Final

Site Investigation Report
Motor Pool Area 1600, Parcels 163(7), 17(7), 18(7), 19(7), 71(7), 503(7), and 504(7)

Fort McClellan
Calhoun County, Alabama

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK05, IT Corporation completed a site investigation (SI) at Motor Pool Area 1600, Parcels 163(7), 17(7), 18(7), 19(7), 71(7), 503(7), and 504(7), at Fort McClellan in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site and, if present, whether the concentrations present an unacceptable risk to human health or the environment. The SI at Motor Pool Area 1600, Parcels 163(7), 17(7), 18(7), 19(7), 71(7), 503(7), and 504(7), consisted of the sampling and analysis of 29 surface soil samples, 2 depositional soil samples, 30 subsurface soil samples, 3 groundwater samples, and 2 surface water and sediment samples. In addition, four permanent groundwater monitoring wells were installed in the residuum groundwater zone to facilitate groundwater sample collection and to provide site-specific geological and hydrogeological characterization information.

Chemical analyses of samples collected at Motor Pool Area 1600, Parcels 163(7), 17(7), 18(7), 19(7), 71(7), 503(7), and 504(7), indicate that metals, VOCs, and SVOCs were detected in the various site media. To evaluate whether the detected constituents pose an unacceptable risk to human health or the environment, the analytical results were compared to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for Fort McClellan.

The potential threat to human receptors is expected to be low. Although the site is projected for industrial reuse, the soils and groundwater data were screened against residential human health SSSLs to evaluate the site for possible unrestricted land reuse. In soils, with the exception of antimony (one location), arsenic (two locations), and iron (several locations), the concentrations of the metals that exceeded SSSLs were below their respective background concentrations or within the range of background values and thus do not pose an unacceptable risk to human health. Polynuclear aromatic hydrocarbon (PAH) compounds were detected at one surface soil sample location at concentrations exceeding SSSLs and PAH background values. In addition, the PAH compound benzo(a)pyrene was detected in two subsurface soil samples at concentrations exceeding the SSSL. However, these PAH compounds are believed to be related to anthropogenic activities (i.e., asphalt pavement) and not related to operations conducted at the site. VOC concentrations in site media were below SSSLs.

Metals and PAH compounds were detected in surface/depositional soils and sediments at concentrations exceeding ESVs. However, the potential impact to ecological receptors is expected to be minimal, based on the existing viable habitat and site conditions. The site is fenced and is located in a well-developed area of the Main Post consisting of buildings, concrete foundations, and paved/gravel-covered areas. Grassy or wooded areas are very limited, and the site does not support viable ecological habitat.

Based on the results of the SI, past operations at Motor Pool Area 1600, Parcels 163(7), 17(7), 18(7), 19(7), 71(7), 503(7), and 504(7), do not appear to have adversely impacted the environment. The metals and chemical constituents detected in site media do not pose an unacceptable risk to human health and the environment. Therefore, IT Corporation recommends "No Further Action" and unrestricted land reuse at Motor Pool Area 1600, Parcels 163(7), 17(7), 18(7), 19(7), 71(7), 503(7), and 504(7).

1.0 Introduction

The U.S. Army has selected Fort McClellan (FTMC) located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE contracted with IT Corporation (IT) to perform the site investigation (SI) at Motor Pool Area 1600, Parcels 163(7), 17(7), 18(7), 19(7), 71(7), 503(7), and 504(7), under Contract Number DACA21-96-D-0018, Task Order CK05. The site is hereinafter referred to as Motor Pool Area 1600 and includes all associated parcels unless otherwise specified.

This SI report presents specific information and results compiled from the SI, including field sampling and analysis and monitoring well installation activities conducted at Motor Pool Area 1600.

1.1 Project Description

Motor Pool Area 1600 was identified as an area to be investigated prior to property transfer. The site was classified as a Category 7 site in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

A site-specific field sampling plan (SFSP) attachment (IT, 1999a) and a site-specific safety and health plan (SSHP) attachment were finalized in September 1999. The SFSP and SSHP were prepared to provide technical guidance for sample collection and analysis at Motor Pool Area 1600. The SFSP was used in conjunction with the SSHP as attachments to the installation-wide work plan (IT, 1998) and the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan (SHP) and quality assurance plan.

The SI included fieldwork to collect 29 surface soil samples, 2 depositional soil samples, 30 subsurface soil samples, 3 groundwater samples, and 2 surface water and sediment samples to

determine whether potential site-specific chemicals are present at the site and to provide data useful for supporting any future corrective measures and closure activities.

1.2 Purpose and Objectives

The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at Motor Pool Area 1600 at concentrations that would present an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC. The SSSLs and ESVs were developed by IT as part of the human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs, ESVs, and polynuclear aromatic hydrocarbon (PAH) background screening values are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). The PAH background screening values were developed by IT at the direction of the BRAC Cleanup Team to address the occurrence of PAH compounds in surface soils as a result of anthropogenic activities at FTMC. Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

Based on the conclusions presented in this SI report, the BRAC Cleanup Team will decide either to propose "No Further Action" at the site or to conduct additional work at the site.

1.3 Site Description and History

Motor Pool Area 1600 (Parcel 163[7]) is located in the central portion of the FTMC Main Post at the south end of 10th Avenue (Figures 1-1 and 1-2). Motor Pool Area 1600 comprises approximately 11 acres and is a secure facility that is fenced and gated. Motor Pool Area 1600 contains several buildings or facilities that are identified in Table 1-1. The motor pool was active until 1998 and inactive from 1998 to August 1999. Since August 1999, the site has been used as a motor pool area by the 310th Chemical Company, a Biological Integrated Detection Systems unit. The following paragraphs provide a site description and history of Motor Pool Area 1600 prior to 1998.

Two wash areas, two grease racks, and an oil/water separator are located within Parcel 163(7). A washrack is located on the east side of the site, just north of a concrete pad (former Building

1699) and southeast of Building T-1689. Light vehicle maintenance was conducted on large military vehicles, including cranes, roadway graders, water tank trucks, and fuel tank trucks. Materials stored on site included diesel fuel, motor gasoline (MOGAS), antifreeze, fog oil, and engine oil. The majority of the site was designated for military vehicle parking.

Parcel 17(7) is an underground storage tank (UST) location associated with Building T-1696. Waste oil was placed in a sump on the southwest wall of Building T-1696 and gravity-fed through an underground polyvinyl chloride (PVC) pipe to a 2,000-gallon steel waste oil UST. The steel UST was closed in place in 1994 and replaced with 2,500-gallon fiberglass UST.

Parcel 18(7) is a UST location associated with Building T-1697. Waste oil was placed in a sump on the southwest wall of Building T-1697 and gravity-fed through an underground PVC pipe to a 2,000-gallon steel waste oil UST. The steel UST was closed in place in 1994 and was not replaced.

Parcel 19(7) consists of two 10,000-gallon USTs that were removed from a former FTMC gas station (Building 1694) in 1991. The FTMC gas stations were constructed in 1941 and are associated with former motor pool areas. The gas station buildings were of similar construction, consisting of a 9- by-21-foot concrete foundation with corrugated steel walls. Two fuel pumps were located on an island directly in front of the building, approximately 20 feet away. The original plans called for two 10,000-gallon tanks at each gas station (ESE, 1998). Building 1694 reportedly matched this description but was removed. A closure report is not on file at FTMC or with the Alabama Department of Environmental Management (ADEM), and the status of these potential USTs is unknown.

The Equipment Concentration Site (Parcel 71[7]) was located in the southwest corner of Motor Pool Area 1600 and had two grease racks (T-1643 and T-1644) and a wash area (T-1645) that included a wash pad, a washrack, and an oil/water separator (Figure 1-2). The wash area was built in 1942 and was equipped with a rotating, skimmer-type oil/water separator located northwest of Building T-1645 (ESE, 1998). This facility was rebuilt in 1991 with a settling basin attached to a coalescing plate oil/water separator that discharged into the sanitary sewer (Roy F. Weston, Inc., 1990).

Parcel 503(7) is a suspected UST location at Building T-1689. The UST was reportedly located at the east end of Building T-1689 (Figure 1-2) and had a capacity of approximately 500 gallons.

In January 1991, the suspected UST location was excavated; however, no UST was found (IT, 1999b). The excavated area was backfilled; additional sampling was not performed.

An estimated 10,000-gallon UST (Parcel 504[7]) was reportedly located approximately 100 feet east of Building 1693, near the fence line (IT, 1999b). The UST was removed in February 1991; however, a closure report for the UST could not be located.

2.0 Previous Investigations

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

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas)

2. Areas where only release or disposal of petroleum products has occurred

3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response

4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken

5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken

6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented

7. Areas that are not evaluated or require additional evaluation.

The EBS was conducted in accordance with the Community Environmental Response Facilitation Act (CERFA) (CERFA-Public Law 102-426) protocols and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, ADEM, the U.S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historical maps and aerial photographs were reviewed to document historical land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In

addition, visual site inspections were conducted to verify conditions of specific property parcels. Previous investigations have been conducted at Motor Pool Area 1600, as described below.

UST, Parcel 17(7). The 2,000-gallon waste oil UST located at the south end of Building T-1696 (Figure 2-1) was closed in place in April 1994 (Braun Intertec Corporation [Braun], 1995a). The PVC piping extending approximately seven feet to the UST was removed. The UST was constructed of single-wall steel, and no holes were observed in the tank. The tank was filled with a concrete slurry. The UST was replaced with a 2,500-gallon fiberglass UST.

One soil boring was completed to a depth of 15.5 feet below ground surface (bgs) on the southeast side of the UST (Figure 2-1). A soil sample (1696-E) was collected at 7.5 feet bgs for analysis. Soil samples were also collected from the pipe trench and submitted for analysis. The soil samples collected at the site were analyzed for total petroleum hydrocarbons (TPH) and total lead. High concentrations of TPH were detected in the pipe trench samples. TPH was not detected in the sample collected on the east side of the UST (1696-E). Soil samples were not collected on the north, south, or west sides of the UST. Because groundwater was not encountered in the soil boring installed at the site, groundwater sampling was not conducted (Braun, 1995a). Table 2-1 lists the analytical results for the samples collected during closure of the 2,000-gallon waste oil UST at Building T-1696. The closure report concluded that a petroleum release had occurred on site and that the vertical and horizontal extent of contamination in the soil had not been determined (Braun, 1995a).

UST, Parcel 18(7). The 2,000-gallon waste oil UST located on the southwest side of Building T-1697 (Figure 2-1) was closed in place in May 1994 (Braun, 1995b). The PVC piping, extending approximately seven feet to the UST, was also removed. The UST was constructed of single-wall steel, and no holes were observed in the tank. The tank was filled with a concrete slurry. The UST was not replaced.

Soil borings (1697-E, 1697-S, and 1697-W) were drilled on the east, west, and south sides of the UST at Building T-1697 (Figure 2-1). The borings were extended to a depth believed to be the bottom of the UST. Because groundwater was not encountered in the soil borings, groundwater sampling was not conducted at this site (Braun, 1995b).

Soil samples were collected at 7.5 feet bgs in each of the soil borings installed around the UST excavation and from the pipe trench. The samples were analyzed for TPH and total lead. The sample results for the waste oil UST at Building T-1697 are listed in Table 2-2. TPH

concentrations in samples collected on the east (1697-E) and south (1697-S) sides of the UST were below the method detection limit (5 parts per million [ppm]). The TPH concentration in the west side soil sample (1697-W) was 10 ppm, which was slightly above the method detection limit. The pipe trench samples had TPH concentrations of 3,300 and 4,200 ppm. The closure report concluded that a petroleum release had occurred on site and that the vertical and horizontal extent of contamination in the soil had not been determined (Braun, 1995b).

USTs, Parcel 19(7). IT removed two 10,000-gallon USTs (one for MOGAS and one for diesel fuel) from the former FTMC gas station (Building 1694) in February 1991 (IT, 1999b). However, closure reports for these USTs are not on file at FTMC or ADEM and may not have been required at the time of closure (ESE, 1998). Although Building 1694 has been removed, an area near the center of the northwest site boundary is the suspected location of the former building and UST excavation (Figure 1-2). Six soil borings were installed around the perimeter of the USTs prior to closure (IT, 1999b). Soil samples were collected and analyzed for lead; benzene, toluene, ethylbenzene, and xylenes (BTEX); and oil and grease (O&G). The sample results are listed in Table 2-3. O&G concentrations ranged from not detected (ND) to 1,100 parts per million (ppm) (IT, 1999b). The depth to groundwater was not noted.

UST, Parcel 503(7). A suspected 500-gallon UST was located at the southeast end of Building T-1689 (Figure 1-2). However, a closure report for this UST could not be located. In December 1990, IT completed six soil borings around the suspected UST site (IT, 1999b). Soil samples were collected and analyzed for total lead, BTEX, and O&G. Total lead concentrations in the samples ranged from 0.82 mg/kg to 140 mg/kg (Table 2-3). O&G concentrations ranged from ND to 580,000 mg/kg. The depth to groundwater was not referenced in the field notes reviewed. Benzene was detected at a concentration of 140 parts per billion (ppb) in Boring No. 6 at a depth of 8 to 10 feet bgs (Table 2-3). In January 1991, the area of the suspected UST was excavated; however, no UST was found. Additional sampling was not performed, and the excavated area was backfilled. The location of the excavation is not available.

UST, Parcel 504(7). A UST located east of Building 1693 was reportedly removed in February 1991 (IT, 1999b); however, a closure report for this UST was not available. In December 1990, IT completed six soil borings and collected soil samples for total lead, BTEX, and O&G analyses (IT, 1999b). The soil boring sample results are listed in Table 2-3. The sample results indicated that total lead concentrations ranged from 7.9 to 120 mg/kg. O&G concentrations in the samples ranged from ND to 2,000 mg/kg. Upon UST removal, soil samples were collected from the sides and the bottom of the excavation and submitted for analysis. The excavation soil sample results are listed in

Table 2-3. O&G concentrations from the excavation ranged from ND to 710 ppm. Contaminated soils were excavated and transported to an area on site for incineration (IT, 1999b). The depth to groundwater was not identified with the UST sample results.

Motor Pool Area 1600 was identified as a Category 7 CERFA site: areas that are not evaluated or require further evaluation. The site lacked adequate documentation and, therefore, required additional evaluation to determine the environmental condition of the parcel.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT at Motor Pool Area 1600, including unexploded ordnance (UXO) avoidance, environmental sampling and analysis, and groundwater monitoring well installation activities.

3.1 UXO Avoidance

UXO avoidance was performed at Motor Pool Area 1600 following methodology outlined in Section 4.1.7 of the SAP (IT, 2000a). IT UXO personnel used a Schonstedt Heliflux Magnetic Locator to perform a surface sweep of the parcel prior to site access. After the parcel was cleared for access, sample locations were cleared using a Foerster Ferex Electromagnetic Detector, following procedures outlined in Section 4.1.7.3 of the SAP (IT, 2000a).

3.2 Environmental Sampling

The environmental sampling performed during the SI at Motor Pool Area 1600 included the collection of surface and depositional soil samples, subsurface soil samples, groundwater samples, and surface water and sediment samples for chemical and physical analyses. The sample locations were determined by observing site physical characteristics during a site walkover and by reviewing historical documents pertaining to activities conducted at the site. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figure 3-1. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.4.

3.2.1 Surface and Depositional Soil Sampling

Surface soil samples were collected from 29 locations, and depositional soil samples were collected from two locations at Motor Pool Area 1600, as shown on Figure 3-1. Soil sampling locations and rationale are presented in Table 3-1. Sample designations and quality assurance/quality control (QA/QC) samples are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on sampling rationale, presence of surface structures, site topography, and buried utilities.

Sample Collection. Surface soil samples were collected from the upper 1 foot of soil with either direct-push samplers or with a 3-inch diameter stainless-steel hand auger using the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000a). Depositional soil samples were collected from the upper 0.5 foot of soil with a stainless-steel spoon and placed in a stainless-

steel bowl. Surface and depositional soil samples were collected by first removing surface debris, such as fill material or vegetation, from the immediate sample area. The soil was then collected with the sampling device and screened with a photoionization detector (PID) in accordance with Section 4.7.1.1 of the SAP (IT, 2000a). Samples for volatile organic compound (VOC) analysis were collected directly from the sampler (or bowl for depositional soil samples) using three EnCore® samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.4. Sample collection logs are included in Appendix A.

3.2.2 Subsurface Soil Sampling

Thirty subsurface soil samples were collected from 29 soil borings at Motor Pool Area 1600 at the locations shown on Figure 3-1. Two subsurface soil samples were collected at sample location FTA-163-GP09 because of elevated PID readings. One of the subsurface soil samples at FTA-163-GP09 was collected at 3 to 4 feet bgs, and the other sample was collected at 10 to 12 feet bgs. Subsurface soil sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations, depths, and QA/QC samples are listed in Table 3-2. Soil boring sampling locations were determined in the field by the on-site geologist based on sampling rationale, presence of surface structures, site topography, and buried and overhead utilities. IT contracted TEG, Inc., a direct-push technology subcontractor, to assist in subsurface soil sample collection.

Sample Collection. Subsurface soil samples were collected from soil borings at depths greater than 1 foot bgs in the unsaturated zone. The soil borings were advanced and soil samples collected using the direct-push sampling procedures specified in Section 4.9.1.1 of the SAP (IT, 2000a). Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.4.

Subsurface soil samples were collected continuously to 12 feet bgs or until direct-push sampler refusal was encountered. Samples were field screened using a PID in accordance with Section 4.7.1.1 of the SAP (IT, 2000a) to measure for volatile organic vapors. The soil sample displaying the highest reading was selected and sent to the laboratory for analysis; however, at those locations where PID readings were not greater than background, the deepest soil sample interval above the saturated zone was submitted for analysis. Samples for VOC analysis were collected directly from the sampler using three EnCore samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the

appropriate sample containers. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.4. The on-site geologist constructed a detailed boring log for each soil boring. The lithological log for each borehole is included in Appendix B.

At the completion of soil sampling, boreholes were abandoned with bentonite pellets and hydrated with potable water, following borehole abandonment procedures summarized in Appendix B of the SAP (IT, 2000a).

3.2.3 Well Installation

Fourteen permanent residuum monitoring wells (FTA-163-MW01 through FTA-163-MW14) were proposed for installation at Motor Pool Area 1600. However, eleven of the proposed wells were not installed at the site because competent bedrock was encountered during hollow-stem auger drilling operations. Three unsuccessful attempts were made to install each monitoring well. Therefore, a decision was made by the BCT to install an additional permanent residuum monitoring well (FTA-163-MW15) in the northeastern portion of Parcel 163(7) to provide additional site coverage. Permanent monitoring wells were installed at four locations (FTA-163-MW02, FTA-163-MW07, FTA-163-MW14, and FTA-163-MW15), as shown on Figure 3-1. Table 3-3 summarizes construction details of the permanent wells installed at Motor Pool Area 1600. The well construction logs are included in Appendix B.

IT contracted Miller Drilling, Inc. to install the permanent wells using a hollow-stem auger rig. The wells were installed following procedures outlined in Section 4.7 and Appendix C of the SAP (IT, 2000a). The monitoring well boreholes were drilled to the top of bedrock using a truck-mounted hollow-stem auger drill rig. The boreholes at these locations were advanced with a 4.25-inch inside diameter (ID) hollow-stem auger from ground surface to the first water-bearing zone in residuum or to the top of bedrock at the well location. A 2-foot-long, 2-inch ID carbon steel split-spoon sampler was driven at 5-foot intervals to collect residuum for observing and describing lithology. Where split-spoon sampler refusal was encountered, the auger was advanced until the first water-bearing zone was encountered. The on-site geologist logging the auger boreholes continued the lithological log for each borehole from the depth of split-spoon sampler refusal to the bottom of the borehole by logging the auger drill cuttings. The drill cuttings were logged to determine lithologic changes and the approximate depth of groundwater encountered during drilling. The lithological log for each borehole is included in Appendix B.

The monitoring well casing consisted of 2-inch ID threaded flush-joint Schedule 40 PVC pipe. A 10- or 20-foot length of threaded flush-joint 0.010-inch continuous-wrap PVC well screen was

attached to the bottom of the well casing. The screen and end cap were attached to 2-inch ID, flush-threaded Schedule 40 PVC riser. A sand pack consisting of number 1 filter sand (environmentally safe, clean fine sand, sieve size 20 to 40) was tremied around the well screen to approximately 2 feet above the top of the well screen as the augers were removed. The wells were surged using a solid PVC surge block for approximately 10 minutes, or until no more settling of the sand pack occurred inside the borehole. A bentonite seal, consisting of approximately 2 feet of bentonite pellets, was placed immediately on top of the sand pack and hydrated with potable water. If the bentonite seal was installed below the water table surface, the bentonite pellets were allowed to hydrate in the groundwater. Bentonite seal placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). The wells were then grouted to ground surface, and a concrete surface pad was installed. A locking well cap was placed on the PVC well casing.

The wells were developed by surging and pumping with a submersible pump in accordance with methodology outlined in Section 4.8 and Appendix C of the SAP (IT, 2000a). The submersible pump used for well development was moved in an up-and-down fashion to encourage any residual well installation materials to enter the well. These materials were then pumped out of the well in order to re-establish the natural hydraulic flow conditions. Development continued until the water turbidity was equal to or less than 20 nephelometric turbidity units or for a maximum of 8 hours. The well development logs are included in Appendix C of this report.

3.2.4 Water Level Measurements

The depth to groundwater was measured in wells at Motor Pool Area 1600 on January 29, 2001, following procedures outlined in Section 4.18 of the SAP (IT, 2000a). Depth to groundwater was measured with an electronic water-level meter. The meter probe and cable were cleaned after use at each well following decontamination methodology presented in Section 4.10 of the SAP (IT, 2000a). Measurements were referenced to the top of the PVC casing. A summary of groundwater level measurements is presented in Table 3-4.

3.2.5 Groundwater Sampling

Groundwater samples were collected from three of the four permanent wells installed during the SI at Motor Pool Area 1600 at the locations shown on Figure 3-1. A groundwater sample was not collected at well location FTA-163-MW14 because there was not enough groundwater to collect a representative sample. The groundwater sampling locations and rationale are listed in Table 3-1. The groundwater sample designations and QA/QC samples are listed in Table 3-5.

Sample Collection. Groundwater sampling was performed following procedures outlined in Section 4.9.1.4 of the SAP (IT, 2000a). Groundwater was sampled after purging a minimum of three well volumes and after field parameters (i.e., temperature, pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, and turbidity) stabilized. Purging and sampling were performed with a submersible or peristaltic pump equipped with Teflon™ tubing. Field parameters were measured using a calibrated water quality meter. Field parameter readings are summarized in Table 3-6. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.4.

3.2.6 Surface Water Sampling

Two surface water samples were collected at Motor Pool Area 1600 at the locations shown on Figure 3-1. The surface water sampling locations and rationale are listed in Table 3-1. Surface water sample designations are listed in Table 3-7. The actual sampling locations were determined in the field, based on drainage pathways and field observations.

Sample Collection. Surface water samples were collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP (IT, 2000a). The surface water samples were collected by dipping a stainless-steel pitcher in the water and pouring the water into the sample containers. Surface water samples were collected after field parameters had been measured using a calibrated water quality meter. Surface water field parameters are listed in Table 3-6. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.4.

3.2.7 Sediment Sampling

Two sediment samples were collected at the same locations as the surface water samples, as shown on Figure 3-1. Sediment sampling locations and rationale are presented in Table 3-1. The sediment sample designations are listed in Table 3-7.

Sample Collection. Sediment samples were collected in accordance with the procedures specified in Section 4.9.1.2 of the SAP (IT, 2000a). Sediments were collected with a stainless-steel spoon and placed in a clean stainless-steel bowl. Samples for VOC analysis were then immediately collected from the stainless-steel bowl with three EnCore samplers. The remaining portion of the sample was homogenized and placed in the appropriate sample containers. Sample collection logs are included in Appendix A. The sediment samples were analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.4.

3.3 Surveying of Sample Locations

Sample locations were surveyed using global positioning system survey techniques described in Section 4.3 of the SAP (IT, 2000a) and conventional civil survey techniques described in Section 4.19 of the SAP (IT, 2000a). Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix D.

3.4 Analytical Program

Samples collected during the SI were analyzed for various chemical and physical parameters. The specific suite of analyses performed was based on the potential site-specific chemicals historically at the site and EPA, ADEM, FTMC, and USACE requirements. Samples collected at Motor Pool Area 1600 were analyzed for the following parameters:

- Target compound list VOCs – EPA Method 5035/8260B
- Target compound list semivolatile organic compounds (SVOC) – EPA Method 8270C
- Target analyte list metals – EPA Method 6010B/7000.
- Total organic carbon (TOC) – EPA Method 9060 (sediment only)
- Grain size – American Society for Testing and Materials Method D421/D422 (sediment only).

The samples were analyzed using EPA SW-846 methods, including Update III methods where applicable, as presented in Table 6-1 in Appendix B of the SAP (IT, 2000a). Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of Appendix B of the SAP [IT, 2000a]). Chemical data were reported via hard-copy data packages by the laboratory using Contract Laboratory Program-like forms. These packages were validated in accordance with EPA National Functional Guidelines by Level III criteria. A summary of validated data is included in Appendix E. The Data Validation Summary Report is included as Appendix F.

3.5 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping followed requirements specified in Section 4.13.2 of the SAP (IT, 2000a). Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in Section 5.0, Table 5-1, of Appendix B of the SAP (IT, 2000a). Sample documentation and chain-of-custody records were recorded as specified in

Section 4.13 of the SAP (IT, 2000a).

Completed analysis request and chain-of-custody records (Appendix A) were secured and included with each shipment of sample coolers to Severn Trent Laboratories, Inc. (formerly Quanterra Environmental Services) in Knoxville, Tennessee. Split samples were shipped to the USACE South Atlantic Division Laboratory in Marietta, Georgia.

3.6 Investigation-Derived Waste Management and Disposal

Investigation-derived waste (IDW) was managed and disposed as outlined in Appendix D of the SAP (IT, 2000a). The IDW generated during the SI at Motor Pool Area 1600 was segregated as follows:

- Drill cuttings
- Purge water from well development and sampling activities, and decontamination fluids
- Spent well materials and personal protective equipment.

Solid IDW was stored inside the fenced area surrounding Buildings 335 and 336 in lined roll-off bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analyses. Based on the results, drill cuttings, spent well materials, and personal protective equipment generated during the SI were disposed as nonregulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

Liquid IDW was contained in the existing 20,000-gallon sump associated with the Building T-338 vehicle washrack. Liquid IDW was characterized by VOC, SVOC, and metals analyses. Based on the analyses, liquid IDW was discharged as nonregulated waste to the FTMC wastewater treatment plant on the Main Post.

3.7 Variances/Nonconformances

Three variances to the SFSP were recorded during completion of the SI at Motor Pool Area 1600. The variances did not alter the intent of the investigation or the sampling rationale presented in Table 4-2 of the SFSP (IT, 1998a). The variances to the SFSP are summarized in Table 3-8 and included in Appendix G. There were not any nonconformances to the SFSP recorded during completion of the SI.

3.8 Data Quality

The field sample analytical data are presented in tabular form in Appendix E. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan; the FTMC SAP and quality assurance plan; and standard, accepted methods and procedures. Sample collection logs pertaining to the collection of these samples were reviewed and organized for this report and are included in Appendix A. As discussed in Section 3.7, three variances to the SFSP were recorded during completion of the SI. However, the variances did not impact the usability of the data.

Data Validation. A complete (100 percent) Level III data validation effort was performed on the reported analytical data. Appendix F consists of a data validation summary report that was prepared to discuss the results of the validation. Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System™ database for tracking and reporting. The qualified data were used in the comparison to the SSSLs and ESVs. Rejected data (assigned an "R" qualifier) were not used in the comparison to the SSSLs and ESVs.

The data presented in this report, except where qualified, meet the principle data quality objective for this SI.

4.0 Site Characterization

Subsurface investigations performed at Motor Pool Area 1600 provided soil, bedrock, and groundwater data used to characterize the geology and hydrogeology of the site.

4.1 Regional and Site Geology

4.1.1 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.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold-and-thrust structural belt (Valley and Ridge Province) where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted, with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992), and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984) but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper undifferentiated Wilson Ridge and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated greenish-gray and black mudstone makes up the Nichols Formation, with thin interbeds of

siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies 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 FTMC 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 FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post as mapped by Warman and Causey (1962) and Osborne and Szabo (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated, thinly interbedded grayish-red-purple mudstone, shale, siltstone, and greenish-red and light gray sandstone, with locally occurring limestone and dolomite. The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962), (Osborne and Szabo, 1984) and the northern portion of the Main Post (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 weather to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

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

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

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

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

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

4.1.2 Site Geology

The soil type at Motor Pool Area 1600 is mapped as the Anniston and Allen gravelly loams. The Anniston and Allen gravelly loams consist of friable soils that have developed in old alluvium on foot slopes and fans along the bases of mountains. The surface soil ranges from very dark grayish brown to dark reddish gray and dark reddish brown. The subsurface soil ranges from dark red to yellowish red (U.S. Department of Agriculture, 1961).

Bedrock at the site is mapped as the Ordovician Little Oak and Newala Limestones (Osborne et al., 1997). 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 (Osborne et al., 1989). The Mississippian/Ordovician Floyd/Athens Shale (undifferentiated) is mapped east of the northeastern section of Parcel 163(7) (Figure 4-1). This unit is dark gray to black shale with interbedded dark gray limestone.

A geologic cross section was constructed from hollow-stem auger boring data collected during the SI, as shown on Figure 4-2. The geologic cross section location is shown on Figure 3-1. The soil encountered during drilling activities at Motor Pool Area 1600 was a brown to yellowish-red clay, silt, sand, and gravel mixture from ground surface to approximately 19 to 22 feet bgs. A reddish-yellow to yellow-brown gravelly clay was found below the clay, sand, silt, and gravel mixture along the southwest portion of the parcel. The reddish-yellow to yellow-brown gravelly

clay was also found from ground surface to a depth of approximately 35 feet bgs in the northeastern portion of the parcel. Dark blue limestone was encountered beneath the gravelly clay in the southwest portion of the parcel. Hard, black shale was encountered beneath gravelly clay in the northeastern portion of the parcel at a depth of approximately 35 feet bgs. Based on the boring data, it appears that the contact between the Floyd/Athens Shale undifferentiated and Little Oak/Newala Limestone is between FTA-163-MW07 and FTA-163-MW15.

4.2 Site Hydrology

4.2.1 Surface Hydrology

Precipitation in the form of rainfall averages about 54 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates (National Oceanic and Atmospheric Administration, 1998). The major surface water features at the Main Post of FTMC include Remount Creek, Cane Creek, and Cave Creek. These waterways flow in a general northwest to westerly direction towards the Coosa River on the western boundary of Calhoun County.

Ground elevation at Motor Pool Area 1600 is approximately 850 feet above mean sea level. The land surface at the site gently slopes to the southwest toward South Branch of Cane Creek and to the northeast toward Ingram Creek.

4.2.2 Hydrogeology

Static groundwater levels were measured in permanent monitoring wells at Motor Pool Area 1600 on January 29, 2001 (Table 3-4). Groundwater elevations were calculated by measuring the depth to groundwater relative to the surveyed top-of-casing elevations. Figure 4-3 is a groundwater elevation contour map constructed from the January 2001 data. As shown on Figure 4-3, groundwater flow in the southwestern portion of the site is to the west-southwest towards South Branch of Cane Creek, with a hydraulic gradient of approximately 0.013 feet per foot. The groundwater elevation data also suggest that groundwater flow in the northeastern portion of the site is to the north-northeast towards Ingram Creek.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at Motor Pool Area 1600 indicate that metals, VOCs, and SVOCs were detected in the various site media. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, the analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to metals background screening values (background concentrations) (SAIC, 1998) to determine if the metals concentrations are within natural background concentrations. Summary statistics for background metals samples collected at FTMC (SAIC, 1998) are included in Appendix H. Additionally, PAH concentrations in surface and depositional soils that exceeded the SSSLs and ESVs were compared to PAH background screening values. The PAH background screening values were derived from PAH analytical data from 18 parcels at FTMC that were determined to represent anthropogenic activity (IT, 2000b). PAH background screening values were developed for two categories of surface soils: beneath asphalt and adjacent to asphalt. The PAH background screening values for soils adjacent to asphalt are the more conservative (i.e., lower) of the PAH background values and are the values used herein for comparison.

Six compounds were quantified by both SW-846 Method 8260B (as VOC) and Method 8270C (as SVOC), namely 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobutadiene, and naphthalene. Method 8260B yields a reporting limit of 0.005 mg/kg, while Method 8270C has a reporting limit of 0.330 mg/kg, which is typical for a soil matrix sample. Because of the direct nature of the Method 8260B analysis and its resulting lower reporting limit, this method should be considered superior to Method 8270C when quantifying low levels (0.005 to 0.330 mg/kg) of these compounds. Method 8270C and its associated methylene chloride extraction step is superior, however, when dealing with samples that contain higher concentrations (greater than 0.330 mg/kg) of these compounds. Therefore all data were considered, and none were categorically excluded. Data validation qualifiers were helpful in evaluating the usability of data, especially if calibration, blank contamination, precision, or accuracy indicator anomalies were encountered. The validation qualifiers and concentrations reported (e.g., whether concentrations were less than or greater than 0.330 mg/kg)

were used to determine which analytical method was likely to return the more nearly accurate result.

The following sections and Tables 5-1 through 5-5 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix E.

5.1 Surface and Depositional Soil Analytical Results

Twenty-nine surface soil samples and two depositional soil samples were collected for chemical analysis at Motor Pool Area 1600. Surface and depositional soil samples were collected from the upper 1 foot of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and background screening values (metals and PAHs), as presented in Table 5-1.

Metals. Twenty-one metals were detected in surface and depositional soil samples collected at Motor Pool Area 1600. The concentrations of eight metals (aluminum, antimony, arsenic, chromium, iron, manganese, thallium, and vanadium) exceeded SSSLs. Of these metals, the concentrations of aluminum (at ten locations), antimony (one location), arsenic (nine locations), chromium (five locations), iron (thirteen locations), mangenese (three locations), and vanadium (five locations) also exceeded their respective background concentration. With the exception of antimony (sample location FTA-163-DEP02) and iron (four locations), the concentrations of these metals were within the range of background values determined by SAIC (1998) (Appendix H). The antimony concentration (4.8 mg/kg) exceeded the range of background values (0.11 to 2.6 mg/kg). The iron results (61,600 to 97,500 mg/kg) exceeded the range of background values for iron (2,510 to 56,300 mg/kg).

The following metals were detected at concentrations exceeding ESVs and their respective background concentrations: aluminum (ten locations), antimony (one location), arsenic (nine locations), beryllium (three locations), cadmium (one location), chromium (five locations), copper (one location), iron (thirteen locations), lead (six locations), manganese (three locations), mercury (nine locations), vanadium (five locations), and zinc (thirteen locations).

Volatile Organic Compounds. Thirteen VOCs were detected in surface and depositional soil samples collected at Motor Pool Area 1600. The 1,1,1-trichloroethane results, methylene chloride results, and all but three of the acetone results were flagged with a “B” data qualifier,

signifying that these compounds were also detected in an associated laboratory or field blank sample. VOC concentrations in the surface and depositional soil samples ranged from 0.0007 to 0.36 mg/kg, and the cumulative concentration was 1.11 mg/kg.

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

Semivolatile Organic Compounds. Nineteen SVOCs, including 13 PAH compounds, were detected in surface and depositional soil samples collected at Motor Pool Area 1600. Di-n-butyl phthalate (sample location FTA-163-GP13), 2-methylnaphthalene (FTA-163-GP13), and diethyl phthalate (FTA-163-DEP02) were each detected in only one of the samples. Sample locations FTA-163-GP13 and FTA-163-GP09 contained 17 and 16 SVOCs, respectively, of the 19 detected SVOCs. SVOC concentrations in the surface and depositional soil samples ranged from 0.026 to 2.5 mg/kg, and the cumulative concentration was 43.3 mg/kg.

The concentrations of six PAH compounds (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene, and pyrene) exceeded SSSLs and/or ESVs and PAH background values at one sample location (FTA-163-GP13). The concentrations of the PAHs at this sample location ranged from 0.45 to 2.5 mg/kg. The concentrations of the non-PAH compounds (2-methylnapthalene, carbazole, di-n-butyl phthalate, diethyl phthalate, phenol, and bis[2-ethylhexyl]phthalate) were below SSSLs and ESVs.

5.2 Subsurface Soil Analytical Results

Thirty subsurface soil samples were collected for chemical analysis at Motor Pool Area 1600. Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-2.

Metals. Twenty-one metals were detected in subsurface soil samples collected at Motor Pool Area 1600. Cadmium was detected at only one sample location (FTA-163-GP11). In addition, all of the detected metals were present in the sample collected at FTA-163-GP11.

The concentrations of seven metals (aluminum, arsenic, chromium, iron, manganese, thallium, and vanadium) exceeded SSSLs. Of these metals, the concentrations of aluminum (at eight locations), arsenic (ten locations), iron (eleven locations), manganese (four locations), and thallium (four locations) also exceeded their respective background concentrations. With the

exception of arsenic (at sample locations FTA-163-GP06 and FTA-163-GP16) and iron (ten locations), the concentrations of the aforementioned metals were within the range of background values determined by SAIC (1998) (Appendix H). Arsenic results (55.2 mg/kg and 58.3 mg/kg) exceeded its range of background values (0.77 to 38 mg/kg). Iron concentrations (48,500 to 97,400 mg/kg) exceeded the range of background values for iron (4,840 to 48,000 mg/kg).

Volatile Organic Compounds. Twenty VOCs were detected in subsurface soil samples collected at Motor Pool Area 1600. The methylene chloride results, 1,1,1-trichloroethane results, and all but one of the acetone results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. In addition, acetone, methylene chloride, and/or 1,1,1-trichloroethane were the only detected VOCs in 19 of the 30 subsurface soil samples. The sample collected at sample location FTA-163-GP09 (3 to 4 feet bgs) contained 16 of the 20 detected VOCs. VOC concentrations in the subsurface soil samples ranged from 0.00066 to 0.81 mg/kg, and the cumulative concentration was 1.82 mg/kg.

The VOC concentrations in subsurface soils were below SSSLs.

Semivolatile Organic Compounds. Eighteen SVOCs, including fifteen PAH compounds, were detected in subsurface soil samples collected at Motor Pool Area 1600. SVOCs were not detected at seven sample locations, and bis(2-ethylhexyl)phthalate was the only detected SVOC at 13 additional locations. SVOC concentrations in the subsurface soil samples ranged from 0.023 to 1.6 mg/kg, and the cumulative concentration was 13.4 mg/kg.

The concentrations of two PAH compounds exceeded SSSLs. Benzo(a)pyrene concentrations (0.19 mg/kg and 0.38 mg/kg) exceeded the SSSL (0.085 mg/kg) at two sample locations (FTA-163-GP19 and FTA-163-MW07); the dibenz(a,h)anthracene concentration (0.11 mg/kg) exceeded the SSSL (0.086 mg/kg) at one sample location (FTA-163-MW07). The concentrations of the non-PAH compounds (2-methylnaphthalene, phenol, and bis[2-ethylhexyl]phthalate) were below SSSLs.

5.3 Groundwater Analytical Results

Three groundwater samples were collected for chemical analysis at Motor Pool Area 1600. The well locations are shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-3.

Metals. Ten metals were detected in groundwater samples collected at Motor Pool Area 1600. Thallium was detected at only one sample location (FTA-163-MW07), and the result was flagged with a "B" data qualifier, signifying that thallium was also detected in an associated laboratory or field blank sample.

The concentrations of four metals (barium, iron, manganese, and thallium) exceeded SSSLs. Of these metals, the concentrations of barium (FTA-163-MW02 and FTA-163-MW15) and thallium (FTA-163-MW07) also exceeded their respective background concentrations. The barium results were within the range of background values determined by SAIC (1998) (Appendix H). The "B"-flagged thallium concentration (0.006 mg/L) at FTA-163-MW07 exceeded its range of background values (0.0001 to 0.0053 mg/L).

Volatile Organic Compounds. Four VOCs (acetone, chloroform, chloromethane, and trichloroethene) were detected in groundwater samples collected at Motor Pool Area 1600. The acetone and chloromethane results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. The chloroform and trichloroethene results were flagged with a "J" data qualifier, signifying that the results were greater than the method detection limit but less than the reporting limit. VOC concentrations in the groundwater samples ranged from 0.00011 to 0.00087 mg/L, and the cumulative concentration was 0.003 mg/L.

The VOC concentrations in groundwater were below SSSLs.

Semivolatile Organic Compounds. SVOCs were not detected in the groundwater samples collected at Motor Pool Area 1600.

5.4 Surface Water Analytical Results

Two surface water samples were collected for chemical analysis at Motor Pool Area 1600 at the locations shown on Figure 3-1. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background concentrations, as presented in Table 5-4.

Metals. Eight metals were detected in surface water samples collected at Motor Pool Area 1600. The aluminum and zinc results were flagged with a "B" data qualifier, signifying that these metals were also detected in an associated laboratory or field blank sample.

The metal concentrations in surface water were below SSSLs. The concentrations of aluminum (sample location FTA-163-SW/SD02) and barium (both locations) exceeded ESVs. With the exception of the barium result at FTA-163-SW/SD02, these metals concentrations were below their respective background concentrations. The barium concentration at FTA-163-SW/SD02 was within the range of background values determined by SAIC (1998) (Appendix H).

Volatile Organic Compounds. Six VOCs (acetone, bromodichloromethane, chloroform, dibromochloromethane, trichloroethene, and cis-1,2-dichloroethene) were detected in surface water samples collected at Motor Pool Area 1600. All of the detected VOCs were present in the sample collected at FTA-163-SW/SD01. Chloroform was the only detected VOC at sample location FTA-163-SW/SD02.

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

Semivolatile Organic Compounds. SVOCs were not detected in the surface water samples collected at Motor Pool Area 1600.

5.5 Sediment Analytical Results

Two sediment samples were collected for chemical and physical analyses at Motor Pool Area 1600. Sediment samples were collected from the upper 0.5 foot of sediment at the locations shown on Figure 3-1. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background concentrations, as presented in Table 5-5.

Metals. Twenty metals were detected in sediment samples collected at Motor Pool Area 1600. Sample location FTA-163-SW/SD01 contained all of the detected metals, and FTA-163-SW/SD02 contained 19 of the 20 detected metals. The thallium and mercury results were flagged with a "B" data qualifier, signifying that these metals were also detected in an associated laboratory or field blank sample.

The metals concentrations in sediments were below SSSLs. The concentrations of five metals (antimony, cadmium, copper, lead, and zinc) exceeded ESVs and their respective background concentrations at sample location FTA-163-SW/SD01. The antimony, cadmium, lead, and zinc results also exceeded the range of background values determined by SAIC (1998) (Appendix H).

Volatile Organic Compounds. Five VOCs (chloroform, methylene chloride,

trichloroethene, trichlorofluoromethane, and p-cymene) were detected in sediment samples collected at Motor Pool Area 1600. The methylene chloride results were flagged with a "B" data qualifier, signifying that the compound was also detected in an associated laboratory or field blank sample.

With the exception of trichlorofluoromethane at sample location FTA-163-SW/SD01, the VOC concentrations in sediments were below SSSLs and ESVs. The trichlorofluoromethane concentration (0.0039 mg/kg) marginally exceeded the ESV (0.0031 mg/kg).

Semivolatile Organic Compounds. Fourteen SVOCs, including thirteen PAH compounds, were detected in sediment samples collected at Motor Pool Area 1600. All of the detected SVOCs were present in the sample collected at sample location FTA-163-SW/SD01. Bis(2-ethylhexyl)phthalate was the only detected SVOC at sample location FTA-163-SW/SD02. SVOC concentrations in the sediment samples ranged from 0.058 to 0.89 mg/kg.

The SVOC concentrations in sediments were below SSSLs. The concentrations of four PAH compounds exceeded ESVs in one sample (FTA-163-SW/SD01). Bis(2-ethylhexyl)phthalate concentrations exceeded the ESV in both sediment samples.

Total Organic Carbon. The sediment samples were analyzed for TOC content. TOC concentrations in the samples were 6,100 mg/kg and 91,100 mg/kg. The TOC results are summarized in Appendix E.

Grain Size. The results of grain size analysis for sediment samples are included in Appendix E.

6.0 Summary, Conclusions, and Recommendations

IT, under contract with USACE, completed an SI at Motor Pool Area 1600 at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site at concentrations that present an unacceptable risk to human health or the environment. The SI at Motor Pool Area 1600 consisted of the sampling and analysis of 29 surface soil samples, 2 depositional soil samples, 30 subsurface soil samples, 3 groundwater samples, and 2 surface water and sediment samples. In addition, four permanent monitoring wells were installed in the residuum groundwater zone to facilitate groundwater sample collection and provide site-specific geological and hydrogeological characterization information.

Chemical analyses of samples collected at Motor Pool Area 1600 indicate that metals, VOCs, and SVOCs were detected in the various site media. Analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC. Additionally, metal concentrations exceeding SSSLs and ESVs were compared to media-specific background screening values (SAIC, 1998), and PAH compound concentrations exceeding SSSLs and ESVs in surface and depositional soils were compared to PAH background screening values (IT, 2000b).

The potential threat to human receptors is expected to be low. Although the site is projected for industrial reuse, the soils and groundwater data were screened against residential human health SSSLs to evaluate the site for possible unrestricted land reuse. In soils, with the exception of antimony (one location [4.8 mg/kg]), arsenic (two locations [55.2 mg/kg and 58.3 mg/kg]), and iron (several locations), the concentrations of the metals that exceeded SSSLs were below their respective background concentrations or within the range of background values and thus do not pose an unacceptable risk to human health. PAH compounds were detected at one surface soil sample location (FTA-163-GP13) at concentrations (0.45 to 2.5 mg/kg) exceeding SSSLs and PAH background values. In addition, the PAH compound benzo(a)pyrene was detected in two subsurface soil samples at concentrations (0.19 mg/kg and 0.38 mg/kg) exceeding the SSSL. However, these PAH compounds are believed to be related to anthropogenic activities (i.e., asphalt pavement) and not related to operations conducted at the site. VOC concentrations in site media were below SSSLs.

Metals and PAH compounds were detected in surface/depositional soils and sediments at concentrations exceeding ESVs. However, the potential impact to ecological receptors is

expected to be minimal, based on the existing viable habitat and site conditions. The site is fenced and is located in a well-developed area of the Main Post consisting of buildings, concrete foundations, and paved/gravel-covered areas. Grassy or wooded areas are very limited, and the site does not support viable ecological habitat.

Based on the results of the SI, past operations at Motor Pool Area 1600 do not appear to have adversely impacted the environment. The chemical constituents detected in site media do not pose an unacceptable risk to human health and the environment. Therefore, IT recommends "No Further Action" and unrestricted land reuse at Motor Pool Area 1600, Parcels 163(7), 17(7), 18(7), 19(7), 71(7), 503(7), and 504(7).

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ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

APPENDIX A

SAMPLE COLLECTION LOGS AND ANALYSIS REQUEST/CHAIN-OF-CUSTODY RECORDS

SAMPLE COLLECTION LOGS

ANALYSIS REQUEST/CHAIN-OF-CUSTODY RECORDS

APPENDIX B

BORING LOGS AND WELL CONSTRUCTION LOGS

BORING LOGS

WELL CONSTRUCTION LOGS

APPENDIX C

WELL DEVELOPMENT LOGS

APPENDIX D

SURVEY DATA

APPENDIX E

SUMMARY OF VALIDATED ANALYTICAL DATA

APPENDIX F

DATA VALIDATION SUMMARY REPORT

APPENDIX G

VARIANCES REPORTS

APPENDIX H

SUMMARY STATISTICS FOR BACKGROUND MEDIA, FORT McCLELLAN, ALABAMA