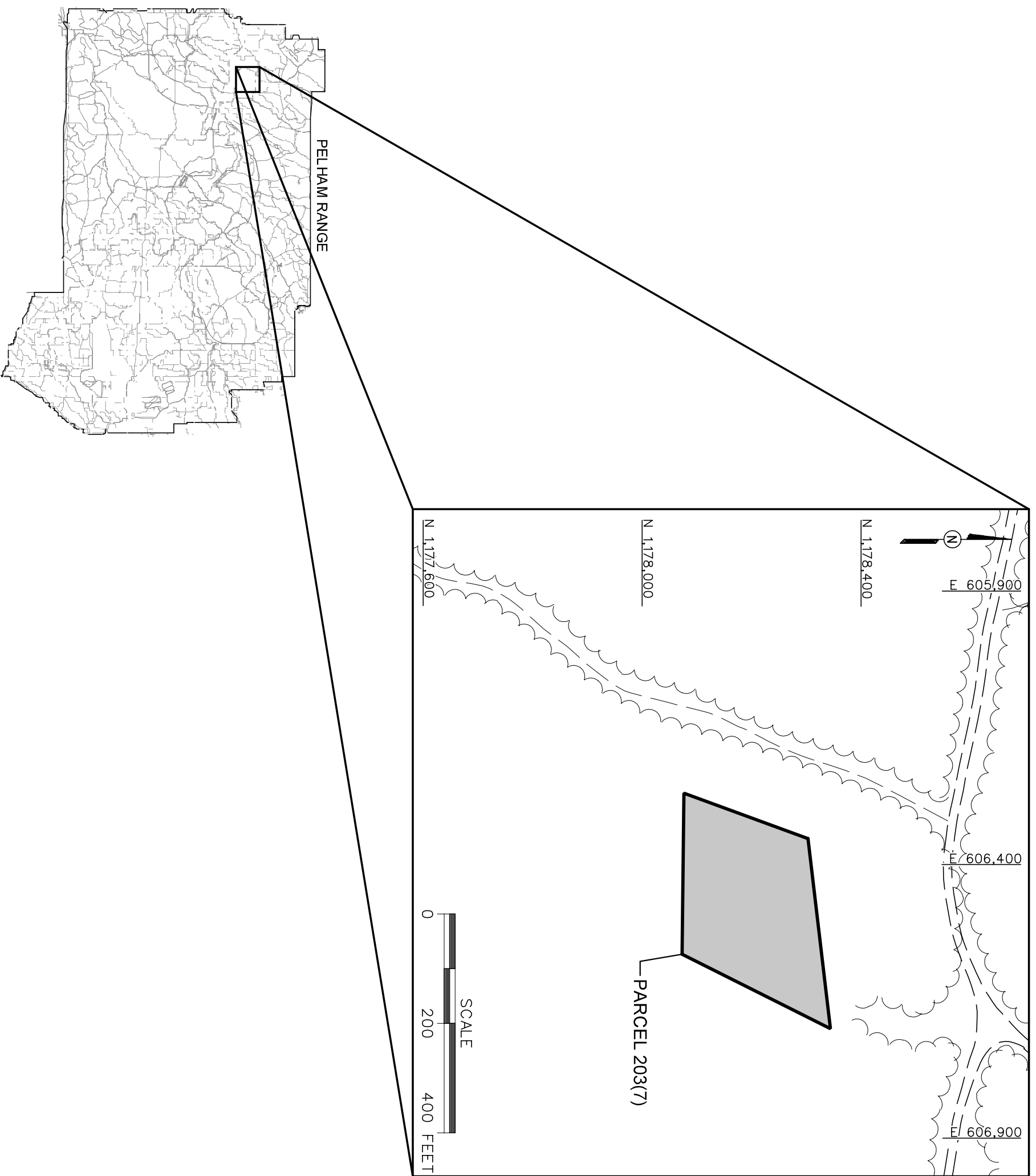
The U.S. Army is conducting studies of the environmental impact of suspected contaminants at Fort McClellan (FTMC) in Calhoun County, Alabama, under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE has contracted IT Corporation (IT) to provide environmental services for the remedial investigation (RI) of Range K, Former Agent Training Area, Parcel 203(7), under Task Order CK05, Contract Number DACA21-96-D-0018.

This RI field sampling plan for FTMC has been prepared to provide technical guidance and rationale for sample collection and analysis at Range K (Figure 1-1). The objective of this investigation is to further characterize the potential contamination resulting from training activities that occurred at the site, and to better define the extent of groundwater contamination observed during previous investigations. IT will collect samples to characterize the source, nature, and extent of contamination. The data collected will also be used to evaluate the level of risk to human health and the environment posed by releases of chemicals. This RI field sampling plan will be used in conjunction with the site-specific safety and health plan (SSHP), the site-specific unexploded ordnance (UXO) safety plan, the installation-wide work plan (WP) (IT, 1998), and the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan, waste management plan, ordnance and explosives management plan, and quality assurance plan (QAP). Site-specific hazard analysis is included in the SSHP and the site-specific UXO safety plan attachments.

1.2 FTMC Site Description and History

FTMC is located in the foothills of the Appalachian Mountains of northeastern Alabama near the cities of Anniston and Weaver in Calhoun County. FTMC is approximately 60 miles northeast of Birmingham, 75 miles northwest of Auburn, and 95 miles west of Atlanta, Georgia. FTMC consists of three main areas of government-owned and leased properties: the Main Post, Pelham Range, and Choccolocco Corridor (lease for Choccolocco Corridor terminated in May 1998). The size of each property is presented below:

- Main Post 18,929 acres
- Pelham Range 22,245 acres
- Choccolocco Corridor (leased-terminated in 1998) 4,488 acres.



- LEGEND**
- UNIMPROVED ROADS AND PARKING
 - PAVED ROADS AND PARKING
 - BUILDING
 - TREES / TREELINE
 - PARCEL BOUNDARY

FIGURE 1-1
SITE LOCATION MAP
RANGE K
FORMER AGENT TRAINING AREA
PARCEL 203(7)

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



The Main Post is bounded on the east by the Choccolocco Corridor, which connects the Main Post with the Talladega National Forest. Pelham Range is located approximately 5 miles west of the Main Post and adjoins the Anniston Army Depot on the southwest. Pelham Range is located to the west of U.S. Highway 431, approximately five miles from the Main Post.

FTMC is under the jurisdiction of the U.S. Army Training and Doctrine Command (TRADOC). Until September 1999, the installation housed three major organizations including the U.S. Army Military Police School, the U.S. Army Chemical School, and the Training Center (under the direction of the training brigade) in addition to other major support units and tenants.

The U.S. government purchased 18,929 acres of land near Anniston in 1917 for use as an artillery range and a training camp due to the outbreak of World War I (WWI). The site was named Camp McClellan in honor of Major General George B. McClellan, a former leader of the Union Army during the Civil War. Camp McClellan was used to train troops for WWI from 1917 until the armistice. It was then designated as a demobilization center. Between 1919 and 1929, Camp McClellan served as a training area for active army units and other civilian elements. Camp McClellan was redesignated as FTMC in 1929, and continued to serve as a training area.

In 1940, the government acquired an additional 22,245 acres west of FTMC. This tract of land was named Pelham Range. In 1941, the Alabama legislature leased approximately 4,488 acres to the U.S. government to provide an access corridor from the Main Post to Talladega National Forest. This corridor provides access to additional woodlands for training.

The U.S. Army operated the Chemical Corps School at FTMC from 1951 until the school was deactivated in 1973. The Chemical Corps School offered advance training in all phases of chemical, biological, and radiological warfare to students from all branches of the military service.

Until closure (September 1999), activities at FTMC could be divided into support activities, academic training, and practical training. Support activities included housing, feeding, and moving individuals during training. Academic training included classroom, laboratory, and field instruction. Practical training included weapons, artillery and explosives, vehicle operation and maintenance, and physical and tactical training activities.

1.3 Range K, Former Agent Training Area, Parcel 203(7): Site Description and History

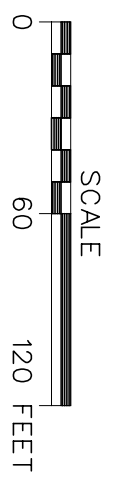
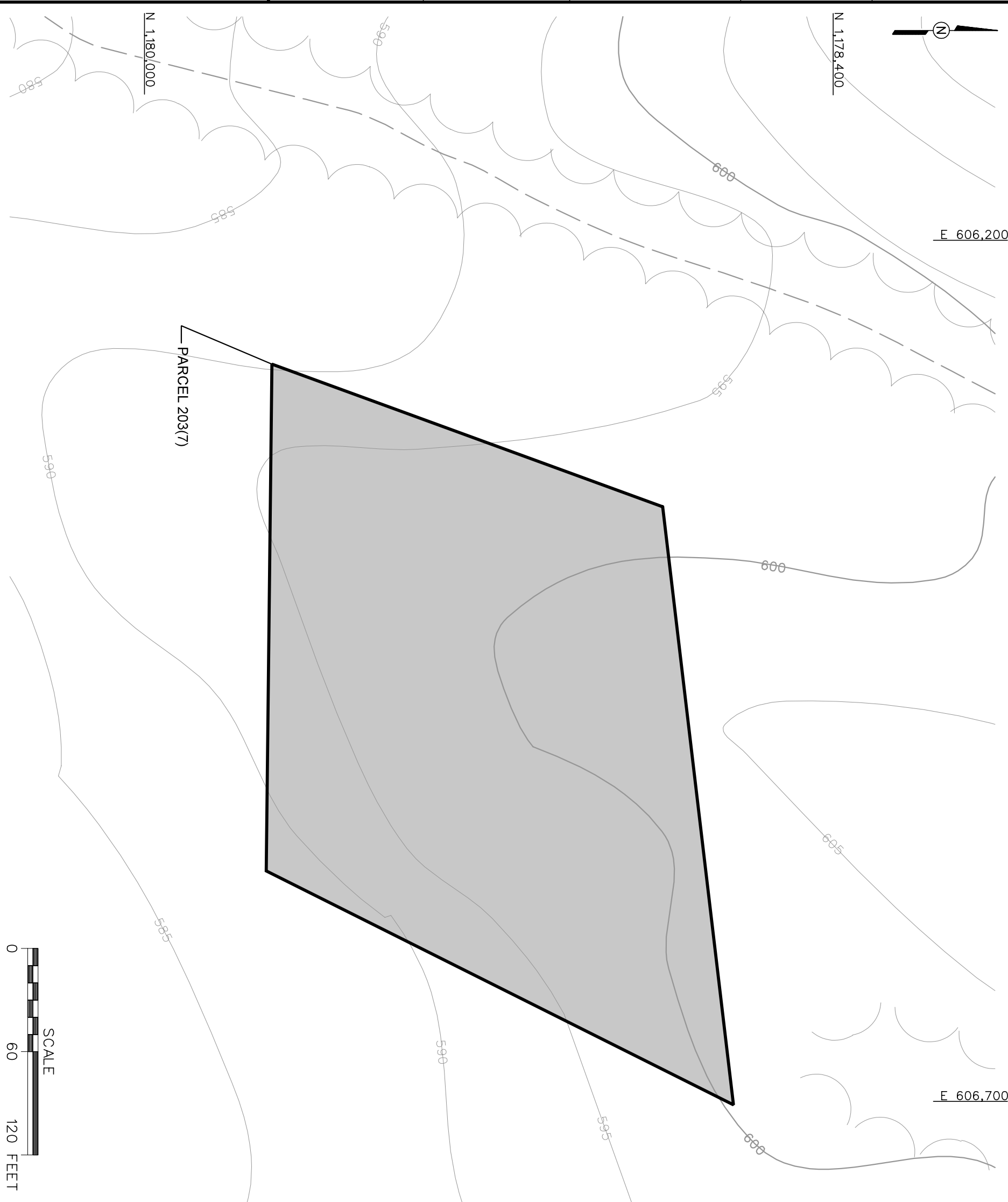
Range K, Former Agent Training Area, Parcel 203(7) (Range K) is a 2-acre former chemical agent training area located in the northwest section of Pelham Range (Environmental Science Engineering [ESE], 1998) (Figures 1-1 and 1-2). The complete time of operation and the precise nature of the activities conducted at the site have not been completely documented. A reported shell tapping area, where rounds were opened and decontaminated, was operated at Range K prior to 1961 and continued through the summer of 1963 (ESE, 1998). During training exercises, breaking open one 155-millimeter distilled mustard (HD), one 105-millimeter sarin (GB), and one 4.2-inch phosgene (CG) mortar round was standard practice. The site has been physically rearranged by bulldozing, and records indicate that the area was cleared for surface use in 1967 (ESE, 1998). Spent rounds, decontamination agent-noncorrosive (DANC) cans, and diethylenetriamine, sodium hydroxide, ethylene glycol monomethyl ether (DS2) cans were observed by the U.S. Army Environmental Center (USAEC) beyond a tree line to the south and west in November 1992, and have been confirmed during subsequent site trips by both Science Applications International Corporation (SAIC) and U.S. Army for Health Promotion and Prevention Medicine (CHPPM). The Alabama National Guard presently uses Range K and the surrounding areas for ongoing military training maneuvers and bivouac activities. The site was located based on coordinates in the 1997 U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) installation assessment and on the location of a downed fence line (SAIC, 1998).

The following are the chemical agents and decontaminants, and the description of each chemical compound that was reportedly used at Range K, Former Agent Training Area:

- HD - Distilled mustard
- DANC - Decontamination agent-noncorrosive
- DS2 - Decontamination solution No. 2
- CG - Carbonyl chloride (phosgene)
- GB - Sarin.

HD. HD (bis-[2-chloroethyl]sulphide) is an oily chemical that has a high boiling point. HD was used extensively in WWI. HD hydrolyzes quickly in nature. If diluted, it degrades to form thiodiglycol, and if concentrated, it forms either 1,4-dithiane or 1,4-oxathiane.

DANC. Prior to World War II, a well-known and often used decontaminating agent, DANC, may have been used or disposed of at the site in conjunction with other types of decontaminants such as DS2 and/or supertropical bleach (STB). DANC is a 6.25 percent solution of RH-195 (1,3-dichloro-5, 5-dimethylhydantoin) in 1,1,2,2-tetrachloroethane (acetylene tetrachloride)



- LEGEND**
- UNIMPROVED ROADS AND PARKING
 - PAVED ROADS AND PARKING
 - BUILDING
 - TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
 - TREES / TREELINE
 - PARCEL BOUNDARY

NOTE:

1. TOPOGRAPHIC DATA SUPPLIED BY USACE AND IS NOT CONFIRMED BY FIELD SURVEY.

FIGURE 1-2
SITE MAP
RANGE K
FORMER AGENT TRAINING AREA
PARCEL 203(7)

U. S. ARMY CORPS OF ENGINEERS
 MOBILE DISTRICT
 FORT MCCLELLAN
 CALHOUN COUNTY, ALABAMA
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adopted as a satisfactory HD decontaminant in small-scale operations. It is an effective decontaminant for arsenicals, if sufficient time is allowed for it to react (U.S. Department of the Army and Air Force, 1963).

DS2. DS2 is a clear general-purpose decontaminant solution consisting of 70 percent diethylenetriamine, 28 percent solvent (ethylene glycol monomethylether), and 2 percent active agent booster (sodium hydroxide). DS2 decontaminant reacts with GB and HD to effectively reduce their hazards within 5 minutes of application. It is effective for all toxic chemical agents. DS2 was applied manually or by using a portable decontaminating apparatus such as the M11 (U.S. Department of Army and Air Force, 1963).

Phosgene. CG (carbonyl chloride) is a gaseous chemical agent used in WWI. It has a vapor density of 3.4 compared to air, and is not readily hydrolyzed under usual field conditions (U.S. Department of the Air Force, 1963).

GB. Sarin nerve agent is a gaseous chemical agent that produces hydrogen fluoride under acidic, isopropyl, and alkaline conditions.

1.4 Regional and Site-Specific Geology

Calhoun County includes parts of two physiographic provinces, the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post and Pelham Range of FTMC, lies within the Appalachian fold and thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold and thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted with major structures and faults striking in a northeast-southwest direction. Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge

Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992), and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group is comprised of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984), but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated, greenish-gray and black mudstone makes up the Nichols Formation with thin interbeds of siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appear to dominate the unit and consist primarily of coarse-grained, vitreous quartzite, and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consist of sandy and micaceous shale and silty, micaceous mudstone, which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation east and north of the Main Post and consists of interlayered bluish-gray or pale yellowish-gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post as mapped by Warman and Causey (1962) and Osborne and Szabo (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated thinly interbedded grayish-red-purple mudstone, shale,

siltstone, and greenish-red and light gray sandstone, with locally occurring limestone and dolomite. The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962) (Osborne and Szabo, 1984). The Conasauga Formation is composed of dark-gray, finely to coarsely crystalline medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weathers to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone is comprised of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped together as undifferentiated at FTMC and other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark-gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded "window" in the uppermost structural thrust sheet at FTMC, and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites, and limestones, and are mapped as one undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish-gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Szabo et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark- to light-gray limestone with abundant chert nodules and greenish-gray to grayish-red phosphatic shale with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale on the basis of fossil data.

The Jacksonville Thrust Fault is the most significant structural geologic feature in the vicinity of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City Fault (Osborne and Szabo, 1984). The Ordovician sequence comprising the Eden thrust sheet is exposed at FTMC through an eroded "window" or "fenster" in the overlying thrust sheet. Rocks within the window display complex folding with the folds being overturned, and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formations north by the Conasauga Formation, northeast and east by the Shady Dolomite, and southeast and southwest by the Chilhowee Group (Osborne et al., 1989).

Range K is located in a valley flanked by northeast-southwest trending thrust faults as shown in Figure 1-3. Range K is underlain by the Parkwood Formation and Floyd Shale, undifferentated (Osborne, et al., 1989). The Parkwood Formation is described by the Geologic Survey of Alabama as an interbedded medium to dark gray shale and light to medium gray sandstone. It locally contains dusky red and grayish green mudstone, argillaceous limestone, and clayey coal. The Floyd Shale is a brown to black shale, with thin beds of sandstone, limestone, and chert locally present. Beds of partly bioclastic, partly argillaceous limestone are abundant in parts of Calhoun and Cherokee Counties.

Range K is covered with soils from the Rarden Series, which consists of moderately well drained, strongly acid to very strongly acid soils (U.S. Department of Agriculture, 1961). They have developed in the residuum of shale and fine-grained platy sandstone or limestone. In eroded areas, the surface soil is brown silt loam. The subsoil is yellowish-red clay or silty clay

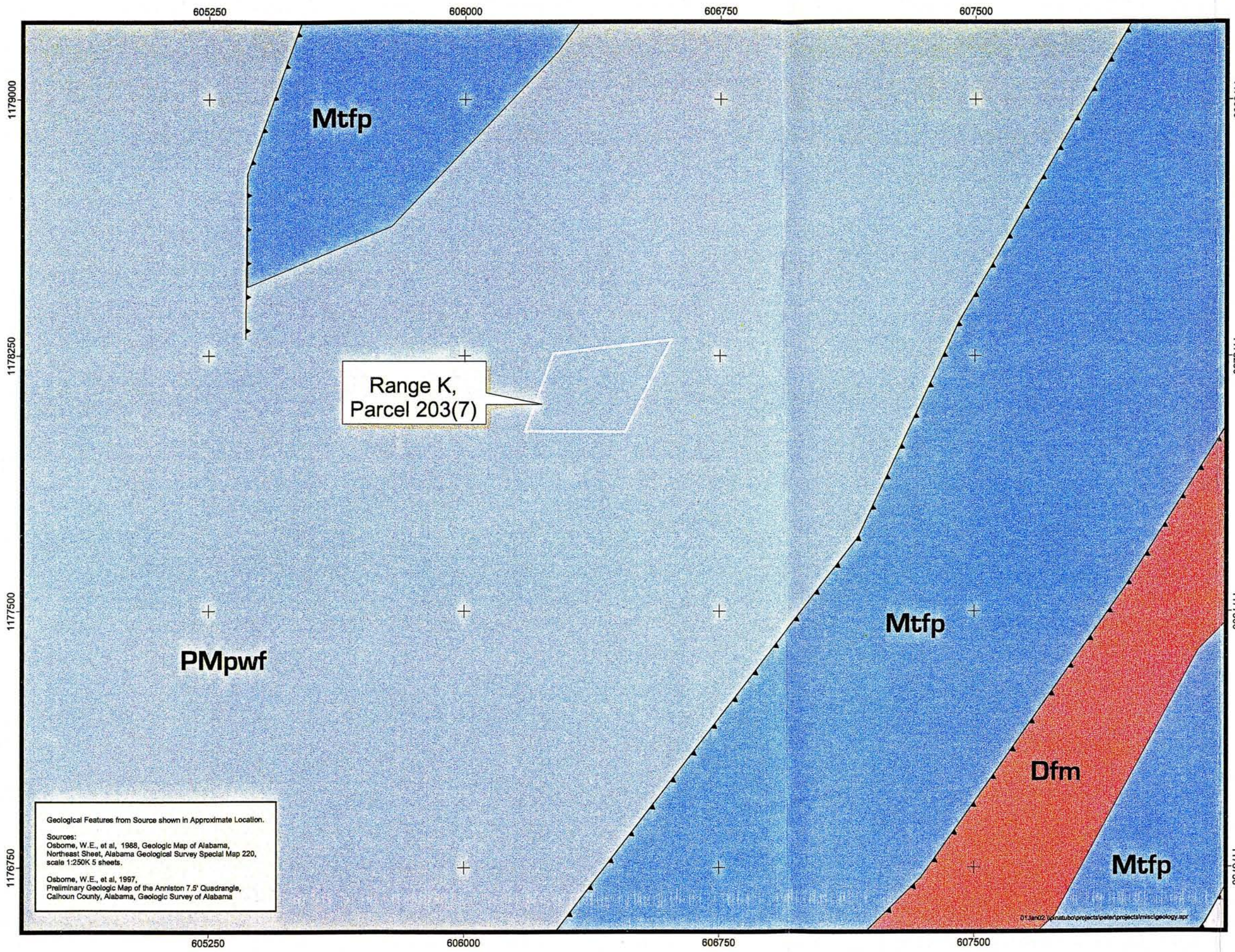


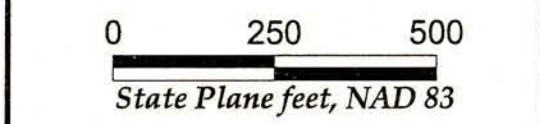
Figure 1-3
Geologic Map of
Range K,
Parcel 203(7) Area,
Pelham Range, FTMC

Legend

- Thrust Fault
- CERFA Parcels

Geology

- Pennsylvanian/Missippian - Parkwood Formation and Floyd Shale undifferentiated
- Mississippian - Tuscumba Limestone and Fort Payne Chert undifferentiated
- Devonian - Frog Mountain Sandstone
- Ordovician - Athens Shale



January 2001



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 Mobile District
 Fort McClellan
 Calhoun County, Alabama
 Contract No. DACA21-96-D-0018



Geological Features from Source shown in Approximate Location.
 Sources:
 Osborne, W.E., et al, 1988, Geologic Map of Alabama, Northeast Sheet, Alabama Geological Survey Special Map 220, scale 1:250K 5 sheets.
 Osborne, W.E., et al, 1997, Preliminary Geologic Map of the Anniston 7.5' Quadrangle, Calhoun County, Alabama, Geologic Survey of Alabama

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mottled with strong brown. Concretions and fragments of sandstone, up to .5 inch in diameter, are commonly found on and in the soil. Runoff and infiltration are medium. Permeability is slow, and internal drainage is medium to slow. The capacity for available moisture is low. The specific soil type from the Rarden Series at this site is Rarden silt clay loam, 6 to 10 percent slopes, eroded (RdC2).

Surface topography ranges between 590 and 610 feet above mean sea level (msl) in the immediate site area (Figure 1-2). Surface drainage is to the southeast.

The soil and lithologic information collected from the installation of four groundwater monitoring wells in 2000 support the information from the above references. Yellow to yellowish-orange to light brown clays and silts are described in all four borings. Brown to black weathered shale was encountered at depths of less than 10 feet at two locations. Boring logs for the four monitoring wells installed by IT can be found in Appendix A.

1.5 Regional and Site-Specific Hydrogeology

The hydrogeology of Calhoun County has been investigated by the Geologic Survey of Alabama (GSA) (Moser and DeJarnette, 1992) and the U.S. Geological Survey in cooperation with the GSA (Warman and Causey, 1962) and Alabama Department of Environmental Management (ADEM) (Planert and Pritchette, 1989). Groundwater in the vicinity of FTMC occurs in residuum derived from bedrock decomposition; within fractured bedrock; along fault zones; and from the development of karst frameworks. Groundwater flow may be estimated to be toward major surface water features. However, because of the impacts of differential weathering, variable fracturing, and the potential for conduit flow development, the use of surface topography as an indicator for groundwater flow direction must be used with caution in the area. Areas with well-developed residuum horizons may subtly reflect the surface topography, but the groundwater flow direction also may exhibit the influence of pre-existing structural fabrics or the presence of perched water horizons on unweathered ledges or impermeable clay lenses.

Precipitation and subsequent infiltration provide recharge to the groundwater flow system in the region. The main recharge areas for the aquifers in Calhoun County are located in the valleys. The ridges generally consist of sandstones, quartzite, and slate, which are resistant to weathering and relatively unaffected by faulting and therefore are relatively impermeable. The ridges have steep slopes and thin to no soil cover, which enhances runoff to the edges of the valleys (Planert and Pritchette, 1989).

The thrust fault zones typical of the county form large storage reservoirs for groundwater. Points of discharge occur as springs, effluent streams, and lakes. Coldwater Spring is the largest spring in the state of Alabama, with a discharge of approximately 32 million gallons per day. This spring is the main source of water for the Anniston Water Department from which FTMC buys its water. The spring is located approximately 5 miles southwest of Anniston, and discharges from the brecciated zone of the Jacksonville Fault (Warman and Causey, 1962).

Shallow groundwater on FTMC occurs principally in the residuum developed from Cambrian sedimentary and carbonate bedrock units of the Weisner Formation, Shady Dolomite, and locally in lower Ordovician carbonates. The residuum may yield adequate groundwater for domestic and livestock needs, but may go dry during prolonged dry weather. Groundwater within the residuum serves as a recharge reservoir for the underlying bedrock aquifers. Bedrock permeability is locally enhanced by fracture zones associated with thrust faults and by the development of solution (karst) features.

Two major aquifers were identified by Planert and Pritchette (1989), the Knox-Shady and Tuscumbia-Fort Payne Aquifers. The continuity of the aquifers has been disrupted by the complex geologic structure of the region, such that each major aquifer occurs repeatedly in different areas. The Knox-Shady Aquifer group occurs over most of Calhoun County and is the main source of groundwater in the county. It consists of the Cambrian and Ordovician aged quartzite and carbonates. The Conasauga Dolomite is the most utilized unit of the Knox-Shady Aquifer, with twice as many wells drilled as any other unit (Moser and DeJarnette, 1992).

The Tuscumbia-Fort Payne Aquifer occurs in the extreme northwestern portion of the county. This aquifer consists of Mississippian age carbonates and shales. Because of its limited outcrops in the recharge area, and the rugged terrain of the outcrop area, the Tuscumbia-Fort Payne Aquifer is not considered a major groundwater supply in Calhoun County (Moser and DeJarnette, 1992). However, it is an important source of groundwater in counties to the west (Planert and Pritchette, 1989).

Depth to groundwater at the site is approximately 15 to 26.5 feet below ground surface (bgs) (IT, 2000a). Groundwater elevations at Range K were calculated by measuring depth to groundwater relative to top-of-casing elevations in each of the four recently installed monitoring wells designated RNG-203-MW01, RNG-203-MW02, RNG-203-MW03, and RNG-203-MW04.

Static groundwater elevations were measured in June and August 2000 and are presented in Table 1-1. A groundwater elevation map is shown on Figure 1-4. Based on groundwater elevation data in wells RNG-203-MW01 through RNG-203-MW04, shallow groundwater flow is to the southwest.

1.6 Scope of Work

The scope of work for activities associated with the RI for Range K includes the following tasks:

- Develop the RI site-specific field sampling plan (SFSP) attachment.
- Develop the RI 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 direct-push and drilling activity to determine the presence of potential downhole hazards.
- Install two soil borings to collect surface and subsurface soil samples and obtain lithologic and structural data.
- Install eleven groundwater monitoring wells (seven residuum and four bedrock wells).
- Collect nine surface soil samples, nine subsurface samples, fifteen groundwater samples, a surface water sample if available at time of sampling, and a sediment sample (if available).
- Samples will be analyzed for the parameters listed in Section 5.5.
- Compare the analytical results with site-specific screening levels presented in the IT 2000 *Final Human Health and Ecological Screening Values and PAH Background Summary Report* and regulatory agency guidelines.
- Conduct slug tests on a minimum of three bedrock and three residuum wells.
- Conduct a feasibility study in accordance with the guidelines, criteria, and considerations set forth in the U.S. Environmental Protection Agency (EPA) 1988 guidance document entitled *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final*.

Table 1-1

**Summary of Groundwater Elevations
Range K, Parcel 203(7)
Fort McClellan, Calhoun County, Alabama**

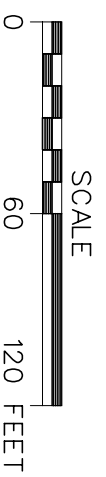
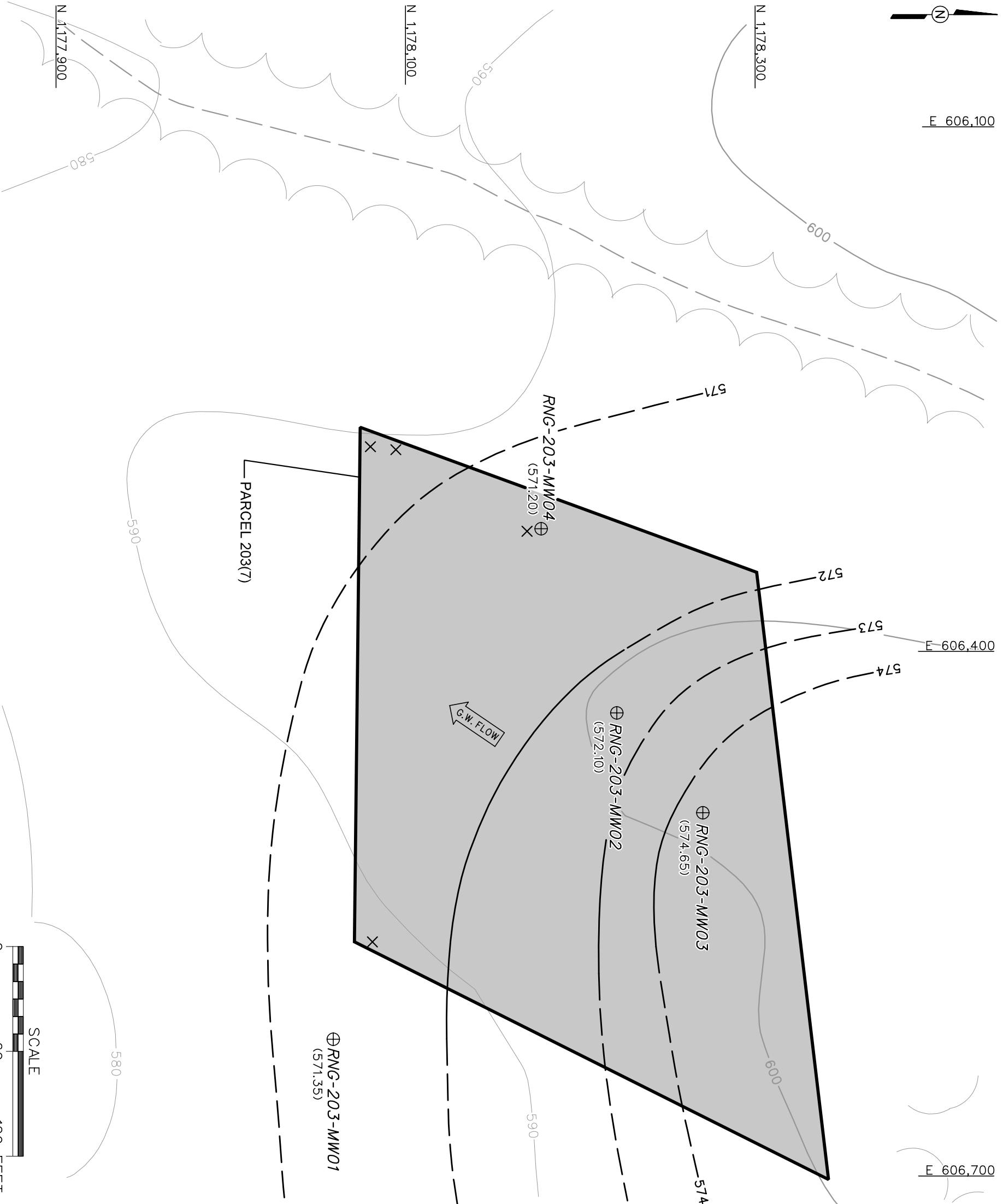
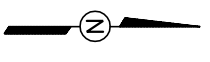
Well Location	Date	Depth to Water (ft BTOC)	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Groundwater Elevation (ft msl)
RNG-203-MW01	01-Jun-00	9.50	586.37	583.95	576.87
	31-Aug-00	15.02	586.37	583.95	571.35
RNG-203-MW02	06-Jun-00	18.02	596.59	593.90	578.57
	31-Aug-00	24.49	596.59	593.90	572.10
RNG-203-MW03	01-Jun-00	20.54	600.99	598.26	580.45
	31-Aug-00	26.34	600.99	598.26	574.65
RNG-203-MW04	01-Jun-00	10.32	589.61	586.73	579.29
	31-Aug-00	18.41	589.61	586.73	571.20

Elevations referenced to the North American Vertical Datum 1988 (NAVD88).

BTOC - Below top of casing.

ft - Feet.

msl - Mean sea level.



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 10 FOOT)
- GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
- GROUNDWATER ELEVATION (FT MSL) (AUGUST 31, 2000)
- GROUNDWATER FLOW DIRECTION
- TREES / TREELINE
- PARCEL BOUNDARY
- SURFACE DEBRIS (USAEC 1992)
- RESIDUUM MONITORING WELL

NOTE:

1. TOPOGRAPHIC DATA SUPPLIED BY USAGE AND IS NOT CONFIRMED BY FIELD SURVEY.

FIGURE 1-4
GROUNDWATER ELEVATION MAP
RANGE K
FORMER AGENT TRAINING AREA
PARCEL 203(7)

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



The possibility of UXO exists at Range K, Parcel 203(7), therefore UXO surface sweeps and downhole surveys of soil borings will be required to support field activities. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purposes of UXO avoidance.

At the completion of the field activities and sample analyses, draft and final RI summary reports will be prepared. Reports will be prepared in accordance with current EPA Region IV and ADEM requirements.

Subsequent to completion of the RI field work, a feasibility study (FS) will be conducted for Range K. The FS will identify, develop, screen, and evaluate remedial alternatives for contaminated media at the site, as required under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and as specified in the National Oil and Hazardous Substances Contingency Plan (40 *Code of Federal Regulations*, Part 300). An FS report will be prepared in accordance with the guidelines, criteria, and considerations set forth in the EPA guidance document entitled *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA, 1988). The report will provide the Base Realignment and Closure (BRAC) Cleanup Team sufficient data to select a feasible and cost-effective remedial alternative that will protect human health and the environment.

The sections within the FS report will provide the following:

- An introduction detailing site background information and a summary of the RI, including the nature and extent of contamination, contaminant fate and transport, and the results of the human health and ecological risk assessments
- Identification and screening of remedial technologies
- Development and screening of remedial alternatives
- A detailed analysis of remedial alternatives.

The Identification and Screening of Technologies section of the report will present objectives for remedial action(s), a summary of applicable health and environmental protection criteria and standards, and identification of volumes or areas of media to which remedial actions may be applied. It will also identify general response actions for each medium of interest defining containment, treatment, excavation, or other actions, singularly or in combination, that may be

taken to satisfy the remedial action objectives (RAO). Potentially feasible technologies will be presented for each of the general response actions, along with the technical criteria and the site-specific requirements used in the technology screening process, and the results of the remedial technology screening.

The Development and Screening of Remedial Alternatives section of the report will present the remedial alternatives developed by combining the technologies carried forward from the initial screening. Each of the identified alternatives will be screened against three evaluation criteria: 1) effectiveness, 2) implementability, and 3) cost.

The Detailed Analysis of Remedial Alternatives section will present a description and evaluation of each of the alternatives retained from the alternative screening process. Each alternative will be evaluated individually, and a comparative analysis among alternatives will be presented. The remedial action alternatives selected for evaluation will be individually evaluated against the following seven criteria:

- Overall protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements (ARAR)
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume
- Short-term effectiveness
- Implementability
- Cost.

Although CERCLA requires the evaluation of alternatives against nine evaluation criteria; the “state acceptance” and “community acceptance” criteria will be evaluated in the record of decision (ROD) after comments have been received on the FS report from the regulatory agencies and the public.

2.0 Summary of Existing Environmental Studies

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

1. Areas where no storage, release, or disposal of hazardous substances 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 substances has occurred, but at concentrations that do not require a removal or remedial response
4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment has been taken
5. Areas where release, disposal, and/or migration of hazardous substances 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 substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken
7. Areas that are not evaluated or require further evaluation.

The EBS was conducted in accordance with the Community Environmental Response Facilitation Act (CERFA) (CERFA-Public Law 102-426) protocols and DOD 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 facilities. Available historic maps and aerial photographs were reviewed to document historic 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.

Range K, Parcel 203(7), which is being investigated under this RI, was initially identified in the EBS as a Category 7 CERFA site. CERFA sites are parcels where site-specific chemicals were stored, and possibly released onto the site or to the environment, and/or were disposed of on site property. Category 7 CERFA sites are areas that lack adequate documentation and therefore require additional evaluation to determine the environmental condition of the parcel.

Available reports were reviewed to provide a summary of previous investigations (SI) and reports of relevance in an attempt to document past site activities at Range K. The following section includes a summary of previous investigations conducted at Range K prior to the relative risk field work conducted by IT. Section 2.2 summarizes the relative risk field investigation performed by IT.

2.1 Previous Site Investigations

According to the 1999 *Preliminary Assessment No. 38-EH-1775-99* by CHPPM, the following studies and/or reports have been completed, and have some relevance to activities conducted at Range K:

- In 1975, a U.S. Army Environmental Hygiene Agency (USAEHA) report noted Range K was possibly used for post World War II disposal (CHPPM, 1999).
- A 1977 installation assessment report provided the coordinates for Range K (CHPPM, 1999).
- In 1980, surface monitoring was conducted at Range K; no residual surface contamination was detected and surface activity at the site was deemed unrestricted. It is unclear who performed the surface monitoring and what it specifically consisted of (CHPPM, 1999).
- In 1984, a reassessment of FTMC report by ESE stated that Range K was marked by rusted toxic agent signs, had been physically rearranged (bulldozed). The U.S. Army Chemical School (USACMS) records had indicated the site was previously clear in 1967. Subsurface activity at the site was restricted due to possible persistence of isolated pockets of live agent (CHPPM, 1999).
- A 1989 report, by the USAEC and submitted to EPA, identified Range K as 1 of 17 sites, requiring an initial investigation (SAIC, 1993).
- In 1990, an enhanced preliminary assessment was performed by Roy F. Weston, Inc. (Weston). Based on a review of information and site conditions, Weston recommended the implementation of a RI sampling design plan, which included the

proposed installation of three to four soil borings/monitoring wells around the periphery of a depression found on the site (Weston, 1990). Sediment and surface water samples from the depression at the site were also recommended. There was not any follow-up data available from these recommendations.

- Between June 1991 and July 1993, SAIC conducted a SI (SAIC, 1993) to determine the presence and nature of potential environmental contamination at Range K, one of the seventeen sites identified by the USAEC. On April 27, 1992, a sediment sample (RK-D01) was collected at Range K from sampling location S1 in a ponded drainage area approximately 5 feet in diameter as shown in Figure 2-1. Laboratory analysis (Table 2-1) of the sediment sample did not detect the presence of chemical agent breakdown products. The sediment sample was screened in the field for the presence of HD, GB, and nerve agent (O-ethyl-S- [diisopropylaminoethyl]-methylphosphonothiolate) (VX) and analyzed in the laboratory for HD degradation products, GB degradation products, and VX degradation products. There were not any degradation products detected in the sample.

An electromagnetic (EM) survey was conducted to investigate the presence or absence of buried objects. The locations of transects and interpretation of EM data conducted by SAIC at Range K are shown in Figure 2-1. Transect P3 was reported to be disturbed at a distance of 22 to 54 feet in an area where several partially buried drums were located. The remainder of the EM profiles appeared to be undisturbed. Since the EM survey, regrading has occurred at the site, and therefore, the placement of sampling location S1 can no longer be determined.

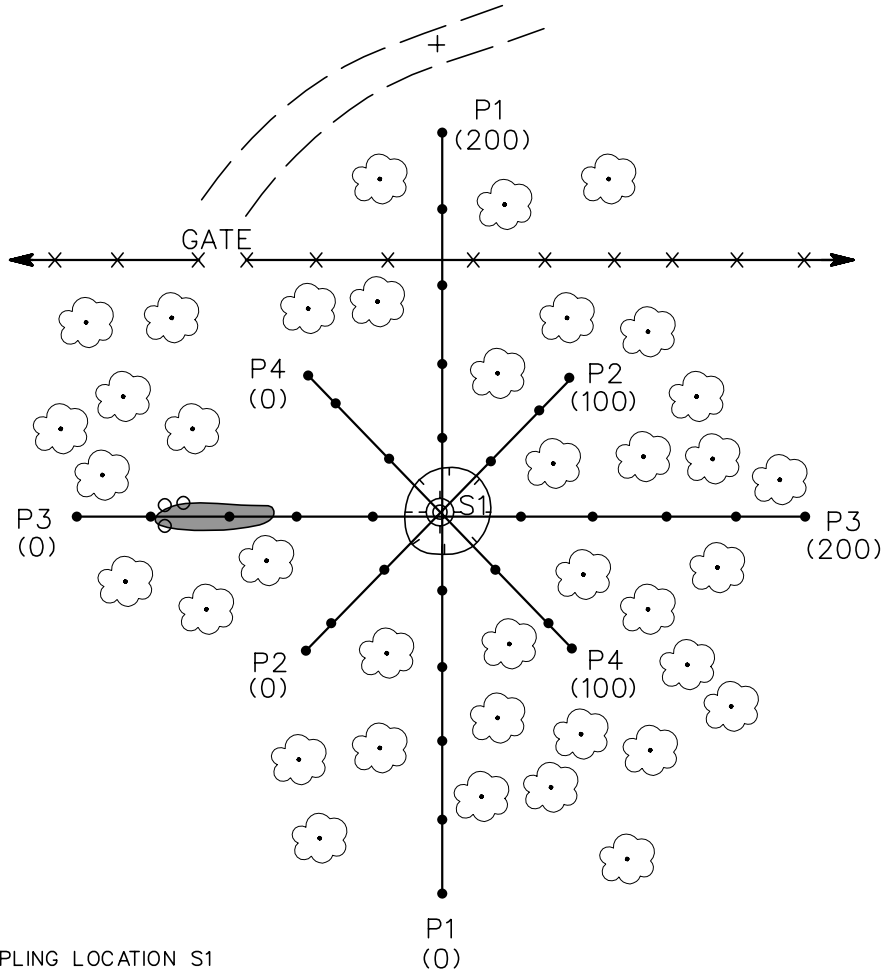
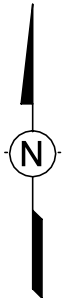
An independent site visit by USAEC on November 16, 1992 identified DS2 cans, HD, GB rounds, and other ordnance in the southern portion of the site beyond a tree line. The location of this tree line was not defined on a figure in available documents. Based on this discovery, the SI report concluded that Range K should be evaluated in greater detail through surface reconnaissance, geophysical surveying, and soil sampling.

- SAIC – RI/FS (SAIC, 1995): An RI/FS was conducted at Range K by SAIC. Four shallow soil samples (RK-S01, RK-S02, RK-S03, and RK-S04) were collected at Range K and analyzed for HD breakdown products and explosive compounds. Based on the text of the RI report, an unconfirmed concentration of nitroglycerine (NG) (0.96 milligrams per kilogram [mg/kg]) was detected at sampling location RK-S01. The chemical analytical data from this sampling event are provided in Table 2-1. Figure 2-2 depicts the sample/screening locations for this field event.

SAIC also conducted a geophysical survey. Time domain EM (TDEM) and magnetometer measurements were obtained over a gridded area measuring 280 feet by 400 feet at Range K. The data were collected on mesh centered points along lines 400 feet long at 10-foot station intervals. Four anomalous areas were identified in the TDEM data that indicated the burial of metallic material (fence posts and sectioned

DWG. NO.: 774645ES. 674
 PROJ. NO.: 774645
 INITIATOR: C. RHODES
 PROJ. MGR.: J. YACOUB
 DRAFT. CHCK. BY:
 ENGR. CHCK. BY: J. RAGSDALE

STARTING DATE: 11/30/00
 DATE LAST REV: 01/18/01
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LEGEND:

- SAMPLING LOCATION S1 (RK-D01)
- EM PROFILE
- P1 LINE IDENTIFICATION
- (0) STATION NUMBER
- STAKED LOCATION
- + BASE STATION
- DISTURBED AREA
- DEPRESSION WITH SURFACE WATER
- GROUND ROAD
- TREE
- BARBED-WIRE FENCE (PARTIALLY ON GROUND)
- DRUM ON GROUND SURFACE

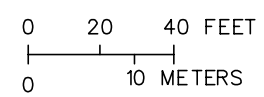


FIGURE 2-1
 LOCATION OF SAIC S1 TRANSECTS
 AND INTERPRETATION OF EM DATA
 FOR SAMPLING LOCATION S1
 RANGE K
 PARCEL 203(7)

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

SOURCE: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION (SAIC), 1993 "SITE INVESTIGATION REPORT, FORT McCLELLAN, ALABAMA", AUGUST 31.



Table 2-1

SAIC SI and RI Soil Analytical Results Summary
 Range K, Parcel 203(7)
 Fort McClellan, Calhoun County, Alabama

Site ID		RK-D01	RK-D01	RK-S01	RK-S02	RK-S03	RK-S03
Field Sample Number		RK-D01	RKDD01	SAIC01	SAIC01	SAIC01	SAIC01
Site Type		STWA	STWA	BORE	BORE	BORE	BORE
Collection Date		04/27/1992	04/27/1992	06/30/1994	06/30/1994	06/30/1994	06/30/1994
Depth (ft)	Unit	0	0	2	2	2	2
EXPLOSIVES							
Laboratory ID Number				UB04468	UB04469	UB04470	UB04471
Parameter							
1,3,5-Trinitrotoluene	µg/g	N/A	N/A	LT 0.922	LT 0.922	LT 0.922	LT 0.922
2,4,6-Trinitrotoluene	µg/g	N/A	N/A	LT 2.00 7	LT 2.00 7	LT 2.00 7	LT 2.00 7
2,4-Dinitrotoluene	µg/g	N/A	N/A	LT 2.50	LT 2.50	LT 2.50	LT 2.50
2,6-Dinitrotoluene	µg/g	N/A	N/A	LT 2.00	LT 2.00	LT 2.00	LT 2.00
HMX	µg/g	N/A	N/A	LT 2.00	LT 2.00	LT 2.00	LT 2.00
Nitrobenzene	µg/g	N/A	N/A	LT 1.14	LT 1.14	LT 1.14	LT 1.14
Nitroglycerine	µg/g	N/A	N/A	0.962 U	LT 0.510	LT 0.510	LT 0.510
Pentaerythritol (PETN)	µg/g	N/A	N/A	LT 1.00	LT 1.00	LT 1.00	LT 1.00
RDX	µg/g	N/A	N/A	LT 1.28	LT 1.28	LT 1.28	LT 1.28
Tetryl	µg/g	N/A	N/A	LT 2.11	LT 2.11	LT 2.11	LT 2.11
GB/VX BREAKDOWN PRODUCT							
Laboratory ID Number		MCSAS*49	MCSAS*50	MCBS*51	MCBS*54	MCBS*52	MCBS*53
Parameter							
Chloroacetic acid	µg/g	N/A	N/A	LT 0.500	LT 0.500	LT 0.500	LT 0.500
Diisopropyl methylphosphonate	µg/g	LT 0.114	LT 0.114 D	N/A	N/A	N/A	N/A
Dimethyl methylphosphonate	µg/g	LT 0.133	LT 0.133 D	N/A	N/A	N/A	N/A
Fluoroacetic acid	µg/g	N/A	N/A	LT 0.182	LT 0.182	LT 0.182	LT 0.182
Isopropyl methylphosphonate	µg/g	LT 2.11	LT 2.11 D	LT 0.500	LT 0.500	LT 0.500	LT 0.500
Methylphosphonic acid	µg/g	LT 2.00	LT 2.00 D	LT 0.500	LT 0.500	LT 0.500	LT 0.500
HD BREAKDOWN PRODUCT							
Laboratory ID Number		MSASA*49	MCSAS*50	MCBS*51	MCBS*54	MCBS*52	MCBS*53
Parameter							
Benzothiazole	µg/g	N/A	N/A	LT 1.08	LT 1.08	LT 1.08	LT 1.08
Dimthyl disulfide	µg/g	N/A	N/A	LT 0.692	LT 0.692	LT 0.692	LT 0.692
Thiodiglycol	µg/g	LT 3.94	LT 3.94 D	LT 3.94	LT 3.94	LT 3.94	LT 3.94

Footnotes:

N/A - Not analyzed

Boolean Codes

LT - Less than the certified reporting limit

Flagging Codes

D - Duplicate analysis

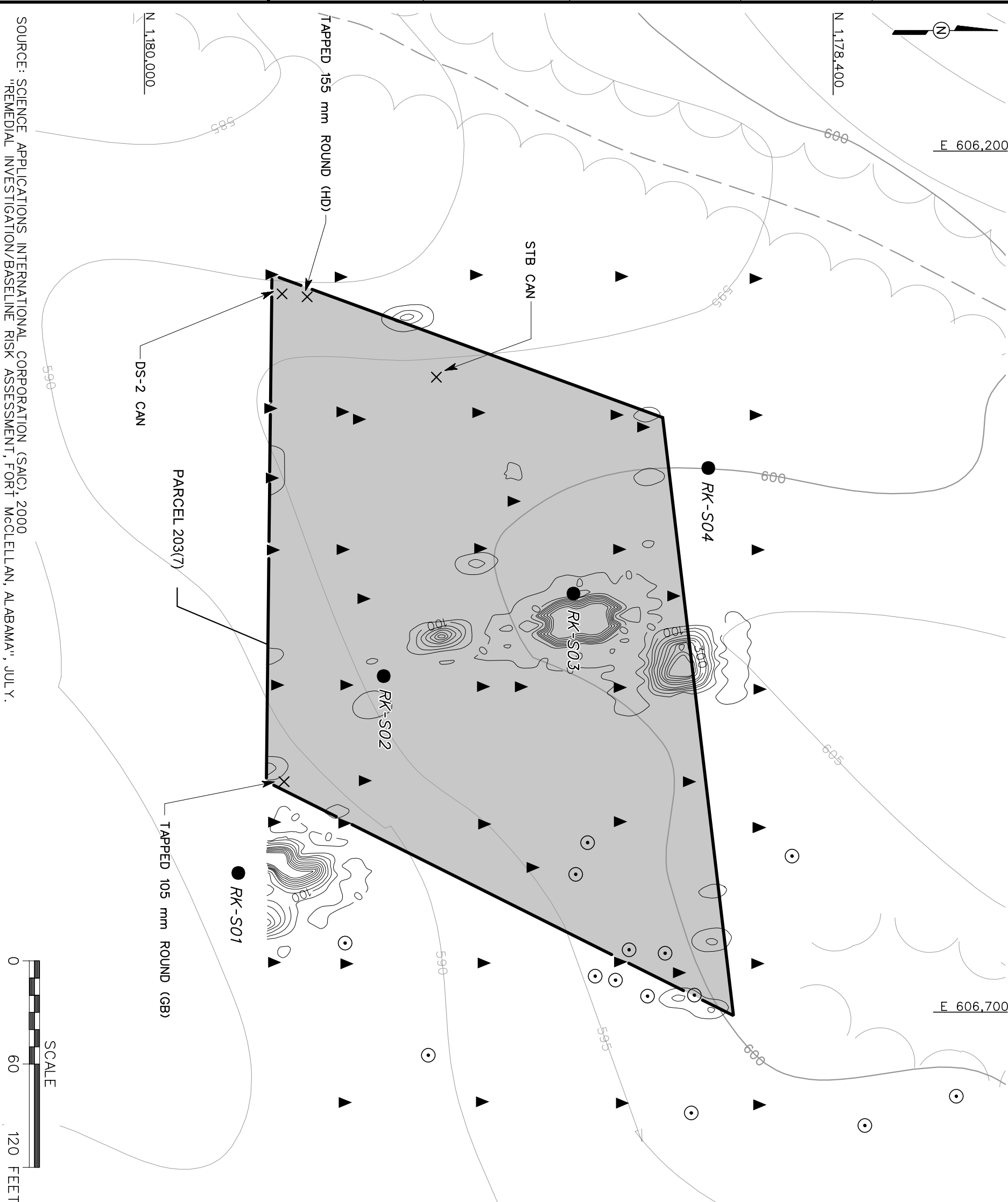
U - Analysis is unconfirmed

µg/g - Micrograms per gram

HMX - Octahydro - 1357 - tetranitro - 1357 - tetrazocine

RDX - Royal demolition explosive

ft - Foot



- LEGEND**
- UNIMPROVED ROADS AND PARKING
 - ~ (CONTOUR INTERVAL - 5 FOOT)
 - ☁ TREES / TREELINE
 - ▭ PARCEL BOUNDARY
 - ▲ MINICAMS SCREENING LOCATION
 - X SURFACE DEBRIS (USAEC 1992)
 - SOIL SAMPLE (SAIC, 1995)
 - ⊙ STOLS MAGNETOMETER TARGET (GEOCENTERS, INC. 1995)
 - ~ TIME DOMAIN ELECTROMAGNETIC SURVEY CONTOURS (mV)

- NOTES:**
1. GEOPHYSICAL CONTOUR DATA SUPPLIED BY SAIC. LOCATIONS ARE APPROXIMATE.
 2. TOPOGRAPHIC DATA SUPPLIED BY USACE AND IS NOT CONFIRMED BY FIELD SURVEY.

FIGURE 2-2
SAIC RISAMPLING LOCATION AND
GEOPHYSICAL DATA MAP
RANGE K
FORMER AGENT TRAINING AREA
PARCEL 203(7)

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



SOURCE: SCIENCE APPLICATIONS INTERNATIONAL CORPORATION (SAIC), 2000
 "REMEDIAL INVESTIGATION/BASELINE RISK ASSESSMENT, FORT MCLELLAN, ALABAMA", JULY.

steel drums) at Range K. Other surficial materials (empty DANC cans, ordnance) were observed and implied their usage at the site. The magnetometer data yielded results similar to the TDEM survey. Several anomalies existed that were attributed to surficial or buried fencing material. Anomalies observed in total field contour data along the west side of the surveyed area correlated with a potential fence location and are probably buried material associated with a former barbed wire fence. Similar correlations could be made for anomalies along the south side of the plot.

The results of the tandem geophysical survey were not comprehensive due to the lack of satellite visibility from the moderately wooded site. Although the site coverage was described as poor, 14 magnetic anomalies were detected across the site. The majority of the detected anomalies were comparatively small and ranged in depth between the surface and approximately 4 feet bls. Geophysical survey results are shown on Figure 2-2.

Analysis of forty-five Miniature Continuous Air Monitoring System (MINICAMS) samples during the RI did not indicate the presence of HD, VX, or chemical warfare agents (CWA). MINICAMS locations are shown on Figure 2-2.

The SAIC RI report concluded that additional investigative work should be conducted at Range K to isolate contaminant sources and to delineate the extent of contamination. Human health risks were not calculated, nor were chemicals of concern identified for the site because explosives and CWA breakdown products were not detected in any of the samples. Non-CWA analyses were not performed on the samples.

The FS concluded that, based on the RI results, soil or groundwater remediation would not be necessary at Range K. The following preliminary alternatives were developed for Range K based on available data: (1) No action, (2) UXO survey, removal of surface debris, and off-site disposal. UXO, if present, would be detonated locally. Surface debris and other buried material excavated from the site would be taken to an off-site solid waste disposal facility.

- In October 1992, Public Law 102-426, the CERFA amended Section 120(h) of the CERCLA and established new procedures with respect to contamination assessment, cleanup, and regulatory notification and concurrence for federal facility closures. In March 1997, ESE issued the final EBS for FTMC. The overall objectives of the EBS were to document the current environmental condition of FTMC property, and to evaluate adjacent properties that may affect the BRAC property. The information developed from the EBS was used to group areas on FTMC property into standardized parcel categories using DOD guidance. Range K was labeled as Parcel 203(7)HR(P) with a CERFA Category 7. HR indicated hazardous substance release and/or disposal. A CERFA Category 7 was defined as an area that was not evaluated or required further evaluation.

- A preliminary assessment site visit (CHPPM, 1999): In May 1999, personnel from CHPPM and the USACE-St. Louis District conducted a visual survey of Range K. Tapped shells were observed on the surface inside and outside the boundary delineated by a chain-link fence, which was in a state of disrepair. Old containers of STB were also observed. A small depression that appeared to be used as an ammunition burn area was also observed.

2.2 Relative Risk Site Evaluation

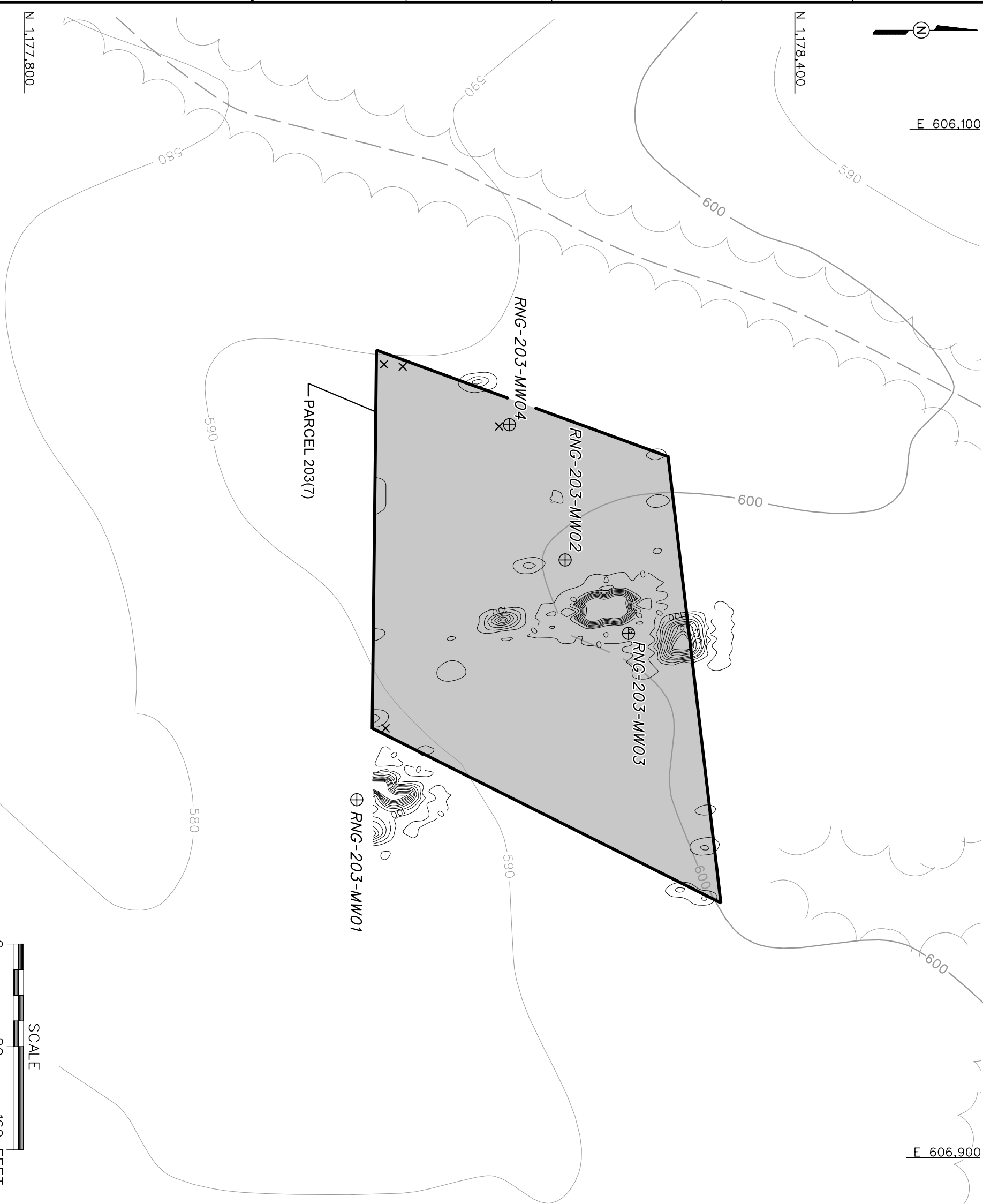
In 2000, IT conducted field work in order to provide data for a DOD relative risk site evaluation (IT, 1999). Four groundwater monitoring wells were installed at Range K in February and March 2000. Four surface soil samples, four subsurface soil, and four groundwater samples were collected during this field work investigation. Quicksilver provided MINICAMS screening services during the intrusive work that was completed. There was not any CWA identified by Quicksilver during the MINICAMS screening. Sample locations are shown on Figure 2-3.

The analytical results were compared to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background values for FTMC. The SSSLs and ESVs were developed by IT as part of the human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs and ESVs are presented in the Final Human Health and Ecological Screening Values and PAH Background Summary Report (IT, 2000b). Background metals screening values are presented in the background metals survey report (SAIC, 1998). Analytical results of these investigations are summarized in Tables 2-2 through 2-4.

The results of the chemical analyses of samples collected at Range K, Parcel 203(7) indicate that metals, VOCs, nitroaromatics (nitroexplosives), and semivolatiles were detected in various site media. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, detected constituent concentrations were compared to the human health SSSLs and ESVs for FTMC.

Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to background metals screening values (background concentrations) (SAIC, 1998) to determine whether the metals concentrations are within natural background concentrations.

2.3 Summary of Analytical Results



LEGEND

	UNIMPROVED ROADS AND PARKING
	TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 10 FOOT)
	TREES / TREELINE
	PARCEL BOUNDARY
X	SURFACE DEBRIS (USAEC 1992)
⊕	EXISTING RESIDUUM MONITORING WELL LOCATION
	TIME DOMAIN ELECTROMAGNETIC SURVEY CONTOURS (mV)

- NOTES:**
1. GEOPHYSICAL CONTOUR DATA SUPPLIED BY SAIC. LOCATIONS ARE APPROXIMATE.
 2. TOPOGRAPHIC DATA SUPPLIED BY USACE AND IS NOT CONFIRMED BY FIELD SURVEY.

FIGURE 2-3
EXISTING MONITORING WELL LOCATIONS
RANGE K
FORMER AGENT TRAINING AREA
PARCEL 203(7)

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

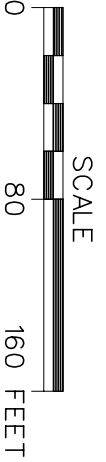


Table 2-2
 Surface Soil Analytical Sample Results
 Range K, Parcel 203(7)
 Fort McClellan, Calhoun County, Alabama

Parameter	Units	RNG-203 RNG-203-MW01 RG0001 29-Feb-00 0-2		RNG-203 RNG-203-MW02 RG0005 1-Mar-00 0-2		RNG-203 RNG-203-MW03 RG0007 1-Mar-00 0-2		RNG-203 RNG-203-MW04 RG0009 2-Mar-00 0-2					
		Qual	>BKG	>SSSL	>ESV	Result	>BKG	>SSSL	>ESV	Result	>BKG	>SSSL	>ESV
METALS													
Aluminum	mg/kg	1.62E+04	7.80E+03	5.00E+01	1.17E+04	YES	1.72E+04	YES	1.50E+04	YES	9.44E+03	YES	YES
Antimony	mg/kg	1.99E+00	3.11E+00	3.50E+00	ND		6.70E-01 J		ND		ND		YES
Arsenic	mg/kg	1.37E+01	4.26E+01	1.00E+01	1.32E+01	YES	1.23E+01	YES	7.00E+00	YES	2.58E+01	YES	YES
Barium	mg/kg	1.24E+02	5.47E+02	1.65E+02	3.26E+01		4.50E+01		3.52E+01		3.84E+01		YES
Beryllium	mg/kg	8.00E-01	9.60E+00	1.10E+00	5.30E-01 B		7.10E-01		5.50E-01 J		7.40E-01		
Calcium	mg/kg	1.72E+03	NA	NA	6.80E+02 J		3.84E+02 J		1.25E+02 J		3.93E+02 J		
Chromium	mg/kg	3.70E+01	2.32E+01	4.00E-01	3.53E+01 J	YES	3.27E+01 J	YES	1.93E+01 J	YES	3.35E+01 J	YES	YES
Cobalt	mg/kg	1.52E+01	4.68E+02	2.00E+01	2.80E+00 J		7.60E+00		9.50E-01 J		3.50E+00 J		YES
Copper	mg/kg	1.27E+01	3.13E+02	4.00E+01	2.39E+01 J	YES	2.23E+01 J	YES	2.82E+01 J	YES	9.70E+00 J	YES	YES
Iron	mg/kg	4.01E+01	4.00E+02	5.00E+01	1.17E+01		1.18E+01		1.66E+04		2.49E+04		YES
Lead	mg/kg	1.03E+03	NA	4.40E+05	3.04E+02 J		3.76E+02 J		1.52E+01		2.28E+01		YES
Magnesium	mg/kg	1.58E+03	3.63E+02	1.00E+02	6.72E+01		4.26E+01		4.90E+00		1.12E+02		YES
Manganese	mg/kg	8.00E-02	2.33E+00	1.00E-01	6.50E-02		3.80E-02 J		7.50E-02		4.70E-02		
Mercury	mg/kg	1.03E+01	1.54E+02	3.00E+01	2.39E+01	YES	1.11E+01	YES	2.70E+00 J		6.30E+00		
Nickel	mg/kg	8.00E+02	NA	NA	5.16E+02 J		6.31E+02 J		7.94E+02		3.40E+02 J		
Potassium	mg/kg	4.80E-01	3.91E+01	8.10E-01	2.20E+00	YES	ND	YES	5.40E-01 B	YES	ND		
Selenium	mg/kg	3.43E+00	5.08E-01	1.00E+00	1.00E+00 B	YES	5.65E+01 J	YES	3.29E+01 J	YES	4.70E+01 J	YES	YES
Thallium	mg/kg	5.88E+01	5.31E+01	2.00E+00	5.91E+01 J	YES	4.80E+01 J	YES	2.26E+01 J		2.65E+01 J		YES
Vanadium	mg/kg	4.08E+01	2.34E+03	5.00E+01	1.02E+02 J	YES							
Zinc	mg/kg	NA	3.88E+02	1.00E-01	ND		1.60E+03 J		1.60E+03 J		ND		
VOLATILE ORGANIC COMPOUNDS													
1,2,4-Trimethylbenzene	mg/kg	NA	7.78E+02	2.50E+00	3.00E-02 J		1.90E-02 J		7.10E-02 J		ND		
Acetone	mg/kg	NA	7.77E+02	NA	ND		ND		3.90E-03 J		ND		
Cumene	mg/kg	NA	8.41E+01	2.00E+00	4.90E-03 B		5.40E-03 B		4.20E-03 B		5.10E-03 B		
Methylene chloride	mg/kg	NA	1.21E+01	1.00E-02	ND		ND		ND		8.70E-04 J		
Tetrachloroethane	mg/kg	NA	1.55E+03	NA	ND		ND		9.70E-04 J		ND		
p-Cymene	mg/kg	NA	4.52E+01	9.30E-01	6.80E-02 B		1.20E-01 B		9.10E-02 B		1.00E-01 B		
SEMIVOLATILE ORGANIC COMPOUNDS													
bis(2-Ethylhexyl)phthalate	mg/kg	NA	7.77E+01	NA	4.20E-01		ND		ND		ND		
NITROAROMATICS													
2-Nitrotoluene	mg/kg	NA	7.77E+01	NA	4.20E-01		ND		ND		ND		
p-Nitrotoluene	mg/kg	NA	7.77E+01	NA	4.20E-01		ND		ND		ND		

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

* BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), Final Background Metals Survey Report, Fort McClellan, Alabama, July. For SVOCs, value listed is the background screening criterion for soils adjacent to asphalt as given in IT Corporation (2000), Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama, July.

° Residential human health site-specific screening level (SSSL) and ecological screening value (ESV) as given in IT Corporation (2000), Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).

J - Result is greater than method detection limit but less than or equal to reporting limit.

mg/kg - Milligrams per kilogram

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

KN14040/RangeK/P203FINAL/Tables/2-27/3/5/01(8-13 AM)

Table 2-3

Subsurface Soil Analytical Sample Results
Range K, Parcel 203(7)
Fort McClellan, Calhoun County, Alabama

(Page 1 of 2)

Parameter	Units	BKG ^a		SSSL ^b		Result		>BKG		>SSSL		Result		>BKG		>SSSL	
		NA	NA	NA	NA	NA	NA	Qual	>BKG	>SSSL	Qual	>BKG	>SSSL	Qual	>BKG	>SSSL	
EXPLOSIVES																	
Nitroglycerine	mg/kg	NA	NA	NA	NA												
METALS																	
Aluminum	mg/kg	1.36E+04	7.80E+03	1.01E+04	6.90E-01 J	YES	1.53E+04	YES	1.45E+04	YES	1.24E+04	YES	1.24E+04	YES	6.00E-01 J	YES	1.24E+04
Antimony	mg/kg	1.31E+00	3.11E+00	4.24E+01	YES	YES	8.40E-01 J	YES	9.80E-01 J	YES	6.00E-01 J	YES	6.00E-01 J	YES	1.57E+01	YES	1.57E+01
Arsenic	mg/kg	1.83E+01	4.26E-01	3.94E+01	YES	YES	1.71E+01	YES	1.98E+01	YES	1.57E+01	YES	1.57E+01	YES	7.00E+01	YES	7.00E+01
Barium	mg/kg	2.34E+02	5.47E+02	3.59E+01	YES	YES	8.90E-01	YES	3.00E+00	YES	1.00E+00	YES	1.00E+00	YES	3.67E+03 J	YES	3.67E+03 J
Beryllium	mg/kg	8.60E-01	9.60E+00	8.20E-01	YES	YES	2.73E+01 J	YES	8.47E+02 J	YES	3.17E+01 J	YES	3.17E+01 J	YES	1.78E+01 J	YES	1.78E+01 J
Calcium	mg/kg	6.37E+02	NA	3.43E+02 J	YES	YES	2.73E+01 J	YES	1.79E+01	YES	5.00E+00 J	YES	5.00E+00 J	YES	5.00E+00 J	YES	5.00E+00 J
Chromium	mg/kg	3.83E+01	2.32E+01	2.62E+01 J	YES	YES	2.57E+01 J	YES	5.73E+01 J	YES	1.78E+01 J	YES	1.78E+01 J	YES	1.78E+01 J	YES	1.78E+01 J
Cobalt	mg/kg	1.75E+01	4.68E+02	3.90E+00 J	YES	YES	3.46E+04	YES	9.50E+00	YES	2.63E+02 J	YES	2.63E+02 J	YES	9.10E+00	YES	9.10E+00
Copper	mg/kg	1.94E+01	3.13E+02	3.90E+01 J	YES	YES	2.16E+02 J	YES	9.19E+02 J	YES	2.63E+02 J	YES	2.63E+02 J	YES	3.98E+01	YES	3.98E+01
Iron	mg/kg	4.48E+04	2.34E+03	2.81E+04	YES	YES	7.50E-02	YES	4.60E-02	YES	6.70E-02	YES	6.70E-02	YES	2.22E+01	YES	2.22E+01
Lead	mg/kg	3.85E+01	4.00E+02	1.99E+01	YES	YES	5.47E+02 J	YES	1.40E+00	YES	4.62E+02 J	YES	4.62E+02 J	YES	9.10E+00	YES	9.10E+00
Magnesium	mg/kg	7.66E+02	NA	2.38E+02 J	YES	YES	1.25E+01	YES	1.25E+01	YES	9.10E+00	YES	9.10E+00	YES	9.10E+00	YES	9.10E+00
Manganese	mg/kg	1.36E+03	3.63E+02	6.23E+01	YES	YES	2.30E+02	YES	2.30E+02	YES	2.30E+02	YES	2.30E+02	YES	2.30E+02	YES	2.30E+02
Mercury	mg/kg	7.00E-02	2.33E+00	6.80E-02	YES	YES	7.50E-02	YES	4.60E-02	YES	6.70E-02	YES	6.70E-02	YES	2.22E+01	YES	2.22E+01
Nickel	mg/kg	1.29E+01	1.54E+02	4.23E+01	YES	YES	3.25E+01	YES	6.29E+01	YES	2.22E+01	YES	2.22E+01	YES	2.22E+01	YES	2.22E+01
Potassium	mg/kg	7.11E+02	NA	5.28E+02 J	YES	YES	5.47E+02 J	YES	7.24E+02	YES	4.62E+02 J	YES	4.62E+02 J	YES	4.62E+02 J	YES	4.62E+02 J
Selenium	mg/kg	4.70E-01	3.91E+01	1.30E+00	YES	YES	ND	ND	1.40E+00	YES	ND	ND	ND	ND	ND	ND	ND
Sodium	mg/kg	7.02E+02	NA	ND	YES	YES	ND	ND	7.69E+01 J	YES	1.40E+00	YES	1.40E+00	YES	1.40E+00	YES	1.40E+00
Thallium	mg/kg	1.40E+00	5.08E-01	1.10E+00 B	YES	YES	9.60E-01 B	YES	1.70E+00 B	YES	1.10E+00 B	YES	1.10E+00 B	YES	1.10E+00 B	YES	1.10E+00 B
Vanadium	mg/kg	6.49E+01	5.31E+01	4.66E+01 J	YES	YES	2.80E+01 J	YES	5.30E+01 J	YES	4.36E+01 J	YES	4.36E+01 J	YES	4.36E+01 J	YES	4.36E+01 J
Zinc	mg/kg	3.49E+01	2.34E+03	1.48E+02 J	YES	YES	1.07E+02 J	YES	2.34E+02 J	YES	6.18E+01 J	YES	6.18E+01 J	YES	6.18E+01 J	YES	6.18E+01 J
SEMIVOLATILE ORGANIC COMPOUNDS																	
bis(2-Ethylhexyl)phthalate	mg/kg	NA	4.52E+01	7.80E-02 B	YES	YES	1.20E-01 B	YES	8.00E-02 B	YES	1.40E-01 B	YES	1.40E-01 B	YES	1.40E-01 B	YES	1.40E-01 B
VOLATILE ORGANIC COMPOUNDS																	
1,2,4-Trimethylbenzene	mg/kg	NA	3.88E+02	2.20E-03 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dimethylbenzene	mg/kg	NA	1.55E+04	5.90E-03 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	mg/kg	NA	3.88E+02	1.80E-03 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	mg/kg	NA	7.76E+02	1.10E-02 B	YES	YES	1.20E-02 B	YES	1.20E-02 B	YES	1.20E-02 B	YES	1.20E-02 B	YES	1.20E-02 B	YES	1.20E-02 B
Benzene	mg/kg	NA	2.17E+01	1.20E-03 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	mg/kg	NA	1.55E+02	4.10E-03 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cumene	mg/kg	NA	7.77E+02	8.80E-04 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	mg/kg	NA	7.77E+02	2.80E-03 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	mg/kg	NA	8.41E+01	7.00E-03 B	YES	YES	6.10E-03 B	YES	6.00E-03 B	YES	6.40E-03 B	YES	6.40E-03 B	YES	6.40E-03 B	YES	6.40E-03 B
Naphthalene	mg/kg	NA	1.55E+02	1.40E-03 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	mg/kg	NA	1.21E+01	ND	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	mg/kg	NA	1.55E+03	1.10E-02 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	mg/kg	NA	5.72E+01	1.70E-03 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	mg/kg	NA	3.32E-01	3.00E-03 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,2-Dichloroethene	mg/kg	NA	7.77E+01	5.60E-01 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylenes	mg/kg	NA	1.55E+04	9.90E-03 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Chlorotoluene	mg/kg	NA	1.55E+02	4.60E-02 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Chlorotoluene	mg/kg	NA	1.55E+02	1.50E-02 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Cymene	mg/kg	NA	1.55E+03	6.50E-03 J	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	mg/kg	NA	1.55E+02	1.20E-01	YES	YES	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 2-3

**Subsurface Soil Analytical Sample Results
Range K, Parcel 203(7)
Fort McClellan, Calhoun County, Alabama**

(Page 2 of 2)

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

^a BKG - Background. Concentration listed is two times (2x) the arithmetic mean of background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

^b Residential human health site-specific screening level (SSSL) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).

J - Result is greater than method detection limit but less than or equal to reporting limit

mg/kg - Milligrams per kilogram.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

Table 2-4

Groundwater Analytical Sample Results
Range K, Parcel 203(7)
Fort McClellan, Calhoun County, Alabama

(Page 1 of 2)

Parameter	Units	BKG*	SSSL ^o	RNG-203 RNG-203-MW01 RG3001 1-Jun-00		RNG-203 RNG-203-MW02 RG3004 6-Jun-00		RNG-203 RNG-203-MW03 RG3005 1-Jun-00		RNG-203 RNG-203-MW04 RG3006 1-Jun-00	
				Result	Qual	Result	Qual	Result	Qual	Result	Qual
METALS											
Aluminum	mg/L	2.34E+00	1.56E+00	2.66E+00	YES	4.18E-01 B		1.88E-01 B		1.34E+01	YES
Arsenic	mg/L	1.78E-02	4.00E-05	7.96E-02	YES	ND		ND		7.90E-03 J	YES
Barium	mg/L	1.27E-01	1.10E-01	4.53E-02 J	YES	1.37E-02 J		8.75E-02 J		1.33E-01 J	YES
Beryllium	mg/L	1.24E-03	3.12E-03	1.70E-03 B	YES	6.30E-04 B		ND		2.70E-03 B	YES
Cadmium	mg/L	2.51E-03	7.80E-04	1.90E-03 J	YES	9.36E+00		ND		1.14E-02	YES
Calcium	mg/L	5.65E+01	NA	5.27E+00		ND		1.13E+02	YES	9.17E+01	YES
Chromium	mg/L	NA	4.69E-03	2.80E-03 J		ND		ND		4.09E-02	YES
Cobalt	mg/L	2.34E-02	9.39E-02	5.60E-02	YES	8.90E-03 J		ND		1.06E-02 J	
Copper	mg/L	2.55E-02	6.26E-02	ND		ND		ND		2.44E-02 B	
Iron	mg/L	7.04E+00	4.69E-01	2.77E+01	YES	2.81E-01		1.66E+00	YES	1.47E+01	YES
Lead	mg/L	7.99E-03	1.50E-02	1.90E-03 J		ND		ND		1.40E-02	YES
Magnesium	mg/L	2.13E+01	NA	6.95E-01 J		1.03E+00 J		1.46E+01		3.24E+00 J	
Manganese	mg/L	5.81E-01	7.35E-02	1.17E+00	YES	8.79E-02		1.88E-01	YES	1.26E-01	
Mercury	mg/L	NA	4.60E-04	7.20E-05 J		ND		ND		1.70E-04 J	
Nickel	mg/L	NA	3.13E-02	3.82E-02 J	YES	5.30E-03 J		3.10E-03 J		2.58E-02 J	
Potassium	mg/L	7.20E+00	NA	4.89E-01 J		2.99E-01 J		2.64E+00 J		1.37E+00 J	
Silver	mg/L	4.00E-03	7.82E-03	2.20E-03 J		ND		ND		ND	
Sodium	mg/L	1.48E+01	NA	1.24E+01		3.47E+00 J		2.66E+01 J	YES	4.44E+00 J	
Vanadium	mg/L	1.70E-02	1.10E-02	4.60E-03 J		ND		ND		4.55E-02 J	YES
Zinc	mg/L	2.20E-01	4.69E-01	1.50E-01		5.80E-03 J		5.90E-03 J		1.52E-01	
NITROAROMATICS											
2,4,6-Trinitrotoluene	mg/L	NA	2.22E-03	2.80E-04		ND		ND		ND	
2-Nitrotoluene	mg/L	NA	1.53E-02	ND		1.60E-03		ND		6.50E-04	
Nitrobenzene	mg/L	NA	7.10E-04	ND		1.30E-03	YES	ND		ND	
p-Nitrotoluene	mg/L	NA	1.53E-02	ND		ND		ND		7.80E-04	
SEMIVOLATILE ORGANIC COMPOUNDS											
Phenanthrene	mg/L	NA	2.81E-01	ND		ND		ND		1.60E-03 J	
VOLATILE ORGANIC COMPOUNDS											
1,1,2,2-Tetrachloroethane	mg/L	NA	2.00E-04	1.00E-01 J	YES	ND		ND		ND	
1,2-Dichloroethane	mg/L	NA	4.40E-04	ND		ND		ND		9.80E-04 J	YES
Acetone	mg/L	NA	1.56E-01	ND		ND		ND		4.30E-03 B	
Carbon disulfide	mg/L	NA	1.51E-01	ND		1.40E-04 B		ND		ND	
Chloromethane	mg/L	NA	3.92E-03	ND		1.80E-04 J		1.40E-04 B		1.80E-04 B	
Methylene chloride	mg/L	NA	7.85E-03	6.50E-02 B	YES	ND		ND		ND	
Trichloroethene	mg/L	NA	1.25E-03	ND		ND		ND		3.10E-04 J	
Trichloroethane	mg/L	NA	4.50E-03	ND		ND		ND		2.90E-04 J	
Vinyl chloride	mg/L	NA	3.00E-05	4.30E-02 J	YES	ND		ND		7.00E-03	YES
cis-1,2-Dichloroethene	mg/L	NA	1.55E-02	3.80E+00	YES	ND		ND		ND	
trans-1,2-Dichloroethene	mg/L	NA	3.07E-02	1.20E+00	YES	ND		ND		ND	

Table 2-4

**Groundwater Analytical Sample Results
Range K, Parcel 203(7)
Fort McClellan, Calhoun County, Alabama**

(Page 2 of 2)

Analyses performed by Quanterra Environmental Services using U.S. Environmental Protection Agency (EPA) SW-846 analytical methods, including Update III methods where applicable.

^a BKG - Background. Concentration listed is two times (2x) the arithmetic mean on background metals concentration given in Science Applications International Corporation (1998), *Final Background Metals Survey Report, Fort McClellan, Alabama*, July.

^b Residential human health site-specific screening level (SSSL) as given in IT Corporation (2000), *Final Human Health and Ecological Screening Values and PAH Background Summary Report, Fort McClellan, Calhoun County, Alabama*, July.

B - Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero).
J - Result is greater than method detection limit but less than or equal to reporting limit.

mg/L - Milligrams per liter.

NA - Not available.

ND - Not detected.

Qual - Data validation qualifier.

The following sections and Tables 2-2 through 2-4 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background concentrations. Complete analytical results are presented in Appendix E.

2.3.1 Surface Soil Analytical Results

Four surface soil samples were collected for chemical analysis at Range K, Parcel 203(7), at the monitoring well locations shown on Figure 2-3. Analytical results were compared to residential human health SSSLs, ESVs, and background screening values (metals and PAHs) as presented in Table 2-2.

Metals. Twenty metals were detected in surface soil samples collected at the site. The thallium results were flagged with a “B” data qualifier signifying that thallium was also detected in an associated laboratory or field blank.

The concentrations of six metals (aluminum, arsenic, chromium, iron, thallium, and vanadium) exceeded SSSLs. Of these metals, the concentrations of aluminum, arsenic, iron, and vanadium at one location each also exceeded their respective background concentrations. However, these metals concentrations were within the range of background values determined by SAIC (1998).

The following metals were detected at one location each at concentrations exceeding ESVs and their respective background concentration: aluminum, arsenic, iron, selenium, vanadium, and zinc. With the exception of one selenium result, these metals concentrations were within the range of background values determined by SAIC (1998).

Volatile Organic Compounds. Six VOCs, including 1,2,4-trimethyl-benzene, acetone, cumene, methylene chloride, tetrachloroethene, and p-cymene, were detected in surface soil samples collected at the site. The methylene chloride results were flagged with a “B” data qualifier indicating that the compound was also detected in an associated laboratory or field blank. The remaining VOC results were flagged with a “J” data qualifier indicating that the results were greater than the method detection limit (MDL) but less than the reporting limit (RL).

The VOC concentrations in surface soils were below SSSLs and ESVs.

Semivolatile Organic Compounds. Bis(2-ethylhexyl)phthalate was detected in each of the four surface soil samples. Each result was flagged with a “B” data qualifier, indicating that the

compound was also detected in an associated laboratory field blank. The bis(2-ethylhexyl) phthalate concentrations were below the SSSL and ESV.

Nitroaromatics. Two nitroaromatic compounds (2-nitrotoluene and 4-nitrotoluene) were detected in the sample collected at RNG-203-MW01. Nitroaromatic compounds were not detected in any of the other surface soil samples. The 2-nitrotoluene and p-nitrotoluene concentrations were below SSSLs. ESVs for the compounds were not available.

2.3.2 Subsurface Soil Analytical Results

Four subsurface soil samples were collected for chemical analyses at Range K, Parcel 203(7). Subsurface soils were collected at depths greater than 2 feet below ground surface (bgs) at the monitoring well locations shown on Figure 2-3. The detected analytical results were compared to residential human health SSSLs and metals background screening values, which are also presented on Table 2-3.

Metals. Twenty-one metals were detected in subsurface soil samples collected at the site. Sample locations RNG-203-MW03 and RNG-203-MW01 contained twenty-one and twenty metals respectively. The thallium results were flagged with a “B” data qualifier signifying that thallium was also detected in an associated laboratory or field blank.

The concentrations of five metals (aluminum, arsenic, chromium, iron, and thallium) exceeded SSSLs. Of these metals, the concentration of aluminum (two locations), arsenic (two locations), iron (one location), and thallium (one location) also exceeded their respective background concentration. With the exception of an arsenic result (RNG-203-MW01) and one iron result (RNG-203-MW03), these metals concentrations were within the range of background values determined by SAIC (1998).

Volatile Organic Compounds. Twenty VOCs were detected in subsurface soil samples collected at Range K, Parcel 203(7). The acetone and methylene chloride results were flagged with a “B” data qualifier indicating that these compounds were also detected in an associated laboratory or field blank. All but three of the remaining results were flagged with a “J” data qualifier indicating that the results were greater than the MDL but less than the RL. The sample collected from RNG-203-MW01 contained nineteen of twenty detected VOCs.

The VOC concentrations in subsurface soils were below SSSLs.

Semivolatile Organic Compounds. Bis(2-ethylhexyl)phthalate was detected in each of the four subsurface soil samples. However, the results were flagged with a “B” data qualifier signifying that the compound was also detected in an associated laboratory or field blank. The bis(2-ethylhexyl)phthalate concentrations were below the SSSL.

Nitroaromatics. Nitroaromatic compounds were not detected in any of the subsurface soil samples collected at Range K, Parcel 203(7).

2.3.3 Groundwater Analytical Results

Four groundwater samples were collected from the monitoring wells installed at the site at the locations shown on Figure 2-3. Analytical results were compared to residential human health SSSLs and background concentrations, as presented in Table 2-4.

Metals. Samples that were found to have metal concentrations exceeding both background and SSSL values include: aluminum from the samples collected at RNG-203-MW01 and RNG-203-MW04; arsenic in RNG-203-MW02; barium, cadmium, and vanadium in RNG-203-MW03; iron in RNG-203-MW01 and RNG-203-MW04; and manganese in RNG-203-MW01. The barium and vanadium results from RNG-203-MW04 were qualified with a ‘J’ qualifier, indicating that the analyte was detected at levels greater than the MDL but less than the RL. The metals data may be biased high as a result of high turbidity. The majority of these metals were present in groundwater samples that had high turbidity at the time of sample collection. To evaluate the effects of turbidity on metals concentrations in groundwater at FTMC, IT resampled five wells that previously had high turbidity using a “low-flow” groundwater purging and sampling technique to reduce turbidity to below 10 NTUs. The resampling effort demonstrated that the concentrations of most metals in the lower turbidity samples were significantly lower (1-2 orders of magnitude) than in the higher turbidity samples (IT, 2000c) (Appendix D). The field data from RNG-203-MW01, RNG-203-MW03, and RNG-203-MW04 indicate that the turbidity levels exceed 10 nephelometric turbidity units (NTU); therefore some analytes may be artificially high.

Other analytes were detected at levels exceeding SSSLs such as cadmium and nickel in RNG-203-MW01, manganese in RNG-203-MW02, iron and manganese in RNG-203-MW03, and arsenic, chromium, and manganese in RNG-203-MW04. These detections were less than the reported backgrounds for these analytes at FTMC.

Volatile Organic Compounds. Eleven VOCs were detected in groundwater samples collected at the site. The sample results for acetone, carbon disulfide, methylene chloride, and two for chloromethane were flagged with a “B” data qualifier signifying that these compounds were also detected in an associated laboratory or field blank sample. Sample location RNG-203-MW04 and RNG-203-MW-01 contained six and five VOCs, respectively, of the eleven detected VOCs. The following six VOCs were detected at concentrations exceeding SSSLs: 1,1,2,2-tetrachloroethane (RNG-203-MW01), 1,2-dichloroethane (RNG-203-MW04), methylene chloride (RNG-203-MW01), vinyl chloride (RNG-203-MW01 and RNG-203-MW04), cis-1,2-dichloroethene (RNG-203-MW01), and trans-1,2-dichloroethene (RNG-203-MW01).

Furthermore, as shown in Table 2-4, the concentrations of cis-1,2-dichloroethane, trans-1,2-dichloroethane, 1,1,2,2-tetrachloroethane, and vinyl chloride at sample location RNG-203-MW01 were significantly greater than their respective SSSLs.

Semivolatile Organic Compounds. Only one SVOC (phenanthrene) was detected in groundwater samples collected at the site. Phenanthrene was detected at an estimated value (‘J’) of 0.0016 mg/L in the sample from well RNG-203-MW04, indicating the value was between the MDL and the RL. The phenanthrene concentration was below the SSSL.

Nitroaromatics. Four nitroaromatic compounds were detected in groundwater samples collected at the site. The concentration of nitrobenzene (0.0013 mg/L) exceeded the SSSL (0.00071 mg/L) at one sample location (RNG-203-MW02).

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 future action for Range K. This section incorporates the components of the DQO process described in the publication EPA 540-R-93-071 *Data Quality Objectives Process for Superfund* (EPA, 1993). The DQO process as applied to Range K is described in more detail in Appendix B of the SAP, Section 3.0, contained in the SAP (IT, 2000a). Table 3-1 provides a summary of the factors used to determine the appropriate quantity of samples, the procedures necessary to meet the objectives of the RI, and establish a basis for future action at this site.

To support this RI at Range K, Parcel 203(7), three types of samples will be collected: surface soil, subsurface soil, and groundwater.

The water and soil matrix samples will be analyzed for this RI using EPA SW-846 methods, including Update III methods where applicable, as presented in Chapter 5.0 in this RI field sampling plan and Table 6-1 in the QAP (IT, 2000a). Data will be reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported via hard copy data packages by the laboratory using Contract Laboratory Program (CLP)-like forms along with electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines Level III criteria.

3.2 Data Users and Available Data

The available data related to the RI field sampling plan at the Former Agent Training Area, Range K, 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 RI field sampling plan, 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 information generated during field activities are primarily EPA, USACE, ADEM, FTMC, and the USACE supporting contractors. This RI field sampling plan, 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

Table 3-1

**Human Health Conceptual Site Exposure Model
Range K, Parcel 203(7)
Fort McClellan, Calhoun County, Alabama**

Potential Data Users	Available Data	Conceptual Site Model	Media of Concern	Data Uses and Objectives	Data Types	Analytical Level	Data Quantity		
EPA ADEM USACE DOD IT Corporation Other Contractors Possible future land users	SAIC, Site Investigation Report, 1993	<u>Contaminant Source</u> Decontaminating agents used on CWA. Toxic agents and munitions	Surface Soil	Obtain sufficient data to support, as appropriate, the following: - Implementing an immediate response. - No further action. - Proceeding with a remedial action.	<u>Surface Soils</u> TCL-VOCs TCL-SVOCs Metals CWM Breakdown Products Nitroexplosives OP pesticides CL pesticides CL herbicides PCBs	Definitive + CESAS Level B data	9 surface soil samples + QC		
	SAIC, Remedial Investigation Report, 1995	<u>Migration Pathways</u> Infiltration and leaching to subsurface soil and groundwater. Biotransfer to venison through browsing. Dust emissions and volatilization from soil to ambient air.	Subsurface Soil		<u>Subsurface Soil</u> TCL-VOCs TCL-SVOCs Metals CWM Breakdown Products Nitroexplosives OP pesticides CL pesticides CL herbicides PCBs			Definitive + CESAS Level B data	9 subsurface soil samples + QC
	SAIC, Remedial Investigation/ Baseline Risk Assessment Report, 1999	<u>Potential Receptors</u> Resident (future) and recreational site user (current and future). <u>PSSC</u> decontaminating chemicals metals munitions Volatile organics	Groundwater		<u>Groundwater</u> TCL-VOCs TCL-SVOCs TAL metals (total and dissolved) CWM Breakdown Products Explosives OP pesticides CL pesticides CL herbicides PCBs TOC Nitrate/nitrite Sulfate/sulfite Hardness TDS TSS				
IT Relative Risk Screening for the Former Agent Training Area, Range K, Parcel 203(7) SI Work Plan, November 1999 (Results of the SI field work)									

ADEM - Alabama Department of Environmental Management.
CESAS - Corps of Engineers South Atlantic Savannah.
CL - Chlorinated.
CWM - Chemical warfare materials.
DOD - U.S. Department of Defense.
EPA - U.S. Environmental Protection Agency.
ESE - Environmental Science and Engineering.

OP - Organophosphate.
PCBs - Polychlorinated biphenyls.
PSSC - Potential site-specific chemicals.
QC - Quality control.
RI - Remedial investigation.
SAIC - Science Applications International Corporation.
SVOC - Semivolatile organic compound.

TCL - Target compound list.
TDS - Total dissolved solids.
TOC - Total organic carbon.
TSS - Total suspended solids.
USACE - U.S. Army Corps of Engineers.
VOC - Volatile organic compound.

work. The program has also been designed to provide defensible information required to confirm or deny the existence and nature of residual chemical contamination in site media.

3.3 Conceptual Site Exposure Model

The conceptual site exposure model (CSEM) provides the basis for identifying and evaluating the 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 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.

Primary contaminant releases were probably leaks and spills that entered surface soil. Potential contaminant transport pathways include infiltration and leaching to subsurface soil and groundwater, dust emissions and volatilization to ambient air, and biotransfer to deer through browsing. Although runoff and erosion to surface water and sediment may be contaminant transport pathways, no surface water or sediment sample is currently proposed at the site; therefore no evaluation is possible for these pathways unless samples are collected.

Currently, the site is still used for training exercises and access is not restricted; most of the site is undeveloped. It is not thought that the site is currently maintained in any fashion. Because trespassers or hunters may access the site, a recreational site user will be evaluated for the current land-use scenario. Other potential receptors considered, but not included under current land-use scenarios, are the:

- Construction worker: The site is unused, and no development or construction is occurring or scheduled.

- Resident: The site is not currently used for residential purposes.
- Groundskeeper: The site is not currently maintained by a groundskeeper.

Future land use in this area is as an active range; the range is currently operated by the U.S. Army National Guard. The site may not be deemed safe for public access until remediation has been completed because of the potential for UXO (FTMC, 1997). Thus, the following future land-use receptor scenarios are included in the CSEM:

- Resident: Although the site is not expected to be utilized for residential purposes, the resident is considered in order to provide information for the Project Manager and regulators.
- Recreational Site User: Since the site future use is unknown and not restricted, and since hunting is a viable option, the recreational site user must be included. His exposure to sediment and surface water will be evaluated if surface water is present.

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

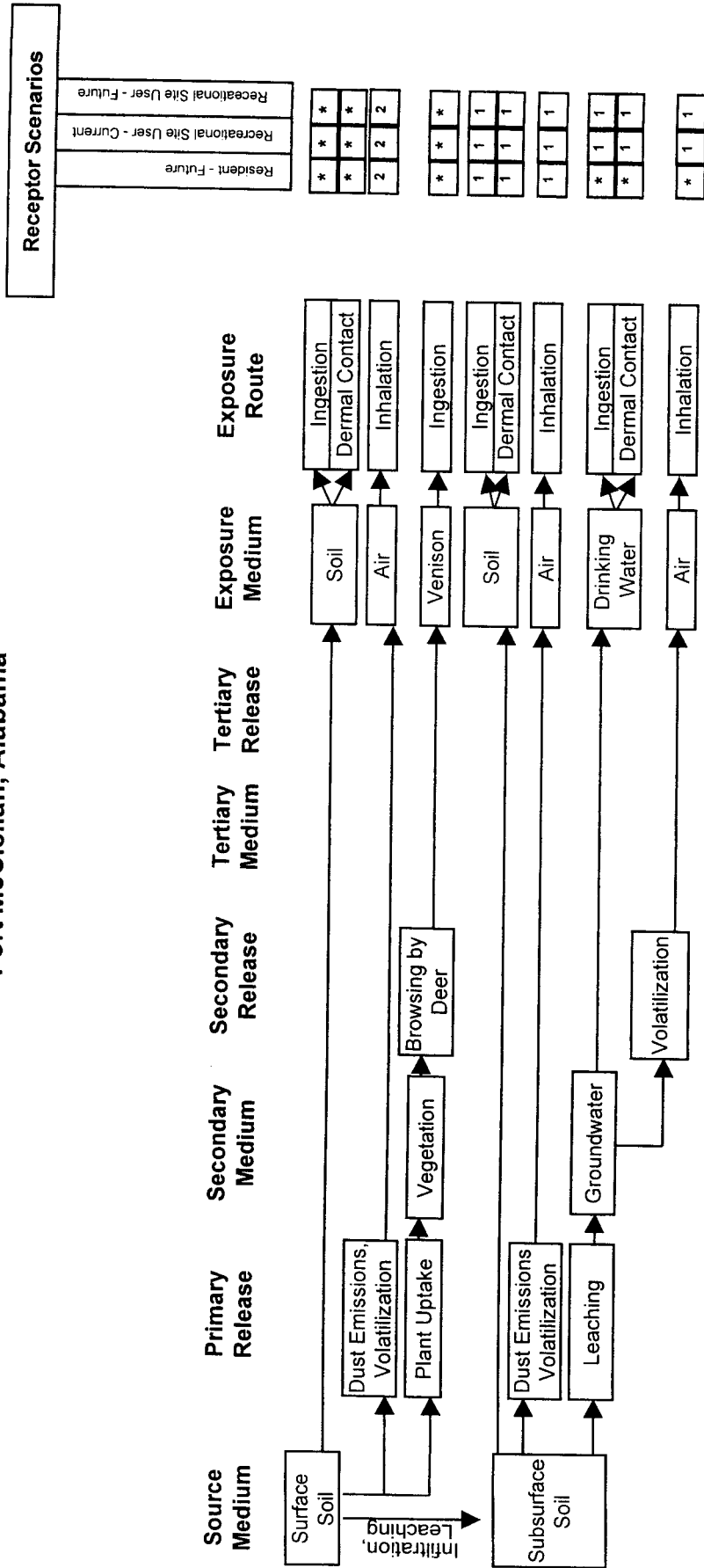
The decision-making process consists of a seven-step process that is presented in detail in Appendix B of the *Installation Wide Quality Assurance Plan*, Section 3.0, contained in the SAP (IT, 2000a). The process will be followed during the RI at Range K. Data uses and needs are summarized in Table 3-1.

3.4.1 Risk Evaluation

Confirmation of contamination at the Range K Training Area will be based upon a comparison of detected site chemicals of potential concern to site-specific screening levels developed in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). The data will be reported and evaluated using EPA definitive data with Corps of Engineers South Atlantic Division Level B criteria. Data packages will contain RLs sufficient to determine whether the established guidance criteria are exceeded in site media. Definitive data will be adequate for confirming the presence of site contamination and for supporting additional decision-making steps, such as remedial action and risk assessment, if necessary.

Figure 3-1

Human Health Conceptual Site Exposure Model
 Range K, Former Agent Training Area
 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 will be addressed in accordance with the procedures in the WP (IT, 1998).

3.4.2 Data Types and Quality

Surface soil, subsurface soil, and groundwater will be sampled and analyzed to meet the objectives of the RI at the Range K. In association with these definitive samples, QA/QC samples will be collected for sample types as described in Chapter 5.0 of this RI field sampling plan.

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 RI field sampling plan, data analyzed at this level of quality are appropriate for all phases of site characterization, RI, and risk assessment.

3.4.3 Precision, Accuracy, and Completeness

Laboratory requirements of precision, accuracy, and completeness for this RI are provided in Chapter 9.0 of the QAP.