Final
Resource Conservation Recovery Act Facility Investigation
Fill Area East of Reilly Airfield, Parcel 227(7) and
Former Post Garbage Dump, Parcel 126(7)
McClellan
Anniston, Alabama

Prepared for:

Anniston Calhoun County Fort McClellan Development Joint Powers Authority, McClellan, Anniston, Alabama

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LIST OF ABBREVIATIONS AND ACRONYMS

°F	Degrees Fahrenheit
ADEM	Alabama Department of Environmental Management
Army	United States Department of the Army
Bgs	Below ground surface
BRAC	Base Realignment and Closure
CA	Cleanup agreement
CDTF	Chemical Defense Training Facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFDP	Center for Domestic Preparedness
CMIP	Corrective Measures Implementation Plan
COC	Constituent of concern
COPC	Constituent of potential concern
DO	Dissolved oxygen
DOD	United States Department of Defense
DOJ	United States Department of Justice
DQS	*Data Quality Summary*
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
EPC	Exposure point concentration
EPIC	Environmental Photographic Interpretation Center
ESCA	Environmental Services Cooperative Agreement
ESE	Environmental Science & Engineering, Inc.
ESMP	Endangered Species Management Plan
ESV	Ecological screening value
FOSET	Finding of Suitability for Early Transfer
FOST	Finding of Suitability for Transfer
HI	Hazard index
HQ	Hazard quotient
HTRW	Hazardous Toxic and Radioactive Waste
IDW	Investigation Derived Waste
ILCR	Incremental lifetime cancer risk
IT	IT Corporation
JPA	Joint Powers Authority
LCS	Laboratory control sample
MCA	Menzie-Cura & Associates
McClellan	McClellan, Anniston, Alabama
MDC	Maximum detected concentration
MES	Matrix Environmental Services, LLC
mg/kg	Milligram per kilogram
mg/L	Milligram per liter
MS	Matrix spike
Msl	Mean sea level
NOAEL	No-observed-adverse-effect-levels

ORP	Oxidation-reduction potential
PCB	Polychlorinated biphenyl
QA	Quality assurance
QAP	*Quality Assurance Plan*
QC	Quality control
RCRA	Resource Conservation Recovery Act
RFI	RCRA Facility Investigation
SAIC	Science Applications International Corporation
SAP	*Draft Installation-Wide Sampling and Analysis Plan*
SI	*Draft Final Site Investigation and Fill Area Definition Report*
SINA	Special interest natural areas
Site	Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
SSSL	Site-Specific Screening Level
SVOC	Semivolatile Organic Compound
TRV	Toxicity Reference Value
U.S.	United States
USACE	United States Army Corps of Engineers
UCL	Upper confidence limit
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compounds
WRS	Wilcoxon Rank Sum

EXECUTIVE SUMMARY

The Anniston-Calhoun County Fort McClellan Development Joint Powers Authority (JPA) has assumed from the United States (U.S.) Department of the Army (Army) the responsibility for environmental closure of certain sites at McClellan. Transfer of these sites to the JPA was conducted pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 120(h)(3)(C) which allows federal agencies to transfer contaminated property before all necessary cleanup has taken place. The basis for the continuing effort at these parcels is the execution of an Environmental Services Cooperative Agreement (ESCA) dated September 29, 2003 between the JPA and the Army (Army, 2003) and a Cleanup Agreement (CA) between the JPA and the Alabama Department of Environmental Management (ADEM).

The Fill Area East of Reilly Airfield, Parcel 227(7), and the Former Post Garbage Dump, Parcel 126(7), are currently vacant parcels that formerly served as post garbage dumps and will collectively be referred to as the Site. The Site's proposed future use is open space and recreational. The Site was originally investigated as part of a site investigation and fill area delineation investigation (*Draft Final Site Investigation and Fill Area Definition Report [SI]) (IT, 2002b)* and an *Engineering Evaluation and Cost Analysis* (*EE/CA*) (IT, 2002a) conducted on behalf of the Army by IT Corporation (IT). After the submission of the *EE/CA* to ADEM, the JPA and Army agreed to conduct a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at the Site to confirm that contamination is not above ADEM-approved site-specific screening levels.

The 2004 RFI activities consisted of: (1) installation of one bedrock monitoring well; (2) groundwater level measurements in the new bedrock well and in 15 existing residuum monitoring wells; (3) abandonment of the 15 residuum wells; (4) sampling, analysis and data quality review of groundwater from one bedrock groundwater monitoring well, and six surface water samples co-located with six sediment samples; and (5) the collection of fish within Reilly Lake and East Reilly Lake for fish tissue analysis.

Groundwater flow direction, based upon the 2004 water level data in the residuum, is to the northwest across the Site. This flow direction is consistent with the anticipated influence of Cave Creek on the shallow groundwater flow system and the previous groundwater flow directions observed at this Site (IT, 2001). The horizontal gradients vary from a low of approximately 0.008 foot/foot to a maximum of 0.01 foot/foot. No groundwater flow direction could be calculated for the shallow bedrock well due to the lack of other wells in the area also completed into the shallow bedrock.

No well pairs are available to calculate vertical gradients; however comparison of water level measurements from the single bedrock monitoring well with the groundwater contours presented in Figure 5-1 indicates an downward component of groundwater flow.

The analytical samples submitted for analysis for the 2004 RFI included: six surface water samples collected from Reilly Lake, East Reilly Lake, and from Reilly Lake tributaries; six sediment samples collected from locations collocated with surface water sampling locations; and

one groundwater sample from the shallow bedrock monitoring well. Samples were analyzed for metals.

Fish were collected from Reilly Lake and East Reilly Lake and the fish tissue samples were analyzed for metals. The fish sampling and analyses were performed to estimate the potential for exposure and risk to human health and ecological receptors that may frequent Reilly Lake.

A data quality review of analytical results was performed to assess compliance with quality assurance (QA) objectives and to assess hard copy consistency and integrity with electronic data deliverables. A statistical evaluation was subsequently performed to identify metals that may be present at elevated concentrations as a result of site related activities and screening level human and ecological risk assessments were performed to evaluate potential risk to receptors from elevated metal concentrations.

A statistical evaluation was performed to identify metal constituents of potential concern (COPCs). To evaluate constituents of concern (COCs) for the Site, the metal COPCs were compared to site-specific screening levels (SSSLs) and ecological screening values (ESVs). Several metals were detected in groundwater, surface water and sediment, although at concentrations that typically were less than corresponding background concentrations.

In the groundwater sample, aluminum exceeded residential SSSLs. In surface water, arsenic was detected in three samples at estimated concentrations that exceeded recreational SSSLs. Cobalt was detected in two samples at concentrations that exceeded ESVs. Locations where metal concentrations in surface water exceeded SSSLs or ESVs were upstream and north of Reilly Lake (FA-227-012-SW), south of East Reilly Lake (FA-227-007-SW) and between east and west Reilly Lake (FA-227-010-SW). The concentrations of metals detected at these locations were generally less than laboratory reporting limits, were estimated and provided little evidence of Site-related release of metals into the environment.

In sediment, no metal exceeded recreational SSSLs and copper exceeded ESVs at two locations.

Based on the 2004 RFI data, site-related metals do not appear to have been released to the groundwater in the bedrock aquifer. Based on the limited distribution of the relatively few metal COCs observed in surface water and sediment at the Site, there does not appear to be site-related release of metals to the environment and consequently the nature and extent of metals contamination in surface water and sediment was defined.

A risk assessment was performed to evaluate the potential threat to human health from exposure to environmental media at the Site. Three receptor scenarios were evaluated based on future land use as open space and recreational: residential, groundskeeper and recreational user. Exposure point concentrations (EPCs) (representing the chemical concentrations in environmental media that may come in contact with a receptor) were selected based on the 95 percent upper confidence limit (UCL) or the maximum detected concentration (MDC). The EPC for each COC was compared to the cancer and non-cancer SSSLs for each receptor scenario. The EPCs were used to calculate the incremental lifetime cancer risk (ILCR) and non-cancer hazard index (HI) for each COC in each environmental medium. The ILCRs and HIs for the COCs were summed to yield a total ILCR and total HI for a given receptor exposed to a given medium. Total ILCRs that were between1E-06 and 1E-04 fall within an acceptable risk range. Because aluminum is not a carcinogen, cancer risk was not identified for residents or groundskeepers exposed to groundwater. No ILCR was calculated for human receptors exposed to sediment because no COCs were identified. The total ILCR (9.07E-06) for the recreational user exposed to surface water was within the acceptable risk range.

In a separate human health risk assessment, metals in fish tissue collected from Reilly Lake and East Reilly Lake were evaluated for their risk to potential human receptors including a young child. The concentrations of metals in fish tissues from Reilly Lake and East Reilly Lake do not pose an unacceptable risk to human health.

An ecological risk assessment was performed to evaluate the potential for ecological risks posed by COCs at the Site. COCs that exceeded their respective ESVs were limited to cobalt in surface water and copper in sediment. To assess whether the COCs have the potential to pose adverse ecological risks, the COCs were evaluated against the ESVs by calculating screening-level hazard quotients (HQs) for surface water and sediment. An HQ of 2.8 for cobalt in surface water and an HQ of 1.1 for copper in sediment were calculated. Because of the low concentrations of cobalt in surface water and the variability of copper concentrations in sediment, uncertainties are associated with the calculated HQ values. The HQs for each of these constituents were slightly above 1 and less than 5; therefore the potential for increased ecological risk due to a Site-related release is minimal.

The concentrations of metals in the fish tissues collected from the Site are below toxicity reference values (TRVs) associated with adverse effects to fish.

The dietary doses of the metals to wildlife that consume fish from the Site are also below TRVs associated with adverse effects; therefore no measurable ecological risk appears to be present due to fish consumption.

Based on the information collected as part of the RFI, no further actions are warranted with respect to defining the nature and extent of contamination in environmental media at the Site. Based on the results of this RFI and previous studies, no remedial action is warranted and the JPA requests a RCRA “No Further Action with Land Use Controls” letter from ADEM. Removal of non-hazardous surface debris present at the Site coupled with selective addition of a soil cap may be warranted to enhance suitability of the Site for the future land use of open space and recreational.

The JPA proposes the submittal of a corrective measures implementation plan (CMIP) to ADEM following approval of this RFI. The CMIP will outline the process and schedule for implementation of the LUCs. The specific LUCs include placing a deed notice that will prevent residential reuse of the property and excavation within the landfill or fill areas, and installing signs and monuments to mark the boundaries of the fill areas. These LUCs are selected to fulfill the requirements of Section IV B of the CA. The LUCs will be completed by the JPA following approval of a CMIP.

In addition, JPA proposes removal of non-hazardous surface debris present at the Site coupled with selective repair of a soil cap as warranted, to enhance suitability of the Parcels 227(7) and 126(7) for the future open space and recreational land use.

1.0 INTRODUCTION

Matrix Environmental Services, LLC (MES) has prepared this Resource Conservation Recovery Act (RCRA) Facility Investigation (RFI) Report to summarize environmental investigations at the Fill Area East of Reilly Airfield, Parcel 227(7), and the Former Post Garbage Dump, Parcel 126(7), within McClellan, Anniston, Alabama (McClellan) formerly known as Fort McClellan. Figure 1-1 shows a site map of McClellan and Figure 1-2 the location of Parcels 227(7) and 126(7).

This report was prepared on behalf of the Anniston-Calhoun County Fort McClellan Development Joint Powers Authority (JPA). The JPA has assumed from the Army the responsibility for environmental closure of certain sites at McClellan. Transfer of these sites to the JPA was conducted pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 120(h)(3)(C) which allows federal agencies to transfer contaminated property before all necessary cleanup has taken place. The basis for the continuing effort at these parcels is the execution of an Environmental Services Cooperative Agreement (ESCA) dated September 29, 2003 between the JPA and the Army (Army, 2003). In addition, the JPA has negotiated a Cleanup Agreement (CA) with the Alabama Department of Environmental Management (ADEM) that describes the responsibilities for completing the investigation and remediation of potentially impacted sites at McClellan (ADEM, 2003).

1.1 Status of Parcels 227(7) and 126(7) and Justification for Environmental Investigations

Parcels 227(7) and 126(7) are currently vacant parcels that formerly served as post garbage dumps and will be collectively referred to as the Site. Proposed future land use of the parcels is recreational with planned addition of the parcels to the McClellan Park System as proposed in the Re-Use Plan (November 1997 as amended by EDC Application of March 2000) (EDAW, 1997).

The Fill Area East of Reilly Airfield and the Former Post Garbage Dump are included in the *Draft Final Engineering Evaluation/Cost Analysis Landfills and Fill Areas, Parcels 78(6), 79(6), 80(6), 81(5), 175(5), 230(7), 227(7), 126(7), 229(7), 231(7), 233(7), and 82(7), Fort McClellan, Calhoun County, Alabama*, (Army *EE/CA*) (IT, 2002a) prepared by IT on behalf of the United States Army Corps of Engineers (USACE) to summarize environmental conditions at the landfills and fill areas at McClellan. The Army *EE/CA* and earlier environmental investigations concluded that these parcels do not pose an unacceptable risk to human health; and that metals and pesticides in soil and metals and SVOCs in surface water could potentially pose risks to ecological receptors. The Army *EE/CA* recommendations were for a CERCLA No Further Action.

The Army EE/CA was reviewed by state and Federal agencies and the U.S. Environmental Protection Agency (EPA) chaired a meeting held March 24-26, 2003 to discuss the *EE/CA*. Recommendations from this meeting regarding additional environmental investigations required at Parcels 227(7) and 126(7) are captured in the meeting minutes (Appendix G) and included:

- Landfill gas monitoring (Completed by the Army in May 2003).

- Install one new bedrock monitoring well and analyze for metals.
- Evaluate metals in fish for food chain exposures.
- Delineate metals with concentrations exceeding ecological screening values (ESVs) in wetlands along the northern edge of the parcel boundary.

Based on recommendations from the March 24-26, 2003 *EE/CA* meeting and requirements listed in the ESCA and CA, field investigations were performed in March, April, August and October 2004 consisting of sediment, groundwater, surface water, and fish sampling. This RFI presents descriptions of the 2004 environmental investigations as well as a summary of the previous *SI* performed by IT (2002b).

1.2 McClellan Site Description and History

McClellan is located in the foothills of the Appalachian Mountains of northeastern Alabama, near the cities of Anniston and Weaver in Calhoun County. McClellan is approximately 60 miles northeast of Birmingham, 75 miles northwest of Auburn, and 95 miles west of Atlanta, Georgia.

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. The site was named Camp McClellan in honor of Major General George B. McClellan, a leader of the Union Army during the Civil War. Camp McClellan was used to train troops for World War I 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 re-designated as Fort McClellan in 1929 and continued to serve as a training area.

In 1940, the government acquired an additional 22,245 acres west of McClellan. 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 provided access to additional woodlands for training.

The Army operated the Chemical Defense Training Facility (CDTF) at Fort McClellan from 1951 until the school was deactivated in 1973. The CDTF was then reactivated in 1979 and was closed at the time of base closure in 1999 (Environmental Science & Engineering, Inc. [ESE], 1998). The CDTF offered advanced training in all phases of chemical, biological, and radiological warfare to personnel from all branches of the military.

In 1995, the U.S. Department of Defense announced that Fort McClellan would close by October 1999. The Base Realignment and Closure (BRAC) commission recommended closure of the installation, except for minimum essential land and facilities for a Reserve Component Enclave and essential facilities needed to provide support for the chemical demilitarization operation at Anniston Army Depot. Subsequently, the U.S. Department of Justice (DOJ) requested a transfer of some facilities and training area to their authority for ongoing training exercises. The Army transferred the CDTF and ancillary support facilities to the DOJ in 2000 to establish the Center for Domestic Preparedness (CFDP).

Property that was determined by the Army and ADEM to be suitable for transfer (i.e., "clean property") was transferred to the JPA under a Finding of Suitability for Transfer (FOST). Subsequently, remaining contaminated property was transferred to the JPA under a Finding of Suitability for Early Transfer (FOSET). The basis for the continuing effort at these FOSET parcels is the execution of an ESCA and the CA that describe the responsibilities of all parties in completing the investigation and remediation of environmentally impacted sites at McClellan.

1.3 Purpose and Objectives

The purpose of this RFI report is to summarize environmental sampling data from previous investigations and to present analytical results for the 2004 field activities. Objectives for the 2004 field activities and this RFI included:

- Further characterize groundwater in the interior of the parcels.
- Evaluate chemical concentrations in sediment and surface water in areas upstream of and downstream from the two parcels.
- Evaluate the concentrations of metals in fish tissue collected from nearby Reilly Lake and East Reilly Lake.

1.4 Report Organization

Section 2.0 of this report presents a summary of the environmental setting including location, soil types, geology, and hydrogeology of the parcel. Section 3.0 presents a summary of previous environmental investigations. Section 4.0 describes the activities conducted during the 2004 investigations, and Section 5.0 presents the results of the 2004 environmental investigations. Contaminant fate and transport is discussed in Section 6.0. Screening-level human health and ecological risk discussions are presented in Sections 7.0 and 8.0, respectively. Section 9.0 presents the summary, conclusions, and recommendations. Section 10.0 provides the references cited in this report.

Additional supporting information is provided in Appendices included with this report, as follows:

Appendix A	Boring Logs and Well Completion Data for 2004 RFI Well
Appendix B	Field Documentation Forms
Appendix C	Analytical Data for 2004 RFI
Appendix D	*Data Quality Summary: Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)*
Appendix E	*Statistical Comparison of Site and Background Data for Metals, Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)*
Appendix F	Body Burden Analysis of Fish, Reilly Lake and East Reilly Lake
Appendix G	Minutes from Landfill EE/CA Meeting, March 24-26, 2003

2.0 SITE CHARACTERIZATON

2.1 Site Description and History of Parcels 227(7) and 126(7)

The following information was adapted from the *Draft Final Site Investigation and Fill Area Definition Report* (IT, 2002b). Parcels 227(7) and 126(7) are adjacent sites located in the northern portion of the Main Post at the eastern end of Reilly Airfield (Figure 1-2). Parcel 227(7) is bounded on the west by Reilly Lake, on the north by trees and dense foliage and adjacent Parcel 126(7), on the east by trees, and on the south by Reilly Airfield. The site contains several potential disposal areas identified in the Environmental Photographic Interpretation Center (EPIC) report (EPA, 1990). The EPIC aerial photo composite dated 1949 annotates two ground scars with the label "Fill Area." The aerial photo composite dated 1961 annotates one site as "Pit" and another as "TR" (trench). The parcel encompasses the four sites identified by the EPIC. The parcel also includes an adjacent area of disturbed ground that was not identified in the EPIC report, but which appeared to possibly contain mounded material (ESE, 1998).

Parcel 126(7) is located near the northern boundary of the Main Post; it is located southeast of East Reilly Lake and east of Reilly Lake (Figure 1-2). Parcel 126(7) covers approximately 1.6 acres. The parcel is bounded on the south by Parcel 227(7). Parcel 126(7) is bounded on the west, east, and south by undeveloped land. Parcel 126(7) consists of a steep north-facing slope. Shallow groundwater at the site is likely controlled by surface drainage and/or topography. Site elevation is approximately 725 to 755 feet above mean sea level (msl) (IT, 2002b).

2.2 Geology

The geology of McClellan is discussed in the following sections. Information contained in these sections is adapted from previous work performed by IT (2002b).

2.2.1 Regional 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. Figure 2-1 shows the geologic map of the area that includes Parcels 227(7) and 126(7).

The majority of Calhoun County, including McClellan, 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 comprises 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 Formation 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 (Osbourne 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 appears to dominate the unit and consists primarily of coarse-grained, vitreous quartzite, and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consists 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 McClellan belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east, and southwest 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 Ft McClellan (Osborne and Szabo, 1984). The character of the Shady Dolomite in the McClellan 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 McClellan, 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) and the northern portion of McClellan (Osborne et al., 1997). 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 consists of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped together as undifferentiated at McClellan and in 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 McClellan 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, dolomitic mudstone, and glauconitic limestone (Osbourne, 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 McClellan, 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 McClellan, 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 McClellan 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 McClellan window is framed on the northwest by the Rome Formation, north by the Conasauga Formation, northeast, east, and southwest by the Shady Dolomite, and southeast and southwest by the Chilhowee Group (Osborne et al., 1997).

2.2.2 Site-Specific Geology

Bedrock beneath Parcels 227(7) and 126(7) is mapped as the Cambrian Conasauga Formation. The Cambrian Conasauga Formation is composed of dark-gray, finely to coarsely crysalline medium to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989). A geologic map of the area, including Parcels 227(7) and 126(7) is presented in Figure 2-1.

2.3 Soil

The soil types of McClellan are discussed in the following sections.

2.3.1 Regional Soil

The soil associations found at McClellan (U.S. Department of Agriculture [USDA], 1961), include:

- **Anniston-Allen, Decatur-Cumberland**. Alluvium, resulting from weathering of older residual soils developed from sandstone, shale and quartzite; deep, well-drained, level to moderately steep soil in valleys underlain by limestone and shale. Subsoil is dark red sandy clay loam. Cumberland and Decatur soils are dark reddish brown gravelly loam developed from weathered limestone.
- **Clarksville-Fullerton.** Well-drained to moderately well-drained stony or cherty soils developed in the residuum of cherty limestone. This association is limited to Pelham Range. The soils are generally dark brown to dark gray-brown silt loam.
- **Rarden-Montevallo-Lehew.** Moderately deep or shallow soils on ridgetops and steep slopes and in local alluvium in draws. Soils are developed from the residuum of shale and fine-grained, micaceous sandstone; reddish brown to dark gray-brown to yellow-brown silt loam, clay or silty clay.
- **Stony Rough Land**. Shallow, steep, and stony soils formed from the weathering of sandstone, limestone, and Talladega Slate. Infiltration is slow; the soils contain many boulders and fragments with clayey residuum. This association underlies a large portion of the Main Post at McClellan.

2.3.2 Site-Specific Soil

Soils underlying Parcels 227(7) and 126(7) are mapped as Cumberland gravelly loam, 2 to 6 percent slopes, eroded soil type (CoB2) (USDA, 1961). The thickness of the alluvium ranges from 2 to 15 feet or more, and in some areas overlies beds of gravel or sand. These soils have developed an old alluvium that washed from soils derived mainly from limestone and cherty limestone, and to some extent, shale and sandstone. Rounded chert, sandstone, and quartized gravel, as large as 3 inches in diameter, are on and in the soil (IT, 2002b).

Sixteen temporary groundwater monitoring wells were installed during the SI conducted by IT (IT, 2002b). The borings drilled into the residuum consisted of red to mottled brown silts, clays, and minor clayey sands, will few thin gravels. Some intervals contained chert nodules (IT, 2002b).

Soils observed from the borings installed during the April 2004 investigation were consistent with observations made during previous investigations and consisted of reddish-yellow sand, fine to coarse, subangular, with clay, chert nodules and small sandstone cobbles.

2.4 Hydrogeology

The hydrogeology of McClellan is discussed in the following sections. Information contained in these sections is in part adapted from previous work performed by IT (2002b).

2.4.1 Regional Hydrogeology

The hydrogeology of Calhoun County has been investigated by the Geologic Survey of Alabama (Moser and DeJarnette, 1992), the U.S. Geological Survey (USGS) in cooperation with the General Services Administration (Warman and Causey, 1962), and ADEM (Planert and Pritchette, 1989). Groundwater in the vicinity of McClellan occurs in residuum derived from bedrock decomposition along fault zones within fractured bedrock and from the development of karst frameworks. Groundwater flow direction is generally toward major surface water features. However, because of 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. Groundwater flow direction in areas with well-developed residuum horizons may subtly reflect the surface topography, but it 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 sandstone, quartzite, and slate which are resistant to weathering, relatively unaffected by faulting, and therefore, 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 one of the largest springs 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, and serves McClellan. 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 at McClellan 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 aquifer and the Tuscumbia-Fort Payne aquifer. The continuity of these 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 Formation is the most utilized unit of the Knox-Shady aquifer, with twice as many wells drilled as any other unit (Moser and DeJamette, 1992).

2.4.2 Site-Specific Hydrogeology

Groundwater levels were measured in the monitoring wells at Parcels 227(7) and 126(7) as part of the SI performed by IT in 2000 (2002b) and as part of this RFI. The results of these groundwater levels are discussed in the following sections.

2.4.2.1 March 2000 SI Groundwater Levels

IT installed 16 temporary wells at Parcels 227(7) and 126(7) at the locations shown in Figure 2-2. Table 2-1 presents the static ground water elevations measured in the temporary wells on March 13, 2000 (IT, 2002b). Groundwater elevations ranged from approximately 721 to 742 feet above msl. As indicated in Figure 1-4 of the *Draft Final Site Investigations and Fill Area Definition Report (SI)* (IT, 2002b), the potentiometric surface map constructed from the March 2000 data generalized the direction of groundwater flow at the site was predominantly north on the western portion of the site, northwest along the northern edge of the site, and almost due west along the eastern side of the site. The average horizontal hydraulic gradient varied across the site from approximately 0.1 to 0.01 foot per foot (IT, 2002b). During boring and well installation activities, groundwater was generally encountered in clayey sand zones at depths ranging from 2 to 35 feet below ground surface (bgs).

2.4.2.2 2004 RFI Groundwater Levels

One of the temporary wells (FTA-126-GP02) installed by IT was not located, therefore groundwater levels were measured in 15 existing monitoring wells and one new monitoring well at the Site on March 22 and 23, 2004. When the 2004 water level data was compared to the 2000 groundwater level data collected by IT, the total well depth of groundwater monitoring well PPMP-227-GP09 was found to be approximately 9 feet deep, which is substantially shallower than the original well depth of 25.25 feet as reported by IT. Based upon this datum this well is assumed to have collapsed and therefore the data collected from the well were not used as part of the development of groundwater elevation map. The 2004 RFI groundwater levels are presented and discussed in Section 5.1.

2.4.3 Surface Hydrology

The land surface at the Fill Area East of Reilly Airfield and Former Post Garbage Dump is relatively flat with only a slight slope to the north and west. Surface run off appears to follow topography and generally flows into either an unnamed, intermittent tributary to Reilly Lake located along the northern boundary of the Fill Area East of Reilly or directly into East Reilly Lake. Dothard Creek is located to the north of Reilly and East Reilly Lakes and flows from the east to the west.

2.5 Wetlands

McClellan contains an estimated 3,424 acres of delineated Wetlands. Major Wetland communities were originally characterized and mapped in 1984 with supplementary mapping performed in 1992. Wetland habitats at McClellan are generally located in topographical depressions near stream seepage and in valleys along creek floodplains. The indicator plant species that assist in defining a wetland include water oaks, sweet gum, bulrush, needlerush, and cattail. Wetland communities found on the Main Post are the Marcheta Hill Orchard Seep, Cane Creek Seep, South Branch of Cane Creek, and 200 acres west of the airstrip that comprises the tributary to Victoria Creek. Parcel 126(7) consists of a north-facing slope that borders a non-delineated potential wetland. This area is a previously forested lowland with open water depths too great to support indicator plant species and is referred to in this report as East Reilly Lake.

2.6 Sensitive Habitats

An Endangered Species Management Plan (ESMP) (Garland, 1996) developed for McClellan identified 11 special interest natural areas (SINAs) within McClellan. SINAs are locations where the habitat fosters one or more rare, threatened, or endangered species. Because these species are sensitive to environmental degradation, SINAs require management practices that promote the continued well being of these ecosystems. According to the ESMP, the 11 SINAs located on the Main Post include:

- Mountain Longleaf Community Complex
- Cave Creek Seep
- Moorman Hill Mountain Juniper
- Freerick Hill Aster Site
- Bains Gap Seep
- Marcheta Hill Crow-Poison Seep
- Marcheta Hill Orchid Seep
- South Branch of Cane Creek Seep
- Stanley Hill Chestnut Oak Forest
- Reynolds Hill Turkey Oak

- Davis Hill Honeysuckle

No available documentation that was reviewed was found to support that Parcels 227(7) and 126(7) are located within SINAs.

2.7 Threatened and Endangered Species

Two species of fauna listed by the U.S. Fish and Wildlife Service (USFWS) as endangered or threatened have been recorded on McClellan. They are the gray bat (*Myotis grisescens*), which uses the Cane Creek Corridor as a foraging habitat, and the blue shiner (*Cyprinella caerulea*), located within the Choccolocco Creek watershed. An additional endangered species, the red-cockaded woodpecker, historically has inhabited McClellan. The red-cockaded woodpecker has not been observed at McClellan in the recent past. Based on the forested area as well as the lakes, streams, and Reilly Lake located on the site, sufficient habitat is available for the gray bat (IT, 2002a). However, no information has been found to suggest that the gray bat currently uses the site as a foraging habitat.

2.8 Meteorology

McClellan has a temperate continental, humid climate. The annual rainfall is distributed throughout the year but tends to be heavier during the winter and spring months. The average annual precipitation totals about 53 inches. Most flood-producing storms are frontal type, and occur during the winter and spring. Summer thunderstorms sometimes cause serious local floods. Snow accumulation is generally 1 inch or less. Temperature extremes are a few degrees below freezing to just over 100 degrees Fahrenheit (°F). Summer temperatures of 90°F or more occur about 70 days per year, and the average annual temperature is 63°F. Frosts are common but usually of short duration. Winds are typically light breezes with no persistent direction. Tornadoes are rare but do occur in the area. Humidity is moderate during cooler months to high during the warmer part of the year.

2.9 Floodplains

The Federal Emergency Management Agency has identified “Special Flood Hazard Areas”. The Special Flood Hazard Areas are based on an area with a 1 percent annual chance of inundation by flooding for which Base flood elevations or velocities may have been determined. Parcels 227(7) and 126(7) are not located within a recognized floodplain.

3.0 PREVIOUS INVESTIGATIONS

This section summarizes findings of previous investigations conducted at Parcels 126(7) and 227(7). Previous investigations include:

- 1998 and 1999 IT Geophysical Surveys
- 2001 Site Investigation and Fill Area Report
- 2003 Review of Existing Data
- 2003 Soil Gas Investigation

3.1 1998 and 1999 IT Geophysical Surveys

IT conducted a grid-based geophysical survey at Parcels 126(7) and 227(7) during September 1998 to March 1999 to estimate the horizontal and vertical extent of the waste fill area (IT, 2002b). The total area surveyed was approximately 32 acres. Based on analysis of site magnetic and electromagnetic (EM) data, the geophysical interpretation map (Figure 3-1) shows the locations of large-scale disposal areas and landfill pits. Geophysical data analyses indicated the presence of several landfill pits that appear to contain buried metallic and surface metallic debris (Figure 3-1).

3.2 2001 Site Investigation and Fill Area Report

IT conducted the *SI* to identify COPCs in various site matrices, characterize the source of COPCs, identify the nature and extent of COPCs, and support the evaluation of the level of risk to human health and the environment posed by potential releases of the COPCs. The *SI* included field work to collect surface soil samples, subsurface soil samples, groundwater samples, surface water samples, sediment samples, and depositional soil samples at the Site.

Results of the *SI* identified the presence of metals in surface and subsurface soil samples. Typically metal concentrations were comparable to background screening concentrations; however, isolated detections of arsenic and chromium exceeded background screening concentrations. Organic compounds including volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) and pesticides were sporadically detected in surface and subsurface soil samples but typically at concentrations less than their corresponding SSSLs.

Groundwater samples collected from temporary wells within Parcels 126(7) and 227(7) contained metals at concentrations exceeding background-screening levels; however, the samples were turbid and elevated metal concentrations were likely associated with suspended solids. Concentrations of detected VOCs, SVOCs and pesticides were less than corresponding SSSLs.

In surface water and sediment, metals exceeding their corresponding ecological screening values (ESVs) were detected.

Metals exceeding ESVs in surface water or sediment included: arsenic, cobalt, copper, lead, mercury and nickel. Organic compounds including VOCs and SVOCs, if detected, were at concentrations less than corresponding ESVs or SSSLs.

Fill area definition activities were conducted by IT within Parcel 126(7) and 227(7). These activities included trenching, soil borings, and fill material sampling and analysis to further identify the extent of fill within these parcels.

Trenching, boring and sampling activities were conducted within the parcels to identify fill material content and extent. Fill material consisting of construction materials and debris were identified along with miscellaneous domestic waste material. Based on the results of the exploratory trenching at Parcels 126(7) and 227(7), the horizontal extent of the Fill Area is defined as shown in Figure 3-2. The estimated extent of waste fill within these parcels covers approximately 6.5 acres.

3.3 2002 Engineering Evaluation/Cost Analysis

The Army *EE/CA* was performed by IT on behalf of the Army (IT, 2002a) to summarize site characterization for McClellan fill areas including Parcels 126(7) and 227(7). The *EE/CA* also provided human health and ecological risk assessments; for parcels where risks were associated with site activities, remedial action objectives were developed and potential corrective measures were evaluated. Findings of the *EE/CA* for Parcels 126(7) and 227(7) indicated that the surface soil, surface water, sediment, and groundwater at the Site pose no unacceptable cancer risk or non-cancer hazard to human residents or the recreational site-user. Moreover, it was identified that chemical constituents in sediment and surface water most likely do not pose significant ecological risk (IT, 2002a).

Based on the results of the field investigations, the current and proposed future land use, and the results of the risk assessments completed for Parcels 227(7) and 126(7), the recommended remedy for the parcels was no further action.

3.4 EE/CA Review Meeting

The *EE/CA* was reviewed by state and Federal agencies and the EPA chaired a meeting held March 24-26, 2003 to discuss the *EE/CA* (Appendix G). During this meeting it was recommended that additional environmental investigation be performed including groundwater sampling and evaluation of metals in local wetlands. Additionally, because of the potential for volatile emissions from the Fill Area East of Reilly Airfield and the Former Post Garbage Dump, landfill gas monitoring was recommended.

3.5 2003 Soil Gas Investigation

In partial fulfillment of the agreement reached during the 2003 EE/CA review meeting, landfill gas monitoring was completed in May 2003 and results reported in the *Landfill Gas Investigation Report* (Shaw, 2003). Methane was not detected in landfill gas samples; however 21 VOCs were detected in samples collected from Parcel 227(7) with concentrations ranging from 2 to 680 parts per billion by volume (ppbv). Similarly, methane was not detected in landfill gas samples, but 19 VOCs were detected in samples collected from Parcel 126(7) with concentrations ranging from 2.4 to 330 ppbv.

3.6 Data Gaps

Based on recommendations from the March 24-26, 2003 *EE/CA* review meeting the following data gaps were identified and serve as the basis for additional environmental investigation activities conducted at Parcels 227(7) and 126(7) and reported herein:

- Further characterize groundwater in the interior of the parcels
- Evaluate chemical concentrations in surface water and sediment in areas upstream of and downstream from the two parcels
- Evaluate the concentrations of metals in fish tissue collected from nearby Reilly Lake and East Reilly Lake

Field activities were performed during March, April, August and October 2004 to address these data gaps. The subsequent field activities are described in the following sections.

4.0 2004 RCRA FACILITY INVESTIGATION

To fill the data gaps discussed in Section 3.0, the following activities were performed during the March, April, August and October 2004 field investigations:

- Installed one bedrock monitoring well PPMP-227-GP14 at Parcel 227(7).
- Collected water levels from 15 previously installed temporary wells as well as the newly installed bedrock well.
- Abandoned 15 temporary wells.
- Collected one groundwater sample from the new monitoring well for metals analyses.
- Collected one round of surface water and sediment samples from six locations north of the parcels for metals analyses.
- Collected fish samples from Reilly Lake and East Reilly Lake for metals analyses.

The field activities are described in the following subsections.

4.1 Monitoring Well Installation

Monitoring well PPMP-227-GP14 was installed between PPMP-227-GP07 and PPMP-227-GP12 to the west and downgradient of Fill Area East of Reilly Airfield. This monitoring well was completed in bedrock. Figure 4-1 shows the location of the well. Table 4-1 summarizes the 2004 RFI well installation information. The drilling methods were consistent with the methods presented in the *Installation-Wide Sampling and Analysis Plan* (*SAP*) (MES, 2004b). Well installation followed procedures presented in Appendix C of the *SAP*. See Appendix A of this report for the boring and well completion logs for PPMP-227-GP14.

Lithologic sampling was performed concurrently when advancing borings for monitoring well construction. Generally, continuous sampling was performed in residuum from ground surface to 12 feet below ground surface. From 12 feet below ground surface to the bottom of the borehole, samples were collected at 5-foot intervals. At bedrock well locations where primary and secondary structures are suspected that may influence groundwater and contaminant movement, continuous bedrock sampling was performed.

4.2 Monitoring Well Abandonment

Fifteen temporary monitoring wells within Parcels 227(7) and 126(7) were abandoned during the 2004 RFI investigation. The temporary monitoring wells were installed during February and March 1999 as part of earlier site investigations. During the 1999 installation of each temporary monitoring well, the annular space between the well casing and soil boring wall was not filled with a bentonite-cement grout mixture as is typically performed. Accordingly, to minimize infiltration of surface runoff into the open annular space, the following temporary monitoring wells within Parcels 227(7) and 126(7) were abandoned following procedures presented in the *SAP* (MES 2004b):

FTA-126-GP02	PPMP-227-GP03	PPMP-227-GP07	PPMP-227-GP11
FTA-126-GP03	PPMP-227-GP04	PPMP-227-GP09	PPMP-227-GP12
PPMP-227-GP01	PPMP-227-GP05	PPMP-227-GP10	PPMP-227-GP13
PPMP-227-GP02	PPMP-227-GP06		

Well abandonment was performed by filling each temporary monitoring well with cement grout slurry and cutting the temporary monitoring well casing at least two feet below ground surface. Any surface completion materials were removed and the remaining soil boring was filled with the cement grout slurry.

4.3 Groundwater Sampling

A groundwater sample was collected during one round of sampling from PPMP-227-GP14.

Groundwater samples were collected in accordance with methodology presented in the *SAP* (MES, 2004b). Before groundwater samples were collected, water levels were measured to the nearest hundredth of a foot using a Solinst™ water level indicator and total well depth was measured and recorded.

Groundwater samples were collected using a submersible pump (Grundfos Redi Flo 2). The pump was lowered into the well and positioned at the screened interval. Teflon tubing leading from the discharge side of the submersible pump was connected to a flow-through cell equipped with a YSI Model 6820 Water Quality Meter. Measurements of field screening data were used to indicate when groundwater quality had stabilized and sampling could begin. Chemical and physical parameters included pH, conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), turbidity, and temperature. Pumping rate, water level and volume of groundwater removed were also recorded. The monitoring well sample collection log is provided in Appendix B.

Groundwater samples were collected from the well pump outlet after it was identified that the field screening data had stabilized. Laboratory-supplied sample bottles were filled. Sample containers were labeled, placed in a chilled cooler and shipped under chain-of-custody procedures to EMAX Laboratories, Torrance, CA. Figure 4-1 shows the groundwater sampling locations. Table 4-2 presents groundwater sampling locations and analytical parameters. The chain-of-custody forms for the groundwater samples collected for the 2004 RFI are provided in Appendix B.

4.4 Surface Water Sampling

Surface water samples were co-located with the sediment samples. Surface water samples were collected following methodology presented in the *SAP* (MES, 2004b). Surface water samples were collected at mid-depth using a stainless-steel pitcher. The surface water samples were collected before sediment samples were collected to avoid undue disturbance of the sediment and possible contaminant release into the surrounding surface water. Figure 4-1 shows the surface water sampling locations. Table 4-2 presents surface water sampling locations and analytical parameters. COCs for surface water samples collected for the 2004 RFI are provided in

Appendix B.

4.5 Sediment Sampling

Sediment samples were collected at locations along the northern edge of the parcel boundary (Figure 4-1). Sediment sampling was performed following the methodology presented in the *SAP* (MES, 2004b). Sediment samples were collected using a decontaminated stainless steel spoon. Figure 4-1 shows the approximate sediment sampling locations. Table 4-2 presents sediment sample designations and analytical parameters. COCs for sediment samples collected for the 2004 RFI are provided in Appendix B.

4.6 Fish Tissue Sampling

Williams-Russell and Johnson, Inc (WRJ) originally conducted fish sampling on April 28, 2004. The fish samples were sent to Environmental Services Network (ESN) for analysis of metals. The laboratory was unable to provide sufficient quality assurance/quality control (QA/QC) documentation for the data reviewers; therefore results for these analyses were deemed unacceptable for use in this RFI. Subsequently, Menzie-Cura and Associates, Inc. (MCA) collected fish on August 24 and 25, 2004. Thirteen fish collected from Reilly Lake and East Reilly Lake using bait and hook included: *Micropterus salmonides* (largemouth bass), *Lepomis macrochirus* (bluegill), and *Lepomis auritus* (redbreasted sunfish).

Fish collection was conducted in general accordance with applicable methods described in ADEM's *Standard Operating Procedures and Quality Control Assurance Manual Volume III, Fish Sampling and Tissue Preparation for Bioaccumulative Contaminants* (ADEM, 1996). Samples were sent to Woods Hole Group Laboratories (Raynham, Massachusetts) for analysis of metals.

The complete summary of the fish sampling field program, fish analysis, and human health and ecological risk assessments are provided in Appendix F.

4.7 Management of Investigation Derived Waste

Investigation derived waste (IDW) was managed and disposed as described in the *SAP* (MES, 2004b). The liquid IDW generated during the groundwater sampling was collected in 55 gallon drums at the site. The drums were stored at 1160B Town Center Drive, Building 1698. IDW fluids were transferred to a 5,000 gallon polyethylene tank and sampled for VOCs, polychlorinated biphenyls (PCBs), and metals. Following approval of the City of Anniston Water Department, IDW fluids were discharged to the sanitary sewer.

The solid IDW was transferred to 20 cubic yard rolloffs and sampled for VOCs, PCBs, and Lead. Following approval from ADEM, solid IDW was transferred to the Sand Valley Landfill (Subtitle D landfill) located in Collinsville, Alabama, by Allied Waste Industries, Inc.

4.8 Data Quality Review

MES reviewed the analytical data for the groundwater, surface water, and sediment samples collected in March, April, and October 2004. The data quality review was performed in accordance with the *Quality Assurance Plan (QAP)* (MES, 2004c) to assess compliance with the QA objectives, and to assess hard copy and electronic deliverable consistency and integrity. The data quality summary for groundwater, surface water, and sediment may be found in Appendix D.

MCA collected the fish tissue samples in August 2004 and performed a review of laboratory QA/QC measures including, but not limited to holding times, blank analyses, laboratory control sample (LCS), matrix spike (MS), and duplicate analyses. Further discussion regarding the data quality of the fish tissue samples may be found in Appendix F.

4.9 Statistical Evaluation of Metals Results

To assess the nature and extent of metals contamination at the site, a statistical evaluation was performed to identify metals that may be present at elevated concentrations as a result of site related activities. The statistical evaluation consisted of a multi-tiered approach described as follows:

- **Tier 1:** The maximum detected concentration (MDC) of each metal was compared to the background screening value (i.e., two times the mean of the background data) (SAIC, 1998). Metals with MDCs that did not exceed the background screening value were considered to be present at background concentrations, and therefore, were not selected as site-related constituents; these metals were not considered further in the evaluation. Metals with MDCs that exceeded the background screening value were then evaluated under Tier 2.
- **Tier 2:** The Tier 2 evaluation included the: (a) the Slippage test, (b) the Wilcoxon Rank Sum (WRS) test, (c) Box Plots, and (d) the Hot Measurement Test, which was performed when the WRS test could not be performed due to a large number (>50 percent) of non-detects. Metals that failed the Tier 2 evaluation were then evaluated under Tier 3.
- **Tier 3:** Tier 3 was the final evaluation to identify site-related metals with elevated concentrations. This evaluation is based on natural association between a trace element and one or more specific soil-forming minerals that concentrate the trace element. Trace elements that appeared anomalously high relative to the major associated element were considered to be present due to site related activities. At least four detections were required to perform the evaluation. If fewer detections were present, the Tier 3 evaluation could not be performed. Therefore these constituents were carried through to the next phase of evaluation.

Metal results that failed all three tiers were considered COPCs. To evaluate which metals were constituents of concern (COCs) for the site, the metal COPCs were compared to residential SSSLs, groundskeeper SSSLs, recreational SSSLs, and ESVs (IT, 2000). A detailed summary of the statistical evaluation can be found in Appendix E.

5.0 RESULTS OF 2004 RFI AND NATURE AND EXTENT

This section discusses the results of the 2004 RFI investigation at Parcels 227(7) and 126(7) and presents the nature and extent of contamination based on metal analytical results for groundwater, surface water, sediment and fish tissue collected during the 2004 RFI investigation.

5.1 Groundwater Levels

Groundwater levels were measured in 15 existing temporary monitoring wells and one new bedrock monitoring well at Parcels 227 (7) and 126(7) on March 22 and 23, 2004 and are presented in Table 5-1. The 15 existing wells were constructed in the residuum and the water level data from 14 of these wells were used to construct a groundwater elevation map, which is presented in Figure 5-1. The groundwater level elevations ranged from 721.49 to 731.14 feet above msl. The total well depth for PPMP-227-GP09 was reported as significantly shallower than as originally installed and could not be used as part of the data set. FTA-126-GP02 was not used as part of the data set because the well could not be located. The new monitoring well, PPMP-227-GP14, was completed in shallow bedrock and is the only well in this area completed in shallow bedrock. Since it represents the only water level measurement location for the bedrock groundwater system, no water level elevation map is possible.

Figure 5-1 shows a relatively consistent groundwater flow direction to the northwest across both Parcel 227(7) and Parcel 126(7). This flow direction is consistent with the anticipated influence of Cave Creek on the shallow groundwater flow system and the previous groundwater flow directions observed at these Parcels (IT, 2001). The horizontal gradients vary across the parcels from a low of approximately 0.008 foot/foot to a maximum of 0.01 foot/foot.

No well pairs are available to calculate vertical gradients; however, comparison of water level measurements from the single bedrock monitoring well with the groundwater contours presented in Figure 5-1, indicates a downward component of groundwater flow. The water level at PPMP-227-GP14 is 723.72 and the estimated elevation of residuum groundwater at this location on Figure 5-1 is 729.5, which is 5.78 feet higher than the bedrock elevation and suggests a downward component of groundwater movement.

5.2 Analytical Data and Data Quality Review

The analytical data for the 2004 RFI samples are provided in Appendix C. The samples submitted for analysis included one groundwater sample, six surface water and six sediment samples, as well as 13 fish collected for fish tissue analysis. Samples were analyzed for metals. MES reviewed the analytical data in accordance with the quality assurance plan *QAP* (MES, 2004c). The results of the data quality review for the groundwater, surface water, and sediment samples collected during the 2004 RFI are presented in the *Data Quality Summary (DQS)* in Appendix D.

Based on the data quality review, the precision and accuracy of the data were acceptable for their intended use. The sampling procedures and locations selected for this investigation represented the overall site conditions and the comparability objective for the project was fulfilled. Of the

345 investigative and field duplicate sample results for groundwater, surface water and sediment, no results were rejected based on the data review. Therefore, a completeness of 100 percent was calculated for this investigation, which exceeded the project goal of 95 percent. Based on the data quality review, the analytical data generated for this investigation were adequate to fulfill program objectives and may be used to define the nature and extent of contamination and support the selection and implementation of any appropriate corrective measure.

MCA performed a review of laboratory QA/QC measures for the fish analysis including, but not limited to holding times, blank analyses, LCS, MS, and duplicate analyses. Further discussion regarding the data quality of the fish tissue samples may be found in Appendix F. According to MCA, analytical results from the analyses of the fish tissue samples were acceptable for their intended use.

5.3 Groundwater Field Parameter Results

Measurements of field screening parameters were used to indicate when groundwater quality had stabilized and sampling could begin. Field screening parameters included pH, conductivity, DO, ORP, turbidity, and temperature. The field screening parameters for the groundwater samples are summarized in Table 5-2. Field screening parameter results indicated groundwater sampling was performed in accordance with the *SAP* (MES, 2004b).

5.4 Summary of Analytical Results

This section describes the analytical results for groundwater, surface water, sediment and fish tissue detected in the 2004 RFI samples.

5.4.1 Groundwater Analytical Results

During the 2004 RFI, one groundwater sample was collected from the new bedrock well installed at Parcel 227(7) and analyzed for metals. The analytical results for metals detected in the 2004 RFI bedrock groundwater samples are presented in Table 5-3. Nine of the 23 metals were detected in the groundwater sample including: aluminum, barium, calcium, iron, lead, magnesium, manganese, sodium, and zinc.

5.4.2 Surface Water Analytical Results

During the 2004 RFI, six surface water samples and one field duplicate were collected at the Site and analyzed for metals. The analytical results for metals detected in the 2004 RFI surface water samples are presented in Table 5-4. Ten of the 23 metals were detected in one or more of the six surface water samples including: aluminum, arsenic, barium, calcium, cobalt, iron, magnesium, manganese, sodium, and zinc. The distribution of detections based upon sampling locations is relatively uniform; generally no single surface water location had a greater number of detections than any other location. The number of detected metals in the surface water samples ranged from seven metals in sample FA-227-007-SW to nine metals in samples FA-227-007-SW and FA-227-011-SW. Surface water sample FA-227-012-SW was collected north of Reilly Lake. The surface water collected from FA-227-012-SW was collected north of East Reilly Lake in

Dothard Creek, which flows from east to west at this location. The data from this sample location are therefore representative of conditions unrelated to either Parcel 227(7) or 126(7).

5.4.3 Sediment Analytical Results

Sediment samples were collected from six locations co-located with the surface water samples (discussed above) at the Site and analyzed for metals. The analytical results for metals detected in the 2004 RFI sediment samples are presented in Table 5-5. Nineteen of the 23 metals were detected in one or more of the sediment samples including: aluminum, antimony, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, silver, vanadium, and zinc. The distribution of detections based upon sampling locations is relatively uniform; generally no single sediment sample location had a greater number of detections than any other location. The number of detected metals in the sediment samples ranged from 16 metals in sample FA-227-012-SD to 18 metals in samples FA-227-007-SD, FA-227-010-SD, and FA-227-011-SD. Sediment sample FA-227-012-SD was collected north of Reilly Lake. The sediment collected from FA-227-012-SD was collected north of East Reilly Lake in Dothard Creek, which flows from east to west at this location. The data from this sample location are therefore representative of conditions unrelated to either Parcel 227(7) or 126(7).

5.4.4 Fish Tissue Analytical Results

Fish were collected from Reilly Lake and East Reilly Lake and analyzed for metals. The analytical results for metals detected in the 2004 RFI tissue samples are presented in Appendix F. A summary of metals detected by tissue type is also included in Appendix F.

5.5 Nature and Extent of Contamination

To evaluate the nature and extent of contamination at the Site, the groundwater, surface water and sediment metal results were assessed to determine the COPCs. To evaluate the metal COPCs, a statistical evaluation was performed to identify metals that may be present at elevated concentrations as a result of site-related activities. The statistical evaluation consisted of a multi-tiered approach described in Section 4.9. Metal results that failed all three tiers were considered COPCs. A detailed description of the statistical evaluation for the 2004 RFI metal results is discussed in Appendix E. To evaluate which metals were COCs for the Site, the metal COPCs were compared to background, residential SSSLs, recreational SSSLs, groundskeeper SSSLs, and ESVs as applicable to each matrix (IT, 2000).

Because fish tissue analysis is an indicator of the effect of concentrations of a constituent on the food chain; specifically the effect on either human health or ecological risk, the discussion of the results of the fish tissue analysis are included in Section 7.0 and Section 8.0.

5.5.1 Groundwater

A statistical evaluation could not be completed because only one sample was collected for the

2004 RFI investigation. Subsequently, detected concentrations were compared to background screening values. Aluminum exceeded the BSV and is considered a COPC due to site-related activities. Table 5-6 identifies the COPCs in groundwater. For groundwater, the COPCs were then compared to residential SSSLs and groundskeepers SSSLs.

Aluminum exceeded the residential SSSL of 1.56 mg/L at a concentration of 2.87 mg/L and is considered a COC for the Site. Figure 5-2 shows a summary of the COCs and associated SSSLs.

5.5.2 Surface Water

Based on the statistical evaluation, the following metal results were identified as potentially site-related and are considered COPCs in surface water at Parcels 227(7) and 126(7):

- Arsenic in FA-227-007-SW, FA-227-010-SW, and FA-227-012-SW
- Cobalt in FA-227-007-SW and FA-227-010-SW
- Magnesium in FA-227-011-SW
- Zinc in FA-227-007-SW, FA-227-008-SW, FA-227-009-SW, FA-227-010-SW, and FA-227-011-SW

The metal COPCs in surface water were compared to recreational SSSLs and ESVs as presented in Table 5-7. Metal COPCs exceeding the recreational SSSLs or ESV were considered COCs for the Site. Arsenic exceeded the recreational SSSL while cobalt exceeded the ESV. Figure 5-3 shows the sample locations and metal COC concentrations exceeding SSSLs and ESVs.

Magnesium concentrations in surface water failed the three-tiered statistical evaluation (Appendix E). However, magnesium is considered a macronutrient with minimal human or ecological toxicity. Macronutrients were considered COCs only if they were present in site samples at concentrations greater than ten times the background screening criterion. Because the magnesium concentrations in surface water were below the ten times background screening criterion, this constituent is not considered a COC for the site.

Zinc concentrations in surface water, although initially identified as a COPC, did not exceed either the ESV or the recreational SSSL and zinc is therefore not considered a COC for the site.

5.5.3 Sediment

Based on the statistical evaluation, the following metal results were identified as potentially site-related and are considered COPCs in sediment at Parcels 227(7) and 126(7):

- Antimony in samples FA-227-008-SD, FA-227-010-SD, and FA-227-011-SD
- Cobalt in sample FA-227-011-SD
- Copper in samples FA-227-007-SD and FA-227-008-SD
- Manganese in sample FA-227-009-SD

- Silver in sample FA-227-007-SD, FA-227-009-SD, and FA-227-010-SD

The metal COPCs in sediment were compared to recreational SSSLs and ESVs as presented in Table 5-8. Metal COPCs exceeding either recreational SSSLs or ESVs were considered to be COCs for the Site. Antimony, cobalt, copper, manganese and silver did not exceed the recreational SSSLs; however copper exceeded the ESV. Figure 5-4 shows the sample locations and the COC concentration exceeding ESVs in sediment.

5.6 Nature and Extent Conclusions

The goal of improving the definition of contaminant nature and extent for Parcel 227(7) and 126(7) has been accomplished. The additional sampling completed as part of this RFI effort has enabled a more complete understanding of the distribution of contaminants in various environmental media and confirmed the nature of those contaminants. Important conclusions regarding nature and extent are as follows:

- Groundwater gradients are between 0.01 feet per foot and 0.008 feet per foot. Observed gradients and water levels are consistent with results from previous investigations.
- Groundwater COCs are limited to aluminum. This COC exceeded the residential SSSL.
- Surface water COCs exceeding recreational SSSLs included arsenic. Arsenic was detected at estimated concentrations in samples collected from three locations.
- Surface water COCs exceeding ESVs included only cobalt. Cobalt was detected at estimated concentrations in samples collected from two locations.
- No sediment COPCs exceeded recreational SSSLs.
- Copper exceeded the ESV for sediment samples.
- The distribution of the relatively few detections in surface water and sediment in the samples collected in Reilly Lake and East Reilly Lake is relatively uniform and does not indicate a higher number of detections in one area over another.

Based on the limited distribution of the relatively few metals in the COCs observed in groundwater, surface water, and sediment at Parcels 227(7) and 126(7), there does not appear to be site-related release of metals to the environment.

Given the consistent and corroborative nature of the various data collected, as compared to previous investigations conducted, and the number of concentrations either below SSSLs, ESVs or laboratory reporting limits, the investigation has been successful in defining both the nature and extent of environmental contamination at the Site.

6.0 CONTAMINANT FATE AND TRANSPORT

The fate and transport of contaminants when released to the environment will govern the potential for exposures to human and ecological receptors. Contaminants in environmental media may result in direct exposure (e.g., plants exposed to surface soil) and have the potential to migrate to other environmental media or areas. This section discusses the mechanisms by which contaminants can be transported and the physical/chemical characteristics of the contaminant that affects their transport.

6.1 Fate and Transport in Groundwater

Contaminants in groundwater can be transported in either a dissolved phase or a soil-adsorbed state in the direction of groundwater flow. Parameters that can affect the quantity of contaminants that will go into solution are aqueous solubility, distribution coefficient, diffusion coefficients, vapor pressures, adsorption/desorption, and degradation rates.

Groundwater flow direction in the bedrock well cannot be calculated due to the lack of additional bedrock wells to indicate a flow direction. Although the comparison of measured groundwater elevation in bedrock to inferred residuum water levels suggests a downward gradient, the magnitude of the gradient is very high. This indicates that the stratigraphic differences in permeability may be creating the hydraulic head on the bedrock aquifer; therefore the hydraulic communication between the bedrock and residuum aquifer is limited.

Aluminum in groundwater exceeded the SSSL in PPMP-227-GP14 located in the interior of parcels 126(7) and 227(7) (Figure 5-2). For inorganic constituents, the ability to enter the groundwater transport system is related to the distribution coefficient of the chemical. The soil-water distribution coefficient for metals is affected by many geochemical parameters including pH, adsorption to clays, oxidation/reduction conditions, ion chemistry of the water, and the chemical form of the metal. Trace metals in general are highly immobile (Walton, 1985). In general, anions typically are not adsorbed and most cations undergo some adsorption (Murriman and Koutz, 1972). Metals are not degradable through biological or chemical actions and are typically considered to be persistent in the environment. The fate of metals depends primarily on partitioning between soluble and particulate solid phases.

6.2 Fate and Transport in Surface Water

In general, contaminants present in the various surface water bodies associated with fill areas may be the result of erosion and run-off from the fill areas. Contaminants in surface water at the fill areas may be transported from their sources to other locations at the fill areas or to off-site locations by the following mechanisms: transfer to groundwater, transfer to sediment, and flow downstream. The data do not support that the fill areas are transporting any contaminants through any of those mechanisms.

Transfer of contaminants in surface water to aquatic organisms is also a potentially significant transfer pathway. Most of the metals detected are not highly bioconcentratable; therefore transfer though the food web is expected to be minimal for these compounds (IT, 2002a). This is further supported by the bioaccumulation analyses performed by MCA (Appendix F).

6.3 Fate and Transport in Sediment

Contaminant transfer between sediment and surface water potentially represents a significant transfer mechanism; especially when contaminants are in the form of suspended solids. Sediment/surface water transfer is reversible; sediments often act as temporary repositories for contaminants and gradually release contaminants to surface waters. This is especially true in surface water systems that are acidic. Sorbed or settled contaminants can be transported with the sediment to downstream locations. Water bodies, like those near East Reilly Lake, have sediments with high organic carbon content and tend to bind many constituents and sequester them in the sediment in close proximity to the source (IT, 2002a).

7.0 HUMAN HEALTH RISK ASSESSMENT

The human health risk assessment at the Site consisted of the following steps:

- Identified the constituents of concern (COCs).
- Identified the exposure point concentrations for the COCs.
- Calculated the incremental lifetime cancer risk and non-cancer hazard index using the appropriate SSSL.

7.1 Constituents of Concern

COCs are chemicals that may contribute significantly to risk. They are selected by comparing the site-related chemicals to their respective SSSLs. Since the SSSLs are receptor-specific, COCs are also receptor-specific (e.g., a chemical may be selected as a COC for residential exposure but not for groundskeeper exposure). The receptor scenarios evaluated for the Site are residential, groundskeeper, and recreational-user. These receptor scenarios were selected based on the proposed future land use for the Site (Refer to Section 1.1), which is open space and recreational. Exposure to groundwater is evaluated for the residential and groundskeeper receptor scenarios. Exposure to surface water and sediment is evaluated for the recreational user receptor scenario.

SSSLs were developed by IT as part of the human health evaluations associated with site investigations being performed under the BRAC Environmental Restoration Program at McClellan (IT, 2000). The SSSLs are medium-specific and receptor-specific, risk-based screening concentrations that are used to quickly and efficiently screen the site for potential cancer risk and non-cancer hazards from residual chemicals in the environmental media. The SSSLs address significant exposure pathways and are sufficiently site-specific with regard to exposure assumptions that they are used to estimate risk with as much precision as a typical baseline risk assessment (IT, 2002a). COCs potentially affecting human health at the Site are discussed in the following subsections.

7.1.1 Metals

To identify whether metals detected in site samples were the result of site-related activities or were indicative of naturally occurring conditions, the detected metal concentrations were subjected to the multi-tiered statistical evaluation described in Sections 4.0 and 5.0. Metal results that failed all three tiers (COPCs) were then compared to the SSSLs. The metal COPCs that exceeded SSSLs for the residential, groundskeeper, or recreational exposure scenarios were considered COCs at the Site. See Sections 5.5.1, 5.5.2, and 5.5.3 for details concerning the assessment of metal COCs for groundwater, surface water, and sediment, respectively. Table 7-1 presents a summary of the metal COCs that exceeded the human health SSSLs for groundwater and surface water at Parcels 227(7) and 126(7). No metal COCs exceeded the human health SSSLs in sediment at the Site. In groundwater, aluminum exceeded SSSLs; in surface water arsenic exceeded SSSLs.

7.2 Exposure Point Concentrations

Exposure point concentrations (EPCs) represent the chemical concentrations in environmental media that may come in contact with a receptor. EPCs were selected based on the lesser of the 95 percent upper confidence limit (UCL) (an estimate of the concentration of a COC averaged over the entire site) or the MDC. EPCs were selected for each COC identified in Sections 5.5.1, 5.5.2, and 5.5.3. The 95 percent UCLs for the COCs were calculated using ProUCL® as appropriate. ProUCL® is software developed by the EPA to facilitate calculation of UCLs for data sets that are normally distributed or follow some other data distribution (EPA, 2004a). The EPC for each COC was compared to the cancer and non-cancer SSSLs for each receptor scenario. Table 7-2 presents the selected EPC for the aluminum in groundwater and the comparison of the EPC to cancer and non-cancer SSSLs. Table 7-3 presents the selected EPC for the arsenic in surface water and the comparison of the EPC to cancer and non-cancer SSSLs.

For aluminum in groundwater, the MDC (2.87 mg/L) was selected as the EPC because only one sample result was available and the 95 percent UCL could not be calculated. For arsenic in surface water the 95 percent UCL (0.0066 mg/L) was less than the MDC and was therefore selected as the EPC. Estimation of EPCs for sediment was not performed because no COCs exceeded the human health SSSLs at the Site.

7.3 Cancer Risk and Non-cancer Hazard

The EPCs for the cancer risk and non-cancer hazard constituents, identified in Section 7.2, were used to calculate the ILCR and non-cancer HI, respectively, for each COC in each environmental medium. The ILCR and HI are ratios of concentration to risk. Typically, the ILCRs and HIs for COCs are summed to yield a total ILCR and total HI for a given receptor exposed to a given medium. However, because only one COC (aluminum) was present in groundwater and one COC (arsenic) was present in surface water, the ILCR and HI for these COCs represent the total ILCR and HI in groundwater and surface water, respectively.

7.3.1 Incremental Lifetime Cancer Risk

For chemicals with carcinogenic effects, a concentration equivalent to a lifetime cancer risk of 1E-06 is used as the point of departure for determining remediation goals (EPA, 2001). Total ILCRs for a receptor less than 1E-06 are considered negligible. Total ILCRs between 1E-06 and 1E-04 fall within an acceptable risk management range (EPA, 2001). Total ILCRs that exceed 1E-04 are considered unacceptable.

Table 7-4 presents the ILCR for residents and groundskeepers exposed to groundwater. Because aluminum is not a carcinogen, cancer risk was not identified for residents or groundskeepers exposed to groundwater.

Table 7-5 presents the ILCRs for recreational users exposed to surface water. Cancer-based COCs for the recreational user were identified as arsenic in surface water. The total ILCR (9.07E-06) for the recreational user exposed to surface water is within the acceptable risk management range.

7.3.2 Non-cancer Hazard Index

Total HI estimates above 1 raises concern for potential non-cancer effects (EPA, 2001).

As presented in Table 7-2, aluminum is not a carcinogen but was evaluated for non-cancer risk to a resident and groundskeeper. For the groundskeeper, an HI was not calculated because the EPC did not exceed the SSSL. However, the HI for the resident exposed to aluminum in groundwater (0.184) was less than 1, indicating that it does not pose unacceptable risk to human health for non-cancer effects (Table 7-4).

Information presented in Table 7-3 indicates that the concentration of arsenic in surface water exceeded the SSSL for the recreational user. However, the HI for recreational users exposed to surface water (0.141) is less than 1, indicating that it does not pose unacceptable risk to human health for non-cancer effects (Table 7-5).

7.4 Human Health Risk Due to Fish Consumption

Concentrations of metals detected in fish tissue, with the exception of lead, were compared to human health risk based concentrations (HHRBCs) (EPA, 2004b). If the concentration of a given metal was above its respective HHRBC, the potential for risk was further evaluated in a fish-pathway analysis using exposure values for a child fish consumer. The EPA's model (Integrated Exposure Uptake Biokinetic [IEUBK] model) was used to predict the blood levels of metals in children exposed to metals through the consumption of fish from Reilly Lake and East Reilly Lake; these predicted concentrations were compared to the EPA target level. The maximum concentration of metals, with the exception of selenium and vanadium, are less than the human-health risk-based concentrations.

Further evaluation of potential human health risk due to exposure to selenium and vanadium in fish was performed. Risks were conservatively evaluated for a child angler for both short term (3 months) and chronic (7 years) exposures. The estimated site-specific human health risks to a sensitive receptor that could be exposed to selenium and vanadium through the consumption of fish from Reilly Lake and East Reilly Lake are less than the EPA risk limit. Therefore, the concentrations of these metals in fish tissue do not pose a site-related risk to human health. In addition, EPA's blood lead model indicates that the probability of a child's blood level exceeding 10 micrograms per deciliter (μg/dL) is 1.264 percent, which is less than the 5 percent cutoff indicating that no significant lead hazard exists. Finally, the average and maximum concentrations of arsenic and mercury in fillet tissues of largemouth bass are below the respective concentrations in fillet tissues of largemouth bass from this region; therefore no further evaluation of these metals and their impact on human health is warranted.

7.5 Uncertainty Analysis

Uncertainty is a component of any risk assessment and is the result of several factors. For example, calculation of the EPC may contribute to an over-estimate or under-estimate of exposure depending on the representativeness of supporting data. For this RFI, potential risk was identified for the resident exposed to aluminum in groundwater and for the recreational user exposed to arsenic in surface water and uncertainty is associated with the concentrations of both aluminum and arsenic and their EPC values.

Estimating the concentration of aluminum in groundwater is dependent on the number of samples collected and the condition of the groundwater sample collected. This dependency on sample number and sample condition contributes to variability in concentration and therefore uncertainty. One monitoring well was available for groundwater sample collection, and as stated earlier, a statistical evaluation of the aluminum concentration in groundwater from the Site could not be performed. Because only one sample was collected, contemporary comparison to other groundwater samples from the Site was not possible and the concentration of aluminum in this one sample may not be representative of site-specific groundwater quality. In addition the groundwater sample was turbid indicating an excess of suspended material in the sample. Aluminum is prevalent in the earth's crust and abundant in clays and silts and consequently the turbidity of the groundwater sample likely contributed to the aluminum concentration. Groundwater supplied for domestic use would be treated to remove turbidity and thereby lower aluminum concentrations. Because of the relatively low toxicity of aluminum and because of the high uncertainty regarding the concentration of aluminum in groundwater it is likely that risk was over-estimated for residents exposed to aluminum in groundwater.

The uncertainty associated with the risk posed to the recreational user exposed to surface water is high because of the sporadic detections of low concentrations of arsenic in surface water collected from the Site. Arsenic was detected in only three of six surface water samples collected from Reilly Lake and tributaries. The detected concentrations of arsenic were less than the laboratory reporting limit of 0.01 mg/L. Estimated surface water concentrations ranged from 0.00427 J mg/L to 0.00855 J mg/L. The surface water sample FA-227-0120-SW was collected just north of Reilly Lake and upstream of Parcels 227(7) and 126(7) site activities and likely represents site-specific ambient concentrations for arsenic. The EPA maximum contaminant level (MCL) for arsenic in drinking water is 0.01 mg/L; higher than any of the estimated concentrations in surface water samples.

The calculated background concentration of arsenic in surface water at McClellan is greater than the SSSL for recreational users and therefore represents a substantial portion of the risk identified for exposure to arsenic in surface water for the Site. The 95th percentile concentration for arsenic in background surface water at McClellan is 0.0036 mg/L. The EPC for arsenic in surface water collected from the Site is 0.0066 mg/L. Accordingly the background concentration represents up to 54 percent of the concentration of arsenic detected in the surface water samples collected from The Site.

Although the total ILCR of 9.1E-06 is associated with the EPC of 0.0066 mg/L, because some risk is contributed by the background concentration, the actual incremental increase in ILCR above background is 4.37E-06. This low ILCR value attributable to site related arsenic concentration combined with the high uncertainty associated with the arsenic concentration in surface water samples collected from the Site suggests that the ILCR is lower than estimated and is considered acceptable.

Uncertainty associated with body burden analysis of fish results in part from quality of supporting analytical data. Tissues contain complex biological macromolecules than can interfere with chemical analysis. This problem is addressed by spiking tissue samples with metals, analyzing sample duplicates, and laboratory method blanks. In general laboratory quality control for the fish tissue samples was within acceptance criteria and the fish tissue analytical results were acceptable for their intended purpose.

Other uncertainties associated with the evaluation of metals in fish tissue include assumptions associated with the food chain model, ingestion rates and assumed receptor pathway for exposure to fish. Additional discussion of the uncertainties associated with the body burden analysis of fish and associated risk evaluation is provided in Appendix F.

7.6 Human Health Risk Assessment Conclusions

Based on the ILCR, the groundwater at the Site presents negligible risk to the resident and groundskeeper. The surface water at the Site presents an acceptable risk to the recreational user.

The groundwater at the Site does not pose unacceptable risk to the resident or groundskeeper for non-cancer effects. In addition, the surface water at the Site does not pose unacceptable risk to the recreational user for non-cancer effects.

Based on the tissue analyses performed, the concentrations of metals in fish collected from Reilly Lake pose negligible increased risk to human health.

8.0 SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

Potential risks to ecological receptors posed by site-related constituents at the Site were estimated by performing a screening level ecological risk assessment. The screening level ecological risk assessment for the Site consisted of the following steps, discussed in the subsequent sections.

- Identify COCs.
- Identify the exposure point concentrations for the COCs.
- Calculate the screening-level hazard quotients and identify the constituents of concern.
- Assess the COCs in relation to the environmental setting and habitat(s) in and around the Site.

8.1 Environmental Setting and Habitat

Parcels 227(7) and 126(7) are approximately 6.5 acres. Parcel 227(7) is located in the northern portion of the Main Post, north of the eastern end of Reilly Airfield. Reilly Lake borders Parcel 227(7) on the west-northwest. Parcel 126(7) occupies a portion of the northern slope of the Fill Area East of Reilly, adjacent to and within a wetlands area (IT, 2002a).

The following description of environmental setting and habitat has been adapted from earlier reported investigations of Parcels 227(7) and 126(7) (IT, 2002a). The northern boundary of the Site is a forested wetland area and Reilly Lake. The eastern and southern boundaries of this Site is comprised of grassland and the asphalt-paved airfield (Reilly Airfield). The western boundary of this area is the campground at Reilly Lake.

The topography on the Site is mostly flat with a steep slope near the northern boundary of the sites, which abuts the forested wetland. Refuse and other evidence of past disposal practices are prevalent along the steep slope adjacent to the wetland area. Numerous mounds are present in the south-central portion of the Fill Area East of Reilly Airfield and are the result of historical land filling activities that have taken place at the site.

Terrestrial habitat at the Site is comprised of grasslands, typic mesophytic forest, and dry Virginia pine-oak forest. The grassland area of the Fill Area East of Reilly Airfield forms the southern boundary of the site, adjacent to Reilly Airfield. These grasslands were most likely maintained grassy areas that were abandoned and are in the early stages of succession. This area is dominated by various grasses and herbs including dock *(Rumex spp.)*, clover *(Trifolium spp.)*, vetch *(Astragalus spp.)*, milkweed *(Ascelepias spp.)*, bed straw *(Galium spp.)*, ox-eye daisy *(Chrysanthemum leucanthemum)*, and johnson grass *(Sorghum halepense)*.

The majority of the western half of the Site is best characterized as typic mesophytic forest. The canopy species, characteristic of this area, are tulip tree *(Liriodendron tulipifera)*, sweetgum *(Liquidambar styraciflua)*, black gum *(Nyssa sylvatica)*, shortleaf pine *(Pinus echinata)*, loblolly pine *(Pinus taeda)*, white oak *(Quercus alba)*, and northern red *oak (Quercus rubra)*. The dominant understory species of this area are red maple *(Acer rubrum)*, flowering dogwood *(Cornus* *florida),* witch *hazel (Hamamelis virginia),* sweetgum *(Liquidambar styraciflua),* and sourwood *(Oxydendrum arboreum).* The shrub layer is dominated by mountain laurel *(Kalmia latifolia),* southern low blueberry *(Vaccinium pallidum),* southern wild raisin *(Viburnum nudum),*and yellowroot *(Xanthorhiza simplicissima).* Numerous muscadine grape *(Vitis rotundifolia)* vines are also present in this area.

The majority of the eastern half of the Site, is best characterized as dry Virginia pine-oak forest. Virginia pine (Pinus virginiana) is the dominant species in this area by a large margin. Other canopy species that occur infrequently are southern red oak (Quercus falcata), blackjack oak (Quercus marilandica), chestnut oak (Quercus prinis), and post oak (Quercus stellata). Understory and shrub species are virtually nonexistent in this area. The majority of the forest floor in this area is blanketed with pine needles, with the false jessamine (Gelsemium sempervirens) vine and the little bluestem (Schizachyrium scoparium) and black oat grass (Stipa avenacea) occasionally encountered.

Although there are no permanent aquatic features within the Site, an area of forested wetland, East Reilly Lake and Reilly Lake form the northern boundary of the site. The forested wetland area was originally identified as the remnant of an old beaver dam. There is renewed beaver activity in the area which may be the reason for higher water levels and the formation of the open water body referred to as East Reilly Lake. The wetland area is approximately 2 acres and is adjacent to East Reilly Lake. All of the trees in the wetland area and in East Reilly Lake are dead because of the ponding. The vegetation surrounding the former beaver pond is characteristic of forested wetlands and is dominated by willow oak *(Quercus phellos),* overcup oak *(Quercus lyrata),* swamp oak *(Quercus bicolor),* sweet gum *(Liquidambar styraciflua),* red maple *(Acer rubrum),* hackberry *(Celtis laevigata),* American elm *(Ulmus procera),* and tulip tree *(Liriodendron tulipifera).* The understory is characterized by box elder *(Acer negundo),*ironwood *(Carpinus caroliniana),* and alder *(Alnus spp.).*

In general, the terrain at McClellan supports large numbers of amphibians and reptiles. Jacksonville State University has prepared a report titled *Amphibians and Reptiles of Fort McClellan, Calhoun County, Alabama* (Cline and Adams, 1997). The report indicated that surveys in 1997 found 16 species of toads and frogs, 12 species of salamanders, 5 species of lizards, 7 species of turtles, and 17 species of snakes. Typical inhabitants of the area surrounding the Parcels 227(7) and 126(7) are copperhead *(Agkistrodon contortix),* king snake *(Lampropeltis getulus),* black racer *(Coluber constrictor),* fence lizard *(Sceloporour undulatus),* and six-lined racerunner *(Cnemidophorous sexlineatus).*

Terrestrial species that may inhabit the upland areas of the Site, include opossum, short-tailed shrew, raccoon, white-tail deer, red fox, coyote, gray squirrel, striped skunk, a number of species of mice and rats (e.g., white-footed mouse, eastern harvest mouse, cotton mouse, eastern wood rat, and hispid cotton rat), and eastern cottontail. Approximately 200 avian species reside at McClellan at least part of the year (ACOE, 1997). Common species expected to occur in the vicinity of the site include northern *cardinal (Cardinalis cardinalis),* northern mockingbird *(Mimus polyglottus),* warblers *(Dendroica spp.),* indigo bunting *(Passerina cyanea),* red-eyed vireo *(Vireo olivaceus),* American crow *(Corvus brachyrhynchos),* bluejay *(Cyanocitta cristata),*several species of woodpeckers *(Melanerpes spp., Picoices spp.),* and Carolina chickadee *(Parus carolinensis).* Game birds present in the vicinity of the Fill Area East of Reilly

Airfield and Former Post Garbage Dump may include northern bobwhite *(Colinus virginianus),* mourning dove *(Zenaida macroura),* and eastern wild turkey *(Meleagris gallopavo).* A variety of raptors (e.g., red-tailed hawk, sharp-shinned hawk, barred owl, and great homed owl) could also use portions of this area for a hunting ground, particularly the fringe area where the forested areas abut roads and cleared areas. Because of the presence of the forested wetland and Reilly Lake, piscivorous bird species may also be present in the vicinity of the Site. These piscivorous birds may include great blue heron *(Ardea herodias),* green-backed heron *(Butorides striatus),* and belted kingfisher *(Ceryle alcyon).*

The wetland area north of the Site provides habitat for muskrat, beaver, and other aquatic mammals. This wetland area and the adjoining streams and Reilly Lake provide moderate quality gray bat foraging habitat. Two major requirements for gray bat foraging habitat are contiguous forest cover and habitat for aquatic insects (one of the gray bat's preferred dietary items). These two requirements are met by the wetland area, streams, and Reilly Lake; therefore, gray bats could be expected to utilize these areas for foraging. Reilly Lake also provides habitat to support a number of aquatic amphibians including the bullfrog *(Rana catesbeiana)* and leopard frog *(Rana sphenocephala).* Fish species that may be found in Reilly Lake include largemouth bass *(Micropterus salmoides),* bluegill *(Lepomis machrochirus),* and other sunfish, crappie *(Pomoxis spp.),* and catfish *(Ictalurus spp*.)(IT, 2002a).

The following species, listed as threatened or endangered by the USFWS, have been recorded on McClellan (IT, 2002a):

- Gray Bat (Myotis grisescens)
- Blue Shiner (Cyprinella caerulea)
- Mohr’s Barbara Buttons (Marshallia mohril)
- Tennessee Yellow-Eyed Grass (Xyris tennessensis)

Based upon available documentation that was reviewed, none of the above species have been identified at the Site.

As noted above, the wetland area provides a moderate quality gray bat foraging habitat.

8.2 Constituents of Concern

COCs are chemicals that may contribute significantly to risk. COCs are selected by comparing the site-related chemicals to their respective ESVs.

The ESVs used in this screening level ecological risk assessment were developed specifically for McClellan in conjunction with EPA Region IV and are presented in the *Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000). These ESVs represent the most conservative values available from various literature sources. The ESVs are based on no-observed-adverse-effect-levels (NOAEL) when available. If a NOAEL-based ESV was not available, then the most risk-protective value available from the scientific literature was identified as the ESV (IT, 2000). The identification of COCs that may pose a risk to ecological receptors at the Site is discussed in the following sections.

8.2.1 Metals

In order to identify whether metals detected in site samples were the result of site-related activities or were indicative of naturally occurring conditions, the detected metal concentrations were subjected to a multi-tiered statistical evaluation, described in Sections 4.0 and 5.0. Metal results that failed all three tiers (COPCs) were then compared to the ESVs. The metal COPCs that exceeded ESVs were considered COCs at the Site. See Sections 5.5.2 and 5.5.3 for details concerning the assessment of metal COCs for surface water and sediment, respectively. Table 8-1 presents a summary of the metal COCs that exceeded the ESVs for surface water and sediment at the Site. In surface water, cobalt exceeded ESVs while copper exceeded ESVs in sediment. No ESVs were available for groundwater; therefore groundwater is not included in the ecological risk.

8.3 Exposure Point Concentrations

EPCs represent the chemical concentrations in environmental media that may come in contact with a receptor. EPCs were selected based on the lesser of the 95 percent UCL (an estimate of the concentration of a COC averaged over the entire site) or the MDC. EPCs were selected for each COC identified in Section 8.1. The 95 percent UCLs for the COCs were calculated using ProUCL®. The EPC for each COC was compared to the ESV. Table 8-2 presents the selected EPCs and the comparison of the EPCs to ESVs for the COCs in surface water and sediment at the Site. For cobalt in surface water, the MDC (0.00828 J mg/L) was selected as the EPC because only two of surface water samples contained detected concentrations of cobalt and a UCL could not be calculated. For copper in sediment, the 95 percent UCL (21.4 mg/L) was less than the MDC (25.1 mg/L) and was selected as the EPC.

8.4 Screening-Level Hazard Quotients

To assess whether the COCs detected at the Site have the potential to pose increased ecological risks, the COCs were evaluated against the ESVs by calculating screening-level hazard quotients (HQs) for each environmental medium. An HQ was calculated by dividing the EPC by its corresponding ESV. HQs with values of one or less indicated that the COC is not likely to pose adverse ecological risks. COCs with an HQ value greater than one were identified as COCs and may pose adverse ecological risks to one or more receptors. Table 8-2 presents the calculated screening-level HQs for the COCs identified for surface water and sediment at the Site.

The HQ calculated for cobalt in surface water is 2.8 and the HQ calculated for copper in sediment is 1.1. Both cobalt in surface water and copper in sediment potentially pose risk to ecological receptors based on limited data and without consideration for uncertainties in the risk analysis.

8.5 Fish Tissue Summary

Potential for risk due to exposure to metals in fish in Reilly Lake and East Reilly Lake was evaluated. Detailed information describing the approach and results of the body burden analysis of fish and subsequent ecological risk evaluation is presented in Appendix F. The body burden analysis and ecological risk evaluation was performed for the following ecological receptors:

- Fish in Reilly Lake and East Reilly Lake
- Small mammals (e.g., river otters) that use the limnetic zone (open water beyond the littoral zone [area near the shoreline that is impacted by wave action]) of Reilly Lake and East Reilly Lake
- Piscivorous birds (e.g., great blue herons) that use Reilly Lake and East Reilly Lake

Two databases were searched for toxicity reference values (TRVs) that were used to compare the body burdens of metals in fish:

- USACE Waterways Experiment Station's (WES) Environmental Residue Effects Database (ERED) (USACE, 2004)
- EPA's *Linkage of Effects to Tissue Residues: Development of a Comprehensive Database for Aquatic Organisms Exposed to Inorganic and Organic Chemicals* (Jarvinen and Ankley, 1999)

The concentrations of metals in the fish tissues collected from the Site are below toxicity reference values (TRVs) associated with adverse effects to fish. The dietary doses of the metals to wildlife that consume fish from the Site are also below TRVs associated with adverse effects.

8.6 Uncertainty Analysis

Uncertainty is a component of any risk assessment and is the result of several factors. One source of uncertainty is the EPC that may contribute to an over-estimate or under-estimate of exposure depending on the representativeness of supporting analytical data. For this RFI, potential risk was identified for ecological receptors exposed to cobalt in surface water and copper in sediment. Uncertainty is associated with the concentrations of both cobalt and copper and their EPC values.

The uncertainty associated with the risk posed to ecological receptors exposed to surface water is high because of the sporadic detections of low concentrations of cobalt in surface water collected from the Site. Cobalt was detected in only two of six surface water samples collected from Reilly Lake. The detected concentrations of cobalt were less than the laboratory reporting limit of 0.02 mg/L. Estimated surface water concentrations ranged from 0.00626 J mg/L to 0.00828 J mg/L.

According to the background study performed by SAIC, cobalt was not detected in background surface water samples and therefore background levels of cobalt are not available (SAIC, 1998). However, the reporting limit for the SAIC background surface water samples was 0.02 mg/L, well above the ESV values currently used for screening. The reporting limit for the background surface water samples exceeds the concentrations of cobalt detected in the surface water samples collected from Reilly Lake for this RFI. It is likely that the concentrations of cobalt detected in the surface water samples collected from Reilly Lake are representative of ambient conditions. Statistical analysis of cobalt in surface water was incomplete. The statistical analysis consists of a three Tier process. Because background concentrations of cobalt in surface water are not available, the Tier 1 comparison of site cobalt concentrations to background concentrations could not be performed. In addition, because only two surface water samples contained detected concentrations of cobalt the Tier 3 statistical evaluation also could not be performed. Because the statistical analyses were unable to be completed the detected concentrations of cobalt were carried through the screening level risk assessment by default. It is likely that risk to ecological receptors from the detected concentrations of cobalt in surface water collected from Reilly Lake is comparable to risk associated with ambient concentrations of cobalt in Reilly Lake and associated tributaries.

Further evidence of the limited risk associated with cobalt in surface water is supported by results of the body burden analysis of fish. Cobalt concentrations in fish collected from Reilly Lake were typically near or less than laboratory reporting limits. Cobalt concentrations in fish from Reilly Lake do not pose site related risk to ecological receptors.

Copper concentrations detected in sediment samples collected from near Reilly Lake contribute to uncertainty. Concentrations of copper in sediment ranged from 3.75 milligrams per kilogram (mg/kg) to 26.3 mg/kg. Because of the heterogeneity of the copper data the 95 percent upper confidence limit is elevated to accommodate the variability of the results. The arithmetic mean concentration of copper in sediment is 17.1 mg/kg, is less than the SSSL and results in an HI of 0.91. As reported, the EPC for copper in sediment of 21.4 mg/kg is 1.1 and is only slightly greater than the 1.0 HQ limit.

Uncertainty associated with body burden analysis of fish results in part from quality of supporting analytical data. Tissues contain complex biological macromolecules than can interfere with chemical analysis. This problem is addressed by spiking tissue samples with metals, analyzing sample duplicates, and laboratory method blanks. In general laboratory quality control for the fish tissue samples was within acceptance criteria and the fish tissue analytical results were acceptable for their intended purpose.

Other uncertainties associated with the evaluation of metals in fish tissue include assumptions associated with the food chain model, ingestion rates of wildlife and assumed receptor pathway for exposure to fish. Additional discussion of the uncertainties associated with the body burden analysis of fish and associated risk evaluation is provided in Appendix F.

8.7 Conclusions

The screening level ecological risk assessment for the Site included the identification of the COCs for each medium at the site, identification of the EPC for each COC, calculating HQs used to identify COCs, and assessing the COCs in relation to the environmental setting and habitat.

Cobalt was identified as a COC in surface water. Copper was identified as a COC in sediment at Parcels 227(7) and 126(7). The HQs for each of these constituents were slightly above 1 and less than 5; the uncertainty surrounding the data is sufficient to eliminate these compounds from consideration as COCs.

The concentrations of metals in the fish tissues collected from the Site are less than TRVs associated with adverse effects to fish. The dietary doses of the metals to wildlife that consume fish from the Site are also below TRVs associated with adverse effects; therefore no measurable ecological risk appears to be present due to fish consumption.

9.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This section summarizes the investigation activities performed during the 2004 RFI for the Site and presents the major results, conclusions and recommendations. Parcels 227(7) and 126(7) have previously been investigated and included in the *Landfill EE/CA* (IT 2002a). Based on results of the *Landfill EE/CA*, the recommended remedy for Parcels 227(7) and 126(7) was "No Further Action." Subsequent agency review of the *Landfill EE/CA* resulted in recommendations for additional specific environmental investigations at Parcels 227(7) and 126(7). Recommendations included limited groundwater sampling and evaluation of metals in adjacent surface water and sediment. The 2004 RFI investigation was performed to address the agencies' recommendations.

9.1 2004 RFI Activities

The 2004 RFI investigation was performed to fill data gaps to meet the following objectives:

- Further characterize groundwater in the interior of the parcels.
- Evaluate chemical concentrations in sediment and surface water in areas upstream of and downstream from the two parcels.
- Evaluate the concentrations of metals in fish tissue collected from nearby Reilly Lake and East Reilly Lake.

To meet these objectives the RFI activities described in the following paragraphs were performed.

Fifteen temporary monitoring wells installed during previous investigation at the Site were abandoned to eliminate the potential for monitoring wells to act as a conduit for surface runoff to enter groundwater. Groundwater levels were measured before the temporary monitoring wells were abandoned. One shallow bedrock monitoring well was installed at the Site and one groundwater sample was collected from the shallow bedrock monitoring well to further characterize groundwater quality for the Site. The groundwater sample was analyzed for total metals.

A total of six surface water samples were collected from Reilly Lake and from Reilly Lake tributaries. A total of six sediment samples were collected from locations collocated with surface water sampling locations. The surface water samples and sediment samples were analyzed for metals.

Fish were collected from Reilly Lake and East Reilly Lake. Fish tissue samples were analyzed for metals. The fish sampling and analyses were performed to estimate the potential for exposure and risk to human health and ecological receptors that may frequent Reilly Lake.

A data quality review of analytical results was performed to assess compliance with QA objectives and to assess hard copy consistency and integrity with electronic data deliverables. A statistical evaluation was subsequently performed to identify metals that may be present at elevated concentrations as a result of site related activities and screening level human and ecological risk assessments were performed to evaluate potential risk to receptors from elevated metal concentrations.

9.2 Results of the 2004 RFI and Nature and Extent

Groundwater is encountered at depths ranging from less than one foot to more than 28 feet below ground surface beneath Parcels 227(7) and Parcel 126(7). Groundwater flow exhibits a relatively consistent flow direction to the northwest across both Parcels 227(7) and 126(7). This flow direction is consistent with the anticipated influence of Cave Creek on the shallow groundwater flow system and the previous groundwater flow directions observed at these Parcels (IT, 2001). The horizontal gradients vary across the parcels from a low of approximately 0.008 foot per foot to a maximum of 0.01 foot/foot.

A statistical evaluation was performed to identify metal COPCs. The metal COPCs were compared to SSSLs and ESVs to evaluate COCs for the Site. Several metals were detected in groundwater, surface water and sediment, although at concentrations that typically were less than corresponding background concentrations. In the groundwater sample collected from PPMP-227-GP14, only aluminum exceeded the residential SSSL. In surface water, arsenic exceeded recreational SSSLs and cobalt exceeded ESVs. In sediment, no metal exceeded SSSLs and copper exceeded ESVs.

Locations where metal concentrations in surface water exceeded SSSLs or ESVs were upstream and north of Reilly Lake (FA-227-012-SW), south of east Reilly Lake (FA-227-007-SW) and between east and west Reilly Lake (FA227-010-SW). The concentrations of metals detected at these locations were generally less than laboratory reporting limits, were estimated and provided little evidence of site related release of metals into the environment.

Based on the 2004 RFI data, site-related metals do not appear to have been released to the groundwater in the bedrock aquifer. Based on the limited distribution of the relatively few metal COCs observed in surface water and sediment at the Site, there does not appear to be site-related release of metals to the environment and consequently the nature and extent of metals contamination in surface water and sediment was defined.

9.3 Human Health Risk Assessment Summary and Conclusions

A human health risk assessment was performed to evaluate the potential threat to human health from exposure to environmental media at the Site. Three receptor scenarios were evaluated based on future land use: residential, groundskeeper and recreational user. EPCs (representing the chemical concentrations in environmental media that may come in contact with a receptor) were selected based on the 95 percent UCL or the MDC. The EPC for each COC was compared to the cancer and non-cancer SSSLs for each receptor scenario. The EPCs were used to calculate the ILCR and non-cancer HI for each COC in each environmental medium. The ILCRs and HIs for the COCs were summed to yield a total ILCR and total HI for a given receptor exposed to a given medium. Total ILCRs that were between1E-06 and 1E-04 fall within an acceptable risk management range. Because aluminum is not a carcinogen, cancer risk was not identified for residents or groundskeepers exposed to groundwater. In addition, an ILCR was not calculated for sediment because no COCs were identified. The total ILCR (9.07E-06) for the recreational user exposed to surface water is affected by large uncertainties and is within the acceptable risk management range.

In a separate human health risk assessment, metals in fish collected from Reilly Lake and East Reilly Lake were evaluated for their risk to potential human receptors including a young child. The concentrations of metals in fish tissues from Reilly Lake pose negligible increased risk to human health.

9.4 Ecological Risk Assessment Summary and Conclusions

An ecological risk assessment was performed to evaluate the potential for ecological risks posed by site-related constituents at the Site. COCs that exceeded their respective ESVs was limited to cobalt in surface water and copper in sediment. To assess whether the COCs have the potential to pose adverse ecological risks, the COCs were evaluated against the ESVs by calculating screening-level HQs for surface water and sediment. HQs of 2.8 for cobalt in surface water and 1.1 for copper in sediment were calculated. Because of the low concentrations of cobalt in surface water and the variability of copper concentrations in sediment uncertainties are associated with the calculated HQ values. The HQs for each of these constituents were slightly above 1 and less than 5; therefore the potential for ecological risk is minimal.

The concentrations of metals in the fish tissues collected from the Site are below toxicity reference values (TRVs) associated with adverse effects to fish. The dietary doses of the metals to wildlife that consume fish from the Site are also below TRVs associated with adverse effects; therefore no measurable ecological risk appears to be present due to fish consumption.

9.5 Recommendations

Based on the results of the 2004 RFI, no further actions are warranted with respect to defining the nature and extent of contamination in environmental media at the Site. Based on the results of the field investigations, the current and proposed future land use, and the results of the risk assessments completed for the Site, the recommended remedy is RCRA No Further Action (NFA) with Land Use Controls (LUCs).

The JPA proposes the submittal of a corrective measures implementation plan (CMIP) to ADEM following approval of this RFI. The CMIP will outline the process and schedule for implementation of the LUCs. The specific LUCs include placing a deed notice that will prevent residential reuse of the property and excavation within the landfill or fill areas, and installing signs and monuments to mark the boundaries of the fill areas. These LUCs are selected to fulfill the requirements of Section IV B of the CA. The LUCs will be completed by the JPA following approval of a CMIP.

In addition, JPA proposes removal of non-hazardous surface debris present at the Site coupled with selective repair of a soil cap as warranted, to enhance suitability of the Parcels 227(7) and 126(7) for the future open space and recreational land use.

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TABLES

Table 2-1: Groundwater Elevations 2000 SI
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

Well Location	Date	Ground Surface Elevation (feet)	Top of Casing Elevation (feet)	Depth to Water (feet BTOC)	Groundwater Elevation (feet)
FTA-126-GP01	3/13/2000	729.17	731.60	5.93	725.67
FTA-126-GP02	3/13/2000	727.68	730.68	3.80	726.23
FTA-126-GP03	3/13/2000	736.32	737.14	8.35	728.79
PPMP-227-GP01	3/13/2000	751.83	753.71	25.25	728.46
PPMP-227-GP02	3/13/2000	747.55	749.53	24.60	724.93
PPMP-227-GP03	3/13/2000	748.6	751.43	29.94	721.49
PPMP-227-GP04	3/13/2000	749.45	751.58	28.35	723.23
PPMP-227-GP05	3/13/2000	747.1	750.36	26.58	723.78
PPMP-227-GP06	3/13/2000	729.15	731.30	3.27	728.03
PPMP-227-GP07	3/13/2000	759.08	760.08	31.40	728.68
PPMP-227-GP08	3/13/2000	738.46	741.29	NR	NR
PPMP-227-GP09	3/13/2000	749.9	751.31	9.75	741.56
PPMP-227-GP10	3/13/2000	760.89	762.19	32.05	731.14
PPMP-227-GP11	3/13/2000	758.76	759.38	30.28	729.1
PPMP-227-GP12	3/13/2000	759.11	762.00	33.75	728.25
PPMP-227-GP13	3/13/2000	753.79	755.50	26.38	729.12

Notes:
BTOC = Below top of casing
NR = Not recorded

Source: IT, 2002b

Table 4-1: 2004 RFI Well Installation Summary
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

Well Location	Well Type	Northing	Easting	Ground Surface Elevation (feet)	Top of Casing Elevation (feet)	Well Depth (feet bgs)	Screen Length (feet)	Screen Interval (feet bgs)
PPMP-227-GP14	Bedrock	1181190.51	673355.81	758.72	760.93	78.0	9.54	68 - 77.54

Notes:
bgs = below ground surface

Table 4-2: Sample Designations and Analytical Parameters
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

Sample Identification*	Depth (feet)	Well Type	Analytical Parameters
Groundwater Samples			
PPMP-227-GP14	--	Bedrock	Metals
Surface Water Samples			
FA-227-007-SW	0 - 1	Grab	Metals
FA-227-008-SW	0 - 1	Grab	Metals
FA-227-009-SW	0 - 1	Grab	Metals
FA-227-010-SW	0 - 1	Grab	Metals
FA-227-011-SW	0 - 1	Grab	Metals
FA-227-012-SW	0 - 1	Grab	Metals
Sediment Samples			
FA-227-007-SD	0 - 0.5	Grab	Metals
FA-227-008-SD	0 - 0.5	Grab	Metals
FA-227-009-SD	0 - 0.5	Grab	Metals
FA-227-010-SD	0 - 0.5	Grab	Metals
FA-227-011-SD	0 - 0.5	Grab	Metals
FA-227-012-SD	0 - 0.5	Grab	Metals

Notes:
-- = not applicable
Metals = ICP Metals by SW6010B and Mercury by SW7470A/7471A
* Refer to Appendix F for a summary of tissue samples collected for this investigation.

Table 5-1: Groundwater Elevations 2004 RFI
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

Well Location	Date	Ground Surface Elevation (feet)	Top of Casing Elevation (feet)	Depth to Water (feet bgs)	Groundwater Elevation (feet)
FTA-126-GP01	3/23/2004	729.17	731.60	3.05	726.12
FTA-126-GP02	NC	727.68	730.68	NC	NC
FTA-126-GP03	3/23/2004	736.32	737.14	0.8	735.52
PPMP-227-GP01	3/23/2004	751.83	753.71	18.5	733.33
PPMP-227-GP02	3/22/2004	747.55	749.53	20.75	726.80
PPMP-227-GP03	3/23/2004	748.6	751.43	26.7	721.90
PPMP-227-GP04	3/22/2004	749.45	751.58	25	724.45
PPMP-227-GP05	3/22/2004	747.1	750.36	23.1	724.00
PPMP-227-GP06	3/23/2004	729.15	731.30	0.5	728.65
PPMP-227-GP07	3/23/2004	759.08	760.08	27.5	731.58
PPMP-227-GP08	3/23/2004	738.46	741.29	5.7	732.76
PPMP-227-GP09	3/23/2004	749.9	751.31	--	--
PPMP-227-GP10	3/22/2004	760.89	762.19	24.1	736.79
PPMP-227-GP11	3/22/2004	758.76	759.38	23.55	735.21
PPMP-227-GP12	3/23/2004	759.11	762.00	28.9	730.21
PPMP-227-GP13	3/23/2004	753.79	755.50	21	732.79
PPMP-227-GP14	4/15/2004	758.72	760.93	35	723.72

Notes:
bgs = below ground surface
NC = Not collected; well could not be located by Williams-Russell and Johnson, Inc.
-- = not applicable

Table 5-2: Groundwater Field Parameters
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

Well Location	Sample Date	Temperature (°C)	pH	Conductivity (mScm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Oxidation Reduction Potential (mV)
PPMP-227-GP14	5/7/2004	18.23	7.12	0.390	6.77	27.9	242.6

Notes:
°C = Degrees celsius
mg/L = milligrams per liter
mScm = millisiemens per centimeter
mV = millivolts
NTU = nephelometric turbidity units

Table 5-3: Summary of Groundwater Detections
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

Parameter Name	Units	PPMP-227-GP14
Metals (Total)		
Aluminum	mg/L	2.87
Barium	mg/L	0.0212
Calcium	mg/L	33.2
Iron	mg/L	2.38
Lead	mg/L	0.00296 J (J-)
Magnesium	mg/L	20
Manganese	mg/L	0.112
Sodium	mg/L	1.45
Zinc	mg/L	0.0279 J

Notes:
mg/L = milligrams per liter

Lab Flags:
J = Estimated value. The analyte is positively identified and the concentration is less than the reporting limit but greater than the method detection limit.

Validation codes consist of a validation qualifier and a sub-qualfier(s) and are delineated with parenthesis.
Validation Qualifiers:
J = Estimated detection. The associated numerical value is the approximate concentration of the analyte in the sample.

Validation Sub-qualifiers:
- = Analyte was reported as a negative concentration in the method or continuing calibration blank. Detected results are considered biased low.

Table 5-4: Summary of Surface Water Detections
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(6)
McClellan, Anniston, Alabama

Parameter Name	Units	FA-227-007-SW	FA-227-008-SW	FA-227-008-SW (FD)	FA-227-009-SW	FA-227-010-SW	FA-227-011-SW	FA-227-012-SW
Metals (Total)								
Aluminum	mg/L	< 0.2	0.0686 J	< 0.2	< 0.2	< 0.2	0.0829 J	< 0.2
Arsenic	mg/L	0.00563 J	< 0.01	0.00624 J	< 0.01	0.00855 J	< 0.01	0.00427 J
Barium	mg/L	0.0386	0.0306	0.0388	0.0179	0.0628	0.0174	0.0164
Calcium	mg/L	19.2	20.5	19.4	5.78	23.3	29.5	4.71
Cobalt	mg/L	0.00626 J	< 0.02	0.00626 J	< 0.02	0.00828 J	< 0.02	< 0.02
Iron	mg/L	2.28	1.37	2.36	0.267 J	14.9	0.777 J	0.17 J
Magnesium	mg/L	11.2	10.8	11.6	3.23	13.3	17.9	2.65
Manganese	mg/L	0.598	0.406	0.613	0.0863	2.84	0.908	0.0194
Sodium	mg/L	0.903 J	0.903 J	0.869 J	0.903 J	0.896 J	0.849 J	0.889 J
Zinc	mg/L	0.0156 J	0.0451 J	< 0.1	0.0102 J	0.00677 J	0.0416 J	< 0.1

Notes:
< = The result is considered a non-detection at the concentration shown.
FD = Field duplicate
mg/L = milligrams per liter

Lab Flag:
J = Estimated value. The analyte is positively identified and the concentration is less than the reporting limit but greater than the method detection limit.

Table 5-5: Summary of Sediment Detections
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

Parameter Name	Units	FA-227-007-SD	FA-227-008-SD	FA-227-008-SD (FD)	FA-227-009-SD	FA-227-010-SD	FA-227-011-SD	FA-227-012-SD
Metals (Total)								
Aluminum	mg/kg	26500	16300	22500	3010	9490	15100	2730
Antimony	mg/kg	< 14.3	6.63 J	6.63 J	< 11.7	6.84 J	3.22 J	< 12.4
Arsenic	mg/kg	15	2.82	9	7.65	30.7	11.5	3.67
Barium	mg/kg	106	60.6	100	46	45.9	65.6	32.4
Beryllium	mg/kg	1.47	0.688 J	1.28 J	0.735 J	1.57	1.01 J	0.693 J
Calcium	mg/kg	1370	1660	1230	274	452	880	155
Chromium	mg/kg	20.3	15.2	15.8	62.6	358	13.4	24.3
Cobalt	mg/kg	14.9	4.45 J	14	7.56	9.67	19	5.75
Copper	mg/kg	25.1	24.2	26.3	6.62	22.4	14.1	3.75
Iron	mg/kg	44300	10400	40000	27900	82800	27700	18400
Lead	mg/kg	101	35	121	12.4	19	46.4	8.23
Magnesium	mg/kg	1310	931	1070	163	260	1210	217
Manganese	mg/kg	680	93.3	738	1360	473	697	583
Mercury	mg/kg	0.078 J	< 0.19	0.0786 J	< 0.11	< 0.15	0.0682 J	< 0.12
Nickel	mg/kg	17.7	9.44	15.4	9.25	14.5	17.3	7.7
Potassium	mg/kg	1340	1080	1050	174 J	348 J	1110	368 J
Silver	mg/kg	1.14 J	< 4.8	< 3.74	1.15 J	1.01 J	< 3.17	< 3.09
Vanadium	mg/kg	49.9	29.1	43.4	19.8	77	51.8	13.8
Zinc	mg/kg	58.8	49.9	48.5	90.7	52.6	53.7	28.5

Notes:
< = The result is considered a non-detection at the concentration shown.
FD = Field duplicate
mg/kg = milligrams per kilogram

Lab Flag:
J = Estimated value. The analyte is positively identified and the concentration is less than the reporting limit but greater than the method detection limit.

Table 5-6: Groundwater Constituents of Potential Concern Compared to SSSLs
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

COPC	Residential SSSL	Groundskeeper SSSL	PPMP-227-GP14
Metals (Total) (mg/L)			
Aluminum	1.56	10.1	2.87

Notes:
COPC = Constituent of potential concern
mg/L = milligrams per liter
SSSL = Site-Specific Screening Level

> Residential SSSL

Table 5-7: Surface Water Constituents of Potential Concern Compared to SSSLs and ESVs
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

COPC	Recreational SSSL	ESV	FA-227-007-SW	FA-227-008-SW	FA-227-009-SW	FA-227-010-SW	FA-227-011-SW	FA-227-012-SW
Metals (Total) (mg/L)								
Arsenic	0.000731	0.19	0.00563 J			0.00855 J		0.00427 J
Cobalt	0.931	0.003	**0.00626 J**			**0.00828 J**		
Magnesium	--	82					17.9	
Zinc	4.65	0.0589	0.0156 J	0.0451 J	0.0102 J	0.00677 J	0.0416 J	

Notes:
-- = Not applicable
COPC = Constituent of potential concern
mg/L = milligrams per liter
SSSL = Site-Specific Screening Level
ESV = Ecological Screening Value

Lab Flag:
J = Estimated value. The analyte is positively identified and the concentration is less than the reporting limit but greater than the method detection limit.

> Recreational SSSL (shaded)
> **ESV** (boxed)

Table 5-8: Sediment Constituents of Potential Concern Compared to SSSLs and ESVs
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

COPC	Recreational SSSL	ESV	FA-227-007-SD	FA-227-008-SD	FA-227-009-SD	FA-227-010-SD	FA-227-011-SD
Metals (Total) (mg/kg)							
Antimony	422	12		6.63 J		6.84 J	3.22 J
Cobalt	67200	50					19
Copper	47400	18.7	**25.1**	**24.2**			
Manganese	43800	--			1360		
Silver	6070	2	1.14 J		1.15 J	1.01 J	

Notes:
-- = Not applicable
COPC = Constituent of potential concern
mg/kg = milligrams per kilogram
SSSL = Site-Specific Screening Level
ESV = Ecological Screening Value

Lab Flag:
J = Estimated value. The analyte is positively identified and the concentration is less than the reporting limit but greater than the method detection limit.

> ESV (boxed)

Only sample locations containing COPCs are shown.

Table 7-1: Summary of Constituents of Concern Exceeding SSSLs
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

Groundwater COCs	PPMP-227-GP14
Metals (Total) (mg/L)	
Aluminum	2.87

Surface Water COCs	FA-227-007-SW	FA-227-010-SW	FA-227-012-SW
Metals (Total) (mg/L)			
Arsenic	0.00563 J	0.00855 J	0.00427 J

Notes:
mg/L = milligrams per liter
COC = Constituent of concern
SSSL = Site-Specific Screening Level

Lab Flag:
J = Estimated value. The analyte is positively identified and the concentration is less than the reporting limit but greater than the method detection limit.

Table 7-2: Comparison of EPCs to Cancer and Non-Cancer SSSLs for Constituents of Concern in Groundwater
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

				Residential SSSL			Groundskeeper SSSL		
COC	MDC	95% UCL	EPC	cancer	non-cancer	EPC > SSSL	cancer	non-cancer	EPC > SSSL
Metals (Total) (mg/L)									
Aluminum	2.87	NA	2.87	NA	1.56	Yes	NA	10.1	No

Notes:
% = percent
mg/L = milligrams per liter
COC = Constituent of concern
EPC = Exposure point concentration (the lesser value of the 95 percent UCL or maximum detected concentration)
MDC = Maximum Detected Concentration
NA = Not applicable
SSSL = Site-Specific Screening Level
UCL = Upper confidence limit

Table 7-3: Comparison of EPCs to Cancer and Non-Cancer SSSLs for Constituents of Concern in Surface Water
Fill Area East of Reilly, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

COC	MDC	95% UCL	EPC	Recreational SSSL cancer	EPC > SSSL	non-cancer	EPC > SSSL
Metals (Total) (mg/L)							
Arsenic	0.00855	0.006631	0.006631	0.000731	Yes	0.0047	Yes

Notes:
% = percent
mg/L = milligrams per liter
COC = Constituent of concern
EPC = Exposure point concentration (the lesser value of the 95 percent UCL or maximum detected concentration)
MDC = Maximum Detected Concentration
NA = Not applicable
SSSL = Site-Specific Screening Level
UCL = Upper confidence limit

Table 7-4: Cancer Risk and Non-Cancer Hazard Measurements for Resident and Groundskeeper Exposed to Groundwater
Fill Area East of Reilly, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

		Resident		Groundskeeper SSSL	
COC	**EPC**	**cancer ILCR**	**non-cancer HI**	**cancer ILCR**	**non-cancer HI**
Metals (Total) (mg/L)					
Aluminum	2.87	NA	0.184	NA	NA
Total ILCR / HI		**NA**	**0.184**	**NA**	**NA**

Notes:
mg/L = milligrams per liter
COC = Constituent of concern
EPC = Exposure point concentration (the lesser value of the 95 percent UCL or maximum detected concentration)
HI = Hazard index
ILCR = Incremental lifetime cancer risk
NA = Not applicable

Table 7-5: Cancer Risk and Non-Cancer Hazard Measurements for Recreational Users Exposed to Surface Water
Fill Area East of Reilly, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

COC	EPC	Recreational SSSL	
		Cancer ILCR	**Non-cancer HI**
Metals (Total) (mg/L)			
Arsenic	0.006631	9.07E-06	0.141
Total ILCR / HI		**9.07E-06**	**0.141**

Notes:
COC = Constituent of concern
HI = Hazard index
ILCR = Incremental lifetime cancer risk
EPC = Exposure point concentration (the lesser value of the 95 percent UCL or maximum detected concentration)
NA = Not applicable
mg/L = milligrams per liter

Table 8-1: Summary of Constituents of Concern Exceeding ESVs in Surface Water and Sediment
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

Surface Water COCs	FA-227-007-SW	FA-227-010-SW
Metals (Total) (mg/L)		
Cobalt	0.00626 J	0.00828 J

Sediment COCs	FA-227-007-SD	FA-227-008-SD
Metals (Total) (mg/kg)		
Copper	25.1	24.2

Notes:
COC = Constituent of concern
ESV = Ecological Screening Value
mg/L = milligrams per liter
mg/kg = milligrams per kilogram

Lab Flag:
J = Estimated value. The analyte is positively identified and the concentration is less than the reporting limit but greater than the method detection limit.

Table 8-2: Constituents of Concern in Surface Water and Sediment
Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)
McClellan, Anniston, Alabama

COCs	MDC	95% UCL	EPC	ESV	HQ	COC
Surface Water						
Metals (Total) (mg/L)						
Cobalt	0.00828	NA	0.00828	0.003	2.8	Yes
Sediment						
Metals (Total) (mg/kg)						
Copper	25.1	21.4	21.4	18.7	1.1	Yes

Notes:
% = percent
COC = Constituent of concern
EPC = Exposure point concentration (the lesser value of the 95 percent UCL or MDC)
ESV = Ecological Screening Value
HQ = Hazard quotient
MDC = Maximum Detected Concentration
mg/L = milligrams per liter
mg/kg = milligrams per kilogram
UCL = Upper confidence limit

FIGURES

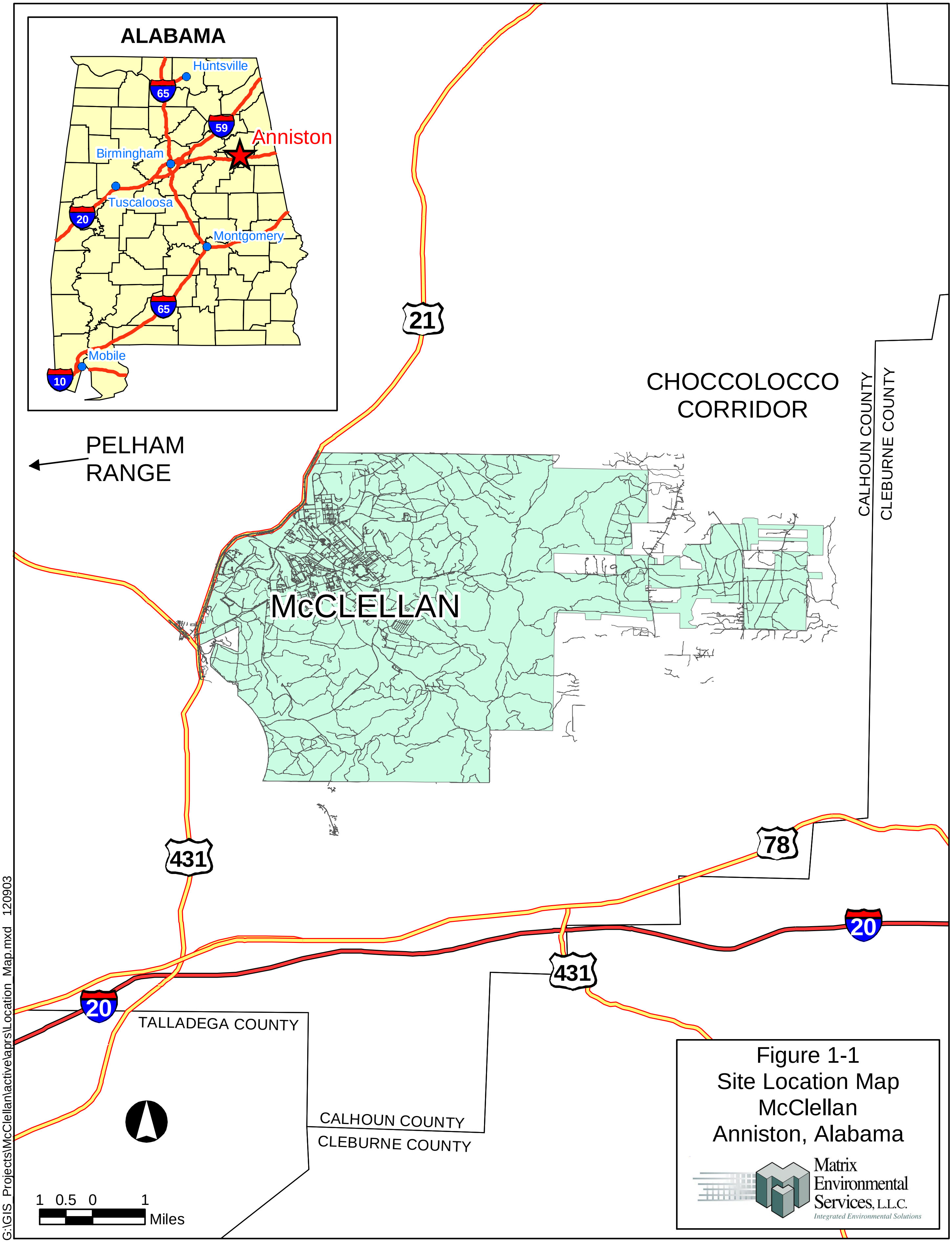

Figure 1-1
Site Location Map
McClellan
Anniston, Alabama

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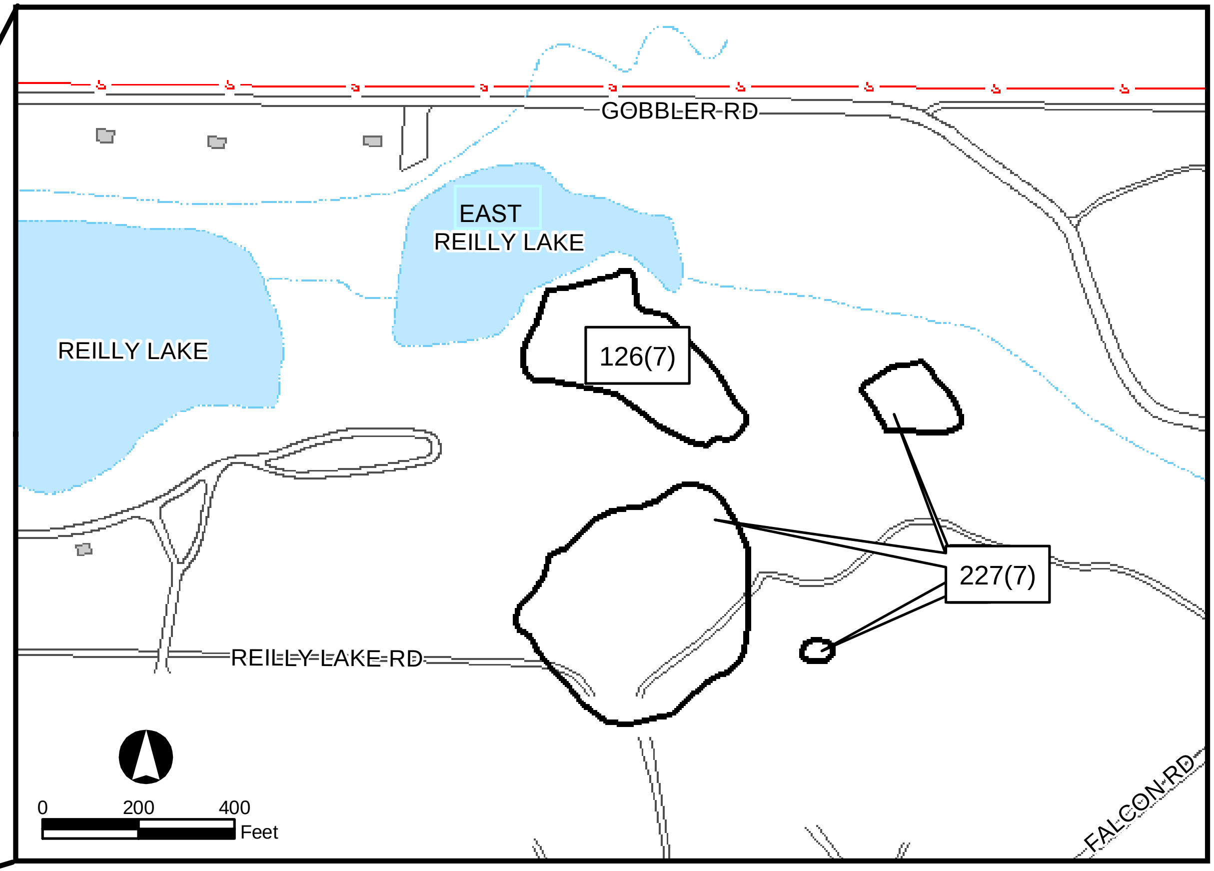

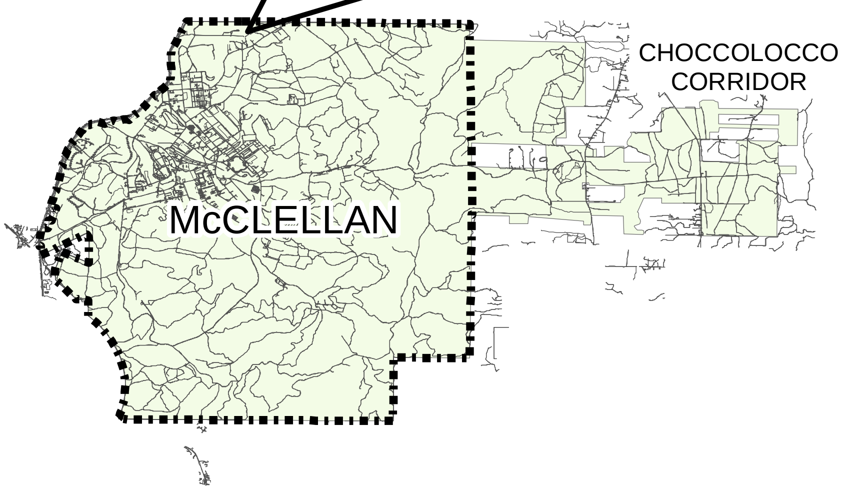

Figure 1-2
Parcel Location Map
Fill Area East of Reilly Air Field, Parcel 227(7)
and Former Post Garbage Dump, Parcel 126(7)
McClellan
Anniston, Alabama

Matrix Environmental Services, L.L.C.
Integrated Environmental Solutions

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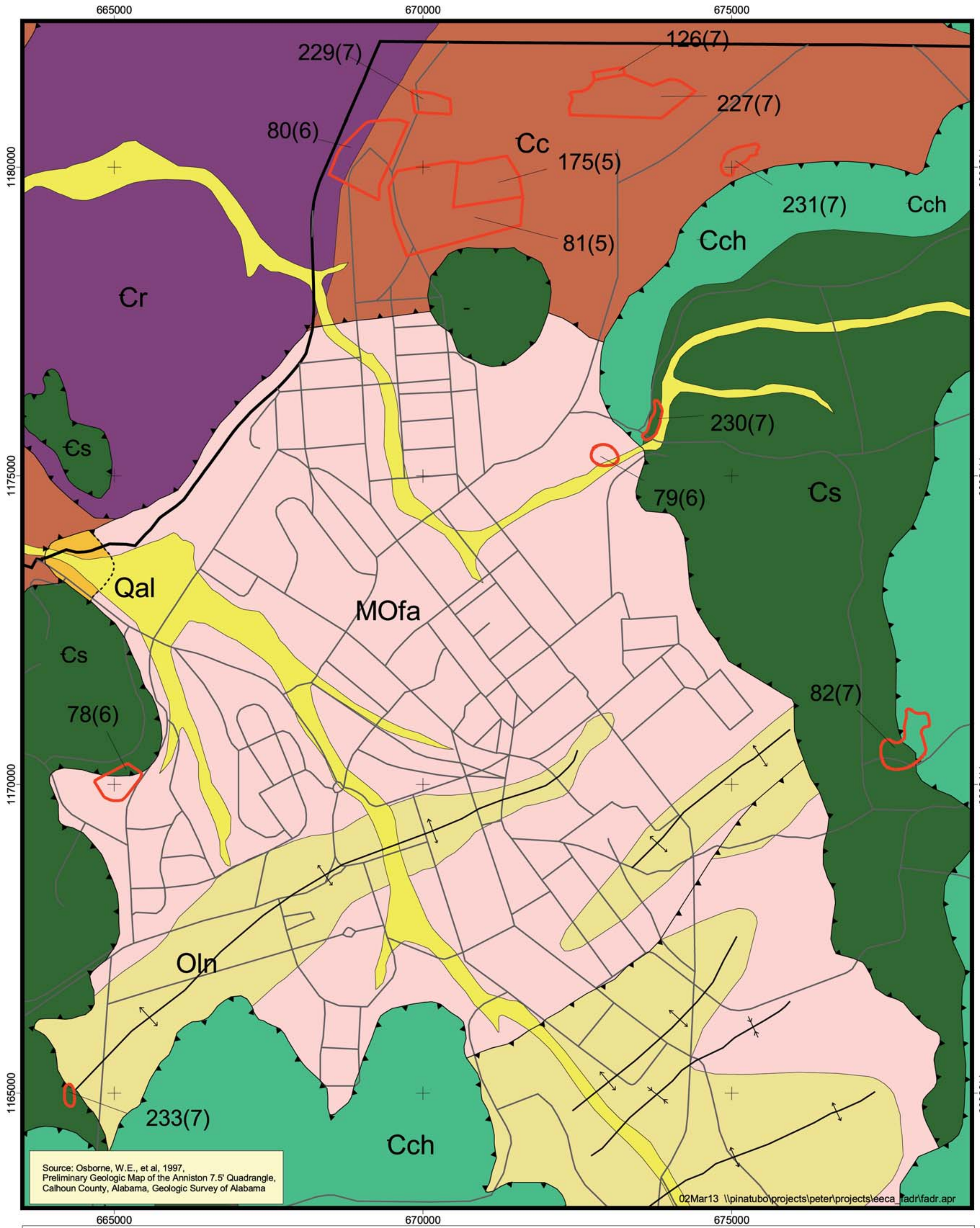


Figure 2-1 Geologic Map

McClellan, Anniston, Alabama

N

0 2000 4000

State Plane feet, NAD 83

Matrix Environmental Services, L.L.C.
Integrated Environmental Solutions

Source: IT Corporation, 2002b

Legend

- Syncline
- Anticline
- Fault
- Roads
- Main Post Boundary
- Original CERFA Parcel

Geology

t	Terrace Deposit - age unknown
ls	Limestone - age unknown
col	Colluvium - age unknown
Qal	Quaternary - alluvium
OCk	Cambrian/Ordovician - Knox Group, Undifferentiated
MOfa	Mississippian/Ordovician - Floyd & Athens Shale, Undifferentiated
Oln	Ordovician - Little Oak and Newala Limestones
Cs	Cambrian - Shady Dolomite
Cr	Cambrian - Rome Formation
Cch	Cambrian - Chilhowee Group
Cc	Cambrian - Conasauga Formation

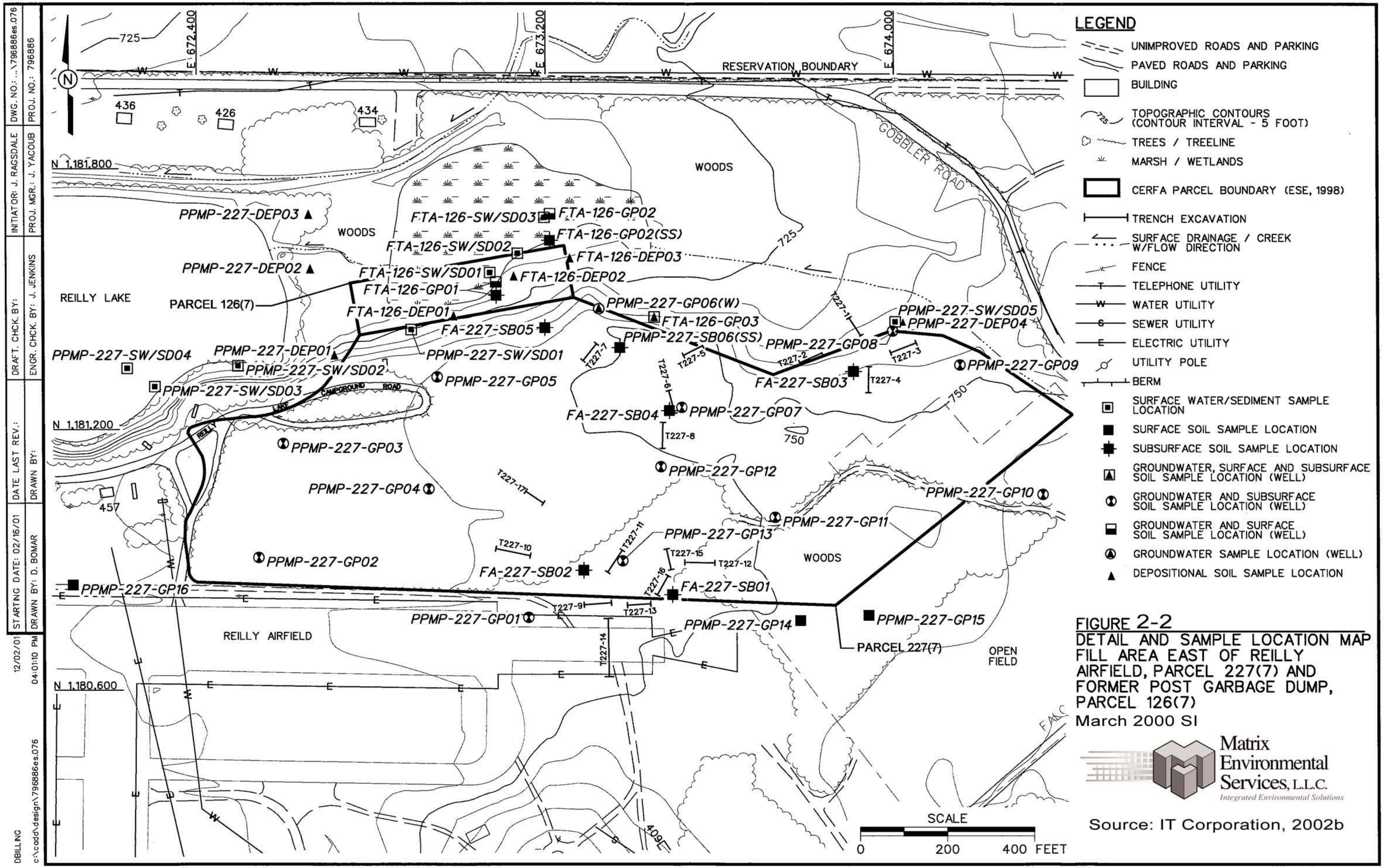


FIGURE 2-2
DETAIL AND SAMPLE LOCATION MAP FILL AREA EAST OF REILLY AIRFIELD, PARCEL 227(7) AND FORMER POST GARBAGE DUMP, PARCEL 126(7)
March 2000 SI

Source: IT Corporation, 2002b

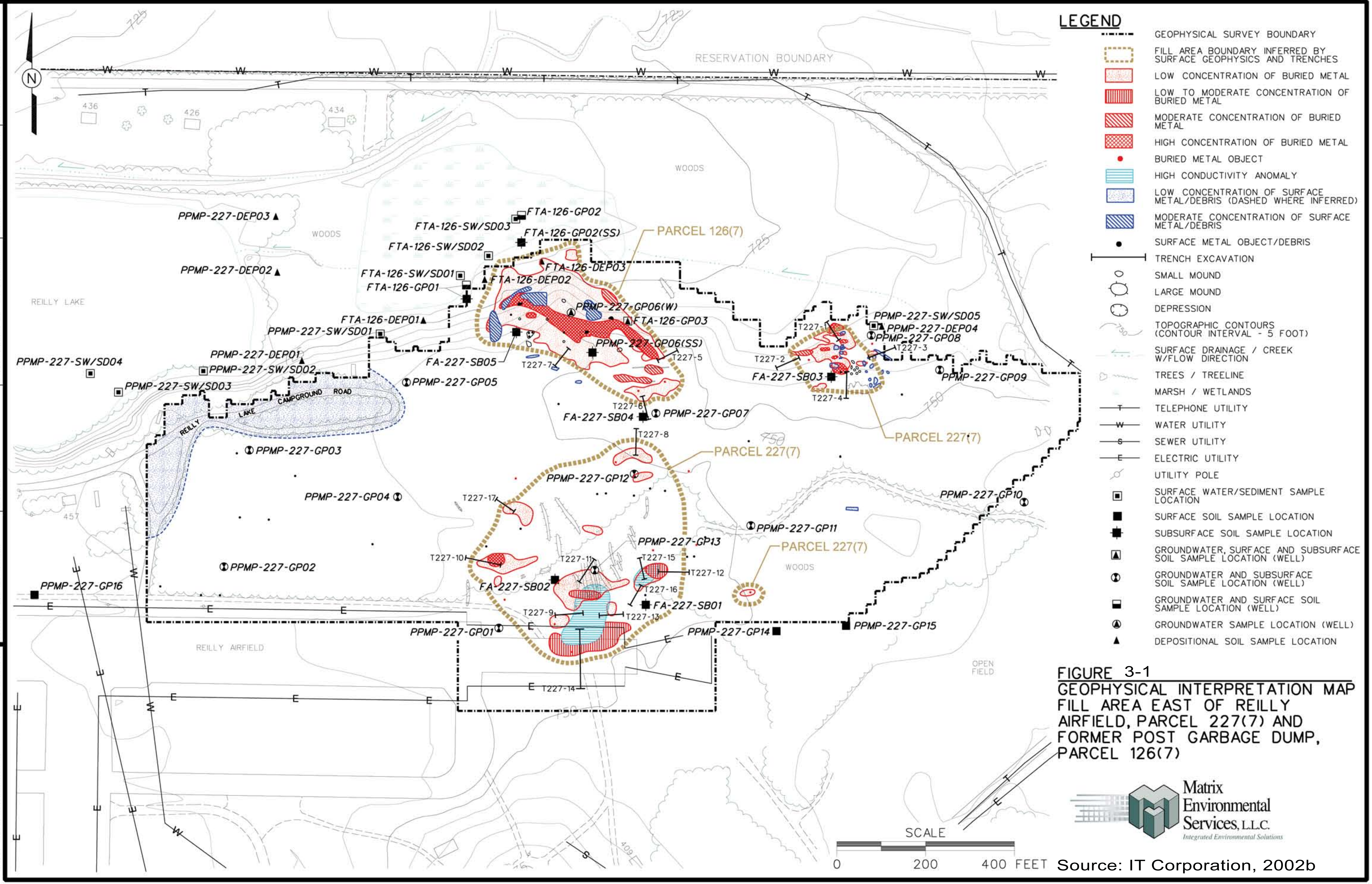
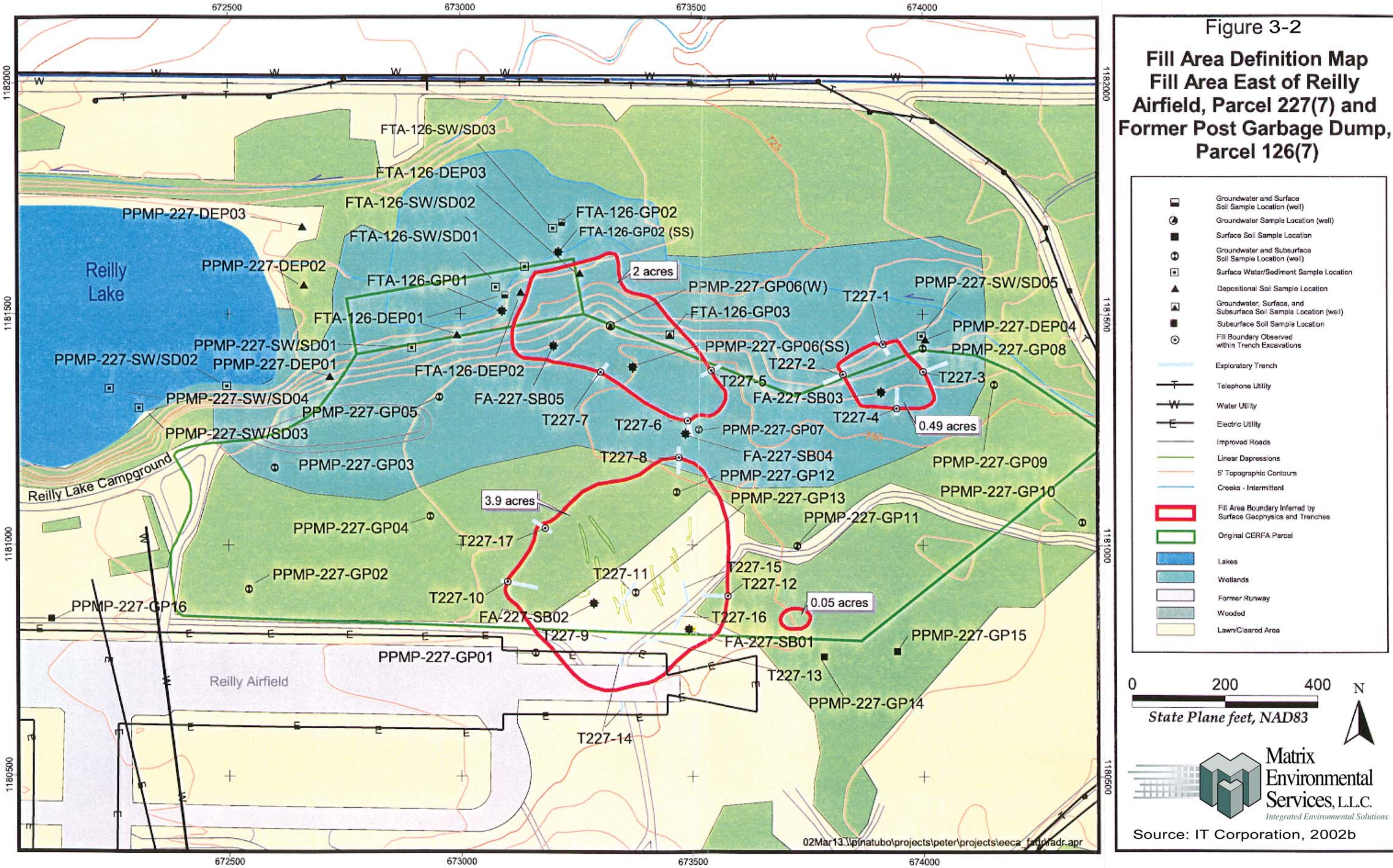


FIGURE 3-1
GEOPHYSICAL INTERPRETATION MAP FILL AREA EAST OF REILLY AIRFIELD, PARCEL 227(7) AND FORMER POST GARBAGE DUMP, PARCEL 126(7)

Figure 3-2

Fill Area Definition Map Fill Area East of Reilly Airfield, Parcel 227(7) and Former Post Garbage Dump, Parcel 126(7)



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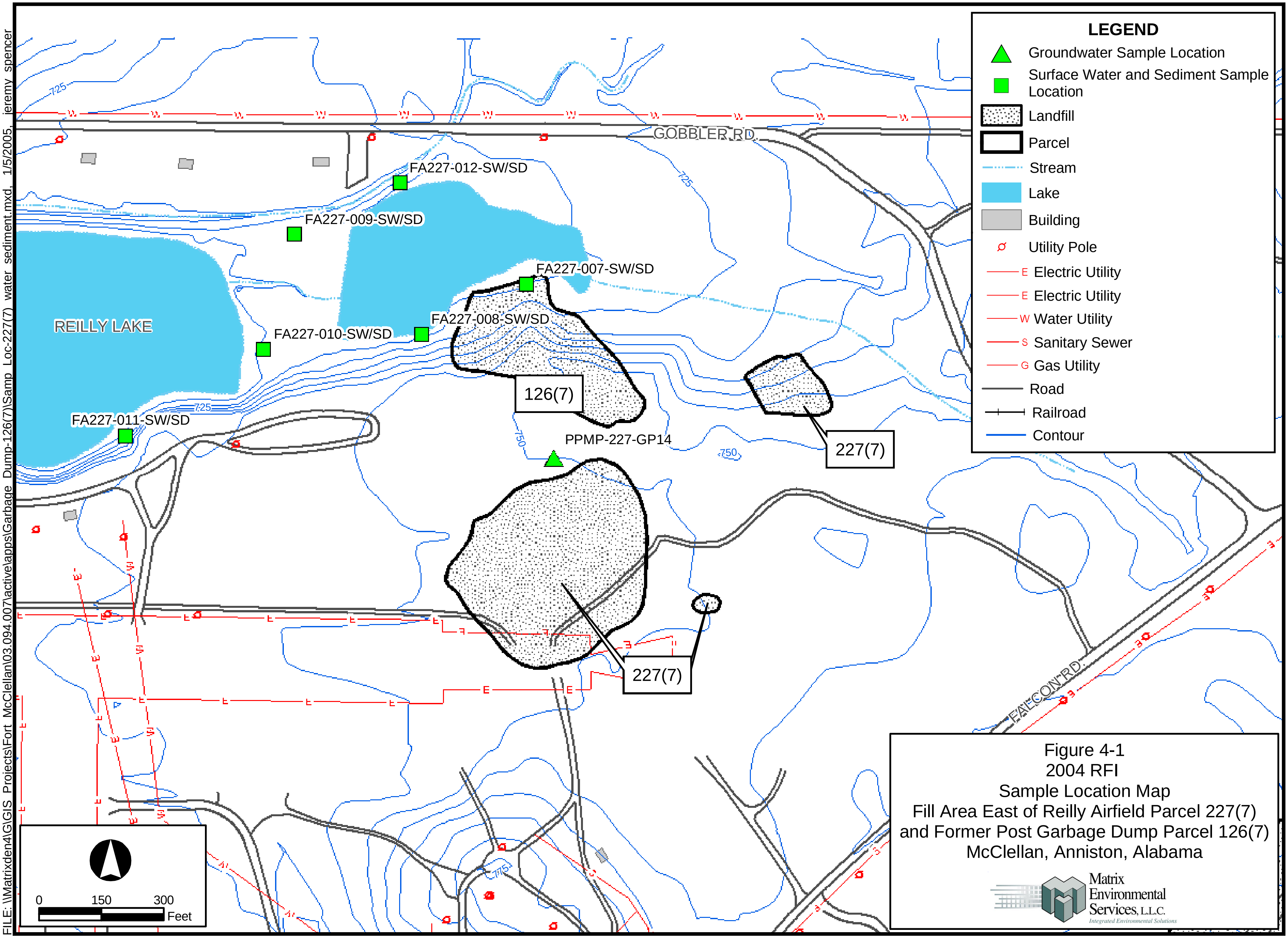

Figure 4-1
2004 RFI
Sample Location Map
Fill Area East of Reilly Airfield Parcel 227(7)
and Former Post Garbage Dump Parcel 126(7)
McClellan, Anniston, Alabama

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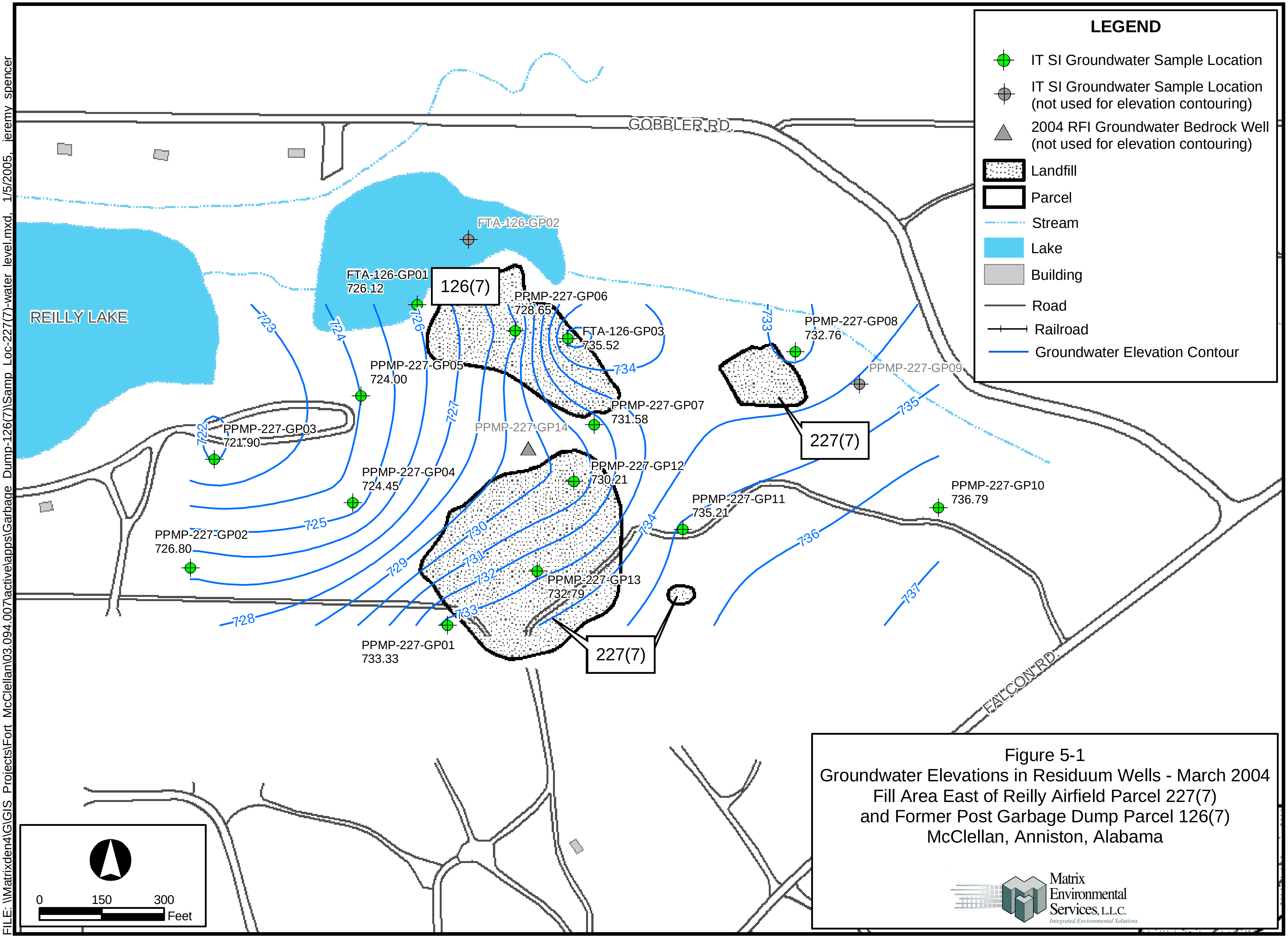

Figure 5-1
Groundwater Elevations in Residuum Wells - March 2004
Fill Area East of Reilly Airfield Parcel 227(7)
and Former Post Garbage Dump Parcel 126(7)
McClellan, Anniston, Alabama

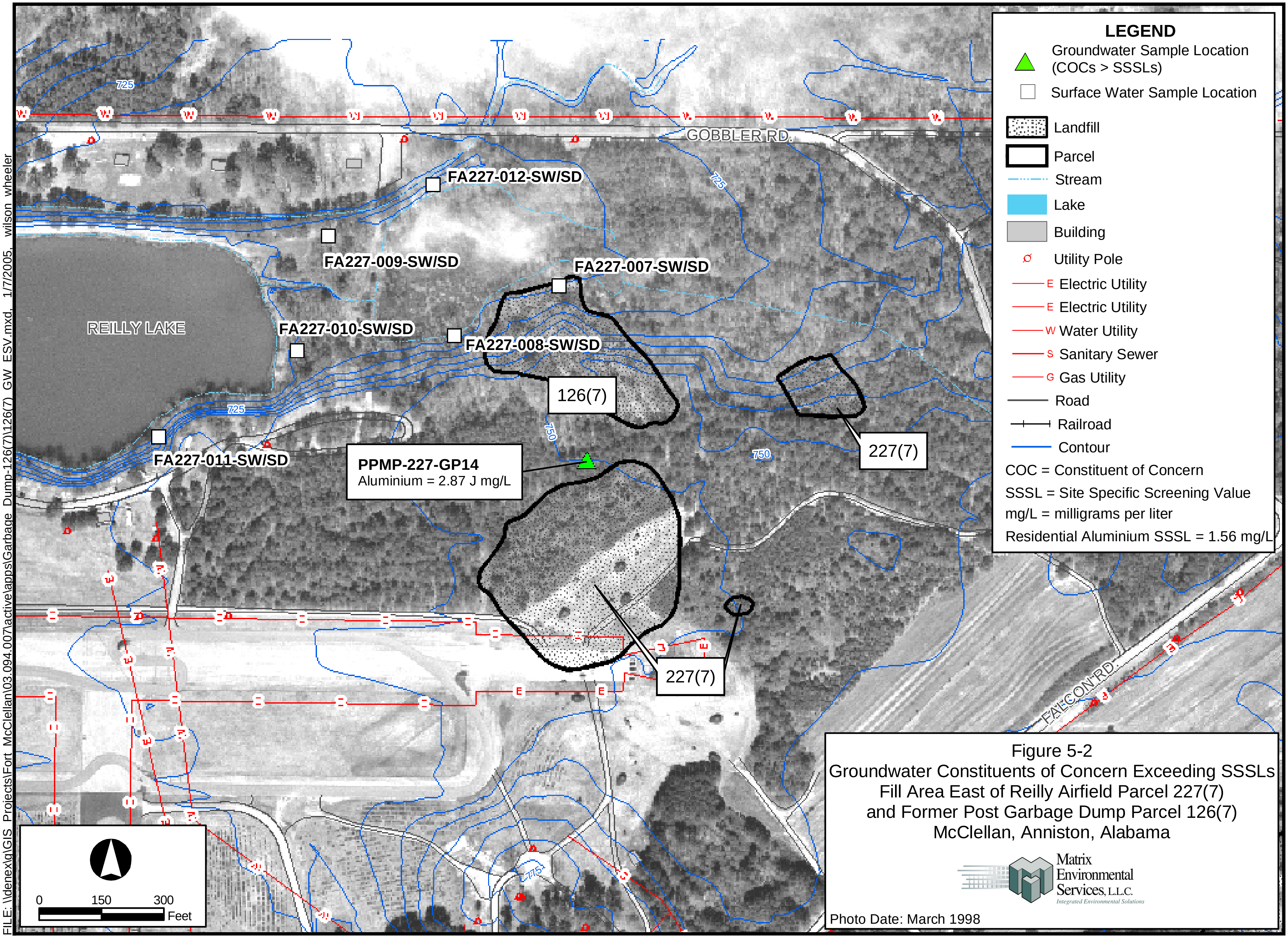

Figure 5-2
Groundwater Constituents of Concern Exceeding SSSLs
Fill Area East of Reilly Airfield Parcel 227(7)
and Former Post Garbage Dump Parcel 126(7)
McClellan, Anniston, Alabama

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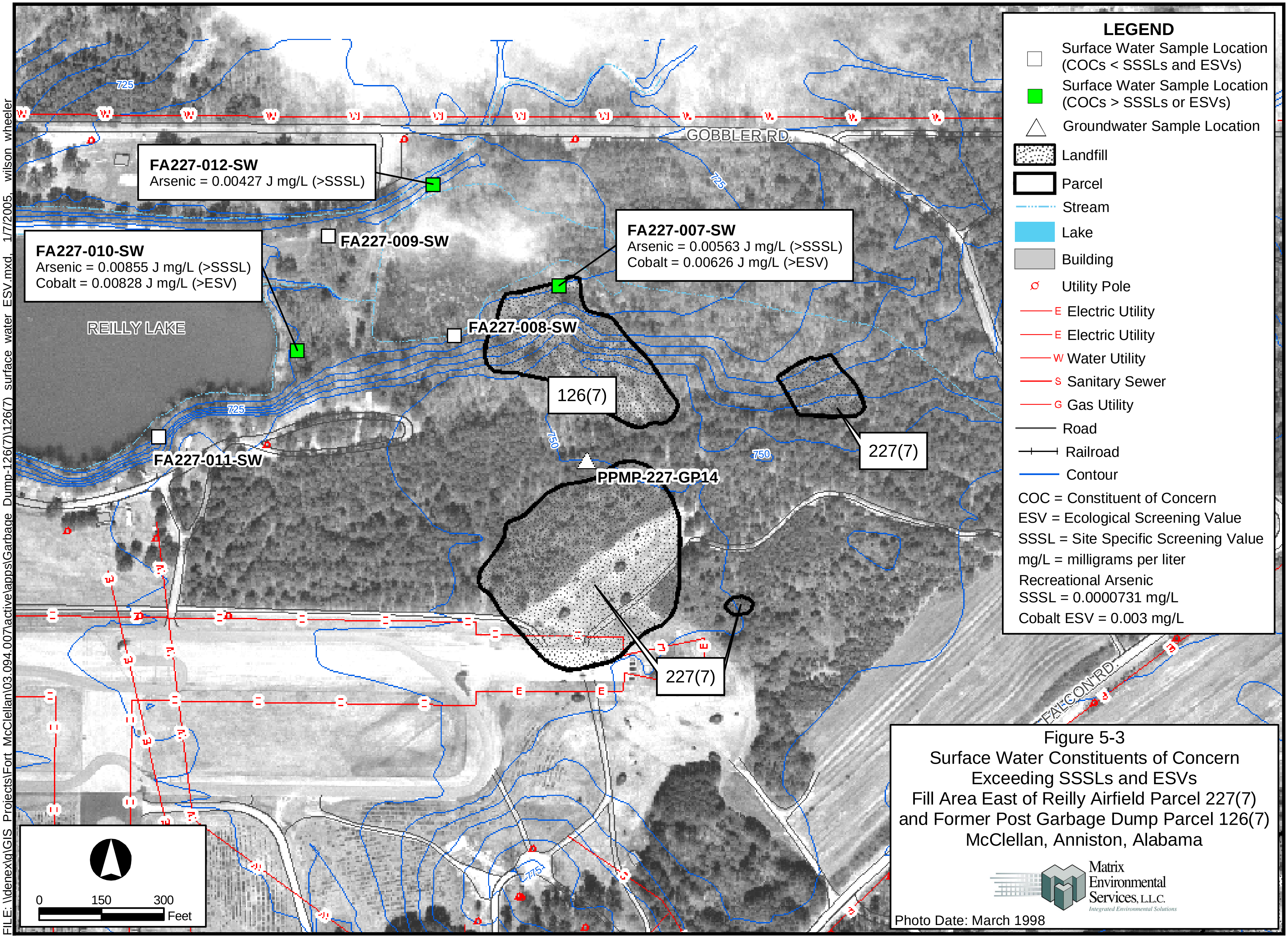

Figure 5-3
Surface Water Constituents of Concern Exceeding SSSLs and ESVs
Fill Area East of Reilly Airfield Parcel 227(7)
and Former Post Garbage Dump Parcel 126(7)
McClellan, Anniston, Alabama

Photo Date: March 1998

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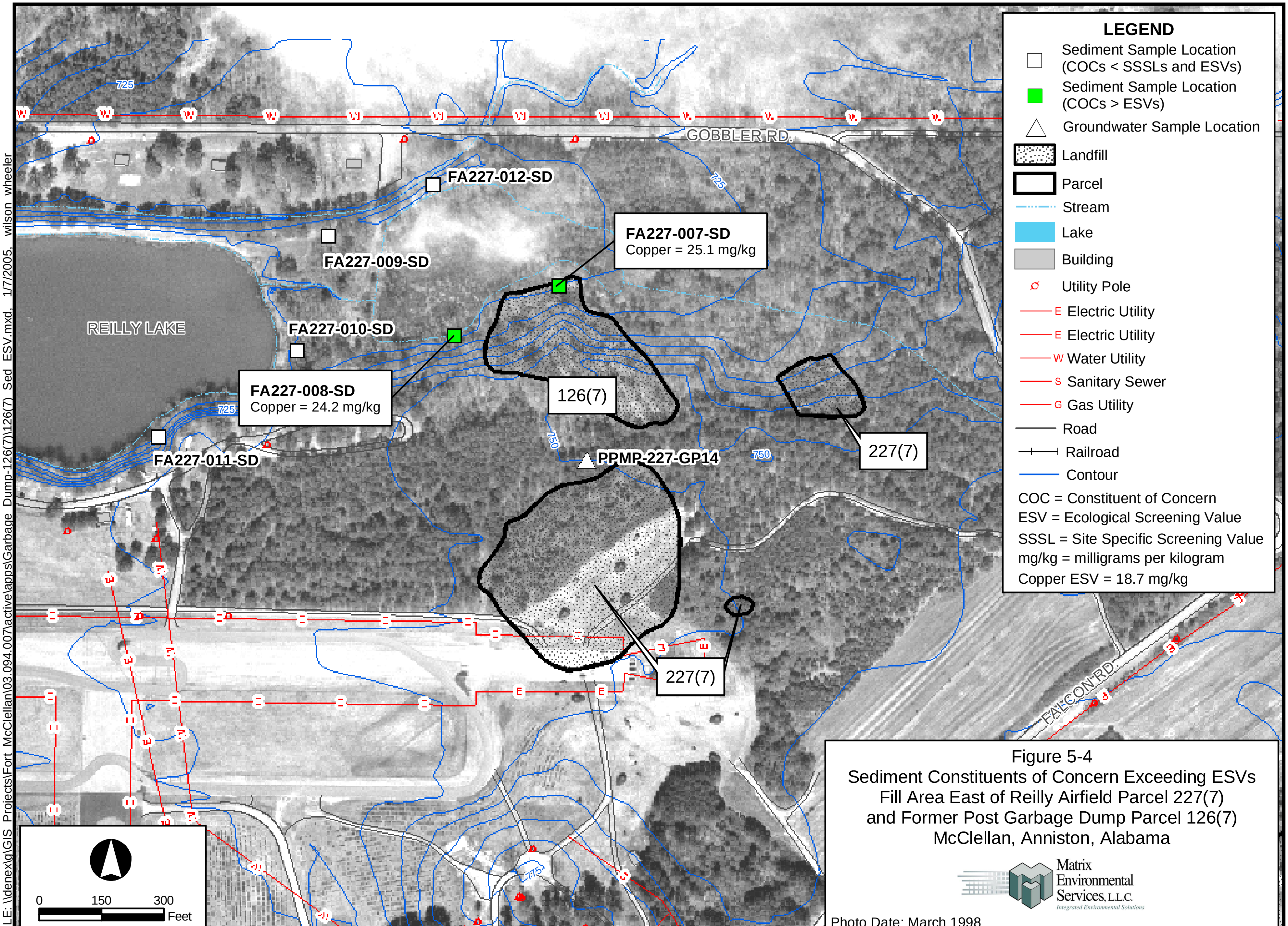

Figure 5-4
Sediment Constituents of Concern Exceeding ESVs
Fill Area East of Reilly Airfield Parcel 227(7)
and Former Post Garbage Dump Parcel 126(7)
McClellan, Anniston, Alabama

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