Final

Site Investigation Report
Ground Scar South of Building 3134, Parcel 153(7)

Fort McClellan
Calhoun County, Alabama

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK08, IT Corporation (IT) completed a site investigation (SI) at the Ground Scar South of Building 3134, Parcel 153(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 the Ground Scar South of Building 3134, Parcel 153(7), consisted of the sampling and analysis of six surface soil samples, four subsurface soil samples, four groundwater samples, one surface water sample, and two sediment samples. In addition, one permanent and three temporary 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. As part of this SI, IT incorporated data previously collected by QST Environmental Inc. at the Ground Scar South of Building 3134, Parcel 153(7).

The analytical results indicate that metals, volatile organic compounds (VOC), and semivolatile organic compounds (SVOC) were detected in the environmental media sampled. Nitroexplosive compounds, pesticides, and polychlorinated biphenyls were not detected in the samples collected. To evaluate whether the detected constituents present 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 impact to human receptors is expected to be minimal. Although the site is projected for mixed business reuse, the soils and groundwater data were screened against residential human health SSSLs to evaluate the site for possible unrestricted land reuse. In soils, the metals that exceeded residential human health SSSLs were below their respective background concentrations or within the range of background values and, thus, do not pose an unacceptable risk to future human receptors. Three polynuclear aromatic hydrocarbon (PAH) compounds (benzo[a]anthracene, benzo[a]pyrene, and benzo[b]fluoranthene) were detected in one surface soil sample at concentrations (1.08 milligrams per kilograms [mg/kg] to 1.1 mg/kg) exceeding SSSLs. Based on the low concentrations and limited spatial distribution, the PAH compounds are not expected to pose a threat to human health. VOC concentrations in soils were below SSSLs.

In groundwater, several metals were detected in three samples at concentrations exceeding SSSLs and background concentrations. However, these groundwater samples were collected from small diameter (1-inch) direct-push temporary wells. It is likely that these groundwater samples had high turbidity at the time of sample collection that caused the elevated metals concentrations. VOC and SVOC concentrations in groundwater were below SSSLs. The VOC methyl tertiary butyl ether (MTBE) was detected in one groundwater sample at a concentration of 0.005 milligrams per liter (mg/L). An SSSL or U.S. Environmental Protection Agency (EPA) drinking water standard for MTBE does not exist; however, the MTBE concentration was below the EPA Region 9 Preliminary Remediation Goal for MTBE in tap water (0.02 mg/L).

Three metals (copper, iron, and nickel) were detected in a limited number of surface soil and sediment samples at concentrations exceeding ESVs and background. Two VOCs (tetrachloroethene and trichloroethene) were detected in surface soils at concentrations (0.0014 to 0.033 mg/kg) exceeding ESVs. In addition, six PAH compounds (up to 2.54 mg/kg) exceeded ESVs in one surface soil sample. Based on the low levels and limited spatial distribution of chemical constituents detected, the potential threat to ecological receptors is expected to be low.

Based on the results of the SI, past operations at the Ground Scar South of Building 3134, Parcel 153(7), do not appear to have adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, IT recommends "No Further Action" and unrestricted land reuse at the Ground Scar South of Building 3134, Parcel 153(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 IT Corporation (IT) to provide environmental services for completion of the site investigation (SI) at the Groundscar South of Building 3134, Parcel 153(7), under Contract Number DACA21-96-D-0018, Task Order CK08.

The U.S. Army Environmental Center (AEC) originally contracted QST Environmental, Inc. (QST) to perform the SI at the Groundscar South of Building 3134, Parcel 153(7). QST prepared an SI work plan (QST, 1998) and conducted field activities in the summer of 1998. Upon further evaluation of the site, the BRAC Cleanup Team (BCT) determined that additional data were needed to characterize the site. Therefore, the USACE contracted IT to collect one surface soil sample, one subsurface soil sample, one groundwater sample, one surface water sample, and one sediment sample. In addition, IT installed one permanent groundwater monitoring well.

This SI report summarizes field activities, including field sampling and analysis and monitoring well installation activities, and data compiled by IT and QST for the SI conducted at the Ground Scar South of Building 3134, Parcel 153(7).

1.1 Project Description

The Ground Scar South of Building 3134, Parcel 153(7), 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.

IT prepared a site-specific field sampling plan (SFSP) addendum (IT, 1999) to the QST work plan (QST, 1998) that was finalized in September 1999. The SFSP addendum provided technical guidance for sample collection and analysis at the Ground Scar South of Building 3134, Parcel

153(7). The SFSP was used as an attachment 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 and quality assurance plan.

The SI included field work to collect six surface soil samples (one by IT and five by QST), four subsurface soil samples (one by IT and three by QST), four groundwater samples (one by IT and three by QST), one surface water sample (IT), and two sediment samples (one by IT and one by QST) to determine if potential site-specific chemicals are present at the Ground Scar South of Building 3134, Parcel 153(7).

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 the Ground Scar South of Building 3134, Parcel 153(7), at concentrations that present an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on comparisons 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 and ESVs are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). Background metals screening values are presented in the *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

The Ground Scar South of Building 3134, Parcel 153(7), is located in the west-central portion of the FTMC Main Post (Figure 1-1), in a wooded area approximately 150 feet south of Building 3134 (Figure 1-2). The ground scar was identified on aerial photographs taken in 1964 (ESE, 1998). The ground scar was a triangular area measuring approximately 160 feet (east-west) by 120 feet (north-south) (Figure 1-2). No other information was available regarding activities at this site (ESE, 1998).

Site elevation is approximately 800 feet above mean sea level. An intermittent stream is located east of the site and flows to the northeast (Figure 1-2).

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, the Alabama Department of Environmental Management (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 to document site environmental conditions have not been conducted at the Ground Scar South of Building 3134, Parcel 153(7). Therefore, the site was classified as a Category 7 CERFA site: areas that are not evaluated or require further evaluation.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT and QST at the Ground Scar South of Building 3134, Parcel 153(7), including environmental sampling and analysis and groundwater monitoring well installation activities.

3.1 Environmental Sampling

The environmental sampling performed during the SI at the Ground Scar South of Building 3134, Parcel 153(7), included the collection of surface soil samples, subsurface soil samples, a surface water sample, sediment samples, and groundwater samples for chemical analysis. 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. Samples collected by IT are designated with the prefix "GSBP-153," and samples collected by QST are designated with the prefix "SI13." Sampling locations are shown on Figure 3-1. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.3.

3.1.1 Surface Soil Sampling

A total of six surface soil samples were collected during the SI at the Ground Scar South of Building 3134, Parcel 153(7). IT collected one surface soil sample and QST collected five surface soil samples. Soil sampling locations and rationale are presented in Table 3-1. Sampling locations are shown on Figure 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 the sampling rationale, presence of surface structures, site topography, and buried utilities.

IT Sample Collection. IT collected one surface soil sample at Parcel 153(7) from the upper 1 foot of soil using direct-push technology (DPT) following the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000a). The surface soil sample was collected by first removing surface debris, such as rocks and 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). The soil to be analyzed for volatile organic compounds (VOC) was collected directly from the DPT 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 sample was analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3. The sample collection log is included in Appendix A.

QST Sample Collection. QST collected five surface soil samples at Parcel 153(7) from 0 to 1 foot below ground surface (bgs) using either DPT samplers or a stainless-steel hand auger in accordance with the QST work plan (QST, 1998). The samples were analyzed for parameters listed in Table 3-2 using methods outlined in Section 3.3. Sample collection logs are included in Appendix A.

3.1.2 Subsurface Soil Sampling

Subsurface soil samples were collected from four soil borings at the Ground Scar South of Building 3134, Parcel 153(7), as shown on Figure 3-1. IT collected one subsurface soil sample and QST collected three subsurface soil samples. 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, and site topography.

IT Sample Collection. IT collected a subsurface soil sample from one soil boring at a depth of 3 to 4 feet bgs in the unsaturated zone. The soil boring was advanced and the soil sample collected using DPT following the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000a). The sample collection log is included in Appendix A. The sample was analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3.

The subsurface soil sample was 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 sample displaying the highest reading was selected and sent to the laboratory for analysis. The soil to be analyzed for VOCs was collected directly from the DPT 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 sample submitted for laboratory analysis is summarized in Table 3-2. The on-site geologist constructed a detailed boring log as presented in Appendix B. At the completion of soil sampling, the borehole was abandoned with bentonite chips hydrated with potable water following borehole abandonment procedures summarized in Appendix B of the SAP (IT, 2000a).

QST Sample Collection. QST contracted Graves Service Company, Inc. to complete the soil borings. QST collected subsurface soil samples at depths of 3 to 4 feet bgs using either a DPT sampling system or a stainless-steel hand auger, in accordance with the procedures outlined in the QST work plan (QST, 1998).

3.1.3 Well Installation

A total of four groundwater monitoring wells were installed at the Ground Scar South of Building 3134, Parcel 153(7), as shown on Figure 3-1. IT installed one permanent groundwater monitoring well, and QST installed three temporary groundwater monitoring wells. Table 3-3 summarizes construction details of the wells installed at the Ground Scar South of Building 3134, Parcel 153(7). The well construction logs are included in Appendix B.

IT Well Installation. IT installed one permanent monitoring well in the residuum groundwater zone at the Ground Scar South of Building 3134, Parcel 153(7), to collect a groundwater sample for laboratory analysis.

IT contracted Miller Drilling, Inc. to install the well with a hollow-stem auger drill rig at the location shown on Figure 3-1. The well was installed following procedures outlined in Section 4.7 and Appendix C of the SAP (IT, 2000a). The borehole at this location was advanced with a 4.25-inch inside diameter (ID) hollow-stem auger from ground surface to the first water-bearing zone in residuum. 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 refusal was encountered, the auger was advanced until the first water-bearing zone was encountered. The on-site geologist constructed a lithological log for 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. This information was used to determine the optimal placement of the monitoring well screen interval and to provide site-specific geological and hydrogeologic information. The lithological log for the borehole is included in Appendix B.

Upon reaching the target depth, a 15-foot-length of 2-inch ID, 0.010-inch factory slotted, Schedule 40 polyvinyl chloride (PVC) screen with a 3-inch PVC end cap was placed through the auger to the bottom of the borehole. 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 well was surged using a solid PVC surge block for approximately 10 minutes, or until no more settling of the filter sand 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. The bentonite seal placement and hydration followed procedures in Appendix C of the SAP (IT, 2000a). The well was then grouted to ground surface with a bentonite-cement grout. A locking well cap was placed on the PVC well casing. The well surface completion included placing a protective steel casing over the PVC riser and installing a concrete pad around the protective steel casing. Concrete-filled protective steel posts were placed around the well pad.

The well was 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 log is included in Appendix C.

QST Well Installation. QST installed three temporary monitoring wells in the residuum groundwater zone at the Ground Scar South of Building 3134, Parcel 153(7), using direct-push technology. The temporary wells were installed in accordance with procedures outlined in the QST work plan (QST, 1998). Table 3-3 summarizes construction details of the wells installed by QST at the site. The well construction logs are included in Appendix B.

QST contracted Graves Service Company Inc. to install the temporary wells at Parcel 153(7) at the locations shown on Figure 3-1. The temporary wells were installed, purged, sampled, and removed within 24 hours. Initially, a 2-inch diameter borehole was installed for each temporary well. The 2-inch borehole was advanced up to 5 feet into the uppermost water-bearing zone. Soil descriptions were prepared by the QST geologist and are presented in Appendix B of this SI report. Upon reaching the target depth at each borehole, a 10-foot-length of 1-inch (nominal) diameter Schedule 40 PVC slotted screen (0.010-inch) was attached to a 1-inch (nominal) PVC riser and lowered into the borehole. A sand pack consisting of 20/40 silica sand was placed into the annular space to the ground surface.

3.1.4 Water Level Measurements

The depth to groundwater was measured in the permanent well installed by IT at the Ground Scar South of Building 3134, Parcel 153(7), on March 14, 2000, following procedures outlined in Section 4.18 of the SAP (IT, 2000a). Depth to groundwater was measured with an electronic water level meter. The measurement was referenced to the top of the well casing (Table 3-4).

3.1.5 Groundwater Sampling

Groundwater samples were collected from a total of four monitoring wells at the Ground Scar South of Building 3134, Parcel 153(7). IT collected a groundwater sample from one permanent monitoring well (GSBP-153-MW01), and QST collected groundwater samples from three temporary wells (SI13-GWS01, SI13-GWS02, and SI13-GWS03). The well locations are shown on Figure 3-1. 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.

IT Sample Collection. Groundwater sample collection 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 (temperature, pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, and turbidity) stabilized. Purging and sampling were performed with a submersible 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 sample was analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.3.

QST Sample Collection. QST collected groundwater samples immediately following completion of well purging using a peristaltic pump and vacuum jar. Groundwater sample parameters were recorded for pH, conductivity, and temperature (turbidity, dissolved oxygen, and oxidation-reduction potential were not monitored). Field parameter readings are summarized in Table 3-6. QST 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 3.3.

3.1.6 Surface Water Sampling

IT collected one surface water sample at the Ground Scar South of Building 3134, Parcel 153(7), at the location shown on Figure 3-1. The surface water sampling location and rationale are listed in Table 3-1. The surface water sample designation and QA/QC samples are listed in Table 3-7. The sampling location was determined in the field, based on drainage pathways and actual field observations.

Sample Collection. The surface water sample was collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP (IT, 2000a). The sample was collected by dipping a clean stainless-steel pitcher in the water and pouring the water in the appropriate sample containers. The surface water sample was collected after the field parameters described in Section 3.1.5 had been measured using a calibrated water-quality meter. The field parameter readings are presented in Table 3-6. The sample collection log is included in Appendix A. The sample was analyzed for the parameters listed in Table 3-7 using methods outlined in Section 3.3.

3.1.7 Sediment Sampling

Two sediment samples were collected during the SI at the Ground Scar South of Building 3134, Parcel 153(7). IT collected one sediment sample at the same location as the surface water sample discussed in Section 3.1.6. QST collected one sediment sample from a different location. The sediment sampling locations are shown on Figure 3-1. Sediment sampling locations and rationale are presented in Table 3-1. The sediment sample designations and QA/QC samples are listed in Table 3-7. The sediment sampling locations were determined in the field, based on drainage pathways and actual field observations.

IT Sample Collection. IT sediment sample collection was conducted in accordance with the procedures specified in Section 4.9.1.2 of the SAP (IT, 2000a). The sample was collected from the upper 0.5-foot of sediment with a clean stainless-steel hand auger and placed in a stainless-steel bowl. The sediment sample to be analyzed for VOCs was then immediately collected from the stainless-steel bowl with three EnCore samplers. The remaining portion of the sediment was homogenized and placed in the appropriate sample containers.

QST Sample Collection. QST sediment sample collection was conducted in accordance with procedures outlined in the QST work plan (QST, 1998). The sediment sample was collected by dipping a clean sample jar that was attached to a stainless-steel pole into the water and dragging it along the bottom to collect the sediment. The sediment was emptied onto a piece of heavy-duty aluminum foil. Once enough sediment had been collected for the required analyses, the fraction for VOC analysis was immediately containerized. Following VOC sample collection, the remaining sediment was thoroughly mixed and then placed into the appropriate sample containers using a stainless-steel spoon.

IT and QST 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 3.3.

3.2 Surveying of Sample Locations

IT 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.

QST surveyed sample locations using global positioning system survey techniques or traditional surveying techniques described in the QST work plan (QST, 1998). Map coordinates for each sample location were determined using a Transverse Mercator (UTM) or State Planar grid to within ± 3 feet (± 1 meter).

3.3 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. Target analyses for samples collected at the Ground Scar South of Building 3134, Parcel 153(7), included:

- Target compound list VOCs – EPA Method 5035/8260B
- Target compound list SVOCs – EPA Method 8270C
- Target analyte list metals – EPA Method 6010B/7000
- Pesticides/polychlorinated biphenyls (PCB) – EPA Method 8081
- Nitroexplosives – EPA Method 8330
- Total organic carbon – EPA Method 9060
- Grain size - American Society for Testing and Materials D421/D422 (sediment only).

The samples were analyzed using EPA SW-846 methods, including Update III Methods where applicable.

3.4 Sample Preservation, Packaging, and Shipping

IT preserved, packaged, and shipped samples following 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 Chapter 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 Quanterra Environmental Services in Knoxville, Tennessee. Split samples were shipped to the USACE South Atlantic Division Laboratory in Marietta, Georgia.

QST preserved, packaged, and shipped samples following guidelines specified in the QST work plan (QST, 1998).

3.5 Investigation-Derived Waste Management and Disposal

IT Investigation-Derived Waste. IT 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 the Ground Scar South of Building 3134, Parcel 153(7), 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 (TCLP) analyses. Based on the results, drill cuttings and personal protective equipment generated during the SI at the Ground Scar South of Building 3134, Parcel 153(7), 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.

QST Investigation-Derived Waste. QST-generated IDW was managed and disposed as outlined in the QST work plan (QST, 1998). Borehole cuttings were collected as they were generated and screened with a PID. If the PID indicated greater than 50 parts per million VOCs in the air, then the soil was containerized in 55-gallon drums. All drilling fluids, purge water, and decontamination fluids were containerized in drums or other appropriate containers. All IDW was characterized as hazardous or nonhazardous using TCLP analysis. If the IDW exceeded the TCLP regulatory criteria, then it was disposed as hazardous waste in an approved hazardous waste facility.

3.6 Variances/Nonconformances

Neither IT nor QST documented any variances or nonconformances during completion of the SI at the Ground Scar South of Building 3134, Parcel 153(7).

3.7 Data Quality

IT Data. 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 3.6, there were not any variances or nonconformances to impact the usability of the data.

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. A summary of validated analytical data is included in Appendix E. A complete (100 percent) Level III data validation effort was performed on the reported analytical data. Appendix F includes a data validation summary report that discusses the results of the IT data 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 ITEMS™ database for tracking and reporting.

QST Data. QST data were submitted to the IRDMIS database at the conclusion of QST field activities. Hard-copy data packages were sent to the AEC in Edgewood, Maryland for storage. IT retrieved the electronic data via IRDMIS and the original data packages from the AEC for evaluation. From the IRDMIS data, IT was able to identify the key fields of information (analytical records, well construction and geotechnical information, sample location information, and water level readings) and translate the data into the ITEMS database.

The field sample analytical data are presented in tabular form in Appendix E. QST hard-copy analytical data packages were validated during a complete (100 percent) Level III data validation effort. Appendix F includes a data validation summary report that discusses the results of the QST data validation. Selected results were rejected or qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the data validation report. In addition, during the validation the electronic results were compared to the hard-copy results. Concentrations in the database were corrected where necessary and validation qualifiers added to the QST data using ITEMS to reflect the findings summarized in the QST data validation report.

After the QST data validation was complete and the results were updated, the QST and IT data were merged using ITEMS for inclusion in this SI report. The combined validated analytical data are presented in tabular form in Appendix E. The qualified data were used in the comparisons to the SSSLs and ESVs developed by IT. The IT and QST 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 the Ground Scar South of Building 3134, Parcel 153(7), provided soil, geologic, 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 soils mapped at the Ground Scar South of Building 3134, Parcel 153(7), consist of Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded, and 10 to 15 percent slopes, eroded. The Anniston and Allen series of soils (which are mapped together as undifferentiated) consist of deep, well-drained, strongly acidic, friable soils that formed in old local alluvium that washed from adjacent, higher-lying Linker, Muskingum, Enders, and Montevallo soils. In turn, these soils developed from weathered sandstone, shale, and quartzite. The texture of the subsoil ranges from light clay loam to clay or silty clay loam. Sandstone and quartzite gravel and cobbles can be found throughout the soil (U.S. Department of Agriculture, 1961).

The Ground Scar South of Building 3134, Parcel 153(7), is situated near the southwestern boundary of the Ordovician window in the uppermost thrust sheet, with a splay of the Jacksonville Fault just south of the site. Bedrock beneath the site is mapped as Mississippian/Ordovician Floyd and Athens shale, undifferentiated. The Cambrian Chilhowee Group underlies the area south of the site and is an area of high relief. Sandstone and quartzite rock fragments present within the residuum at the site likely have been derived from this area.

Based on direct-push and hollow-stem auger boring data collected by IT and QST during the SI, residuum beneath the Ground Scar South of Building 3134, Parcel 153(7), consists of predominantly silt and clay with some gravel, overlying weathered shale. The depth to the weathered shale ranged from 9 to 14 feet bgs across the site. Competent bedrock was not encountered during drilling.

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. 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.

Surface runoff at the Ground Scar South of Building 3134, Parcel 153(7), follows the general topography and flows east towards the intermittent stream located just east of the site. The intermittent stream flows to the northeast towards South Branch of Cane Creek.

4.2.2 Hydrogeology

The static groundwater level was measured in the permanent well installed by IT at the site on March 14, 2000, as summarized in Table 3-4. Based on groundwater elevation data from monitoring wells installed by IT in the vicinity of Parcel 153(7), groundwater flow at the site appears to be to the east/northeast towards the tributary to South Branch of Cane Creek (Figure 4-1). This would suggest that the area is hydraulically connected to the creek.

During boring and well installation activities, groundwater was encountered in clay residuum at a depth of 21 feet bgs at GSBP-153-MW01. The static groundwater level for this well, summarized in Table 3-4, was approximately 11 feet above the depth-to-water data from the boring log for the well (Appendix B). This indicates that the groundwater has an upward hydraulic head and is under semiconfined conditions.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at the Ground Scar South of Building 3134, Parcel 153(7), indicate that metals, VOCs, and SVOCs were detected in the various site media. Nitroexplosive compounds, pesticides, and PCBs were not detected in any of the samples collected. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, 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.

Metal 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 G.

Six compounds were quantified by both SW-846 Method 8260B (as VOC) and Method 8270C (as SVOC), including 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobutadiene, and naphthalene. Method 8260B yields an reporting limit (RL) of 0.005 milligrams per kilogram (mg/kg), while Method 8270C has a RL 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 RL, 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 accurate result.

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

5.1 Surface Soil Analytical Results

Six surface soil samples were collected for chemical analysis at the Ground Scar South of Building 3134, Parcel 153(7). Surface 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 metals background screening values, as presented in Table 5-1.

Metals. Twenty-two metals were detected in surface soil samples collected at the Ground Scar South of Building 3134, Parcel 153(7). One of the mercury results and one of the thallium results were flagged with a "B" data qualifier, signifying that these metals were also detected in an associated laboratory or field blank sample.

Concentrations of aluminum (at four locations), arsenic (six locations), chromium (GSBP-153-MW01), iron (six locations), and thallium (GSBP-153-MW01) exceeded SSSLs. With the exception of iron at two locations (SI13-SS01 and SI13-SS02), the concentrations of these metals were below their respective background concentrations. The iron results were within range of background values determined by SAIC (1998) (Appendix G).

The concentrations of aluminum, arsenic, chromium, copper, iron, manganese, and vanadium exceeded ESVs. With the exception of copper (SI13-SS02) and iron (two locations), the concentrations of these metals were below their respective background concentrations. The iron results were within the range of background values (Appendix G). The copper result (45.2 mg/kg) exceeded the range of background copper values (1.3 to 24 mg/kg).

Volatile Organic Compounds. Thirteen VOCs were detected in surface soil samples collected at the site. All but one of the methylene chloride results were flagged with a "B" data qualifier, signifying that this compound was also detected in an associated laboratory or field blank sample. VOC concentrations in the surface soil samples ranged from 0.00045 to 0.5 mg/kg, and the cumulative concentration was 1.63 mg/kg.

VOC concentrations in surface soils were below SSSLs. Concentrations of tetrachloroethene (five locations) and trichloroethene (four locations) exceeded ESVs.

Semivolatile Organic Compounds. Seventeen SVOCs, including fourteen PAH compounds, were detected in surface soil samples collected at the Ground Scar South of Building 3134, Parcel 153(7). SVOCs were not detected at three sample locations. Sample location SI13-SS05 contained 15 of the 17 detected SVOCs. SVOC concentrations in the surface soil samples ranged from 0.045 to 2.54 mg/kg, and the cumulative concentration was 15.1 mg/kg.

The concentrations of the PAHs benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene exceeded SSSLs at sample location SI13-SS05. The concentrations of six PAH compounds (anthracene, benzo[a]pyrene, fluoranthene, naphthalene, phenanthrene, and pyrene) exceeded ESVs at one sample location (SI13-SS05). The PAH concentrations exceeding SSSLs and ESVs ranged from 0.2 to 2.54 mg/kg.

Total Organic Carbon. Two of the surface soil samples (13-SS01A and 13-SS04) were analyzed for TOC content. TOC concentrations in the samples were 2,590 and 16,600 mg/kg, as summarized in Appendix E.

5.2 Subsurface Soil Analytical Results

Four subsurface soil samples were collected for chemical analysis at the Ground Scar South of Building 3134, Parcel 153(7). 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 screening values, as presented in Table 5-2.

Metals. Twenty-one metals were detected in subsurface soil samples collected at the Ground Scar South of Building 3134, Parcel 153(7). The concentrations of four metals (aluminum, arsenic, iron, and thallium) exceeded residential human health SSSLs but were below their respective background concentrations.

Volatile Organic Compounds. Thirteen VOCs were detected in subsurface soil samples collected at the Ground Scar South of Building 3134, Parcel 153(7). The methylene chloride results were flagged with a "B" data qualifier, signifying that this compound was also detected in an associated laboratory or field blank sample. VOC concentrations in the subsurface soil samples ranged from 0.00056 to 0.15 mg/kg, and the cumulative concentration was 0.49 mg/kg.

The VOC concentrations in subsurface soils were below SSSLs.

Semivolatile Organic Compounds. The SVOC bis(2-ethylhexyl)phthalate was detected in one sample (GSBP-153-MW01) at a concentration below its SSSL.

Total Organic Carbon. Two of the subsurface soil samples (13-SS01B and 13-SS03B) were analyzed for TOC content. TOC concentrations in the samples were 4,400 mg/kg and 2,380 mg/kg, as summarized in Appendix E.

5.3 Groundwater Analytical Results

One permanent monitoring well and three temporary monitoring wells were sampled at the Ground Scar South of Building 3134, Parcel 153(7), at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background screening values, as presented in Table 5-3.

Metals. Nineteen metals were detected in groundwater samples collected at the Ground Scar South of Building 3134, Parcel 153(7). Sample locations SI13-GWS01, SI13-GWS02, and SI13-GWS03 contained 17, 17, and 18 metals, respectively, of the 19 detected metals.

Several metals were detected in the three 1-inch DPT wells at concentrations exceeding SSSLs and background concentrations. Because DPT well construction involves the use of a limited volume of filter-pack sand in the annular space of the well, the limited filter sand does not provide adequate filtration in soils with fine-grained silt and clay particles. Although purge records for these wells did not indicate groundwater turbidity levels, it is suspected that the samples from these wells had high turbidity at the time of sample collection that caused the elevated metals results. The effect of high turbidity on metals concentrations in groundwater has been previously demonstrated in a groundwater resampling study conducted by IT at FTMC (IT, 2000c) (Appendix H).

By comparison, the groundwater sample collected from the permanent well installed using hollow-stem augers, had only one metal (barium) detected at a concentration exceeding the SSSL and background concentration. However, the barium result was within the range of background values determined by SAIC (1998) (Appendix G). The groundwater turbidity at the time of sample collection was 22 NTUs.

Volatile Organic Compounds. Five VOCs (2-butanone, acetone, chloromethane, methyl tertiary butyl ether (MTBE), and methylene chloride) were detected in groundwater samples collected at the Ground Scar South of Building 3134, Parcel 153(7). The acetone and methylene chloride results were flagged with a "B" data qualifier, indicating that these compounds were also detected in an associated laboratory or field blank sample. Sample location SI13-GWS03 contained five of the seven detected VOCs. VOC concentrations in the groundwater samples ranged from 0.00012 to 0.03 mg/L, and the cumulative concentration was 0.082 mg/L.

VOCs concentrations in groundwater were below SSSLs. An SSSL for MTBE does not exist; however, the MTBE concentration (0.005 mg/L) was below the EPA Region 9 Preliminary Remediation Goal for MTBE in tap water (0.02 mg/L) (EPA, 2000).

Semivolatile Organic Compounds. Bis(2-ethylhexyl)phthalate was detected in one groundwater sample (SI13-GWS03) at a concentration below its SSSL.

5.4 Surface Water Analytical Results

One surface water sample was collected for chemical analysis at the Ground Scar South of Building 3134, Parcel 153(7), at the sample location shown on Figure 3-1. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-4.

Metals. Ten metals were detected in the surface water sample collected at the Ground Scar South of Building 3134, Parcel 153(7). The metals concentrations in surface water were below SSSLs. Aluminum, barium, and iron concentrations exceeded ESVs but were below their respective background concentrations.

Volatile Organic Compounds. Acetone was detected in the surface water sample at a concentration below the SSSL and ESV.

Semivolatile Organic Compounds. SVOCs were not detected in the surface water sample collected at the Ground Scar South of Building 3134, Parcel 153(7).

5.5 Sediment Analytical Results

Two sediment samples were collected for chemical and physical analyses at the Ground Scar South of Building 3134, Parcel 153(7). Samples were collected from the upper 0.5-foot of sediment at the sample locations shown on Figure 3-1. Analytical results were compared to recreational site user human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-5.

Metals. Twenty-three metals were detected in sediment samples collected at the Ground Scar South of Building 3134, Parcel 153(7). Each of the detected metals was present in the sample collected at SI13-SED01. One mercury result and one thallium result 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. Concentrations of arsenic (both locations), copper (SI13-SED01), lead (SI13-SED01), and nickel (both locations) exceeded ESVs. However, with the exception of nickel in one of the samples (SI13-SED01), the concentrations of these metals were below their respective background concentrations or within the range of background values determined by SAIC (1998) (Appendix G). The nickel concentration (45.7 mg/kg) exceeded the range of background nickel values (2.4 to 33 mg/kg).

Volatile Organic Compounds. Ten VOCs, (1,1,1-trichloroethane, 1,2-dichloropropane, 2-butanone, acetone, methylene chloride, tetrachloroethene, toluene, trichloroethene, trichlorofluoromethane, and xylenes) were detected in sediment samples collected at the Ground Scar South of Building 3134, Parcel 153(7). The sediment sample collected at SI13-SED01 contained nine of the ten detected VOCs. VOC concentrations in the sediment samples ranged from 0.0013 to 0.17 mg/kg, and the cumulative concentration was 0.3 mg/kg.

With the exception of trichlorofluoromethane in one sample, VOC concentrations in sediments were below SSSLs and ESVs. The trichlorofluoromethane concentration (0.0038 mg/kg) at GSBP-153-SW/SD01 exceeded the ESV (0.0031 mg/kg) but was below the SSSL.

Semivolatile Organic Compounds. Nine SVOCs, including eight PAH compounds, were detected in sediment samples collected at the Ground Scar South of Building 3134, Parcel 153(7). Each of the detected SVOCs was present in the sample collected at SI13-SED01. Bis(2-ethylhexyl)phthalate was the only detected SVOC at sample location GSBP-153-SW/SD01.

With the exception of bis(2-ethylhexyl)phthalate, the SVOC concentrations in sediments were below SSSLs and ESVs. The bis(2-ethylhexyl)phthalate concentrations (0.21 and 0.44 mg/kg) exceeded the ESV (0.182 mg/kg) at both sample locations but were below the SSSL.

Total Organic Carbon. The sediment samples were analyzed for TOC content. TOC concentrations in the sediment samples were 3,500 and 7,990 mg/kg, as summarized in Appendix E.

Grain Size. The sediment sample collected by IT was analyzed for grain size as summarized in Appendix E.

6.0 Summary, Conclusions, and Recommendations

IT, under contract with the USACE, completed an SI at the Ground Scar South of Building 3134, Parcel 153(7), 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 the Ground Scar South of Building 3134, Parcel 153(7), consisted of the sampling and analysis of six surface soil samples, four subsurface soil samples, four groundwater samples, one surface water sample, and two sediment samples. In addition, one permanent groundwater monitoring well and three temporary 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. As part of the SI, IT incorporated data previously collected by QST at the Ground Scar South of Building 3134, Parcel 153(7).

Chemical analysis of samples collected at the Ground Scar South of Building 3134, Parcel 153(7), indicates that metals, VOCs, and SVOCs were detected in the various site media. Nitroexplosive compounds, pesticides, and PCBs were not detected were not detected in any of the samples collected at the site. 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).

The potential impact to human receptors is expected to be minimal. Although the site is projected for mixed business reuse, the soils and groundwater data were screened against residential human health SSSLs to evaluate the site for possible unrestricted land reuse. In soils, the metals that exceeded residential human health SSSLs were below their respective background concentrations or within the range of background values and, thus, do not pose an unacceptable risk to future human receptors. Three PAH compounds (benzo[a]anthracene, benzo[a]pyrene, and benzo[b]fluoranthene) were detected in one surface soil sample at concentrations (1.08 to 1.1 mg/kg) exceeding SSSLs. Based on the low concentrations and limited spatial distribution at the site, the PAH compounds are not expected to pose a threat to human health. VOC concentrations in soils were below SSSLs.

In groundwater, several metals were detected in three samples at concentrations exceeding SSSLs and background concentrations. However, these groundwater samples were collected from small diameter (1-inch) DPT wells. It is likely that these groundwater samples had high turbidity at the time of sample collection that caused the elevated metals concentrations. VOC and SVOC concentrations in groundwater were below SSSLs. MTBE was detected in one groundwater sample at a concentration of 0.005 mg/L. An SSSL or EPA drinking water standard for MTBE does not exist; however, the MTBE concentration was below the EPA Region 9 Preliminary Remediation Goal for MTBE in tap water (0.02 mg/L) (EPA, 2000).

Three metals (copper, iron, and nickel) were detected in a limited number of surface soil and sediment samples at concentrations exceeding ESVs and background. Two VOCs (tetrachloroethene and trichloroethene) were detected in surface soils at concentrations (0.0014 to 0.033 mg/kg) exceeding ESVs. In addition, six PAH compounds (up to 2.54 mg/kg) exceeded ESVs in one surface soil sample. Based on the low levels and limited spatial distribution of chemicals constituents detected, the potential threat to ecological receptors is expected to be low.

Based on the results of the SI, past operations at the Ground Scar South of Building 3134, Parcel 153(7), do not appear to have adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health or the environment. Therefore, IT recommends "No Further Action" and unrestricted land reuse at the Ground Scar South of Building 3134, Parcel 153(7).

7.0 References

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