Final

Site Investigation Report
Training Aids Building (Building 267), Parcel 166(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 (IT) completed a site investigation (SI) at the Training Aids Building (Building 267), Parcel 166(7), at Fort McClellan (FTMC), in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the Training Aids Building (Building 267), Parcel 166(7), and, if present, whether the concentrations present an unacceptable risk to human health or the environment. The SI at the Training Aids Building (Building 267), Parcel 166(7), consisted of the sampling and analysis of two surface soil samples, two subsurface soil samples, and five groundwater samples. In addition, two temporary monitoring wells and three permanent monitoring wells were installed in the saturated zone to facilitate groundwater sample collection and provide site-specific geological and hydrogeological characterization information.

Chemical analysis of samples collected at the Training Aids Building (Building 267), Parcel 166(7), indicates that metals, volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and pesticides were detected in the environmental media sampled. 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 FTMC.

The potential threat to human receptors is expected to be low. In soils, only iron (in one sample) and aluminum (in two samples) exceeded SSSLs and their respective background concentrations. However, the concentrations of these metals were within the range of background values and do not pose an unacceptable risk to human health. VOC and SVOC concentrations in soils were below SSSLs.

In groundwater, three metals (antimony, iron, and manganese) exceeded SSSLs. However, with the exception of antimony in one sample, the concentrations of these metals were below their respective background concentrations or were within the range of background values. The antimony exceedance was flagged with a "B" data qualifier, suggesting that the metal is a laboratory-related contaminant. Antimony was not detected in any of the other soil or groundwater samples collected at the site.

The pesticide 4,4'-DDT (0.00011 milligrams per liter [mg/L]) marginally exceeded its SSSL (0.000109 mg/L) in one groundwater sample. 4,4'-DDT was not detected in the other groundwater samples collected at the site. Based on its low concentration and limited spatial distribution at the site, 4,4'-DDT is not expected to pose an unacceptable human health risk.

Five metals were detected in surface soils at concentrations exceeding ESVs but below background concentrations. In addition, three VOCs (1,2-dimethylbenzene, 1,2,4-trimethylbenzene, and xylenes) were detected at concentrations (less than 0.2 milligrams per kilogram) exceeding ESVs in one surface soil sample. However, the potential impact to ecological receptors is expected to be minimal based on the existing viable habitat and site conditions. The site is located within the developed portion of the Main Post, has limited grassy areas, and is projected for industrial reuse. Viable ecological habitat is presently limited and not expected to increase in the future land use scenario.

Based on the results of the SI, past operations at the Training Aids Building (Building 267), Parcel 166(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 recommends "No Further Action" and unrestricted land reuse at the Training Aids Building (Building 267), Parcel 166(7).

1.0 Project Description

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 perform the site investigation (SI) at the Training Aids Building (Building 267), Parcel 166(7), under Contract Number DACA21-96-D-0018, Task Order CK05.

This SI report presents specific information and results compiled from the SI, including field sampling and analysis and monitoring well installation activities conducted at the Training Aids Building (Building 267), Parcel 166(7).

1.1 Introduction

The Training Aids Building (Building 267) 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, 1998a) and a site-specific safety and health plan (SSHP) attachment were finalized in October 1998. The SFSP and SSHP were prepared to provide technical guidance for sample collection and analysis at the Training Aids Building (Building 267), Parcel 166(7). The SFSP was used in conjunction with the SSHP as attachments to the installation-wide work plan (IT, 1998b) and the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan and the quality assurance plan.

The SI at the Training Aids Building included fieldwork to collect two surface soil samples, two subsurface soil samples, and five groundwater samples. Data from the field investigation were used to determine whether potential site-specific chemicals are present at the Training Aids Building.

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 Training Aids Building 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 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 and ESVs are presented in the *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 Training Aids Building is centrally located on the Main Post at the corner of Blacman Road (formerly MacArthur Avenue) and Castle Avenue (formerly 6th Avenue) (Figures 1-1 and 1-2). The building was constructed as a post exchange in 1942 and was used for that purpose until at least 1975. In 1980, it became the Training Aids Building, where equipment and supplies for classroom training (printed material, transparencies, pictures, and overhead projectors) were produced. The building housed two photographic laboratories and a graphics department that operated from 1989 until Base closure in 1999. The photographic laboratories had four developing machines for slides, black-and-white prints, and color prints (Roy F. Weston, Inc. [Weston], 1990).

Photographic wastes were drained to a sump located on the north end of the building. The sump, which was connected to the sanitary sewer, was constructed during either 1989 or 1990, after the photography laboratory moved to Building 267. The concrete sump extended approximately 10 feet below ground surface (bgs) and was capped with an iron manhole cover. From 1993 until 1995, the FTMC Directorate of Environment sampled the sump contents annually for metals to determine hazardous waste characteristics. Sampling results indicated that the sump contents did not exceed regulatory limits. The photography laboratory was converted to digital processing in 1995, and further sampling was not performed. At the request of FTMC, the sump and associated piping were sampled and removed from the site by IT in February 2001. The sump removal closure report is included in Appendix A

The preliminary assessment report produced by Roy F. Weston in 1990 noted that used "hypo," a developing chemical (sodium thiosulfate, used as a fixing agent in photography), was reportedly stored in 5-gallon buckets behind the building. The used hypo was sent to the U.S. Army Noble Hospital for silver recovery (Weston, 1990). The photography laboratory stored and used small quantities of developing materials. However, there was no evidence of spills at the site.

The site elevation is approximately 770 feet above mean sea level (amsl). The ground surface slopes to the southwest towards Cane Creek, located approximately 400 feet to the southwest.

2.0 Previous Investigations

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

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

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

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

4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment 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) protocols (CERFA-Public Law 102-426) 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.

A preliminary assessment was conducted at this site by Weston in 1990. Conclusions and recommendations of the Weston report stated that evidence of past or present spills does not exist at the site; however, additional investigation was recommended in the EBS (ESE, 1998).

The Training Aids Building (Building 267), Parcel 166(7), was classified as a CERFA Category 7 site: areas that are not evaluated or require further evaluation.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT at the Training Aids Building (Building 267), Parcel 166(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 Training Aids Building included the collection of surface and subsurface soil 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. 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

Two surface soil samples were collected at the Training Aids Building, at the locations 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 the 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 a 3-inch diameter stainless-steel hand auger using the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000a). Surface soil samples were collected by first removing surface debris, such as rocks and asphalt, from the immediate sample area. The soil was 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 with 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 3.3. Sample collection logs are included in Appendix B.

3.1.2 Subsurface Soil Sampling

Subsurface soil samples were collected from two soil borings at the Training Aids Building, as shown on Figure 3-1. Subsurface soil sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations, depths, and analytical parameters samples are listed in Table 3-2. Soil boring 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 and overhead utilities. IT contracted TEG, Inc., a direct-push technology (DPT) 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 samples collected using the DPT sampling procedures specified in Section 4.9.1.1 of the SAP (IT, 2000a). However, subsurface soil from FTA-166-GP01 was collected during monitoring well installation using a split-spoon sampler. DPT sampling attempts at this location failed because of refusal at a depth of 1 foot bgs. Sample collection logs are included in Appendix B. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.3.

Subsurface soil samples were collected continuously 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 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 sample interval above the saturated zone was submitted for analysis. Samples to be analyzed for VOCs were collected directly from the sampler with 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. Samples submitted for laboratory analysis are summarized in Table 3-2. The on-site geologist constructed a detailed boring log for each soil boring. The boring log for each borehole is included in Appendix C.

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

3.1.3 Well Installation

Two temporary monitoring wells and three permanent monitoring wells were installed in the saturated zone at the Training Aids Building to collect groundwater samples for chemical analysis. The two temporary monitoring wells (FTA-166-GP01 and FTA-166-GP02) were installed in 1999, and the three permanent monitoring wells (FTA-166-MW01, FTA-166-MW02, and FTA-166-MW03) were installed in 2001. The well locations are shown on Figure 3-1. Table 3-3 summarizes construction details of the wells installed at the Training Aids Building. The well construction logs are included in Appendix C.

IT contracted Miller Drilling, Inc. to install the temporary and permanent monitoring wells with a hollow-stem auger rig. IT attempted to install temporary wells at the DPT soil boring locations. However, at FTA-166-GP01 this was not possible because of rig access limitations and overhead utilities. Therefore, the temporary well location was moved approximately 10 feet north of the soil boring location. The wells were installed following procedures outlined in Section 4.7 and Appendix C of the SAP (IT, 2000a). The boreholes at these locations were advanced with a 4.25-inch inside diameter (ID) hollow-stem auger from ground surface to the saturated zone at the well location. The borehole was augered to the depth of DPT sampler refusal, and samples were collected from that depth to the bottom of the borehole. A 2-foot-long, 2-inch ID carbon steel split-spoon sampler was driven at 5-foot intervals to collect geologic materials 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 logging the auger boreholes continued the lithological log for each borehole from the depth of split-spoon sampler refusal to the bottom of the auger 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 hydrogeological information. The boring log for each borehole is included in Appendix C.

Upon reaching the target depth in each borehole, a 10- or 15-foot length of 2-inch ID, 0.010-inch slotted Schedule 40 polyvinyl chloride (PVC) screen with a 3-inch long 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 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). In the permanent monitoring wells, the annular space above the bentonite seal was filled with a bentonite-cement grout to just below land surface where the wells were completed as flush-mount wells.

The temporary monitoring well surface completion included attaching plastic sheeting around the PVC riser using duct tape. Additionally, sand bags were used to secure the sheeting to the ground surface around the temporary well. A locking well cap was placed on the PVC well casing.

The permanent and temporary 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 to re-establish the natural hydraulic flow conditions of the formation. Development continued until the water turbidity was equal to or less than 20 nephelometric turbidity units (NTU), or for a maximum of 8 hours (4 hours for the temporary wells). The well development logs are included in Appendix D.

3.1.4 Water Level Measurements

The depth to groundwater was measured in the temporary and permanent wells at the site on June 12, 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 before 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 well casing. A summary of groundwater level measurements for the Training Aids Building is presented in Table 3-4.

3.1.5 Groundwater Sampling

Groundwater samples were collected from the temporary and permanent wells installed at the Training Aids Building. The two temporary wells were sampled in February 1999, and the three permanent wells were sampled in April 2001. The well/groundwater sampling 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.

Sample Collection. The temporary and permanent monitoring wells were sampled with a peristaltic pump equipped with Teflon™ tubing 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, specific conductivity, dissolved oxygen, oxidation-reduction potential, and turbidity) stabilized. 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 B. The samples were analyzed for the parameters listed in Table 3-5 using methods outlined in Section 3.3.

3.2 Surveying of Sample Locations

Sample locations were surveyed using global positioning system survey techniques described in Section 4.3 of the SAP 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 E.

3.3 Analytical Program

Samples collected during the SI were analyzed for various chemical parameters based on potential site-specific chemicals and on EPA, ADEM, FTMC, and USACE requirements. Target analyses for samples collected at the Training Aids Building (Building 267), Parcel 166(7), included the following:

- Target compound list VOCs – EPA Method 8260B
- Target compound list SVOCs – EPA Method 8270C
- Target analyte list metals – EPA Method 6010B/7000
- Chlorinated herbicides – EPA Method 8151A
- Chlorinated pesticides – EPA Method 8081A
- Organophosphorous pesticides – EPA Method 8141A
- Polychlorinated biphenyls (PCB) – EPA Method 8082
- Cyanide – EPA Method 9010B.

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 F. Data Validation Summary Reports are included as Appendix G.

3.4 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 B) were secured and included with each shipment of sample coolers to either Quanterra Environmental Services in Knoxville, Tennessee, or EMAX Laboratories, Inc. in Torrance, California. Split samples were shipped to USACE South Atlantic Division Laboratory in Marietta, Georgia.

3.5 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 the Training Aids Building was segregated as follows:

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

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 analysis. Based on the results, drill cuttings, spent well materials, and PPE generated during the SI at Training Aids Building (Building 267), Parcel 166(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 analysis, liquid IDW was discharged as nonregulated waste to the FTMC wastewater treatment plant on the Main Post.

3.6 Variances/Nonconformances

Two variances to the SFSP were recorded during completion of the SI at the Training Aids Building (Building 267), Parcel 166(7). The variances did not alter the intent of the investigation or the sampling rationale presented in the SFSP (IT, 1998a). The variances to the SFSP are summarized in Table 3-7 and included in Appendix H.

There were not any nonconformances to the SFSP recorded during completion of the SI at the Training Aids Building (Building 267), Parcel 166(7).

3.7 Data Quality

The field sample analytical data are presented in tabular form in Appendix F. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan; the FTMC SAP and the installation-wide quality assurance plan; and standard, accepted methods and procedures. As discussed in Section 3.6, two 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 G consists of data validation summary reports that 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 comparisons to the SSSLs and ESVs developed by IT. Rejected data (assigned an "R" qualifier) were not used in comparisons 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 the Training Aids Building (Building 267), Parcel 166(7), 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 southwest of the Main Post as mapped by Warman and Causey (1962) and 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 Fort McClellan, to the Ordovician Athens Shale on the basis of fossil data.

The Jacksonville Thrust Fault is the most significant structural geologic feature in the vicinity of 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

Soils in the area of the Training Aids Building (Building 267), Parcel 166(7), are mapped as the Rarden Series. The Rarden Series of soils consist of moderately well drained, strongly acidic to very strongly acidic soils that generally occur in large areas on wide shale ridges. These soils have developed from the residuum of shale and fine-grained, platy sandstone or limestone. The subsoil is yellowish-red clay or a brown mottled silty clay (U.S. Department of Agriculture, 1961).

The specific type of soil mapped at the Training Aids Building (Building 267), Parcel 166(7), is Rarden brownish silty clay loam. The Rarden silty clay loam is a shallow soil found on gentle grades with 2 to 6 percent slope. The slow permeability of this soil results in high runoff, making the soil very susceptible to erosion (U.S. Department of Agriculture, 1961).

Description of the soil from the DPT and hollow-stem auger borings revealed that the soil consists of brown to reddish-brown, sandy, silty clay approximately 5 feet thick. This description is consistent with the characteristics of the mapped Rarden silty clay loam.

The bedrock at the site is mapped as the undifferentiated Mississippian/Ordovician Floyd and Athens Shale (Osborne et al., 1997). The Floyd and Athens Shale consists of brown, dark-gray to black shale with localized interbedded limestone and sandstone (Osborne et al., 1989).

Based on the boring log data collected during the SI, residuum beneath the Training Aids Building (Building 267), Parcel 166(7), consists predominantly of sandy, silty clay overlying gray to black weathered shale. The weathered shale was encountered in all of the borings from approximately 3 to 7 feet bgs. Competent shale was not encountered during boring and well installation activities.

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 (U.S. Department of Commerce, 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.

The Training Aids Building is located near Cane Creek, a primary drainage pathway for the Main Post. Surface drainage at the site follows the topography and flows to the southwest towards Cane Creek, located about 400 feet to the southwest.

4.2.2 Hydrogeology

During soil boring and well installation activities, groundwater was encountered at depths ranging from 6 to 13 feet bgs (Appendix C). Static groundwater levels were measured in the monitoring wells at the Training Aids Building (Building 267), Parcel 166(7), on June 12, 2001 (Table 3-4). Groundwater elevations were calculated by measuring the depth to groundwater relative to the surveyed top-of-casing elevations. Figure 4-1 is a groundwater elevation contour map constructed from the June 2001 data. As shown on Figure 4-1, horizontal groundwater flow at the site is to the south-southwest towards Cane Creek. The hydraulic gradient across this area is approximately 0.02 feet per foot.

Static groundwater levels summarized in Table 3-4 are at shallower depths than the depth to groundwater encountered during drilling (Appendix C). This indicates that groundwater has an upward vertical hydraulic head.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at the Training Aids Building (Building 267), Parcel 166(7), indicate that metals, VOCs, SVOCs, and pesticides were detected in 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) to determine if the metals concentrations are within natural background concentrations (SAIC, 1998). Summary statistics for background metals samples collected at FTMC are included in Appendix I.

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 a reporting limit of 0.005 milligrams per kilogram (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, with 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 5-3 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix F.

5.1 Surface Soil Analytical Results

Two surface soil samples were collected for chemical analysis at the Training Aids Building (Building 267), Parcel 166(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. Eighteen metals were detected in surface soil samples collected at the site. The concentrations of four metals (aluminum, arsenic, chromium, and iron) exceeded SSSLs but were below their respective background concentrations.

The concentrations of five metals (aluminum, chromium, iron, manganese, and vanadium) exceeded ESVs but were below their respective background concentrations.

Volatile Organic Compounds. Thirteen VOCs were detected in surface soil samples collected at the site. All of the detected VOCs were present in the sample collected at FTA-166-GP02. Sample location FTA-166-GP01 contained only three of the 13 detected VOCs.

The VOC concentrations in surface soils were below SSSLs. The concentrations of three VOCs (1,2,4-trimethylbenzene, 1,2-dimethylbenzene, and xylenes) exceeded ESVs in one of the samples (FTA-166-GP02). The concentrations of the VOCs that exceeded ESVs ranged from 0.056 to 0.18 mg/kg.

Semivolatile Organic Compounds. SVOCs were not detected in the surface soil samples collected at the Training Aids Building (Building 267), Parcel 166(7).

5.2 Subsurface Soil Analytical Results

Two subsurface soil samples were collected for chemical analysis at the Training Aids Building (Building 267), Parcel 166(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 Training Aids Building (Building 267), Parcel 166(7). Four of the 21 metals (aluminum, arsenic, chromium, and iron) exceeded SSSLs. Only two of these metals, iron (FTA-166-GP01) and aluminum (FTA-166-GP01 and FTA-166-GP02), also exceeded their respective background concentrations. However, the aluminum and iron concentrations were within the range of background values determined by SAIC (Appendix I).

Volatile Organic Compounds. Four VOCs (acetone, bromomethane, chloromethane, and methylene chloride) were detected in subsurface soil samples collected at the Training Aids Building (Building 267), Parcel 166(7). The bromomethane, chloromethane, and methylene chloride results were flagged with a "B" data qualifier, signifying that these compounds were also detected in an associated laboratory or field blank sample. The VOC concentrations in subsurface soils were below SSSLs.

Semivolatile Organic Compounds. The SVOC bis(2-ethylhexyl)phthalate was detected in one of the subsurface soil samples (FTA-166-GP01) collected at the Training Aids Building (Building 267), Parcel 166(7). The bis(2-ethylhexyl)phthalate result was flagged with a "J" data qualifier, indicating that the compound was positively identified but that the concentration was estimated. The bis(2-ethylhexyl)phthalate concentration was below its SSSL.

5.3 Groundwater Analytical Results

Five groundwater samples were collected for chemical analysis at the Training Aids Building (Building 267), Parcel 166(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. Twelve metals were detected in groundwater samples collected at the Training Aids Building (Building 267), Parcel 166(7). The concentrations of three metals (antimony, iron, and manganese) exceeded SSSLs. Manganese (FTA-166-GP01) and antimony (FTA-166-MW03) also exceeded their respective background concentrations. The manganese result was within the range of background values (Appendix I). The antimony result exceeded the background range but was flagged with a "B" data qualifier, indicating that this metal was also detected in a laboratory method blank sample.

Volatile Organic Compounds. One VOC (methylene chloride) was detected in one groundwater sample (FTA-166-MW03) at a concentration below its SSSL.

Semivolatile Organic Compounds. The SVOC bis(2-ethylhexyl)phthalate was detected in two groundwater samples (FTA-166-GP02 and FTA-166-MW03) at the Training Aids Building (Building 267), Parcel 166(7). One of the bis(2-ethylhexyl)phthalate results was flagged with a "B" data qualifier, indicating that the compound was also detected in an associated laboratory or field blank sample. The bis(2-ethylhexyl)phthalate concentration (0.0075 milligrams per liter [mg/L]) exceeded its SSSL (0.0043 mg/L) in one of the samples (FTA-166-GP02). Bis(2-ethylhexyl)phthalate is a common sample contaminant.

Pesticides. Three of the five groundwater samples (FTA-166-MW01, FTA-166-MW02, and FTA-166-MW03) were analyzed for pesticides. Five pesticides (4,4'-dichlorodiphenyl-dichloroethane [DDD], 4,4'-dichlorodiphenyldichloroethene [DDT], endrin aldehyde, alpha-chlordane, and gamma-chlordane) were detected in one groundwater sample (FTA-166-MW01) collected at the site. Pesticides were not detected in the other two samples. The pesticide analytical results were flagged with a "J" data qualifier, indicating that the compounds were postively identified but that the concentrations were estimated. The concentration of 4,4'-DDT (0.00011 mg/L) marginally exceeded its SSSL (0.000109 mg/L).

Herbicides. Three of the five groundwater samples (FTA-166-MW01, FTA-166-MW02, and FTA-166-MW03) were analyzed for herbicides. Herbicides were not detected in the samples.

PCBs. Three of the five groundwater samples (FTA-166-MW01, FTA-166-MW02, and FTA-166-MW03) were analyzed for PCBs. PCBs were not detected in the samples.

Cyanide. Three of the five groundwater samples (FTA-166-MW01, FTA-166-MW02, and FTA-166-MW03) were analyzed for cyanide. Cyanide was not detected in the samples.

6.0 Summary, Conclusions, and Recommendations

Under contract to the USACE, IT completed an SI at the Training Aids Building (Building 267), Parcel 166(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 Training Aids Building (Building 267), Parcel 166(7), consisted of the sampling and analysis of two surface soil samples, two subsurface soil samples, and five groundwater samples. In addition, two temporary monitoring wells and three permanent monitoring wells were installed in the saturated zone to facilitate groundwater sample collection and provide site-specific geological and hydrogeological characterization information.

Chemical analysis of samples collected at the Training Aids Building (Building 267), Parcel 166(7), indicates that metals, VOCs, SVOCs, and pesticides were detected in the environmental media sampled. 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, metals concentrations exceeding SSSLs and ESVs were compared to medium-specific background screening values (SAIC, 1998).

The potential threat to human receptors is expected to be low. In soils, only iron (in one sample) and aluminum (in two samples) exceeded SSSLs and their respective background concentrations. However, the concentrations of these metals were within the range of background values and do not pose an unacceptable risk to human health. VOC and SVOC concentrations in soils were below SSSLs.

In groundwater, three metals (antimony, iron, and manganese) exceeded SSSLs. However, with the exception of antimony in one sample, the concentrations of these metals were below their respective background concentrations or were within the range of background values. The antimony exceedance was flagged with a "B" data qualifier, suggesting that the metal is a laboratory-related contaminant. Antimony was not detected in any of the other soil or groundwater samples collected at the site.

The pesticide 4,4'-DDT (0.00011 mg/L) marginally exceeded its SSSL (0.000109 mg/L) in one groundwater sample (FTA-166-MW01). 4,4'-DDT was not detected in the other groundwater samples collected at the site. Based on its low concentration and limited spatial distribution at the site, 4,4'-DDT is not expected to pose an unacceptable human health risk.

Five metals were detected in surface soils at concentrations exceeding ESVs but below background concentrations. In addition, three VOCs (1,2-dimethylbenzene, 1,2,4-trimethylbenzene, and xylenes) were detected at concentrations (less than 0.2 mg/kg) exceeding ESVs in one surface soil sample. However, the potential impact to ecological receptors is expected to be minimal based on the existing viable habitat and site conditions. The site is located within the developed portion of the Main Post, has limited grassy areas, and is projected for industrial reuse. Viable ecological habitat is presently limited and not expected to increase in the future land use scenario.

Based on the results of the SI, past operations at the Training Aids Building (Building 267), Parcel 166(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 recommends "No Further Action" and unrestricted land reuse at the Training Aids Building (Building 267), Parcel 166(7).

7.0 References

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ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

2,4-D	2,4-dichlorophenoxyacetic acid
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	silvex
3D	3D International Environmental Group
Abs	skin absorption
Amsl	above mean sea level
AC	hydrogen cyanide
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
ADEM	Alabama Department of Environmental Management
AEC	U.S. Army Environmental Center
AEL	airborne exposure limit
AHA	ammunition holding area
AL	Alabama
amb.	amber
ANAD	Anniston Army Depot
AOC	area of concern
APT	armor-piercing tracer
ARAR	applicable or relevant and appropriate requirement
AREE	area requiring environmental evaluation
ASP	Ammunition Supply Point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
ATV	all-terrain vehicle
AWWSB	Anniston Water Works and Sewer Board
'B'	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCF	blank correction factor
BCT	BRAC Cleanup Team
BEHP	bis(2-ethylhexyl)phthalate
BFB	bromofluorobenzene
BFE	base flood elevation
BG	Bacillus globigii
bgs	below ground surface
BHC	betahexachlorocyclohexane
bkg	background
bls	below land surface
BOD	biological oxygen demand
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BSC	background screening criterion
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethyl benzene, and xylenes
BTOC	below top of casing
BTV	background threshold value
BW	biological warfare
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
CAB	chemical warfare agent breakdown products
CAMU	corrective action management unit
CCAL	continuing calibration
CCB	continuing calibration blank
CD	compact disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CG	carbonyl chloride (phosgene)
CFC	chlorofluorocarbon
ch	inorganic clays of high plasticity
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CK	cyanogen chloride
cl	inorganic clays of low to medium plasticity
Cl.	chlorinated
CLP	Contract Laboratory Program
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
Co-60	cobalt-60
COC	chain of custody; contaminant of concern
COE	Corps of Engineers
Con	skin or eye contact
COPC	contaminant of potential concern
COPEC	contaminant of potential environmental concern
CRL	certified reporting limit
CRZ	contamination reduction zone
Cs-137	cesium-137
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
ctr.	container
CWA	chemical warfare agent
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
'D'	duplicate; dilution
DAF	dilution-attenuation factor
DANC	decontamination agent, non-corrosive
ºC	degrees Celsius
ºF	degrees Fahrenheit
DCE	dichloroethene
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DEH	Directorate of Engineering and Housing
DEP	depositional soil
DI	deionized
DIMP	di-isopropylmethylphosphonate
DMMP	dimethylmethylphosphonate
DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DOT	U.S. Department of Transportation
DP	direct-push
DPDO	Defense Property Disposal Office
DPT	direct-push technology
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
DWEL	drinking water equivalent level
E&E	Ecology and Environment, Inc.
EBS	environmental baseline survey
EE/CA	engineering evaluation and cost analysis
Elev.	elevation
EM	electromagnetic
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive ordnance disposal
EODT	explosive ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
ER	equipment rinsate
ESE	Environmental Science and Engineering, Inc.
ESN	Environmental Services Network, Inc.
ESV	ecological screening value
Exp.	explosives
E-W	east to west
EZ	exclusion zone
FAR	Federal Acquisition Regulations
FB	field blank
FD	field duplicate
FedEx	Federal Express, Inc.
FEMA	Federal Emergency Management Agency
FFE	field flame expedient
Fil	filtered
Flt	filtered
FML	flexible membrane liner
FMP 1300	Former Motor Pool 1300
FOMRA	Former Ordnance Motor Repair Area
Foster Wheeler	Foster Wheeler Environmental Corporation

List of Abbreviations and Acronyms *(Continued)*

Frtn	fraction
FS	field split; feasibility study
FSP	field sampling plan
ft	feet
ft/ft	feet per foot
FTA	Fire Training Area
FTMC	Fort McClellan
FTRRA	FTMC Reuse & Redevelopment Authority
g	gram
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
GCR	geosynthetic clay liner
GFAA	graphite furnace atomic absorption
GIS	Geographic Information System
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GS	ground scar
GSA	General Services Administration; Geologic Survey of Alabama
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GST	ground stain
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
HA	hand auger
HCl	hydrochloric acid
HD	distilled mustard
HDPE	high-density polyethylene
Herb.	herbicides
HNO_3	nitric acid
hr	hour
H&S	health and safety
HSA	hollow-stem auger
HTRW	hazardous, toxic, and radioactive waste
'I'	out of control, data rejected due to low recovery
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICRP	International Commission on Radiological Protection
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDM	investigative-derived media
IDW	investigation-derived waste
ILCR	incremental lifetime cancer risk
IMPA	isopropylmethyl phosphonic acid
IMR	Iron Mountain Road
in.	inch
Ing	ingestion
Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IRDMIS	Installation Restoration Data Management Information System
ISCP	Installation Spill Contingency Plan
IT	IT Corporation
ITEMS	IT Environmental Management System ™
'J'	estimated concentration
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
JPA	Joint Powers Authority
K	conductivity
L	lewisite; liter
LC_{50}	lethal concentration for 50 percent of population tested
LD_{50}	lethal dose for 50 percent of population tested
l	liter
LCS	laboratory control sample
LEL	lower explosive limit
LOAEL	lowest-observed-advserse-effects-level
LT	less than the certified reporting limit
LUC	land-use control
LUCAP	land-use control assurance plan
LUCIP	land-use control implementation plan
max	maximum
MCL	maximum contaminant level
MDC	maximum detected concentration
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
min	minimum
MINICAMS	miniature continuous air sampling system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MM	mounded material
MOGAS	motor vehicle gasoline
MPA	methyl phosphonic acid
MR	molasses residue
MS	matrix spike
mS/cm	millisiemens per centimeter
MSD	matrix spike duplicate
MTBE	methyl tertiary butyl ether
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
NA	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NCP	National Contingency Plan
ND	not detected
NE	no evidence; northeast
ne	not evaluated
NFA	No Further Action
ng/L	nanograms per liter
NGVD	National Geodetic Vertical Datum
NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
No.	number
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effects-level
NR	not requested; not recorded
ns	nanosecond
N-S	north to south
NS	not surveyed
nT	nanotesla
NTU	nephelometric turbidity unit
nv	not validated
O&G	oil and grease
O&M	operating and maintenance
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
ORP	oxidation-reduction potential

OSHA	Occupational Safety and Health Administration
OWS	oil/water separator
oz	ounce
PA	preliminary assessment
PAH	polynuclear aromatic hydrocarbon
Parsons	Parsons Engineering Science, Inc.
Pb	lead
PCB	polychlorinated biphenyl
PCE	perchloroethene
PCP	pentachlorophenol
PDS	Personnel Decontamination Station
PEL	permissible exposure limit
Pest.	pesticides
PFT	portable flamethrower
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
POL	petroleum, oils, and lubricants
PP	peristaltic pump
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PRG	preliminary remediation goal
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental, Inc.
qty	quantity
Qual	qualifier
‘R’	rejected data; resample
RAO	removal action objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RDX	cyclonite
RfD	reference dose
ReB3	Rarden silty clay loams
REG	regular field sample
REL	recommended exposure limit
RFA	request for analysis
RGO	remedial goal option
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
RTK	real-time kinematic
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
sc	clayey sands; sand-clay mixtures
Sch.	schedule
SD	sediment
SDG	sample delivery group
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties, Inc.
SFSP	site-specific field sampling plan
SGF	standard grade fuels
SHP	installation-wide safety and health plan
SI	site investigation
SL	standing liquid
SLERA	screening-level ecological risk assessment
sm	silty sands; sand-silt mixtures
SM	Serratia marcescens
SOP	standard operating procedure
sp	poorly graded sands; gravelly sands
SP	submersible pump
Sr-90	strontium-90
SRA	streamlined human health risk assessment
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSL	soil screening level
SSSL	site-specific screening level
SSSSL	site-specific soil screening level
STB	supertropical bleach
STC	source term concentrations
STEL	short-term exposure limit
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA’s *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SWPP	storm water pollution prevention plan
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TERC	Total Environmental Restoration Contract
TIC	tentatively identified compound
TLV	threshold limit value
TN	Tennessee
TOC	top of casing; total organic carbon
TPH	total petroleum hydrocarbons
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TWA	time-weighted average
UCL	upper confidence limit
UCR	upper certified range
‘U’	not detected above reporting limit
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USACMLS	U.S. Army Chemical School
USAMPS	U.S. Army Military Police School
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UST	underground storage tank
UTL	upper tolerance level
UXO	unexploded ordnance
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II

XRF	x-ray fluorescence
yd^3	cubic yards

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

N/A – Not analyzed

ND – Not detected

Boolean Codes

- LT – Less than the certified reporting limit

Flagging Codes

- 9 – Non-demonstrated/validated method performed for USAEC
- B – Analyte found in the method blank or QC blank
- C – Analysis was confirmed
- D – Duplicate analysis
- I – Interfaces in sample make quantitation and/or identification to be suspicious
- J – Value is estimated
- K – Reported results are affected by interfaces or high background
- N – Tentatively identified compound (match greater than 70%)
- Q – Sample interference obscured peak of interest
- R – Non-target compound analyzed for but not detected (GC/MS methods)
- S – Non-target compound analyzed for and detected (GC/MS methods)
- T – Non-target compound analyzed for but not detected (non GC/MS methods)
- U – Analysis in unconfirmed
- Z – Non-target compound analyzed for and detected (non-GC/MS methods)

Qualifiers

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