6.0 Landfill No. 3, Parcel 80(6)

6.1 Site Location

Landfill No. 3, Parcel 80(6), is located in the northwestern corner of the Main Post between Anniston-Jackson Highway (Route 21) to the west, 4th Avenue to the east, the installation's boundary to the north, and Cave Creek farther to the south. Landfill No. 4, Parcel 81(5), is adjacent to the southeast corner of Landfill No. 3. Figure 2-1 shows the location of Landfill No. 3.

6.1.1 Facility Type and Operational Status

Landfill No. 3, Parcel 80(6), received municipal waste from the base. The landfill reportedly operated from about 1946 to 1967 (SAIC, 2000). The landfill is currently (2001) covered with thick vegetation, including trees. The landfill is considered a passive recreational area and there is no current active use of the area within the landfill boundary. Landfill No. 3 features are shown in the Landfill No. 3 detail map (Figure 6-1).

6.1.2 Previous Work

Previous environmental work conducted at Landfill No. 3, Parcel 80(6), includes the following:

- Enhanced Preliminary Assessment (Weston, 1990)
- Site Investigation (SAIC, 1993)
- Remedial Investigation (SAIC, 1995)
- Remedial Investigation Baseline Risk Assessment (SAIC, 2000)
- Site Investigation and Fill Area Definition Report (IT, 2001a).

6.1.2.1 Investigation

The U.S. Army Environmental Hygiene Agency installed five groundwater monitoring wells in 1986. SAIC installed 13 additional monitoring wells during the site investigation and remedial investigation conducted from 1992 through 1995 (SAIC, 1993 and 1995). A review of the boring logs indicates that none of the borings for these wells penetrated fill material and all appear to be outside the fill material boundary. The majority of the wells were installed on the west side of the landfill, which is considered to be hydraulically downgradient. Three of these wells were placed outside of the parcel boundary, in the median of Route 21, to assess the extent of groundwater contamination leaving the post.

A long-term groundwater sampling and analysis event at Landfill No. 3 was performed by IT in 1998. Groundwater samples from 18 wells were collected during this sampling event. Detected

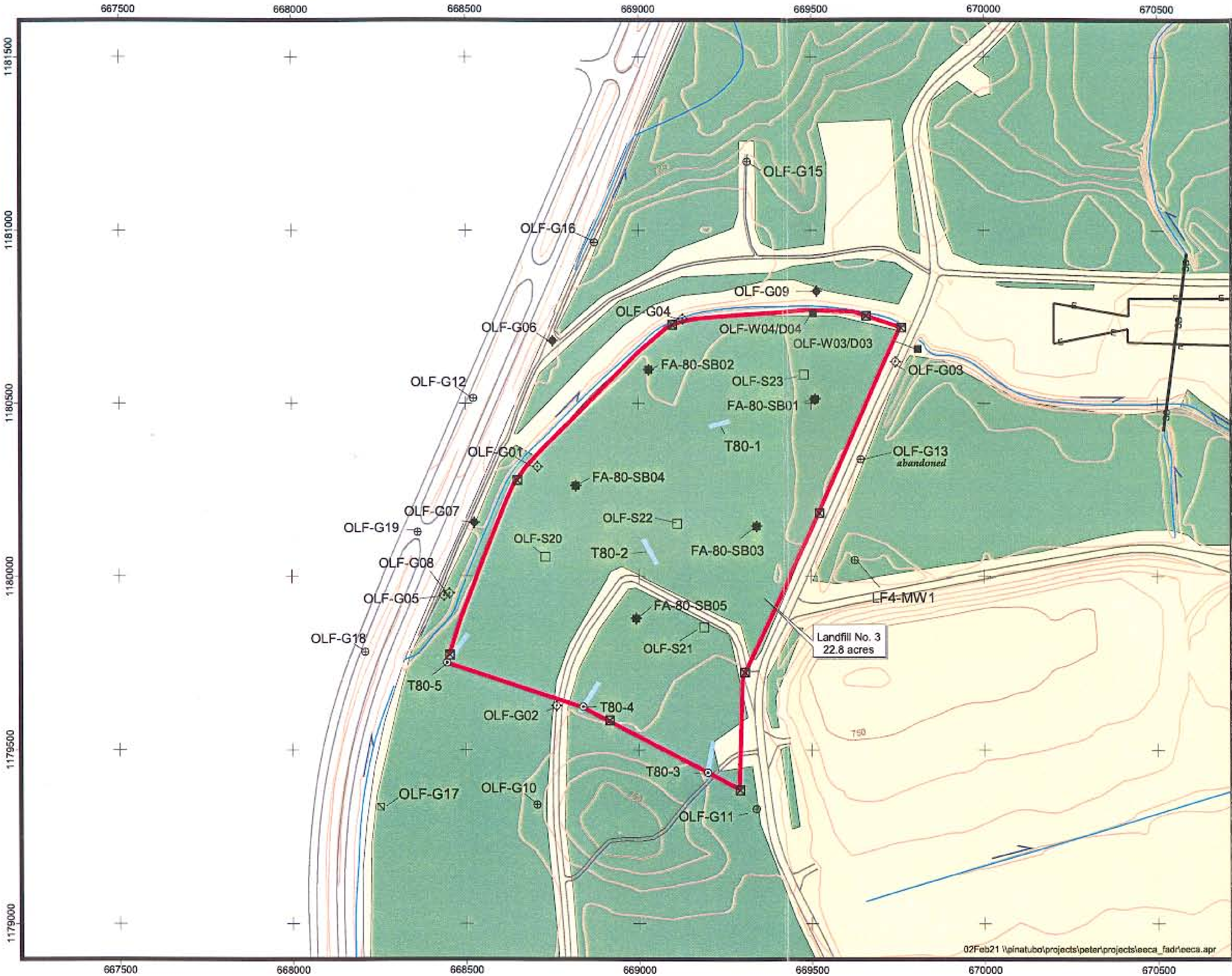

Figure 6-1

Detail Map
Landfill No. 3
Parcel 80(6)

- Proposed Concrete Monument
- Surface Soil Sample Location
- Surface Water/Sediment Sample Location
- Fill Boundary Observed within Trench Excavations
- Residuum Monitoring Well Location
- Subsurface Soil Sample Location
- Bedrock Monitoring Well Location
- Residuum/Bedrock Monitoring Well Location
- Electric Utility
- Storm Drain Utility
- Exploratory Trench
- Improved Roads
- 5' Topographic Contours
- Surface Drainage/Creek w/ Flow Direction
- Landfill Boundary
- Wooded
- Lawn/Cleared Area

0 300 600

State Plane feet, NAD83

N

August 2001

U.S. Army Corps of Engineers
Mobile District
Fort McClellan
Calhoun County, Alabama
Contract No. DACA21-96-D-0018

IT CORPORATION

constituent concentrations were compared to the SSSLs, ESVs, and background screening values for FTMC. Thirteen VOCs were detected in groundwater at Landfill No. 3, including benzene, 1,1,2,2-tetrachloroethane (PCA), 1,1,2-trichloroethane (TCA), 1,1-DCA, 1,2-DCE, PCE, TCE, and total xylenes. However, only six VOCs exceeded the SSSL values, including 1,1,2,2-PCA (at monitoring well OLF-G07 and OLF-G12), 1,1,2-TCA (OLF-G07 and OLF-G12), 1,2-DCA (OLF-G12), TCE (OLF-G07 and OLF-G12), and PCE (OLF-G12). On the basis of these results, VOCs are considered the primary COPCs at Landfill No. 3. Analytical data for Landfill No. 3 is included in Appendix A.

6.1.2.2 EE/CA Fill Area Definition

Five exploratory trenches were excavated at Landfill No. 3 to characterize the horizontal and vertical extent of the fill material. Trenches were excavated to depths ranging from 5 to 15 feet bgs. Trench locations T80-1 and T80-2 were used to further characterize the fill material at those locations. Trench locations T80-3, T80-4, and T80-5 were placed to further characterize the southern horizontal extent of the fill area.

Fill material was observed in all the trenches and included: plastic sheeting, glass, wood, paper, metal cans, electrical wire, bricks, shaving cream bottles/cans, scrap metal, cloth, 55-gallon drum lids, beer cans/bottles, ash, tin cans, aluminum foil, newspaper, two metal chairs, cardboard, aerosol cans, concrete, medical bottle with septum, light bulbs, bones, shoes, metal bucket, steel rebar, building tiles, cinder blocks, and concrete practice bombs.

Based on the results of the exploratory trenching at Landfill No. 3, the southern horizontal extent of the waste fill has been redefined. The approximate area within the new fill area boundary is 22.8 acres. The maximum depth reached was 15 feet bgs in trench T80-3. None of the trench excavations reached native material.

Five fill material borings were drilled to investigate the depth of the waste and to characterize the fill material. Fill material borings were installed at depths ranging from 14 to 24 feet bgs. Trench logs do not indicate the presence of groundwater in the trenches.

Twenty-two metals were detected in the fill material samples collected. The concentration of thallium in the sample collected from location FA-80-SB04 exceeded the background screening value and the SSSL; however, the result was flagged with a "B" data qualifier signifying that the compound was also in an associated laboratory or field blank at a concentration greater than the reporting limit. Fill material boring samples collected had detected concentrations of aluminum, arsenic, and iron exceeding the SSSLs; however, none of the reported concentrations exceeded the background screening values. All the fill material samples collected had detectable concentrations of calcium and zinc exceeding background screening values. Four of the fill material samples collected had detectable concentrations of mercury exceeding the background screening values.

Twenty-one VOCs were detected in the fill material soil boring samples collected; however, none of the VOCs detected exceeded the SSSLs. Sixteen SVOCs were detected in the fill material samples collected; however, none of the detected concentrations exceeded the SSSLs.

One PCB was detected in three of the fill material samples collected. Aroclor 1242 was detected in the fill material samples collected from locations FA-80-SB01, FA-80-SB02, and FA-80-SB04. The sample collected from location FA-80-SB01 had a detectable concentration of Aroclor 1242 that exceeded the ESV. Twelve pesticides were detected in the fill material samples collected. None of the detected pesticides were present at a concentration exceeding the SSSLs. No herbicides or explosives were detected in the fill material samples collected. Analytical data for Landfill No. 3 is included in Appendix A.

IT has estimated the vertical and horizontal extent of fill material at Landfill No. 3 based on information gathered from previous site investigations and trenching and boring activities discussed in this report. The fill area at Landfill No. 3 covers an area of approximately 22.8 acres. The average depth of fill material estimated from the trench and boring log data is approximately 17 feet bgs.

6.1.3 Structures/Topography

The landfill covers approximately 22.8 densely wooded acres of which a portion is within the floodplain of Cave Creek. A floodplain map is illustrated on Figure 2-5. This revised area for Landfill No. 3, Parcel 80(6), is based on the results of the fill area investigation. The landfill site is relatively flat, with a surface elevation of about 740 feet above msl. The surface slopes gently to the north and east from Landfill No. 3. A surface runoff control ditch had been constructed around the west and north edges of the landfill by 1961 and drains to the south. Surface runoff drains to the north along the east side of the landfill, then drains to the southwest in a small drainage ditch from the northeast corner of Landfill No. 3 (Figure 6-1). No buildings or other structures are present on the landfill.

A cut-and-fill trench system of disposal was used at Landfill No. 3, Parcel 80(6). Trenches trended northwest across the site, and the fill operation progressed from south to north across the area. The trench depressions have up to 3 feet of vertical relief from the surrounding ground surface. All of the area is heavily wooded and large trees occur within and between the trenches. Settlement of the trench cells has been noted on high altitude aerial photographs and can be observed as linear depressions on the ground over portions of Landfill No. 3. Waste disposal practices at Landfill No. 3 are thought to have been similar to those used at Landfill No. 4, Parcel 81(5), where trench excavations were typically about 15 feet wide and 12 feet deep (SAIC, 1999). Logs of boreholes drilled within the trench areas indicate waste fill may extend to a depth of 17 feet bgs (IT, 2001a).

The northern, eastern, and western boundaries are well defined (i.e., terminus of trench depressions, drainage swales, and roads). The southern extent of the fill area was redefined by IT, following completion of three exploratory trenches along the previously interpreted southern boundary.

6.1.4 Hydrogeology

Five soil borings and monitoring wells were installed by the U.S Army Environmental Hygiene Agency at Landfill No. 3, Parcel 80(6), in 1986, and thirteen soil borings and monitoring wells were installed by SAIC from 1992 through 1995. The underlying bedrock is mapped as Chilhowee Group, undifferentiated. Boring logs describe the bedrock as highly weathered claystone, highly fractured and porous. The top of bedrock was logged at depths between 27 and 50 feet bgs. Overlying the bedrock are clay, silt and fine sand beds. Distinguishing between weathered bedrock and deposited sediments can be difficult and could explain the variable depths to bedrock reported in the boring logs. Individual beds of clay, silt, or silty sand cannot be correlated with confidence between borings. Figure 2-2 provides the current interpretation of Landfill No. 3 geology.

The groundwater flow is to the west over Landfill No. 3, Parcel 80(6), at an average depth of 28 feet bgs, with depth to water ranging from 70.6 to 14.5 feet bgs. Elevations for groundwater ranged from 718.15 to 689.62 feet above msl within wells located inside the base boundary. The hydraulic gradient varied from approximately 0.04 to 0.02 ft/ft during the March 2000 water level measurements. The average hydraulic conductivity in five wells tested by SAIC (2000) was 4.61×10^{-5} cm/sec. A groundwater elevation map based on March 2000 water levels is shown on Figure 2-3.

6.1.5 Surrounding Land Use and Populations

Landfill No. 3, Parcel 80(6), is currently wooded habitat that shows the residual trenches from the waste disposal. The area is heavily wooded and located along the northwest boundary of the Base. A proposed highway would pass immediately north of the landfill.

The current reuse plan for Landfill No. 3, Parcel 80(6), proposes to maintain the area for passive recreational use (EDAW, 1997). Reuse scenarios for Landfill No. 3 will be primarily recreational, but a residential human health risk scenario will be evaluated for comparison. Because of existing releases to groundwater from the landfill, some areas within and surrounding Landfill No. 3, Parcel 80(6), may require installation of groundwater treatment system components. These would most likely be outside of the waste area footprint.

6.1.6 Sensitive Ecosystems

No sensitive ecosystems have been identified at Landfill No. 3, Parcel 80(6). The ecological setting of Landfill No. 3 is defined by previous land uses (i.e., landfilling) and the land use of the surrounding area. The original ecological setting has been altered through historical anthropogenic activities. Consequently, the topography and resultant habitat types may not be characteristic of similar areas that have not been altered by man.

The entire Landfill No. 3, Parcel 80(6), site is comprised of mixed coniferous/deciduous forest. Landfill No. 3 is bounded on the north and south by mixed coniferous/deciduous forest, on the west by the Anniston – Jacksonville Highway and on the east on asphalt road and by Landfill No. 4, Parcel 81(5). A more complete description of the Landfill No. 3 environmental setting is found in Section 6.3.1.

6.1.7 Analytical Data

The summary tables for Landfill No. 3, Parcel 80(6), identify compounds that exceed the screening criteria as defined in the *Human Health and Ecological Screening Values, and PAH Background Summary Report* (IT, 2000a). Tables in Appendix A provide a summary of detected compounds at Landfill No. 3 and compare analyte concentrations against background values, SSSL, and ESV for the various sample media collected at the site. Metals that exceed both the background threshold limit (two times background) and the SSSL and organic compounds that exceed the SSSL are summarized for each sample medium in Table 6-1. Elevated metals concentrations at Landfill No. 3 were associated with groundwater samples that have high turbidity. Subsequent evaluation of the high turbidity impact on observed metal concentration shows that turbid samples have an artificially high metal concentration. A discussion of the impact from these samples is presented in Appendix E. Subsequent sampling events using low flow methods show significant reduction in metal concentrations.

Table 6-1

Site Investigation Analytical Data Summary
Landfill No. 3, Parcel 80(6)
Fort McClellan, Alabama

Medium Sampled	Metals	VOCs	SVOCs	Pesticides	Explosives	Herbicides	PCBs
Surface and Depositional Soil	Al, Cr, Fe, Mn, Tl, V > BKG and SSSLs	ND	> SSSL[a]	> SSSL[b]	ND	ND	ND
Subsurface Soil	Al, Tl > BKG and SSSLs	ND	All below SSSL	Arochlor 1242 > SSSL	ND	ND	ND
Sediments	< BKG and SSSLs	ND	> SSSL[c]	< SSSLs	ND	ND	ND
Fill Material	Al, Ba, Cd, Fe, Pb, V > BKG and SSSLs	Vinyl chloride > SSSL	2,4-Dinitrotoluene, Pentachlorophenol > SSSL	Alpha-BHC > SSSL	< SSSLs	ND	ND
Groundwater	Al, Ba, Be, Co, Cu, Fe, Pb, Mn, Tl, V > both BKG and SSSL; Hg > SSSL	>SSSL[d]	> SSSL[e]	> SSSL[f]	2,4,6-Trinitrotoulene > SSSL	ND	ND
Surface Water	Pb > BKG and SSSLs	< SSSLs	ND	< SSSLs	ND	ND	ND

Al - aluminum
Ba - barium
Be - beryillium
BKG - background
Cd - cadmium
Co - cobalt
Cr - chromium
Cu - copper
Fe - iron
Pb - lead
Mn - manganese
ND - not detected
SSSL - site-specific screening level
SVOC - semivolatile organic compound
Tl - thallium
V - vanadium
VOC - volatile organic compound

[a] compounds above SSSL include: Fluoranthene and Pyrene

[b] compounds above SSSL include: 4,4'-DDD, 4,4'-DDE, Chlordane

[c] compounds above SSSL include: Benzo(a)anthracene, Benzo(b)fluoranthene, Chrysene, Fluoranthene, Pyrene

[d] compounds above SSSL include: 1,2-Dichloroethene 1,1,2-Trichloroethane, 1,1,2,2-Tetrachloroethane, Acetone, Benzene, Tetrachloroethene, Trichloroethene and Vinyl chloride

[e] compounds above SSSL include: 1,4-Dichlorobenzene, 2,6-Dinitrotoulene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluroanthene, Benzo(k)fluoranthene, Bis(2-Ethylhexyl)phthalate, Dibenz(a,h)anthracene, Indeno(1,2,3-cd)pyrene, and Pentachlorophenal

[f] compounds above SSSL include: 4,4'-DDT, Aldrin, Alpha-BHC, Arochlor 1248, Beta-BHC, Dieldrin, Gamma-BHC(lindane), Heptachlor, and Heptachlor epoxide

6.1.8 Potential Source of Contaminants

The location of the fill material in Landfill No. 3, Parcel 80(6), was interpreted from aerial photos, field observations, and from the trench excavations completed by IT in support of the EE/CA. The fill area illustrated on Figure 6-1 incorporates all of the historical and recent data in defining the extent of waste at Landfill No. 3.

Although there are no known manifests available, it has been reported that empty pesticide containers and the burned ammunition pallets or crates, were disposed in this landfill (ESE, 1998). Pesticide containers reportedly were triple-rinsed prior to disposal. Additionally, there is a high potential that disposal of paint containers, fluorescent bulbs and ballasts, waste oil, and construction debris occurred here (ESE, 1998). In addition to municipal waste, animals killed by nerve agent experiments may also have been disposed in Landfill No. 3, Parcel 80(6). The Standard Operating Procedures (SOP) required that the animals be decontaminated, placed in a plastic bag and disposed in sanitary landfills (USATHAMA, 1977).

Fill material observed in the exploratory trenches excavated by IT included the following: plastic sheeting, glass, wood, paper, metal cans, electrical wire, brick, shaving cream bottles/cans, scrap metal, cloth, 50-gallon drum lids, beer cans/bottles, ash, tin cans, aluminum foil, newspaper, two metal chairs, cardboard, aerosol cans, concrete, medical bottle with septum, light bulbs, bones, shoes, metal bucket, steel rebar, building tiles, cinder blocks, and concrete practice bombs (IT, 2001a). Groundwater was not encountered during trenching operations conducted at Landfill No. 3, Parcel 80(6).

The landfill was not capped when it was closed in 1967, and settling is occurring, which indicates that water is infiltrating the surface of the landfill (SAIC, 1993). Ponding of surface water in the trench depressions and the growth of trees through the uncapped surface contribute to the infiltration of surface water. The likely mechanism of groundwater impacts at Landfill No. 3, Parcel 80(6), is the percolation of surface water into the waste fill and the release of leachate to groundwater. The landfill is over 30 years old and thus should be mature relative to potential landfill gas generation. Appendix B shows a gas generation curve for typical municipal waste landfills.

The fill area limits are shown on Figure 6-1. This shows the current interpretation of the landfill boundary and, thus, the lateral extent of the potential source area for any releases from the landfill. Additional investigation of the nature and extent of groundwater impacts off-site is ongoing under a separate RI.

6.2 Streamlined Human Health Risk Assessment

Media evaluated at Landfill No. 3, Parcel 80(6), for the human health SRA include surface soil, surface water, sediment, and groundwater. A recreational site-user and resident were deemed the most appropriate receptor scenarios for the current and future land use at Landfill No. 3. SRA tables and figures are included in Appendix C. Figure C-3 presents the CSEM for Landfill No. 3.

6.2.1 Surface Soil

Five surface soil samples were utilized in the SRA. The samples were collected in April 1994, ranging in depth from 0.3 to 2.8 feet bgs. All of the surface soil samples were analyzed for metals, SVOCs, VOCs, explosives, and pesticides (Table C3-1).

As presented in Table C3-2, twenty metals, five SVOCs, and three pesticides were detected. After background screening and nutrient elimination, nine metals were determined to be site-related; these include aluminum, barium, beryllium, boron, chromium, copper, nickel, thallium, and zinc. In addition, all organics were carried forward to the COPC selection step.

After completion of the COPC screening for the resident and recreational site-user against the receptor specific soil SSSLs, three metals were selected as COPC for the resident: aluminum, chromium, and thallium. Only one COPC, thallium, was selected for the recreational site-user. All of these metals were selected as COPC for noncancer hazard only. Table C3-3 presents the COPC selection for the resident and recreational site-user.

The resulting noncancer HI for the resident is 28; the majority of this hazard is associated with thallium. The thallium HI for the resident is 27, while the HIs for both aluminum and chromium are below 1 (Table C3-4). A target organ analysis was performed for the resident (Table C3-5) including chemicals that contributed an HI greater than 0.1 from surface soil and groundwater. Target organs with an HI greater than 1 include the skin, due to thallium alone, and the liver, largely due to thallium but with significant contributions from chemicals in groundwater. Thallium in surface soil is clearly the risk driver in this scenario. Therefore, only thallium is selected as a surface soil COC for the resident. Remedial goal options based upon target HIs of 0.1, 1, and 3 were calculated for thallium in surface soil; the results are presented in Table C3-6.

The recreational site-user has an HI of 0.34 from thallium (Table C3-7). Because this value is less than 1, thallium is not selected as a surface soil COC for the recreational site-user.

6.2.2 Surface Water

The fourteen surface water samples, collected in 1992 and 1994, utilized in the SRA are presented in Table C3-8. Most samples were analyzed for chemical warfare agent breakdown products (CAB), metals, SVOCs, VOCs, explosives, herbicides, and pesticides; however, some surface water samples were analyzed for only one metal or pesticide.

Eleven metals, three pesticides, and two VOCs were detected (Table C3-9). After the metals were compared to background, and the essential nutrients were excluded, only one metal (boron) and the organics were determined to be site-related. Lead, which was detected in only one of five samples, was excluded as a site-related metal after the Mann-Whitney U Test was conducted. The Mann-Whitney U Test was performed using the STATISTICA software (StatSoft, 1998). All non-detected values are assumed to be present at one-half the reporting limit concentration. This statistical test compares the site data and background data sets to establish if they are similar. It was determined that lead in surface water at 0.07 mg/L was not significantly different from the background population data. Therefore, lead in surface water is not site-related. Appendix C, Attachment C-5 presents the statistical data for the Mann-Whitney U Test.

The site-related chemicals are compared to the receptor specific surface water SSSLs in Table C3-10. None of the site-related chemicals are above either their respective noncancer or cancer surface water SSSLs; therefore, no surface water COPC were selected for Landfill No. 3, Parcel 80(6).

6.2.3 Sediment

Table C3-11 presents the 11 sediment samples, also collected in 1992 and 1994, used in the SRA for Landfill No. 3, Parcel 80(6). Only two samples were analyzed for SVOCs, VOCs, metals, explosives, and pesticides. The remaining nine samples were generally analyzed by only one of the above methods or CAB.

Similar to surface soil at Landfill No. 3, Parcel 80(6), eighteen metals, nine SVOCs, and one pesticide were detected (Table C3-12). After the background comparison and removal of essential nutrients, only aluminum, beryllium, boron, and vanadium remained as metals considered to be site-related. All organics were carried forward to the COPC selection. No site-related chemicals were selected as sediment COPC for the recreational site-user or the resident. All site-related chemical MDCs were below their respective receptors' sediment SSSLs (Table C3-13).

6.2.4 Groundwater

Landfill No. 3, Parcel 80(6), groundwater is evaluated because of the potential for off-site migration. Sixteen groundwater samples, collected in February 1998, were used in the SRA. All but three of the samples were analyzed for explosives, SVOCs, VOCs, metals, polychlorinated biphenyls (PCBs), and pesticides. The remaining three samples were analyzed for only metals, SVOCs, VOCs, and explosives (Table C3-14). Metals data for these groundwater samples were not evaluated in the SRA due to very high turbidity readings.

Table C3-15 presents those chemicals, excluding metals, that were detected. Because there are no background screening criteria for organics, all chemicals presented are considered as being site-related and are carried forward through COPC selection. These chemicals include one pesticide, four SVOCs, and eleven VOCs.

Table C3-16 presents the COPC screening for the resident; based upon the CSEM, the recreational site-user is not anticipated to be exposed to groundwater. beta-BHC, 1,1,2,2-tetrachloroethane (1,1,2,2-PCA), 1,1,2-trichloroethane (1,1,2-TCA), 1,2-dichloroethene (1,2-DCE), acetone, tetrachloroethene (PCE), and trichloroethene (TCE) were selected as groundwater COPC for the resident.

Table C3-17 presents the resulting HI and ILCR values for the resident exposed to groundwater. The total HI for groundwater is 1, while the total ILCR is 7.2E-4. Chemicals contributing significantly to the HI were evaluated in the target organ analysis (Table C3-5). 1,1,2,2-PCA is the cancer risk driver with an ILCR of 7E-4. All of the other COPCs selected based upon their cancer endpoints have low ILCRs ranging from 1.03E-6 to 8.59E-6. Table C3-18 presents the remedial goal options for the cancer COCs. Table C3-19 presents the remedial goal options for noncancer COC in groundwater. All COC source-term concentrations are below their remedial goal options based on an HI of 1, suggesting that there would be little benefit from remediating groundwater.

6.2.5 Future Groundwater Screening

In order to determine if any of the chemicals in soil identified as COPC in groundwater (Table C3-20) may leach to groundwater, thus contributing to future groundwater contamination, a future groundwater screening was completed. Total soil data (a combination of surface and subsurface soil data sets) were evaluated to determine if any of the groundwater COPCs are also present in total soil. If any of the groundwater COPCs are present in total soil, further leaching may occur causing the groundwater COPCs to become COCs. Soil samples used for the total soil evaluation are presented in Table C3-21. All chemicals detected in total soil, their MDCs, and reporting limits are presented in Table C3-22.

The first step in the future groundwater conditions evaluation is to screen the MDC in soil against the generic EPA (1996b) soil screening level (SSL) based on a dilution-attenuation factor (DAF) of 20. The beta-BHC MDC of 3.7E-3 mg/kg is slightly above the EPA (1996b) generic SSL of 3E-3 mg/kg; therefore, beta-BHC was carried forward to the next step.

The next step of the future groundwater conditions evaluation is to develop site-specific soil screening levels (SSSL) for those chemicals selected for further evaluation. The SSSLs are concentrations in soil that reflect risk-specific concentrations in groundwater as a result of leaching. The purpose of the SSSL is to incorporate site-specific values for geologic and hydrogeologic parameters in order to develop a more reasonable DAF, which results in a more realistic relationship between soil concentration and groundwater concentration. However, little site-specific information was available with which to develop a site-specific DAF, so a very conservative default DAF of 1 was chosen as a worst-case approach. The default DAF of 1 was used in the soil-to-groundwater modeling exercise (Appendix C, Attachments C-6a and C-6b) to estimate an SSSSL for beta-BHC in soil of 5.43E-5 mg/kg, associated with an ILCR of 1E-6.

The MDC of 3.7E-3 mg/kg for beta-BHC in soil is adopted as the STC for the purposes of this evaluation. Dividing the STC of 3.7E-3 mg/kg by the SSSL of 5.43E-5 mg/kg, and multiplying the result by the ILCR of 1E-6 (on which the SSSL is based) yields an ILCR for exposure to beta-BHC in groundwater of 6.81E-5. This ILCR value is within the risk management range, and below the unacceptable limit of 1E-4. It should be noted that the soil-to-groundwater leaching model is a very simple and conservative "infinite source" approach that assumes no loss in soil concentration with time. Also, beta-BHC was detected in only 2 of 17 total soil samples. Adopting the MDC as the STC compounds the conservatism of this evaluation. Therefore, the ILCR of 6.81E-5 estimated above should be considered a worst-case rather than a realistic estimate of risk. The actual risk would be much lower, although how much lower is a matter of considerable uncertainty. It is concluded that beta-BHC in soil does not pose an unacceptable cancer risk in groundwater through continued leaching.

6.2.6 Uncertainty Analysis

Subsurface soil was not evaluated at this site for any receptor scenario. If the land use or receptor scenario applicable for this site changes, it may be necessary to evaluate subsurface soil hazard and risk and incorporate the other media into this evaluation as well.

Although the Mann-Whitney U Test for lead in surface water indicates that site lead and background lead are within the same population, a different type of analysis may result in a less definitive result. Lead was only detected in one of five samples, thus it is unlikely that lead is widespread in the site's surface water.

The future groundwater screening process utilized several conservative values, as previously described. Therefore, it is more likely that the actual ILCR for beta-BHC is substantially less than the estimated value.

Surface water and sediment were analyzed for chemical agent breakdown products. Surface soil samples were not analyzed for these parameters; however, these were not detected in surface water or sediment. In addition, the data used for surface soil, surface water, and sediment are several years old. There is uncertainty that the organic chemical concentrations detected in 1992 and 1994 are still present, especially for surface water and sediment.

6.2.7 SRA Conclusions

Table C3-23 presents the total HI and total ILCR for the resident and recreational site-user. The resident's total HI across all media (surface soil, surface water, sediment, and groundwater) is 29, while the total ILCR for the resident across all media is 7E-4. The ILCR for the resident is above the acceptable risk range, thus remedial goal options were developed for groundwater and surface soil COC for the residential receptor scenario. The recreational site-user's total HI across all media was below 1, the generally accepted threshold; therefore, no remedial goal options were calculated for this receptor. The recreational site-user had no cancer COPC, thus there are no ILCR estimates.

Landfill No. 3, Parcel 80(6), poses no cancer risk or noncancer hazard to the recreational site-user. However, surface soil presents an unacceptable noncancer hazard to a resident, while the groundwater presents an unacceptable cancer risk to a resident. Remedial goal options based on a range of target risk and hazard indexes for the resident are presented for informational purposes.

Future groundwater conditions at Landfill No. 3, Parcel 80(6), were evaluated using current groundwater COPCs and total soil. It is concluded that further leaching is unlikely to result in unacceptable risk or hazard to future groundwater use by residents.

6.3 Screening-Level Ecological Risk Assessment

This section presents the SLERA for Parcel 80(6).

6.3.1 Environmental Setting

The ecological setting of Landfill No. 3, Parcel 80(6), is defined by previous land uses (i.e., landfilling) and the land use of the surrounding area. The original ecological setting has been altered through historical anthropogenic activities. As such, the topography and resultant habitat types may not be characteristic of similar areas that have not been altered by man.

Landfill No. 3, Parcel 80(6), is located in the northwestern corner of the Main Post and encompasses a total area of approximately twenty-three acres. Landfill No. 3 is entirely flat except for the drainage ditch that forms its western and northern boundaries. The drainage ditch is approximately 6 to 8 feet deep and 8 to 10 feet wide and has been created/improved by excavation. The site is comprised of mixed coniferous/deciduous forest and is bounded on the north and south by mixed coniferous/deciduous forest, on the west by the Anniston – Jacksonville Highway and on the east by an asphalt road and Landfill No. 4, Parcel 81(5).

Terrestrial habitat at Landfill No. 3, Parcel 80(6), is comprised of mixed coniferous/deciduous forest. This forest is characteristic of a forest that has been disturbed in the past as the diameter of many of the tree trunks are less than the diameter of the mature trees and the understory and shrub layers of vegetation are highly developed. The result of the previous disturbance is a forest community with smaller trees and a densely vegetated shrub layer with numerous vines.

The mixed coniferous/deciduous forest that occupies the entire Landfill No. 3, Parcel 80(6), is best described as typic mesophytic forest. The canopy species characteristic of this area are tulip tree (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), shortleaf pine (*Pinus echinata*), loblolly pine (*Pinus taeda*), white oak (*Quercus alba*), and northern red *oak (Quercus rubra*). The dominant understory species of this area are red maple (*Acer rubrum*), flowering dogwood (*Cornus florida*), witch hazel (*Hamamelis virginia*), sweetgum (*Liquidambar styraciflua*), and sourwood (*Oxydendrum arboreum*). The shrub layer is dominated by mountain laurel (*Kalmia latifolia*), southern low blueberry *(Vaccinium pallidum*), southern wild raisin (*Viburnum nudum*), and yellowroot (*Xanthorhiza simplicissima*). Numerous muscadine grape (*Vitis rotundifolia*) vines are also present in this area.

Although there is a drainage ditch along the western and northern boundaries of Landfill No. 3, Parcel 80(6), this ditch is apparently dry throughout the majority of the year as upland vegetation predominates. There was no water present in this ditch at the time of the ecological investigation (September 2000). This ditch most likely only transmits water during periods of significant rainfall. Therefore, this ditch is not considered aquatic habitat. There are no other permanent aquatic features or aquatic habitat at Landfill No. 3.

As stated previously, there are no permanent aquatic features associated with Landfill No. 3, Parcel 80(6); therefore, aquatic organisms are not present at Landfill No. 3. In general, the terrain at FTMC supports large numbers of amphibians and reptiles. Jacksonville State University has prepared a report titled *Amphibians and Reptiles of Fort McClellan, Calhoun County, Alabama* (Cline and Adams, 1997). The report indicated that surveys in 1997 found 16 species of toads and frogs, 12 species of salamanders, 5 species of lizards, 7 species of turtles, and 17 species of snakes. Typical inhabitants of the area surrounding Landfill No. 3 are copperhead (*Agkistrodon contortix*), king snake *(Lampropeltis getulus*), black racer (*Coluber constrictor*), fence lizard (*Sceloporour undulatus*), and six-lined racerunner (*Cnemidophorous sexlineatus*).

Terrestrial species that may inhabit the vicinity of Landfill No. 3, Parcel 80(6), include opossum, short-tailed shrew, raccoon, white-tail deer, red fox, coyote, gray squirrel, striped skunk, a number of species of mice and rats (e.g., white-footed mouse, eastern harvest mouse, cotton mouse, eastern woodrat, and hispid cotton rat), and eastern cottontail. Approximately 200 avian species reside at FTMC at least part of the year (ACOE, 1998). Common species expected to occur in the vicinity of Landfill No. 3 include northern cardinal (*Cardinalis cardinalis*), northern mockingbird (*Mimus polyglottus*), warblers *(Dendroica spp.*), indigo bunting (*Passerina cyanea*), red-eyed vireo (*Vireo olivaceus*), American crow (*Corvus brachyrhynchos*), bluejay (*Cyanocitta cristata*), several species of woodpeckers (*Melanerpes spp., Picoices spp.*), and Carolina chickadee (*Parus carolinensis*). Game birds present in the vicinity of Landfill No. 3 may include northern bobwhite (*Colinus virginianus*), mourning dove (*Zenaida macroura*), and eastern wild turkey (*Meleagris gallopavo*). A variety of raptors (e.g., red-tailed hawk, sharp-shinned hawk, barred owl, and great horned owl) could also use portions of this area for a hunting ground, particularly the fringe areas adjacent to the roads.

6.3.2 Chemicals Detected On Site

Chemicals detected in soil, sediment, and surface water at Landfill No. 3, Parcel 80(6), are summarized in Appendix A.

6.3.3 Chemicals of Potential Ecological Concern

COPECs are those constituents whose maximum detected concentrations exceed their respective ESVs. The COPECs that have been identified at Landfill No.3, Parcel 80(6), are the following:

- Surface Soil – aluminum, barium, beryllium, boron, chromium, cobalt, manganese, nickel, thallium, vanadium, zinc, fluoranthene, pyrene, 4,4'-DDE, and chlordane

- Surface Water – boron and lead

- Sediment – aluminum, barium, beryllium, boron, copper, nickel, vanadium, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, fluoranthene, pyrene, and 4,4'-DDE.

6.3.4 SLERA Uncertainty Analysis

The following site-related constituents exceeded their respective ESVs in surface soil a Landfill No. 3, Parcel 80(6) (Table D-9): aluminum, barium, beryllium, boron, chromium, cobalt, manganese, nickel, thallium, vanadium, zinc, fluoranthene, pyrene, 4,4'-DDE, and chlordane. Boron and lead exceeded their respective ESVs in surface water (Table D-10). Aluminum, barium, beryllium, boron, copper, nickel, vanadium, benzo(a)anthracene, benzo(b)fluoranthene, chrysene, fluoranthene, pyrene, and 4,4'-DDE exceeded their respective ESVs in sediment (Table D-11). Barium, beryllium, boron, cobalt, nickel, zinc, PAHs and pesticides in soil all had HQ values less than 10. Additionally, aluminum, barium, beryllium, boron, chromium, cobalt, manganese, nickel, vanadium, and zinc all have relatively low bioaccumulation potential. Thallium and chlordane were infrequently detected.

Although several constituents in surface soil exceed their respective ESVs, there are no sensitive ecosystems present at or in the near vicinity of Landfill No. 3, Parcel 80(6). Therefore, based on the lines-of-evidence presented in the previous paragraphs and summarized in Table D-29, it could be concluded that there are no COPECs in surface soil at Landfill No. 3.

Because of the relatively poor quality aquatic habitat present at Landfill No. 3, Parcel 80(6), the fact that boron and lead were infrequently detected, and their bioaccumulation potential is low, it could be concluded that no COPECs were identified in surface water at Landfill No. 3 (Table D-29).

Several PAHs and a pesticide were detected in sediment with maximum concentrations that exceeded their respective ESVs; however, the HQs were all less than 10 and they were infrequently detected. As presented in the detailed description of the ecological setting at Landfill No. 3, Parcel 80(6) (Section 6.3.1), there is a man-made drainage ditch along the western and northern boundaries of the landfill. This ditch is completely dry during significant portions of the year and is vegetated mainly with upland plant species. Therefore, this drainage ditch does not provide viable aquatic habitat for significant portions of the year and is not considered aquatic habitat for this assessment. Based on the lines-of-evidence presented in the preceding paragraphs and summarized in Table D-29, it could be concluded that there are no COPECs in surface soil, surface water, or sediment at Landfill No. 3, Parcel 80(6).

6.3.5 SLERA Conclusions

The terrestrial habitat at Landfill No. 3, Parcel 80(6), is characteristic of land that has been disturbed by man. Furthermore, there are no unique or sensitive habitats associated with the site. The "aquatic habitat" at Landfill No. 3 consists of a man-made drainage ditch along the western and northern boundaries of the landfill. This ditch is completely dry during significant portions of the year and is vegetated mainly with upland plant species. Therefore, this drainage ditch does not provide viable aquatic habitat for significant portions of the year and was not considered aquatic habitat for this assessment.

Although the maximum detected concentrations of a number of constituents exceed their respective ESVs in surface soil (Table D-9) surface water (Table D-10), and sediment (Table D-11) at Landfill No. 3, Parcel 80(6), additional lines-of-evidence suggest that these COPECs may not pose significant risks to the terrestrial or aquatic ecosystems at Fort McClellan. These COPECs (Table D-28) have been identified through a very conservative screening process that utilizes ESVs based largely on NOAELs from the scientific literature and maximum detected constituent concentrations. If additional lines-of-evidence are considered, it could be concluded that there are no COPECs present at Landfill No. 3, Parcel 80(6). If, based on a risk management decision, the potential ecological risks at Landfill No. 3, Parcel 80(6), are determined to be "unacceptable" at this screening-level stage, then a BERA is appropriate. The goal of the baseline ecological risk assessment, if deemed necessary, will be to reduce the levels of uncertainty and conservatism in the assessment process and to determine the potential for ecological risk at Landfill No. 3, Parcel 80(6), through a number of lines of evidence.

6.4 Remedial Action Objectives

The potential CERCLA risk to human health at Landfill No. 3 is associated with surface soils and groundwater. To address the potential groundwater risk, the Army is conducting a groundwater remedial investigation at Landfill No. 3. At this writing, the Army is in the process of defining the nature and extent of groundwater contamination associated with Landfill No. 3.

To address the risk associated with surface soils, the Army has evaluated remedial action technologies including No Action, LUCs, soil cover, excavation, collection (or consolidation into a landfill), in situ treatment technologies, process waste disposal, and emission control for soil.

The preamble to the NCP identifies municipal landfills as a type of site where treatment of waste may be impractical because of the size and heterogeneity of the contents (55 FR 8704). Because treatment is usually impractical, EPA generally considers containment to be the appropriate response action, or "presumptive remedy" for the source areas of municipal landfill sites (EPA, 1996a). This should be considered when evaluating the alternatives in the following sections.

No remedial action technologies were evaluated for groundwater because the characterization of the groundwater contamination at Landfill No. 3, Parcel 80(6), is not complete. As stated previously, the Army is conducting a separate remedial investigation to evaluate groundwater contamination and develop remedial alternatives for groundwater.

6.5 Scope of Remedial Action

The specific goals of remedial actions are to mitigate or eliminate any potential threat to public health, welfare, or the environment (posed by the presence of constituents of concern identified within the respective fill areas [see Appendix A] under CERCLA guidance for remedial actions). The Army's objective is to reduce or eliminate future potential for adverse public impacts consistent with anticipated base reuse plans through land-use controls, physical barriers, and deed notices.

Upon selection of the most appropriate remedial action alternative, the scope of the remedial action will be detailed in a work plan. The scope for the work plan will include the details of the specific remedial action proposed by this EE/CA.

6.6 Applicable or Relevant and Appropriate Requirements

CERCLA specifies that remedial actions for the cleanup of hazardous substances must comply with the requirements under federal or more stringent state environmental laws that are applicable, or relevant and appropriate to the hazardous substances or particular circumstances at a site to the extent practicable. The assumption that human health and the environment are protected is inherent in the interpretation of ARARs. Action-, location-, and chemical-specific ARARs were identified for each alternative (Tables 6-2, 6-3, and 6-4, respectively). A summary of the ARARs for Landfill No. 3 is presented in Table 6-5.

6.7 Site-Specific Descriptions of Alternatives

Based on current Landfill No. 3 investigation data, surface soil and groundwater present unacceptable CERCLA risks to the potential resident. Groundwater at Landfill No. 3 is being evaluated under an independent assessment and recommendations for any groundwater treatment will be made under a separate report. Current data indicate that the Landfill No. 3 contaminant

Table 6-2

Potential Chemical-Specific Federal and State ARARs
Landfill No. 3, Parcel 80(6)
Fort McClellan, Alabama

Subject	Law/Regulation	Requirement of Law/Regulation	A	R&A	TBC	ARAR/TBC Status
Human Health and Ecological Risk Evaluation	Final Human Health and Ecological Screening Values and PAH Background Summary Report, IT Corporation [IT], 2000b August.	Detailed study of Fort McClellan site was used to develop site specific parameters regarding land use, receptors, exposure pathways, exposure duration, ingestion pathways, and bioconcentration potential. These values are associated with designated risk levels, and were used in the baseline risk assessment for the EE/CA.			1,2,3,4	Based on recognized EPA methodology and cancer potency factors from the EPA IRIS database. COCs are chemicals that contribute significantly to a cancer risk or health hazard to a receptor with unacceptable risk levels; i.e., a total ILCR summed across all COPCs and media greater than 1E-4 or a total Hazard Index (HI) greater than 1 (after segregation by target organ). Remediation Goal Objectives (RGOs) are risk-specific concentrations developed for chemicals identified as COCs. The cancer-based site-specific screening levels (SSSL) are adopted as RGOs based on a cancer risk of 1E-6. The noncancer-based SSSLs are adopted as RGOs based on a noncancer HI of 0.1.

ARAR - Applicable or relevant and appropriate requirements.
COC - chemicals of concern
COPC - chemicals of potential concern.
ILCR - Incremental lifetime cancer risk.
IRIS - Integrated risk information service.
PAH - polynuclear aromatic hydrocarbon.
R&A - relevant and appropriate.
TBC - to be considered. 1, 2, 3, and 4 represent the alternatives for this site.

1E-4 1 in 10,000
1E-6 1 in 1,000,000

Table 6-3

Potential Action-Specific Federal and State ARARs
Landfill No. 3, Parcel 80(6)
Fort McClellan, Alabama

Action	Law/Regulation	Requirement of Law/Regulation	A	R & A	TBC	Comment
Open dumping	State: ADEM Administrative Code Chapter 420-3-5.09	Unauthorized open dumps or any activity causing the creation or maintenance of such dumps constitutes a nuisance menacing public health and is subject to abatement by the Environmental Department.	1,2,3,4			Basis for DOD action at former disposal sites to address potential nuisance to public health.
Closing or upgrading open dumps	Federal: 40 CFR 256.23	The State shall provide for classification of existing solid waste disposal facilities. For open dumps, the State shall take steps to close or upgrade the facility. Evidence of that action shall be made publicly available. In providing for closure of open dumps, the State shall take steps necessary to eliminate health hazards and minimize potential health hazards. These steps shall include requirements for long-term monitoring or contingency plans where necessary.		1,2,3,		Basis for DOD action at former disposal sites to minimize potential health hazards. No Action does not meet these criteria if there are potential health hazards.
OSWER Directive 9355.0-67FS	Guidance: Application of the CERCLA Municipal Landfill Presumptive Remedy for Military Landfills	The volume of landfill contents, types of wastes, hydrogeology and safety must be considered when assessing the practicality of excavation and consolidation or treatment of wastes. Although no set volume limits exists, landfills with a content of more than 100,000 cubic yards would normally not be considered for excavation. If military wastes are present, safety considerations may be important in determining the practicality of excavation.			1,2,3,4	Landfill contains an estimated 375,000cubic yards of soil and debris. Therefore, the presumptive remedy would exclude excavation.
On-Site Waste Generation	State: ADEM Admin Code 335-14-3-.01(2)	Person who generates waste shall determine if that waste is a hazardous waste. Including whether waste is excluded from regulation under ADEM Admin Code 335-14-2.01(4) or whether waste is listed under 335-14-2-.04.	4			Hazardous waste is not generated unless the waste is excavated.
Sampling and Analysis	State: ADEM Administrative Code Chapter 335-14-2-Appendix I, II, and III implementing 40 CFR 136, Appendix A (SW-846 sampling methods)	Specific requirements for identifying hazardous wastes. Establishes sampling and analytical requirements for collecting, testing and evaluating wastes.	4	2, 3		Potentially applicable for identifying suspicious (potentially hazardous) waste encountered during implementation of Alternatives 2, 3 and 4.
Management and Disposal of Medical and Petroleum Contaminated Waste	State: ADEM 335-13-4.26	Generators of a special waste may be required to provide an analysis and certification that the waste is nonhazardous waste or treated medical waste. Waste types for which specific rules and regulations have not been developed shall be managed and disposed of in a manner determined by the Department to be consistent with the intent of this Division. Small quantities of petroleum contaminated waste maybe disposed of without testing if it contains < 25 gallons of petroleum, and the total material is <5 cubic yards per occurrence.		2,3,4		Applicable to Municipal Solid Waste Disposal Facilities. Relevant and appropriate due to a similar action at the DOD Landfill site.

Table 6-3

Potential Action-Specific Federal and State ARARs
Landfill No. 3, Parcel 80(6)
Fort McClellan, Alabama

Action	Law/Regulation	Requirement of Law/Regulation	A	R & A	TBC	Comment
Landfill Design to Assure Groundwater Resources Protection	State: ADEM ADMIN. Code 335-13-4-14	Groundwater resources in the vicinity of the landfill unit shall be determined as a basis for facility design, groundwater protection and groundwater monitoring required under 335-13-4.27. Groundwater in the first saturated zone below the landfill unit shall be evaluated with a minimum of one hydraulically upgradient monitoring well for background data and two hydraulically downgradient monitoring well. Monitoring wells should be installed prior to facility opening to provide undisputed background water quality sample.		3,4		These standards are only applicable for establishing a landfill unit. For an existing landfill unit they are potentially relevant and appropriate. Contamination of groundwater associated with the Landfill has not been clearly established. Groundwater remediation is not within the scope of this analysis and it will be addressed as a separate action.
Drainage	State: ADEM Admin Code 335-13-4.17	Owners and operators of all facilities must design, construct and maintain a run-on control system to prevent flow onto the active and or closed portions of the landfill during the peak discharge from a 25-year storm; and a run-off control system to collect and control water volume resulting from 24-hour 25-year storm. The site must also have drainage structures to carry away rain from the disposal site and minimize generation of leachate, erosion and sedimentation.	4	2,3		Applicable for modification of Landfill 4 design after consolidation; relevant and appropriate for design of drainage systems after cover modification at Landfill 3.
Runoff Management	State: ADEM Admin. Code 335-13-4.01(2) (a)&(b)	Runoff management must protect wetlands and surface water quality consistent with NPDES and any applicable Alabama Water Quality Management Plan.	2,3,4			Compliance with substantive requirements of NPDES Stormwater Discharge General Permit requirements is necessary for any construction excavation.
Landfill Cover Design	State: ADEM Admin. Code 335-13-4.20(2)(b)	Final cover system must be comprised of an infiltration layer of at least 18 inches of earthen material and/or a synthetic layer with permeability < or = to permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1 x 10[-5] cm/sec, whichever is less. The infiltration layer for a construction/demolition landfill must be a minimum of 18 inches of compacted earthen materials excluding sands. The erosion layer must be a minimum of 6 inches of earthen material capable of sustaining native plant growth. Alternative designs must achieve an equivalent level of protection.	4	3		Relevant and appropriate standard to guide design of Landfill 3 cover. Applicable to final cover at consolidation landfill.
Final Soil Cover Construction	State: ADEM Admin. Code 335-13-4.20 (2)(c)	Cover shall be graded to prevent ponding, and not exceed 25%. Slopes longer than 25 feet shall require horizontal terraces for every 20 foot rise or utilize other erosion control measures. The minimum final grade shall not be <5%. Deep rooted vegetation penetrating >6 feet below cover is prohibited.	4	3		Relevant and appropriate standard to guide design of Landfill 3 cover. Applicable to final cover at consolidation landfill.

Table 6-3

Potential Action-Specific Federal and State ARARs
Landfill No. 3, Parcel 80(6)
Fort McClellan, Alabama

Action	Law/Regulation	Requirement of Law/Regulation	A	R & A	TBC	Comment
Postclosure	State: ADEM Administrative Code Chapter 335-13-4-.30	Requires 30 years post-closure care for permitted facilities, or a minimum of 5 years if closed prior to 10/9/1993. Specific requirements for landfill post-closure including: 1) maintaining the cover on eroded areas; 2) filling and grading areas where ponding may occur; 3) correcting any surface cracks in the landfill soil cover; 4) maintaining an appropriate cover at all times; 5) establishing and maintaining access control structures and signs; 6) removing any waste disposed following closure; 7) maintaining monitoring devices and pollution control equipment.	4	1,2,3,		Relevant and appropriate to all alternatives because the regulations address locations where wastes have been deposited and are to remain in place. The regulation protects potential human and ecological receptors from adverse impacts resulting from exposure to materials in the landfill. Applicable to final closure of consolidation landfill.
Deed Restrictions	State: ADEM 335-13-4.20(i)	Upon final closure, facility owner shall record a notation onto the land deed for the property used for disposal (or other instrument normally accessed by title search) that will in perpetuity, notify any potential purchaser of the land that it has been used as a solid waste landfill and must include a survey plat, is subject to post closure monitoring and maintenance, and a certification of closure with a detailed design drawing showing final contour and drainage plan.	4	2,3		Not applicable to closure of a non-permitted facility. Relevant and appropriate for a capped unit being closed. Closure will be certified as part of the final remedy for the entire site.
Stormwater Runoff to Surface Water from Construction Excavation Activities	Federal: 40 CFR 122.26 implemented by ADEM Administrative Code Chapter 335-6-6-.03 and .23	Requirements for a storm water discharge permit. Requirements ensure that storm water discharges from construction activities (clearing, grading, and excavating) do not violate surface water quality standards	2,3,4			Substantive requirements are applicable. For construction activities, a Stormwater Pollution Prevention Plan identifying Best Management Practices to be used to control storm water runon and contamination of stormwater runoff must be identified.

Table 6-3

Potential Action-Specific Federal and State ARARs
Landfill No. 3, Parcel 80(6)
Fort McClellan, Alabama

Action	Law/Regulation	Requirement of Law/Regulation	A	R & A	TBC	Comment
Construction Stormwater Discharge Permit Conditions	State: ADEM NPDES General Permit No. ALG610000	Authorizes the discharge of storm water from construction sites and other activities involving land disturbances (i.e., construction, excavation, land clearing). Requires Best Management Practices as provided in the Alabama Nonpoint Source Management Program Document and EPA Storm Water Pollution Prevention for Construction Activities. All materials used as fill for construction purposes must be non-toxic, non-acid forming and free of solid waste or other debris unless approved by the Department. Include a diagram of the facility showing locations where storm water exits the facility, location or structures or other measures to prevent pollution of stormwater or remove pollutants from storm water and locations of collection and handling systems. A copy of the BMP shall be maintained at the facility, along with a log of inspections required by Part IVB of the Permit. Documentation of training must also be kept on site. Training must be performed prior to implementation of the permit.			2,3,4	Substantive requirements are applicable. For construction activities, a Stormwater Pollution Prevention Plan identifying Best Management Practices to be used to control storm water runon and contamination of stormwater runoff must be identified.
Off-Site Disposal of Hazardous Waste	State: Subparts A through E ADEM Administrative Code Chapter 335-14-9	Identifies hazardous wastes that are restricted from land disposal and defines treatment standards for waste, soil and debris. Excavated wastes must be treated to Land Disposal Restriction (LDR) treatment standards prior to disposal, and the disposal facility must be permitted under RCRA to accept hazardous wastes.			4	Excavated waste that is hazardous not be disposed of on site. The Off-site disposal facility will have to be RCRA permitted and waste characterized as Land Disposal Restricted.
Packaging, Labeling, and Storage	Federal: USDOT Hazardous Materials Transportation Regulations: 49 CFR 171 to 173 and 177 to 180	Establishes classification, packaging, and labeling requirements for shipments of hazardous materials on publicly accessible roads.	4			Potentially applicable if hazardous waste is encountered during relocation of the waste fill under Alternative 4.
Transportation of Hazardous Waste	State: ADEM Administrative Code Chapter 335-14-4	Requires RCRA manifesting of hazardous waste shipments, waste characterization, labeling, and packaging; reporting of LDR status; transporter placarding compliance; reporting requirements for transporter, disposal facility and generator, record keeping, and training requirements for off-site transport of and hazardous waste.	4, 3			Potentially applicable if hazardous waste is encountered during relocation of the waste fill under Alternative 4.

Table 6-3

Potential Action-Specific Federal and State ARARs
Landfill No. 3, Parcel 80(6)
Fort McClellan, Alabama

Action	Law/Regulation	Requirement of Law/Regulation	A	R & A	TBC	Comment
Medical Waste	State: ADEM Administrative Code Chapter 335-13-7	Defines medical waste, including "sharps," such as hypodermic needles, IV tubing with needles attached, scalpels, syringes, glassware, blood vials, pipettes and similar items. Establishes guidelines for storage, treatment, and disposal of untreated medical waste.	4			Potentially applicable if medical waste is encountered during relocation of the waste fill under Alternative 4.

A – applicable
ADEM – Alabama Department of Environmental Management
ARAR – applicable or relevant and appropriate requirement
CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
CFR – Code of Federal Regulations
NPDES – National Pollutant Discharge Elimination System
R & A – relevant and appropriate
RCRA – Resource Conservation and Recovery Act
TBC – to be considered
USC – United States Code
UXO – unexploded ordnance
1, 2, 3, and 4 represent the alternatives for this site

Table 6-4

Potential Location-Specific Federal and State ARARs
Landfill No. 3, Parcel 80(6)
Fort McClellan, Alabama

Location	Law/Regulation	Requirement of Law/Regulation	A	R&A	TBC	ARAR/TBC Status
Floodplain	State: ADEM Administrative Code Chapter 335-13-4-.01	Establishes Permit Requirements and location standards for new disposal facilities in floodplains. A facility located in a floodplain shall not restrict the flow of the 100-year flood, reduce temporary water storage capacity of the floodplain, or result in washout of solid waste so as to pose a hazard to human health and the environment. A facility shall not result in the destruction of adverse modifications of critical habitats protected under the Federal Endangered Species Act of 1973, or of threatened or endangered species.		1,2,3,4		Not applicable to existing facilities. Substantive requirements are potentially relevant and appropriate because the standards are intended to identify conditions that could either result in an increased potential for a release from a landfill or would be particularly sensitive if a release occurred. Regulation is appropriate since releases from this landfill would be similar to the types of releases that could occur at a permitted municipal solid waste landfill.
Location Protective of Water Quality	State: ADEM Administrative Code Chapter 335-13-4-.02	Requires that a facility will not be located so as to adversely impact water quality by causing a discharge of pollutants into or degradation of waters of the State. A facility shall not cause non-point pollution of waters of the State that violates any requirement of a water quality management plan that has been approved under the Alabama Water Pollution Control Act.		1,2,3,4		Potentially relevant and appropriate because the standards are intended to identify conditions that could either result in an increased potential for a release from a landfill or would be particularly sensitive if a release occurred. Regulation is appropriate since releases from this landfill would be similar to the types of releases that could occur at a permitted municipal solid waste landfill.
Surface Water	40 CFR 122.41(d) and 122.44(d)	Specifies that reasonable steps must be taken to minimize or prevent discharges that have a reasonable likelihood of causing adverse impacts on surface-water quality (40 CFR 122.41[d]).	2,3,4			Adverse impacts on surface water quality should be minimized through use of drainage controls.
Surface Water	ADEM 335-6-10.04 Antidegradation Policy ADEM 335-6-10.07 Toxic Pollutant Criteria Applicable to State Waters	Specifies that discharges into surface water must achieve Federal and State water-quality standards (40 CFR 122.44[d]).		2,3,4		Relevant and Appropriate for ponded surface water if present.

Table 6-4

Potential Location-Specific Federal and State ARARs
Landfill No. 3, Parcel 80(6)
Fort McClellan, Alabama

A – applicable
ADEM – Alabama Department of Environmental Management
ARAR – applicable or relevant and appropriate requirement
CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
CFR – Code of Federal Regulations
CoA – Code of Alabama
NPDES – National Pollutant Discharge Elimination System
OSHA – Occupational Safety and Health Act
R & A – relevant and appropriate
RCRA – Resource Conservation and Recovery Act
TBC – to be considered
USC – United States Code
UXO – unexploded ordnance
1, 2, 3, and 4 refer to the respective alternatives at each site

Table 6-5

Summary of Detailed Alternative Analysis
Landfill No. 3, Parcel 80(6)
Fort McClellan, Alabama

Criteria	Alternative 1 No Action	Alternative 2 Limited Action with Institutional Controls	Alternative 3 Soil Cover with Institutional Controls	Alternative 4 On-site Disposal in Secure Landfill
Overall Protection of Human Health and the Environment	This alternative does not provide any protection of human health and the environment from the human health risk that was determined to exist at this site.	This alternative provides some protection of human health and the environmental through the use of institutional controls. However, contaminants would continue to leach into the groundwater.	This alternative provides adequate human health and environmental protection through the use of institutional controls and physical barriers to exposed waste.	This alternative provides adequate human health and environmental protection through removal of the waste, and would significantly reduce the timeframe for groundwater cleanup.
Compliance with Applicable or Relevant and Appropriate Requirements (ARAR)	Does not meet the requirements of the ARARs. Groundwater contamination may require Subtitle D compliance action.	Meets some of the requirements of ARARs. This alternative does not mitigate groundwater impacts and source contribution to groundwater impacts.	Meets the requirements of applicable ARARs and EPA guidance for presumptive remedy for military landfill sites.	Clean closure of this landfill site would meet ARARs. This alternative would meet base reuse plan. This alternative would eliminate a source of groundwater contamination.
Long-Term Effectiveness and Permanence	Provides no long-term permanent controls.	This alternative maintains physical access controls and provides for long-term site management but does not create a physical barrier to exposed waste.	This alternative maintains potential exposure controls and provides for long-term site management. The soil cover may reduce surface water infiltration, and thus reduce leaching of contaminants into groundwater.	This alternative provides for long-term effectiveness and permanence by clean closing source waste area.

Table 6-5

Summary of Detailed Alternative Analysis
Landfill No. 3, Parcel 80(6)
Fort McClellan, Alabama

Criteria	Alternative 1 No Action	Alternative 2 Limited Action with Institutional Controls	Alternative 3 Soil Cover with Institutional Controls	Alternative 4 On-site Disposal in Secure Landfill
Reduction of Toxicity, Mobility, or Volume Through Treatment	None of the contaminants will be destroyed, treated, or recycled under this alternative. Thus, toxicity, mobility, and volume will not be affected by this alternative.	No contaminants will be destroyed, treated, or recycled under this alternative. Toxicity, mobility, and volume will not be affected by this alternative.	No contaminants will be destroyed, treated, or recycled under this alternative. The potential mobility of the contaminants may be somewhat reduced by the soil cover. Volume and toxicity will not be reduced.	No contaminants will be destroyed, treated, or recycled under this alternative. This alternative does not reduce toxicity or volume through treatment. The volume of waste is solely transported to an area with more controlled conditions. Placing waste in a waste containment cell will reduce mobility. Hazardous waste will be segregated and disposed under even more controlled conditions.
Short-Term Effectiveness	No short-term risks will be posed during implementation of this alternative.	Minimal short-term risks will be posed to workers and no short-term risks will be posed to the community during implementation of this alternative.	Potential short-term risks will be posed during grading of any contaminated surface soil; can be reduced or eliminated with proper procedures. Some short-term risks will be posed to the community from transportation of soil, and possible obstruction to highway traffic adjacent to the site.	Short-term risks will be posed during implementation of this alternative through exposure to contaminated soil and transportation traffic; can be reduced/mitigated with proper procedures. Short-term risks will be posed to community also, but can be mitigated.

Table 6-5

Summary of Detailed Alternative Analysis
Landfill No. 3, Parcel 80(6)
Fort McClellan, Alabama

Criteria	Alternative 1 No Action	Alternative 2 Limited Action with Institutional Controls	Alternative 3 Soil Cover with Institutional Controls	Alternative 4 On-site Disposal in Secure Landfill
Implementability	No implementing difficulty.	Little implementing difficulty.	Some implementing difficulty associated with site clearance.	Some degree of implementing difficulty in removing slopes and transportation to and from Landfill No. 4.
Community Acceptance	This alternative is not likely to be accepted by the community.	The community will be less likely to accept this alternative because it leaves the waste potentially exposed at the site, and the source to groundwater contamination remains.	The community is more likely to accept this alternative over alternative 2 because it provides an additional barrier to contaminants and decreases infiltration rates. However, contamination from the fill area would continue to leach into the groundwater.	The community will accept this alternative but may not like the increase in Landfill No. 4. This alternative would eliminate a groundwater contamination source.
State Acceptance	This alternative would not be acceptable to the State because the alternative is not protective of human health and the environment.	The State may not accept this alternative because the potential for contaminant migration would support at minimum a soil cover as the presumptive remedy. The soil and groundwater contamination would support the demand for a remedial action.	The State is likely to accept this alternative. However, due to the presence of groundwater contamination, the State may require a groundwater treatment also.	The State is likely to accept this alternative. This alternative provides for clean closure of the site, and eliminates a source of groundwater contamination.
Cost (Net Present Worth)	$0	$1,836,000[a]	$8,093,000[a]	$10,700,000

[a] A groundwater treatment system may be required for the existing contaminant plume. The costs of the system are not considered.

plume extends off base. Cost impacts from a treatment system can only be partially acknowledged and cannot be quantified at this time. During evaluation of each alternative for Landfill No. 3, the impacts to groundwater and the length of groundwater treatment is considered. Long-term groundwater monitoring is considered under all of the following alternatives for Landfill No. 3 (with the exception of Alternative 1, No Action).

The results of the human health streamlined risk assessment showed that there was risk associated with measured compounds in groundwater samples under the proposed future use scenario for Landfill No. 3 (Section 6.2). Although several chemical constituents exceeded their respective ESVs, there are no sensitive ecosystems present at or in the near vicinity of Landfill No. 3, Parcel 80(6). Thus, no ecological risk was determined at Landfill No. 3.

Alternatives were developed for soils in this EE/CA that are intended to prevent further deterioration of groundwater due to landfilled materials in Landfill No. 3. Section 300.430(a)(iii)(B) of the NCP contains the expectation that engineering controls, such as containment, will be used for waste that poses a relatively low long-term threat where treatment is impracticable. The preamble to the NCP identifies municipal landfills as a type of site where treatment of the waste may be impracticable because of the size and heterogeneity of the contents (55 FR 8704). Because treatment is usually impracticable, EPA generally considers containment to be the appropriate response action, or "presumptive remedy" for the source areas of municipal landfill sites (EPA, 1996a). This should be taken into consideration when evaluating the alternatives described in the following sections.

6.7.1 No Action Alternative (Alternative 1)

The No Action Alternative maintains the present conditions at the site with no additional effort to reduce potential exposure. The No Action general response provides no remediation, monitoring, or security activities at the site to reduce risk to human health or the environment. The NCP (40 CFR 300.415) requires that the No Action response be carried through the detailed analysis as a baseline for comparison with other remedial action alternatives.

6.7.2 Limited Action (Drainage Control) with LUCs (Alternative 2)

Under this alternative, limited action would consist of some drainage control to limit Landfill No. 3 surface water infiltration. The site drainage would be maintained to keep surface water from flowing onto the site. Drainage would be directed from the northeast corner to the southwest corner of the site. The drainage ditch bordering the western and northern side of the site would be maintained as well. This alternative would also include decommissioning of nine existing site-monitoring wells in accordance with ADEM requirements.

LUCs for Landfill No. 3 would include restricted access to Landfill No. 3 by physical and legal means. Concrete monuments would be installed around the perimeter of Landfill No. 3. As part of any property transfer, the Army would develop transfer documentation that would limit future activity within the boundary area to passive recreational use and restrict peripheral activities to avoid onflow of storm water runoff.

Landfill No. 3 is located within the floodplain of Cave Creek; however, it does not appear to be in close proximity to the creek and therefore does not seem to have a potential for an erosion problem. However, since Landfill No. 3 is located within the Cave Creek floodplain an evaluation of the site will be required and possible mitigation of flood impacts due to the modified elevations of Landfill No. 3 may be required.

Long-term groundwater monitoring would include semi-annual sampling at 8 wells for 30 years. However, longer monitoring periods could be required, should groundwater contamination persist at Landfill No. 3, Parcel 80(6).

6.7.3 Engineered Low-Permeability Cover with LUCs (Alternative 3)

Under this alternative, an engineered low-permeability cover would be constructed on Landfill No. 3, Parcel 80(6). The clean soil would be imported from the borrow area south of Landfill No. 4, Parcel 81(5) (approximately 0.25 miles away). All brush, timber, stumps, and vegetation would be cleared from Landfill No. 3 to provide a clear base to place the cover soil, and any required drainage features would be constructed to meet design requirements. The value of harvested timber will offset a considerable portion of the clearing and grubbing cost. Once the vegetation was cleared, the hummocks of soil between trenches would be graded to provide a clean and level base for placement of the engineered low-permeability cover.

Prior to any action, an engineered low-permeability cover will be designed to meet site conditions. Following clearing and grubbing, an engineered cover will be constructed over Landfill No. 3. The surface of the landfill should be graded by removing the ridges and filling the depressions to produce a uniform grade over the entire landfill. Following grading of the landfill, the surface will be compacted to a minimum of 90 percent of the maximum dry density at moisture content of plus or minus 2 percent as determined by ASTM D 1557. The final engineered cover will be constructed over the prepared surface and will consist of the following components (from bottom to top):

- Foundation Layer: consists of 1 foot of soil placed over the graded surface of the landfill. The foundation layer will be compacted to a minimum of 90 percent of the maximum dry density at moisture content of plus or minus 2 percent as determined by ASTM D 1557. The surface of the Foundation Layer will be graded to the lines and grades shown on the design drawings with a vertical tolerance of plus or minus 0.2 foot with a thickness tolerance of up to 0.2 foot.

- Geogrid or High-Strength Geotextile: will be placed over the prepared graded surface of the landfill. This material will provide resistance to future settlement of the waste-filled trenches. The geogrid or high-strength geotextile will be selected from available products to accommodate the expected future settlement and to limit the deformation of the overlying low-permeability soil layer due to settlement.

- Low-Permeability Soil Layer: consists of a 1-foot-thick layer of clayey soil that, when compacted, can achieve a maximum hydraulic conductivity of 1×10^{-7} centimeters per second (cm/s). This layer will serve as the primary barrier to the infiltration of precipitation into the underlying wastes. The low-permeability layer will be compacted to a minimum of 90 percent of the maximum dry density at moisture content of plus or minus 2 percent as determined by ASTM D 1557. The soil will be classified as a CH, SL, or SC as determined by the Unified Soil Classification System. The surface of the low-permeability layer will be graded to the lines and grades shown on the design drawings with a vertical tolerance of plus or minus 0.2 foot with a thickness tolerance of up to 0.2 foot (no minus tolerance will be allowed).

- Topsoil: an erosion-resistant layer placed on top of the low-permeability soil layer will be vegetated. This layer will be capable of sustaining native or other suitable plant growth. The topsoil layer will consist of a 12-inch layer of friable material uniformly distributed and evenly spread to its total thickness with minimal compaction requirements. This promotes the generation of the vegetative cover that will reduce erosion.

The cover soil would be placed over the original extent of waste, covering an area of 22.8 acres; thus, approximately 73,600 cubic yards of soil would be transported to Landfill No. 3. Seeding of light vegetation (e.g., grass, forbs, and shrubs) will be conducted to promote growth of vegetation on the soil cover in order to minimize erosion. This alternative would also include decommissioning of nine existing Landfill No. 3 monitoring wells in accordance with ADEM requirements.

Concrete monuments would be installed around the perimeter of Landfill No. 3. As part of any property transfer, the Army would develop transfer documentation that would limit future activity within the boundary area to passive recreational use and restrict peripheral activities to avoid onflow of storm water runoff.

Landfill No. 3 is located within the floodplain of Cave Creek; however, it does not appear to be in close proximity to the creek and therefore does not seem to have a potential for an erosion problem. However, since Landfill No. 3 is located within the Cave Creek floodplain an evaluation of the site will be required and possible mitigation of flood impacts due to the modified elevations of Landfill No. 3 may be required.

This alternative provides for 30 years of Landfill No. 3 cover maintenance, which includes periodic inspections, and maintenance of the physical controls, erosion control, maintenance of drainage structures, and maintenance of shallow-rooted vegetation. Long-term groundwater monitoring would include semi-annual sampling at 8 wells for 30 years. The engineered soil cover is compatible with future groundwater remediation as a proven and effective method for source control.

6.7.4 On-Site Disposal in a Secure Landfill (Alternative 4)

This alternative would consist of disposal of all contaminated soil and waste debris fill to a waste consolidation cell at Landfill No. 4, Parcel 81(5). Prior to disposal, all brush, timber, and vegetation would be cleared from Landfill No. 3, Parcel 80(6) (debris would be disposed at the Industrial Landfill, Parcel 175(5), and timber would be sold to offset costs). The fill area covers 22.8 acres to an average depth of approximately 17 feet bgs. Approximately 60 percent of the volume consists of the waste fill. The remaining 40 percent is native soil that could be segregated and be used as backfill. Thus, approximately 375,200 cubic yards of waste fill would be transported from Landfill No. 3 to Landfill No. 4. The volume of borrow material that would be transported from the area just south of Landfill No. 4 to be used as backfill will be approximately 450,000 cubic yards (20 percent additional volume added for compaction purposes). Landfill No. 3 would be restored to the pre-existing grade. This alternative would also include decommissioning of nine existing Landfill No. 3 monitoring wells in accordance with ADEM requirements.

Long-term groundwater monitoring would continue at Landfill No. 3 through the groundwater remediation project. Should the future groundwater data indicate a decrease in currently observed contaminant concentrations, a request to discontinue monitoring would be submitted to the regulatory agency for concurrence. Source removal may significantly decrease the duration of groundwater treatment. However, as discussed in Section 6.7, the EPA generally considers containment to be the appropriate response action for municipal landfill sites due to the size and heterogeneity of the contents.

6.8 Comparative Analysis

This section consists of the analysis and presentation of the relevant information needed to permit the selection of a site response action. During this analysis, each alternative is assessed against nine evaluation criteria. A comparison of the four alternatives considered for Landfill No. 3, Parcel 80(6), and their evaluation under the nine evaluation criteria is presented in Table 6-5. The human health risk evaluation (Section 6.2) determined that there was a cancer risk and noncancer hazard associated with groundwater down-gradient of Landfill No. 3 based on current site investigation data. However, it should be noted that the impacts to groundwater present at Landfill No. 3 have not been fully addressed under the proposed alternatives. The potential treatment of groundwater is being covered under another ongoing study. No medical debris or potential UXO were identified at Landfill No. 3.

6.8.1 Overall Protection of Human Health and the Environment

The overall protection of human health and the environment analysis provides a summary of how each alternative reduces, eliminates, or controls the risk from potential exposure pathways, through use of land-use controls, treatment, or engineering controls. Any short-term or cross-media impacts posed by the alternative are also considered.

Alternative 1 would not provide any protection of human health and the environment, and Alternative 2 would provide limited protection. Alternative 3 would provide an additional protective barrier, but impacts to groundwater may continue. Alternative 4 provides the greatest protection of human health and the environment.

6.8.2 Compliance with ARARs

Under this criterion, the alternative is evaluated on how completely it will comply with ARARs, and if there will be further action required to comply with the ARARs. The need to justify a waiver from the ARARs is also evaluated. Action-, location-, and chemical-specific ARARs have been identified for the site and are discussed in Section 6.6.

A summary of the ARARs for all of the alternatives is presented in Tables 6-2, 6-3, and 6-4. The No Action Alternative does not comply with chemical-specific ARARs as no actions are taken to reduce contaminant concentrations detected in groundwater. There are no location- or action-specific ARARs associated with Alternative 1 as no actions are taken under this alternative. Alternatives 2, 3, and 4 would be designed to comply with all action- and location-specific ARARs. These alternatives entail actions to prevent (Alternatives 3 and 4) or reduce (Alternative 2) infiltration of surface water through the landfilled materials, thereby, reducing contaminant concentrations in groundwater. Alternative 4 is anticipated to provide the greatest protection of groundwater, followed by Alternative 3, and thereby meet chemical-specific ARARs in the timeliest manner.

6.8.3 Long-Term Effectiveness and Permanence

The analysis of the long-term effectiveness and permanence provides an evaluation of the magnitude of residual risk and the adequacy and reliability of controls used to manage the remaining wastes (untreated waste and treatment residuals) on-site.

Alternative 1 will have no long-term effectiveness. Alternative 4 will have the greatest long-term effectiveness and permanence. Alternative 3 has a slightly greater degree of long-term effectiveness and permanence than Alternative 2.

6.8.4 Reduction of Toxicity, Mobility or Volume

The evaluation of the reduction of toxicity, mobility, or volume through treatment discusses the anticipated performance of the treatment option an alternative utilizes. These criteria are evaluated due to the statutory preference for selecting a remedial action that employs treatment as a means to reduce the toxicity, mobility, or volume of materials. Aspects of this assessment include the amount of materials treated or destroyed; the degree of expected reduction in toxicity, mobility, or volume, the degree of irreversibility, and the type and quantity of residuals remaining on-site after treatment.

The toxicity and volume of waste is not reduced under any of the four alternatives, and the mobility is not affected by Alternatives 1 and 2. However, under Alternative 3 the mobility of contaminants will be reduced by the engineered low permeability soil cover, which will limit surface water infiltration. The mobility of the waste will be greatly reduced under Alternative 4 because the waste will be placed in an appropriate containment cell.

6.8.5 Short-Term Effectiveness

Short-term effectiveness relates to the protection of the community and workers during remedial actions, and environmental impacts that would occur during the implementation of remedial actions.

Short-term effectiveness does not apply to Alternative 1 as no actions are performed under this alternative. Alternative 4 will have the least short-term effectiveness due to risks posed to workers and the community during the remedial action. Alternative 3 poses more exposure of workers to chemicals than Alternative 2. Risks to workers and the community will be controlled by employing the use of proper health and safety measures. Short-term risks to the environment are associated with Alternatives 3 and 4 as habitats will be affected by construction activities. However, these risks are anticipated to be minor to the ecological community at Fort McClellan and the area will be returned to a useable condition following completion of the remedial actions.

6.8.6 Implementability

The discussion of implementability details the technical and administrative feasibility of implementing an alternative as well as the availability of the necessary materials, and technology; the reliability of the technology; the ability to obtain the necessary equipment, specialists, services and capacities; the ability to monitor the remedial performance and effectiveness; and the ability to obtain agency approval and any necessary permits.

Alternatives 1 and 2 are readily implementable. Some degree of complexity may be involved during implementation of Alternatives 3 and 4 associated with Landfill No. 3, Parcel 80(6), clearance. Moving wastes from the trenches may provide some difficulty under Alternative 4.

6.8.7 Community Acceptance

The assessment of community acceptance evaluates the concerns and issues the public may have regarding each alternative. This assessment tries to evaluate the intended reuse option with the final site condition based on the action.

The community is not likely to accept Alternative 1, but may accept Alternative 2. Alternatives 3 and 4 will likely be acceptable to the community.

6.8.8 State Agency Acceptance

State agency acceptance evaluation assesses the technical and administrative issues and concerns the state may have regarding each alternative.

The state is not likely to accept Alternative 1, but may accept Alternative 2. Alternatives 3 and 4 will likely be acceptable to the State.

6.8.9 Cost

The cost estimates presented are based on a variety of information including quotes from vendors and local suppliers, generic unit costs, conventional cost estimating guides, and previous experience. The cost estimates have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The actual costs will depend on true labor and material costs, actual site conditions, competitive market conditions, final project scope, the implementation schedule, government regulatory fees and charges and other variable factors. The cost evaluations are designed to determine relative cost impacts for each alternative.

Annual operation and maintenance (O&M) costs are post-construction expenses necessary to maintain the remedial action. These expenses include operating labor, maintenance materials and labor, energy, purchased services, periodic site reviews and performance monitoring. The estimates include those costs that may have been incurred even after the initial remedial activity is complete.

A present worth analysis is used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year, typically the current year. The present worth costs were determined based on a 5 percent interest rate, for a 30-year time frame. The engineering and design cost is assumed to be 10 percent of the total worth of capital cost.

The estimated costs are used for comparison of alternatives, and are expected to provide an accuracy of +50 percent to –30 percent. The costs are presented in Table 6-5. Cost calculation sheets are provided in Appendix G.

6.8.10 Summary of Comparative Analysis of Alternatives

Each alternative was compared against nine evaluation criteria. The alternative was assigned a point value under each evaluation criteria. The point value ranges from 0 to 3. A description of the point rating system for each criterion is provided in Appendix H. The points for each alternative are added, resulting in a total point value for each alternative. Thus, providing a simple comparison of the alternatives. Table 6-5 provides a summary of the criteria and costs for the four alternatives. The following costs and evaluation scores were determined for each alternative:

- Alternative 1: NPW = $0, Score = 8.5
- Alternative 2: NPW = $1,836,000, Score = 13.0
- Alternative 3: NPW = $8,093,000, Score = 15.1
- Alternative 4: NPW = $10,700,000, Score = 21.6.

Although Alternative 1 has the lowest NPW, it has the lowest evaluation score and would not likely be accepted by the State agency as an acceptable alternative. Alternative 2 has the next lowest cost; however, this alternative does not address the groundwater degradation and potential source area. Alternative 4 has the highest score; however, due to the higher cost and increased risk to on-site personnel this would not be the most cost-effective alternative. Alternative 3 has the second highest score at a cost that is significantly lower than Alternative 4 and will significantly reduce or eliminate the amount of infiltration of surface water to the source. Therefore, Alternative 3 is the most cost-beneficial and is still protective of human health and the environment.

6.9 Recommendations

The recommended alternative is the engineered low-permeability soil cover with LUCs. The streamlined risk assessment indicated that human health risks exist at Landfill No. 3, Parcel 80(6), both in soils and groundwater. Landfill No. 3 presents no unacceptable human health risks for the recreational site-user, which is the proposed future land use for the area. Exposures to surface soil (thallium) and groundwater (trichloroethene and 1,1,2-2 tetrachloroethane) present unacceptable risks to a resident. As elevated levels of contaminants associated with landfilling activities have been detected in groundwater at the site, the Army recommends a low permeability soil cover with LUCs and limited long-term groundwater monitoring.

The existing waste fill trenches act as surface water collection basins that provide moisture to leach through the waste fill. The ecological risk assessment showed no significant ecological risk associated with Landfill No. 3. The No Action and Limited Action alternatives would not address risks to human health and the environment. The low permeability soil cover with LUCs would prevent human exposure to Landfill No. 3 physical hazards and would include appropriate property transfer documentation with notices/restrictions, installation of concrete monuments to delineate the boundary of the site, and the decommissioning of nine of the seventeen groundwater monitoring wells in accordance with ADEM requirements. Long-term monitoring will be required for groundwater at Landfill No. 3 until groundwater contaminant trends indicate a decrease in concentrations. Once analytical trends indicate a reduction in groundwater contaminants, the monitoring program may be discontinued with the concurrence of BCT. Detailed evaluation of the groundwater at Landfill No. 3 is currently being conducted in a separate remedial investigation document. The engineered low permeability soil cover is compatible with source reduction strategies commonly used on groundwater treatment systems.

Alternative 1 and 2 would not be viable at Landfill No. 3, Parcel 80(6), due to human health risks associated with contaminants at the site. In addition, Alternative 1 and 2 would do nothing to address the groundwater contamination source that is thought to exist at Landfill No. 3. Alternative 3 will reduce and possibly eliminate infiltration of surface water through the waste fill. Alternative 3 would not present a barrier to rising groundwater infiltrating into the waste but is clearly the most cost beneficial alternative. Groundwater infiltration into waste has not been demonstrated by current data. Alternative 4 provides for removal of the groundwater contaminant source, control of surface drainage, and the potential for reduced groundwater monitoring and remediation; although, the costs associated with consolidation may far exceed the benefits of the action.

A soil cover will be designed, constructed, and maintained to ensure that no infiltration of precipitation occurs. A passive gas venting system could be built into the cover or vents constructed into the cover layer to allow release of any potential landfill gas. The low permeability cover will be designed to drain to a drainage channel and surface water will be diverted away from the Landfill No. 3, Parcel 80(6), footprint. The low permeability soil cover would be installed to prevent surface water from infiltrating into the waste and leaching into the groundwater. The cover would be installed in accordance with design standards for final covers of municipal solid waste landfills under ADEM Administrative Code 335-13-4-15. Cover maintenance would include repair of eroded areas, maintenance of shallow root vegetative growth, prevention of the growth of tree seedlings in the cap cover material, filling of depressions in the cover, and maintenance of drainage features. Explosive gas monitoring would be employed in accordance with ADEM Administrative Code 335-13-4-16. Groundwater sampling and monitoring would be initiated following installation of the cover system to monitor and meet post closure monitoring requirements specified under ADEM Administrative Code 335-13-4-27.

This alternative is the most cost-beneficial remedy to the surface soil and the potential source area for groundwater contamination and is readily implementable. The capital cost for this alternative is $5,865,000 and the net present worth is $8,093,000. The net present worth for the groundwater monitoring is approximately $2,228,000 over the next 30 years. If the groundwater impacts are not mitigated, Subtitle D and ADEM regulations may extend the groundwater-monitoring period. If in the future, a groundwater remediation system were required, a significant system could easily cost over $3,000,000 to install and operate for a five year period.

7.0 Landfill No. 4 and the Industrial Landfill, Parcels 81(5) and 175(5)

7.1 Site Location

Landfill No. 4, Parcel 81(5), is located at the northern end of the Main Post, east of former Landfill No. 3, Parcel 80(6), and covers a total of 43.3 acres. The active Industrial Landfill, Parcel 175(5), is located on approximately 15.9 acres of Landfill No. 4 that was not previously used (ESE, 1998). Landfill No. 4 was permitted as the "FTMC Sanitary Landfill." A site location map is provided on Figure 2-1.

7.1.1 Facility Type and Operational Status

Landfill No. 4, Parcel 81(5), was opened in 1967 as the Main Post sanitary landfill and operated until April 1994. The landfill was unlined, was not equipped with a leachate collection system, and used trench and fill as the method of disposal. The landfill reportedly received all of the Main Post household garbage, construction and demolition debris, oil-contaminated soil, and dead animals used in the U.S. Army Chemical School demonstrations (Weston, 1990). One pound of waste Diazinon dust (pesticide) also was reportedly disposed at Landfill No. 4 and the Industrial Landfill (ESE, 1998). The landfill was closed in April 1994 because of changes in the permit requirements governing sanitary landfills. The regulations now require all sanitary landfills to be lined. FTMC decided it would be more cost effective to dispose trash off site at the Calhoun County transfer station than to upgrade the landfill. Figure 7-1 indicates the extent of the permitted landfill, the industrial landfill, retention ponds, and borrow area.

FTMC received a temporary permit in 1993 to dispose of industrial and construction debris at this location. An application was then filed for a permanent industrial landfill permit to dispose of waste on top of the filled trenches. ADEM advised FTMC to apply for a 30-ton/day-limit permit and use a previously unused section of the landfill property. This permit was issued in October 1995. The Industrial Landfill, Parcel 175(5), is shown on Figure 7-1 in the northeast corner of Landfill No. 4, Parcel 81(5). A revised permit for the Industrial Landfill allows 1,200 tons per day of disposal. A copy of the permit is included in Appendix I.

7.1.2 Previous Work

Previous environmental work conducted at Landfill No. 4 included the preliminary assessment.

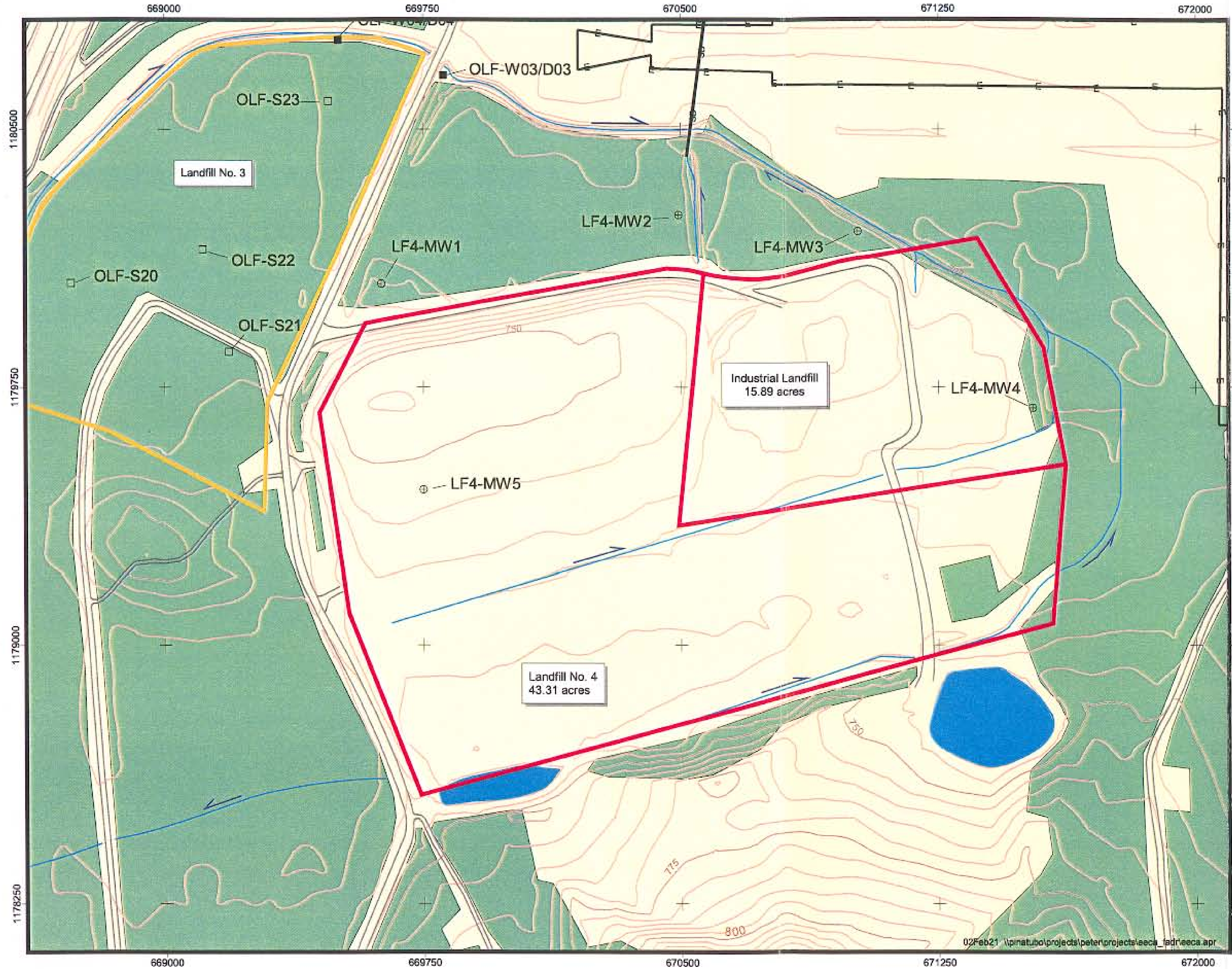

Figure 7-1

Detail Map Landfill No. 4 Parcels 81(5) and 175(5)

Legend

- Surface Soil Sample Location
- Surface Water/Sediment Sample Location
- Residuum Monitoring Well Location
- Electric Utility
- Storm Drain Utility
- Improved Roads
- 5' Topographic Contours
- Surface Drainage/Creek w/ Flow Direction
- Landfill Boundary
- Landfill No. 3 Boundary
- Lakes
- Wooded
- Lawn/Cleared Area

0 300 600

State Plane feet, NAD83

August 2001

N

U.S. Army Corps of Engineers
Mobile District
Fort McClellan
Calhoun County, Alabama
Contract No. DACA21-96-D-0018

IT CORPORATION

7.1.2.1 Investigation

The *Enhanced Preliminary Assessment* (PA) (Weston, 1990) identified Landfill No. 4, Parcel 81(5), as an area requiring environmental evaluation (AREE) and provided general information regarding Landfill No. 4 and the Industrial Landfill operations and known or potential releases from Landfill No. 4 and the Industrial Landfill, Parcels 81(5) and 175(5). Information reported in the PA was obtained from existing records and interviews with various FTMC personnel.

According to the PA report (Weston, 1990), past violations of state and federal requirements included standing water in trenches and lack of adequate compaction. Figure 3-2 of the PA report showed the locations of former monitoring wells A-1 through A-5 (2-inch wells installed in 1976) and wells W-1 through W-9 (4-inch wells installed in 1982). Groundwater data through 1983 indicated four metals, toluene, and chloride had exceeded drinking water standards or the established background levels at Landfill No. 4 and the Industrial Landfill, Parcels 81(5) and 175(5). In 1982, one monitoring well (A-4) located within the waste fill boundary was actively venting landfill gas. Landfill gas data from the past five years are included in Appendix B. Groundwater analytical data collected from 1994 through 1998 is presented in Appendix A, Table A4-1

7.1.2.2 EE/CA Fill Area Definition

IT did not conduct intrusive fill area definition activities at Landfill No. 4 because the landfill boundaries are well-defined and contents are known.

7.1.3 Structures/Topography

The combined landfill area covers 59.2 acres of relatively flat land of which a portion is within the floodplain of Cave Creek (see Floodplain Map on Figure 2-5). A soil borrow area is located south of the landfill. The landfill currently rises above the surrounding grade by approximately 10 to 15 feet. With the exception of the Industrial Landfill, Parcel 175(5), Landfill No. 4, Parcel 81(5), is covered with an engineered, low-permeability clay cover that met the landfill closure requirements at the time of closure. The entire Landfill No. 4 is devoid of natural vegetation, but is currently covered with seeded grasses and vegetation. A concrete-lined drainage swale runs from east to west across most of Landfill No. 4 and the Industrial Landfill. Landfill No. 4 and the Industrial Landfill are bound on the north by mixed coniferous/deciduous forest and Reilly Airfield, on the east by mixed coniferous/deciduous forest, on the south by a borrow area, and on the west by a road and Landfill No. 3, Parcel 80(6). Much of the perimeter of Landfill No. 4 and the Industrial Landfill is enclosed by chain-link fence that restricts access to Landfill No. 4 and the Industrial Landfill. Surface water is diverted around the landfill by concrete ditches that drain into a settling pond at the southeastern end of the landfill. These structures are shown on the Landfill No. 4 and Industrial Landfill detail map (Figure 7-1). Drainage exits the site to the north into a culvert under Reilly Airfield.

The proposed borrow area, located just south of Landfill No. 4 is approximately 1200 x 600 feet and will yield approximately 660,000 cubic yards of soil. The total volume of soil was estimated without a borrow area investigation and assumes that all soils from ground surface to groundwater are suitable for use. The proposed borrow area will be set back 300 feet from the road on the east side and 100 feet from the roads on the west and south sides of the area. A 3:1 cut slope will be utilized on the east, west, and south sides of the borrow area. The floor of the borrow area will be designed to drain freely into the existing retention pond on the southeast corner of Landfill No. 4.

7.1.4 Hydrogeology

Five monitoring wells were installed within Landfill No. 4, Parcel 81(5), in 1976; ten additional wells were installed around the perimeter of the landfill in 1982. Soil boring and well installation records are not available for these wells. All of these wells were decommissioned prior to landfill closure. Five new wells (MW1-94, MW2-94, MW3-94, MW4-94, and MW5-94) were installed at Landfill No. 4 and the Industrial Landfill in 1994. None of the borings for these wells penetrated fill material (IT, 2001a, Appendix F). A geologic map of Landfill No. 4 and the Industrial Landfill is presented on Figure 2-2.

Reported geotechnical soil properties measured in subsurface soils at Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5), show a range in hydraulic K of 3.9×10^{-8} cm/sec to 4.2×10^{-7} cm/sec. Underlying soils are classified generally as silts to silty and clayey sands (USAEHA, 1976).

A groundwater elevation map was constructed using March 2000 water level data and is presented on Figure 2-3. Wells MW-1, MW-2, MW-3, MW-4, and MW-5 were measured and had groundwater elevations ranging from 741.1 to 710.7 feet above msl. Gradient over Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5), ranges from 0.01 to 0.02 ft/ft. Groundwater flow is generally to the northwest and north.

7.1.5 Surrounding Land Use and Populations

The area around Landfill No. 4, Parcel 81(5), is currently used primarily for waste disposal and borrow soil activities. The areas surrounding the landfill and borrow areas are currently used for passive recreation. Figure 1-2, the Base Reuse Map, indicates largely passive recreational reuse with some smaller areas of industrial reuse. There is no likelihood of residential use of Landfill

No. 4 and the Industrial Landfill, and therefore no residential soil exposure scenario has been proposed for Landfill No. 4 and the Industrial Landfill. The groundwater from the site was evaluated using a residential exposure scenario as a conservative baseline. Because of the landfill closure requirements, it is unlikely that any reuse would be allowed until final closure is achieved.

7.1.6 Sensitive Ecosystems

The ecological setting at Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5), is defined by the fact that portions are currently active (i.e., active landfilling and earth-moving operations) and the remainder is characteristic of recent landfilling and earth-moving operations. The original ecological setting has been altered through significant anthropogenic activities. Consequently, the topography and resultant habitat types are not characteristic of similar areas that have not been altered by man. Although Base maps indicate the presence of wetlands in the area of Landfill No. 4 and the Industrial Landfill, due to the activity over the last 40 years, there are no apparent sensitive ecosystems associated with Landfill No. 4 and the Industrial Landfill. A complete description of the Landfill No. 4 and the Industrial Landfill environmental setting is included in Section 7.3.1.

7.1.7 Analytical Data

The summary tables for Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5), identify compounds that exceed the screening criteria as defined in the *Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000a) and the *Final Background Metals Survey Report, FTMC, Alabama* (SAIC, 1998). Appendix A includes a summary of all detected compounds in samples collected at Landfill No. 4 and the Industrial Landfill and compares analyte concentrations against background values (metals only), SSSLs, and ESVs for the various sample media collected at Landfill No. 4 and the Industrial Landfill. Metals that exceed both the background threshold limit (two times background) and the SSSL and organic compounds that exceed SSSL are summarized for each sample medium in Table 7-1.

7.1.8 Potential Source of Contaminants

The PA reported that the area of Landfill No. 4, Parcel 81(5), was used for open burning in 1974 and that a burn pit was used for a fire-fighting exercise. A wood salvage yard reportedly was operated at Landfill No. 4 and the Industrial Landfill but ceased operations because of problems with trash in the wood waste. The contents of the landfill include household garbage, construction and demolition debris, oil-contaminated soil, and decontaminated carcasses of animals used in the U.S. Army Chemical School demonstrations (Weston, 1990). One pound of waste Diazinon dust (pesticide) also was disposed of in the landfill (ESE, 1998).

Table 7-1

Site Investigation Analytical Data Summary
Landfill No. 4 and the Industrial Landfill, Parcels 81(5) and 175(5)
Fort McClellan, Alabama

Medium Sampled	Metals	VOCs	SVOCs	Pesticides	Explosives	Herbicides	PCBs
Surface and Depositional Soil	NS	NS	NS	NS	NS	NS	NS
Subsurface Soil	NS	NS	NS	NS	NS	NS	NS
Sediments	NS	NS	NS	NS	NS	NS	NS
Fill Material	NS	NS	NS	NS	NS	NS	NS
Groundwater	As, Ba, Cd, Fe, Mn, Pb, Sb > BKG and SSSLs	Trichloroethene > SSSL	ND	ND	ND	ND	ND
Surface Water	NS	NS	NS	NS	NS	NS	NS

As - arsenic
Ba - barium
BKG - Background
Cd - cadmium
Fe - iron
Pb - lead

Mn - manganese
ND - not detected
NS - not sampled
Sb - Antimony
SSSL - site-specific screening level
SVOC - semivolatile organic compound

VOC - volatile organic compound

The Industrial Landfill accepts industrial wastes including construction/demolition waste and rubbish. Construction debris includes, but is not limited to: masonry materials, sheet rock, roofing waste, insulation, rebar, scrap metal, paving materials, and wood products. In addition, there is a designated area for asbestos disposal (ESE, 1998). Sludges from the oil/water separators from the Main Post that do not have separate National Pollutant Discharge Elimination System (NPDES) permits are spread in one area of the Industrial Landfill. This type of sludge is classified as a "special waste" and is covered under the Industrial Landfill Permit No. 08-02R (ESE, 1998).

The extent of the landfill and the location of existing monitoring wells are shown on the groundwater elevation map on Figure 2-3. Available validated analytical data indicate that seven metals (antimony, arsenic, barium, cadmium, iron, lead, and magnesium) and one VOC, TCE, have exceeded their respective background values and SSSLs for metals and the SSSL for the VOC. Groundwater analytical results showed TCE exceeded the SSSL for one sampling event at one well. Subsequent samples over the next three events at the same well did not indicate elevated concentrations of TCE. Metals observed in groundwater were associated with high turbidity. Subsequent evaluation of this issue indicates that elevated metals due to highly turbid samples are not representative of actual groundwater concentrations. Appendix E presents a discussion of the issues and the BCT's position regarding metals in these samples. Consequently, metals in groundwater are believed to be the result of high turbidity and not due to impacts to groundwater.

7.2 Streamlined Human Health Risk Assessment

Groundwater was the only medium considered for the human health SRA for Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5). Because the site is covered with clean soil, no exposure route exists for direct human contact with potentially contaminated media. No soil samples have been collected from Landfill No. 4 or the Industrial Landfill. SRA tables, figures, and attachments are included in Appendix C.

7.2.1 Groundwater

Sixty-five groundwater samples, collected between 1994 and 1998, were used to evaluate a resident's exposure to groundwater at these sites (Table C4-1). All of these samples were analyzed for metals and VOCs.

Twelve metals and one VOC (trichloroethene) were detected in the samples, as presented in Table C4-2. After the metals were screened against background, statistical testing was conducted, and the essential nutrients were removed, eight metals were determined to be site-related chemicals (Table C4-2). Antimony concentrations in site groundwater were found to be drawn from the same population as background antimony groundwater concentrations; therefore, antimony was not selected as a site-related chemical (Appendix C, Attachment C-7).

The chemicals determined to be site-related were compared to the residential groundwater SSSLs. All site-related metals, except beryllium, were selected as COPC (Table C4-3). All metals were selected for their noncancer effects.

Table C4-4 presents the HI and ILCR calculated for the resident exposed to groundwater at Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5). The resulting HI (13) is above the acceptable threshold for noncancer hazard. When broken down by target organ, cadmium and manganese are the only metals that are determined to be COC based upon their noncancer effects. The resulting HIs, when broken down by target organ, are cadmium (1.5) and manganese (2.5). RGOs are presented for these metals in Table C4-6. However, cadmium is among the metals detected only in groundwater samples compromised by high turbidity, and manganese is among those whose concentrations are one to two orders of magnitude higher in samples with high turbidity.

7.2.2 Uncertainty Analysis

If land use or receptor scenarios change for Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5), especially if any intrusive work is performed at the site (e.g., construction), it may be necessary to evaluate Landfill No. 4 and the Industrial Landfill in more detail.

A more serious source of uncertainty is the selection of cadmium and manganese as COCs based on their concentrations in groundwater, but it is known that contamination with sediment as reflected by high turbidity exaggerates their apparent concentrations in groundwater.

Another source of uncertainty arises from the detection of TCE in one of 65 samples. The reported concentration is greater than the reporting limits, so there appears to be little question of chemical identity or the reported concentration. The lack of identification of trichloroethene in the other 64 samples, however, suggests that a plume does not exist, or at least that concentrations are well below the reporting limit of 5E-3 milligrams per liter (mg/L). The source of the TCE and whether its concentration is increasing or decreasing imparts uncertainty and possibly a non-conservative bias to the SRA.

7.2.3 SRA Conclusions

It is unlikely that any receptors would be exposed to any potentially contaminated medium at Landfill No. 4, Parcel 81(5), or the Industrial Landfill, Parcel 175(5). Cadmium and manganese were identified as COCs in groundwater, but this is probably due to high turbidity of the samples. With regard to trichloroethene in groundwater, exposure is only possible if the groundwater is developed as a source of potable water. Additionally, the TCE was present in only one of 65 samples collected from the period 1994 through 1998. Subsurface soil becomes a medium of interest only if the proposed site-use changes, and future development requiring excavation is planned.

7.3 Screening-Level Ecological Risk Assessment

This section presents the SLERA for Parcels 81(5) and 175(5).

7.3.1 Environmental Setting

The ecological setting at Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5), is defined by the fact that portions are currently active (e.g. active landfilling and earth-moving previous operations) and the remainder is characteristic of recent landfilling and earth-moving operations. The original ecological setting has been altered through significant anthropogenic activities. As such, the topography and resultant habitat types are not characteristic of similar areas that have not been altered by man.

Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5), are located in the northwestern corner of the Main Post and encompass a total area of approximately 56 acres. Landfill No. 4 and the Industrial Landfill are almost entirely flat except for the northern and western boundaries, which exhibit a steep embankment formed by the placement of landfilled material. The entire Landfill No. 4 and the Industrial Landfill area is devoid of natural vegetation and a concrete-lined drainage swale runs from east-to-west across most of Landfill No. 4 and the Industrial Landfill. Landfill No. 4 and the Industrial Landfill are bounded on the north by mixed coniferous/deciduous forest and Reilly Airfield, on the east by mixed coniferous/deciduous forest, on the south by a borrow area, and on the west by Landfill No. 3, Parcel 80(6). The entire perimeter of Landfill No. 4 and the Industrial Landfill is enclosed by chain-link fence.

Terrestrial habitat at Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5), is restricted to grasslands where active landfilling is not taking place. Where landfilling and other earth-moving activities are taking place, no ecological habitat is present. The grasslands are comprised of areas that have historically been landfilled and have since been covered with soil and subsequently seeded. Therefore, there are no native plants present at Landfill No. 4 and the Industrial Landfill.

There is a small pond present in the southwest corner of Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5), which serves as a retention basin for surface runoff from the landfill. This small pond is relatively shallow, has a mud bottom with no submerged structure and no vegetation along its banks. This pond was completely dry during the ecological investigation of Landfill No. 4 and the Industrial Landfill (September 2000), but most likely holds water for significant periods of time during the year. Another pond is present just southeast of Landfill No. 4 and the Industrial Landfill between the landfill and the borrow area. This pond is also relatively shallow, has a mud bottom and no submerged structure. There is no vegetation along the banks of this pond either. A concrete-lined drainage ditch bisects Landfill No. 4 in an east-west direction, but provides no aquatic habitat because it is concrete-lined and does not hold any standing water. Base maps also show that there may be small, isolated wetlands (see Figure 2-5) that adjoin Landfill No. 4 and the Industrial Landfill, although physical inspection has not identified these areas.

The habitat present at Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5), is minimal due to the continued landfilling operations at the Industrial Landfill and the limited quality of the habitat that exists outside of the active landfilling area. The 6-foot-high chain-link fence that surrounds Landfill No. 4 and the Industrial Landfill also limits the access of larger animals onto Landfill No. 4 and the Industrial Landfill. Terrestrial species that may inhabit the grasslands of Landfill No. 4 and the Industrial Landfill include open field species such as a number of species of mice and rats (e.g., white-footed mouse, eastern harvest mouse, cotton mouse, eastern woodrat, and hispid cotton rat), eastern cottontail, and various song birds. Game birds present in the vicinity of Landfill No. 4 may include northern bobwhite (*Colinus virginianus*), mourning dove (*Zenaida macroura*), and eastern wild turkey (*Meleagris gallopavo*). A variety of raptors (e.g., red-tailed hawk, sharp-shinned hawk, barred owl, and great horned owl) could also use portions of this area for a hunting ground, particularly the fringe areas adjacent to the roads.

7.3.2 Chemicals Detected

Chemicals detected in environmental media at Landfill No. 4 and the Industrial Landfill, Parcels 81(5) and 175(5), are summarized in Appendix A.

7.3.3 Chemicals of Potential Ecological Concern

Groundwater was the only medium sampled at Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5). Because the site is covered with clean soil, no exposure route exists for direct contact of ecological receptors with potentially contaminated media. No soil, surface water, or sediment samples have been collected from Landfill No. 4 or the Industrial Landfill. Therefore, no COPECs have been identified at Landfill No. 4 or the Industrial Landfill.

7.3.4 SLERA Uncertainty Analysis

No surface soil, sediment, or surface water samples were collected at Landfill No. 4 and the Industrial Landfill, Parcels 81(5) and 175(5). However, no sensitive ecological receptors have been identified at the sites. As described in Section 7.3.1, portions of Landfill No. 4 and the Industrial Landfill are currently active (e.g., active landfilling and earth-moving operations) and the remainder of Landfill No. 4 and the Industrial Landfill is characteristic of recent landfilling and earth-moving operations and is covered by grasslands.

If land use or receptor scenarios change for Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5), especially if landfilling operations cease and the area is left to re-colonize ecologically, it may be necessary to evaluate Landfill No. 4 and the Industrial Landfill in more detail.

7.3.5 SLERA Conclusions

No sensitive ecological receptors have been identified at Landfill No. 4, Parcel 81(5), and the Industrial Landfill, Parcel 175(5). As described in Section 7.3.1, portions of the sites are currently active (e.g., active landfilling and earth-moving operations) and the remainder of the sites are characteristic of recent landfilling and earth-moving operations and are covered by grasslands. There are two retention basins at the southwest and southeast corners of Landfill No. 4 and the Industrial Landfill; however, they provide poor quality aquatic habitat due to the fact that they are dry during portions of the year, support no aquatic vegetation, and have no submerged structure or vegetation along their banks. Therefore, no COPECs were identified at Landfill No. 4 and the Industrial Landfill.

7.4 Recommendations

At this writing, the Army is considering reopening this landfill to consolidate the wastes removed from other sites on the installation, and therefore proposes No Further Action under CERCLA pending that decision.

The existing clay soil cover over Landfill No. 4 met all regulatory requirements for closure in 1994, and the Army is continuing long-term groundwater monitoring to maintain compliance with the closure standards for Landfill No. 4. The Industrial Landfill will ultimately require closure as well under ADEM Administrative Code 335-13-4-27 and the current permit.

The SRA did not evaluate soil, surface water, or sediment impacts to human health. Because the clay soil cap currently covers all of the waste at Landfill No. 4, that waste will not impact surface soil, surface water, or sediment exposure pathways. The assessment of groundwater impacts was made using a very conservative residential exposure scenario. Under a residential scenario, two constituents would pose unacceptable risk at Landfill No. 4 and the Industrial Landfill; however, the SRA presents turbidity of the groundwater samples (metals) and frequency of detection (VOC) as factors that may mitigate that risk. Exposure to that risk is also minimal because the likelihood of groundwater wells being placed at these sites is remote. Additionally, groundwater sampling to date indicates that the only VOC concentration observed in a well has not been detected in four subsequent sampling rounds. No ecological risks are associated with Landfill No. 4 and the Industrial Landfill due to anthropogenic activity at the sites.

The use of an existing footprint for waste consolidation is preferred to placement of waste in a new footprint. The need for future actions at this site will be assessed during closure activities under RCRA, following consolidation of the wastes for the other installation sites. If the landfill is not re-opened, the Army will need to initiate final closure of the landfills in accordance with permit and ADEM requirements.

8.0 Fill Area North of Landfill No. 2, Parcel 230(7)

8.1 Site Location

The Fill Area North of Landfill No. 2, Parcel 230(7), is located in the north-central part of the FTMC Main Post, northeast of former Landfill No. 2 and north of the ASP. The fill area is located immediately east of an unimproved road extending north from the CDTF access road (ESE, 1998). This fill area falls within a "Possible Explosive Ordnance Impact Area" shown on Plate 10 of the FTMC *Archive Search Report, Maps* (USACE, 1999b). Figure 2-1 shows the location of the fill area and surrounding area.

8.1.1 Facility Type and Operational Status

The Fill Area North of Landfill No. 2, Parcel 230(7), was identified from a ground scar on the 1961 aerial photo composite (ESE, 1998). Prior to the investigation and fill area definition work performed by IT, there was no documentation of the types of materials disposed at the Fill Area North of Landfill No. 2; however, rusted drum parts, other metal, and construction and demolition debris have been observed. It appears that materials were dumped down the slope, to the east, toward Cave Creek from the unimproved road. The Fill Area North of Landfill No. 2 is now overgrown with vegetation and has large trees growing between the base of the slope on the eastern side of the site and Cave Creek. Figure 8-1 indicates the features within the immediate vicinity around the site.

8.1.2 Previous Work

Previous environmental work addressing the Fill Area North of Landfill No. 2, Parcel 230(7), includes:

- Site-Specific Field Sampling Plan (IT, 1998b)
- Site Investigation and Fill Area Definition Report (IT, 2001a).

8.1.2.1 Investigation

IT conducted an SI in 1999 at Parcel 230(7), which included a geophysical survey, trenching, environmental sampling and analysis, and monitoring well installation activities. Geophysical data analysis indicated several landfill pits ranging from low to moderate concentrations of buried metal, and numerous isolated buried metallic objects/debris exist within site boundaries. The total area surveyed was approximately 115,300 square feet (2.7 acres) (Figure 8-2).

Seven soil borings and three temporary groundwater monitoring wells were installed at the site as part of the SI. Borings PPMP-230-GP04 and PPMP-230-GP06 appear to have penetrated the

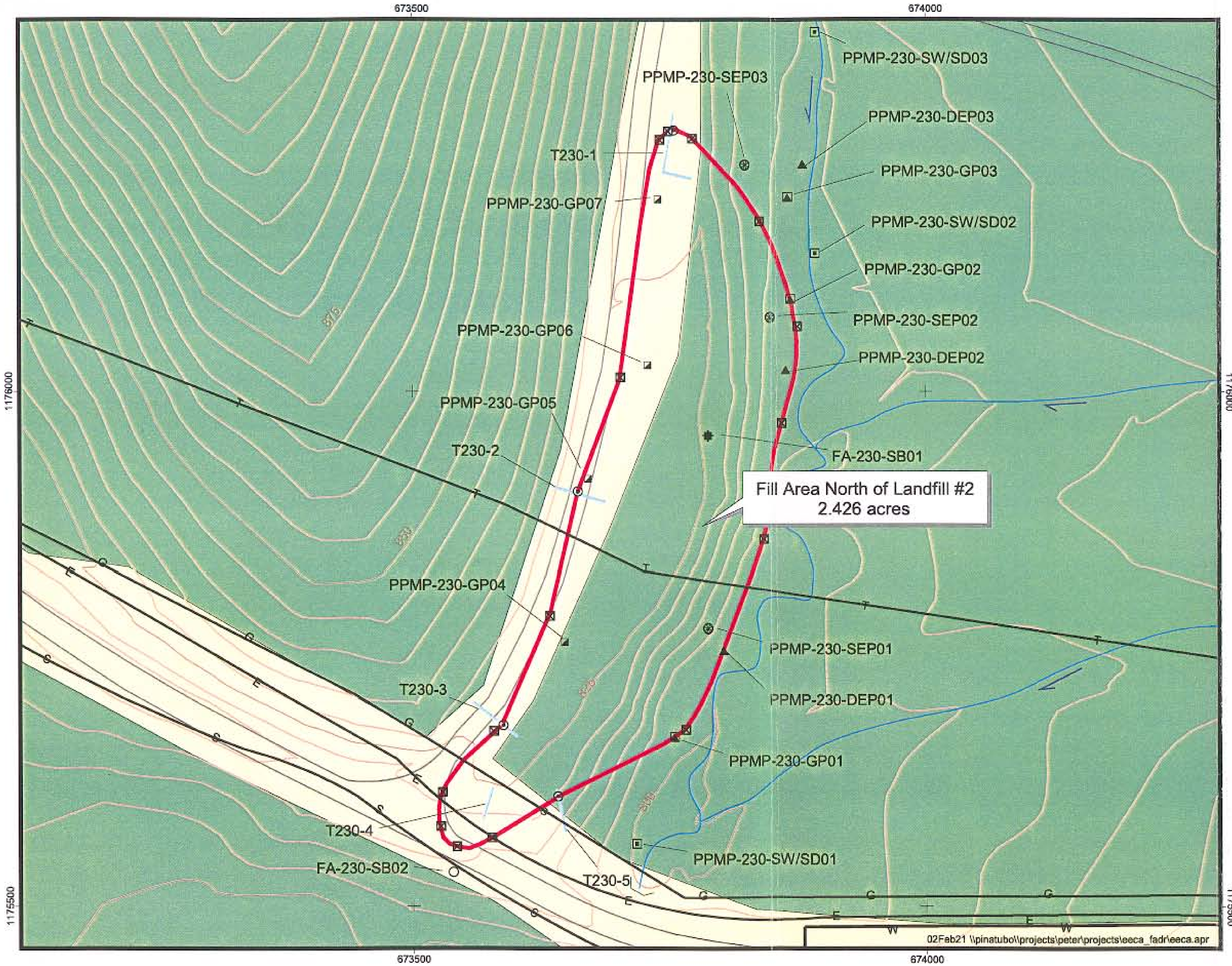

Figure 8-1
Detail Map
Fill Area
North of Landfill No. 2
Parcel 230(7)

- Proposed Concrete Monument
- Fill Boundary Observed within Trench Excavations
- Depositional Soil Sample Location
- Subsurface Soil Sample Location
- Groundwater, Surface, and Subsurface Soil Sample Location (well)
- Seep Water Sample Location
- Surface Water/Sediment Sample Location
- Surface and Subsurface Soil Sample Location
- Posthole Excavation Location
- Water Utility
- Telephone Utility
- Gas Utility
- Sewer Utility
- Electric Utility
- Surface Drainage/Creek w/ Flow Direction
- Exploratory Trench
- Improved Roads
- 5' Topographic Contours
- Fill Area Boundary Inferred by Surface Geophysics and Trenches
- Wooded
- Lawn/Cleared Area

0 100 200

State Plane feet, NAD83

N

August 2001

U.S. Army Corps of Engineers
Mobile District
Fort McClellan
Calhoun County, Alabama
Contract No. DACA21-96-D-0018

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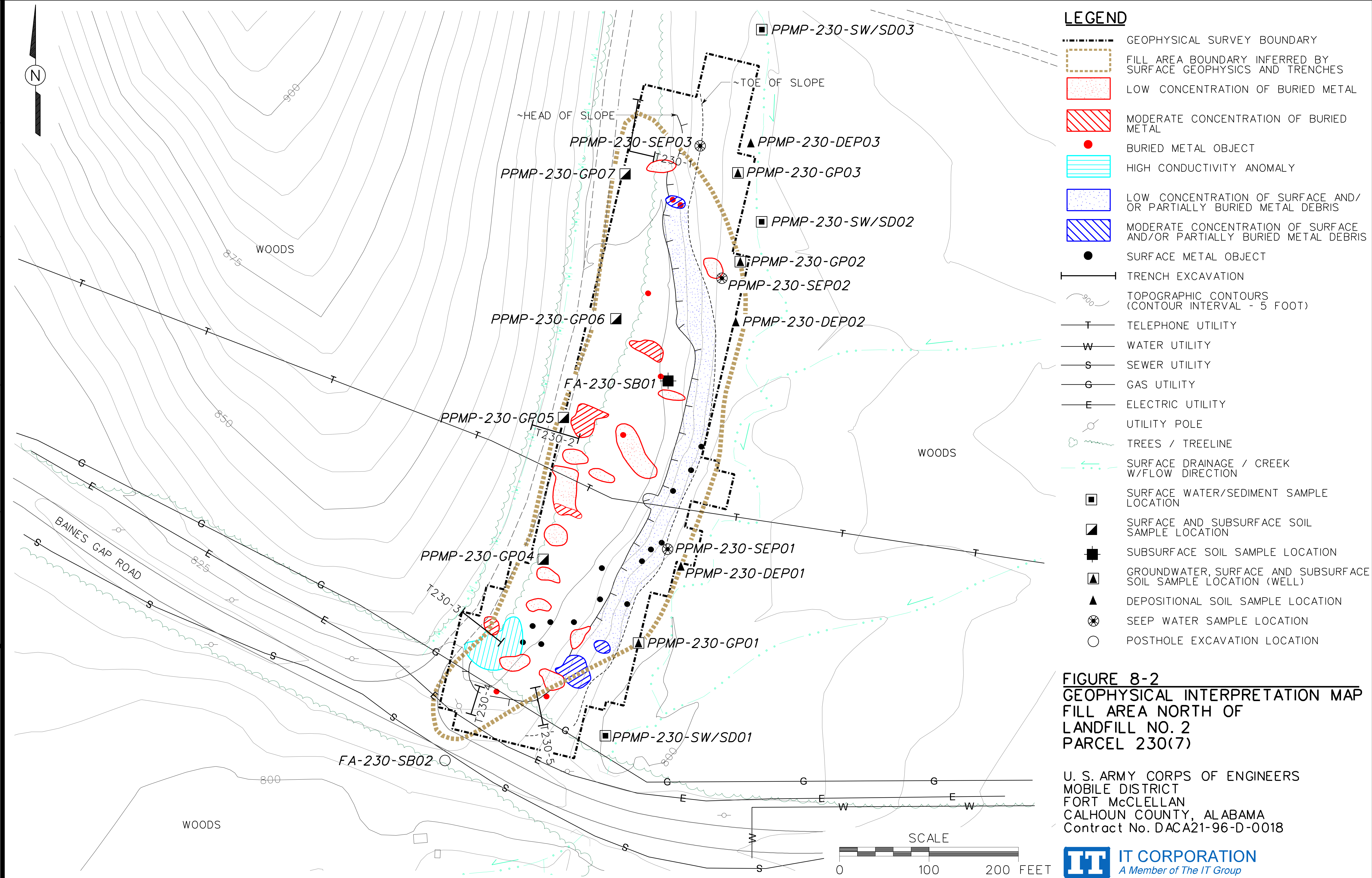

FIGURE 8-2
GEOPHYSICAL INTERPRETATION MAP
FILL AREA NORTH OF
LANDFILL NO. 2
PARCEL 230(7)

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

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DWG. NO.: ...\796886es.062
PROJ. NO.: 796886
INITIATOR: J. RAGSDALE
PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. JENKINS
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 02/15/01
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fill material. The boring log for location PPMP-230-GP04 indicated fill material was encountered between 5 and 7 feet with pieces of brick at about 5 feet bgs. The boring log for location PPMP-230-GP06 indicated backfill material from 4 feet to 8 feet bgs. Fill material was not observed in any other SI borings drilled at the Fill Area North of Landfill No. 2 (see Figure 8-2).

Twenty metals were detected in the surface soil samples and nineteen metals were detected in the depositional soil samples collected. The concentrations of lead, mercury, selenium, and zinc exceeded the background screening values and ESVs in various samples. Arsenic and iron concentrations in all surface soil and depositional soil samples exceeded the SSSLs. The aluminum concentration in the surface soil sample collected from location PPMP-230-GP07 also exceeded the SSSL. The concentrations of aluminum, arsenic, and iron were all within the background screening values. All surface soil and depositional soil samples collected had concentrations of aluminum, chromium, iron, and vanadium that exceeded the ESVs.

Twenty-two metals were detected in subsurface soil samples collected. The concentrations of four metals (arsenic, barium, iron, and lead) exceeded the background screening values and SSSLs in the sample collected from location PPMP-230-GP04 and chromium and iron exceeded both the background screening value and the SSSL in the sample collected from location PPMP-230-GP05. Selenium exceeded the background screening value in the subsurface soil samples collected from locations PPMP-230-GP02, PPMP-230-GP03, PPMP-230-GP04, and PPMP-230-GP05. Fifteen metals detected in the subsurface soil sample collected from location PPMP-230-GP04 exceeded the background screening values.

Eleven VOCs were detected in the surface and depositional soil samples collected. None of the detected VOC concentrations exceeded the SSSLs. The surface sample collected from location PPMP-230-GP05 had a concentration of m,p-xylenes that exceeded the ESV. Six SVOCs were detected in one surface soil sample collected from location PPMP-230-GP04. None of the SVOCs detected exceeded the SSSLs.

Five VOCs were detected in subsurface soil samples collected; however, none exceeded the SSSLs. Eight SVOCs were detected in subsurface soil samples. One SVOC (benzo[a]pyrene) detected in the sample collected from location PPMP-230-GP06 exceeded the SSSLs.

Two pesticides were detected in surface soil samples collected from locations PPMP-230-GP04 and PPMP-230-GP06. None of the detected concentrations exceeded the SSSLs; however, all concentrations exceeded the ESVs. Pesticides were not detected in the three depositional soil samples collected. Three pesticides were detected in the subsurface soil sample collected from location PPMP-230-GP07; however, none of the detected pesticides exceeded the SSSLs. No herbicides, explosives, or PCBs were detected in the surface and depositional soil samples collected. In addition, no herbicides, explosives, or PCBs were detected in the subsurface soil samples collected.

Groundwater samples were collected from the three temporary wells at the Fill Area North of Landfill No. 2. Twelve metals were detected in the groundwater samples collected. Manganese exceeded the SSSLs and the background screening values in the three groundwater samples collected. Aluminum and iron exceeded the SSSLs and background screening values in the groundwater samples collected from locations PPMP-230-GP01 and PPMP-230-GP02. Barium was detected at a concentration exceeding both the SSSL and background screening value in the groundwater sample collected from location PPMP-230-GP02.

Several metals were detected at concentrations exceeding the SSSLs and background screening values. However, the majority of these metals were present in groundwater samples that had elevated turbidity levels at the time of sample collection. The elevated metals results in the groundwater samples collected from locations PPMP-230-GP01 and PPMP-230-GP02 are likely the result of high turbidity.

Eight metals were detected in the surface water samples collected. The surface water sample collected from location PPMP-230-SW/SD01 had a concentration of thallium exceeding the SSSL, ESV, and background screening value; however, the result was flagged with a "B" data qualifier. Two metals (aluminum and barium) exceeded the ESVs ; however, the aluminum result from location PPMP-230-SW/SD03 was flagged with a "B" data qualifier.

Seventeen metals were detected in the sediment samples collected. The sediment sample collected from location PPMP-230-SW/SD03 had a concentration of mercury exceeding the background screening value and the ESV. No other metals exceeded the ESVs, SSSLs, or background screening values.

Ten metals were detected in seep samples collected. The concentration of manganese in the sample collected from location PPMP-230-SEP02 exceeded the background screening value, SSSL, and ESV. Aluminum and barium concentrations exceeded the ESVs in all three samples. Iron and lead exceeded the ESVs in two of the seep samples collected; however, the lead results were all flagged with a "B" data qualifier. Calcium was detected in the seep sample collected from location PPMP-230-SEP01 and potassium was detected in the seep sample collected from location PPMP-230-SEP03 at concentrations that exceeded the background screening values but not the SSSLs or ESVs. Analytical data for Parcel 230(7) is located in Appendix A.

8.1.2.2 EE/CA Fill Area Definition

Five exploratory trenches were excavated at the Fill Area North of Landfill No. 2 to characterize the horizontal and vertical extent of the fill area. A remote-controlled excavator was used for the trenching because of the potential for UXO. Trenches were excavated to depths ranging from 2 to 7 feet bgs. Trench logs do not indicate the presence of groundwater in the trenches.
Trench location T230-1 was placed to characterize the eastern horizontal extent, location T230-2 and T230-3 were placed to characterize the northern horizontal extent, location T230-4 was placed to characterize the northwestern extent, and location T230-5 was placed to characterize the western extent of the fill area.

Fill materials observed in all of the trenches included: metal bars/pipes, wiring, glass bottles/jars, red bricks, light gray sand and clay, orange/red sand and clay, black clay pipe, piece of 100 pound concrete bomb, ceramic pieces, cement blocks, metal u-rings, pieces of a 55-gallon metal drum, gravel, asphalt, empty shotgun shell, burned wood, burned newspaper, burned roots, and tin foil. The trenches contained varying amounts of steel/metal material, which correspond to the varying concentrations of buried metal anomalies shown in the geophysics report. The anomalies shown as elevated conductivity on the geophysical report correspond to the trenches containing varying amounts of disturbed clay and low amounts of metal material.

Based on the results of the exploratory trenching at the Fill Area North of Landfill No. 2, the horizontal extent of the fill area has been defined. The approximate extent of the fill area at this parcel covers 2.4 acres.

One boring was installed to a depth of 18 feet bgs at the Fill Area North of Landfill No. 2. One fill material sample was collected for chemical analysis from the boring at location FA-230-SB01. Nineteen metals were detected in the fill material sample collected. Concentrations of aluminum, arsenic, and iron exceeded the SSSLs. Concentrations of beryllium, calcium, copper, lead, magnesium, potassium, and zinc exceeded the background screening values.

Sixteen SVOCs were detected in the fill material sample collected. Benzo(a)pyrene was detected at a concentration exceeding the SSSLs. None of the reported concentrations exceeded the ESVs. Four pesticides were detected in the fill material sample collected. Pesticides 4,4'-DDD, aldrin, and dieldrin exceeded the SSSLs. One PCB (Aroclor 1260) was detected in the fill material sample at a concentration exceeding the SSSL. Analytical data for Parcel 230(7) is located in Appendix A.

IT has estimated the vertical and horizontal extent of fill material at the Fill Area North of Landfill No. 2 based on information gathered from previous site investigations and trenching and boring activities discussed in this report. The fill area covers approximately 2.4 acres. The average depth of fill material estimated from the trench and boring log data is approximately 15 feet bgs.

8.1.3 Structures/Topography

The Fill Area North of Landfill No. 2, Parcel 230(7), encompasses a total area of approximately 2.4 acres of which a portion is located along the western edge of the floodplain of Cave Creek. A floodplain map is presented on Figure 2-5. The Fill Area North of Landfill No. 2 is bounded on the north by mixed deciduous forest, on the east by Cave Creek, on the south by an asphalt road, and on the west by a dirt road. That portion of the Fill Area North of Landfill No. 2 directly adjacent to the dirt road is relatively flat. The fill area slopes steeply to the east where it adjoins the floodplain of Cave Creek, which flows in a southerly direction. Refuse is also visible along the steep embankment that is adjacent to the creek floodplain. In some areas the refuse slope is directly adjacent to Cave Creek. Surface elevations range from approximately 830 feet above msl near the unimproved road to approximately 805 feet above msl near Cave Creek at the base of the slope.

The Fill Area North of Landfill No. 2, Parcel 230(7), geology is presented on Figure 2-2. The site lies primarily within Shady Dolomite (Cambrian), with a contact with the Chilhowee Group to the west that impinges on the southwestern portion of the site. The Chilhowee Group (Weisner Formation) is composed of an orthoquartzitic sandstone and quartzite. The eastern boundary of the Fill Area North of Landfill No. 2, Parcel 230(7), is made up of alluvium from Cave Creek and tributaries to Cave Creek that join the creek east of the site.

8.1.4 Hydrogeology

Three shallow, temporary groundwater monitoring wells were installed near the toe of the waste fill as part of the SI conducted by IT. Monitoring well locations and groundwater elevation contours (based on March 2000 water level data) are shown on Figure 2-3. Groundwater was encountered during drilling at depths of approximately 1.5 to 5.5 feet bgs. The shallow depth to groundwater reflects the proximity of the wells to Cave Creek. The groundwater gradient follows the topographic gradient of the creek and is approximately 0.02 ft/ft. Groundwater elevations at the Fill Area North of Landfill No. 2, Parcel 230(7), ranged from 810.24 to 801.54 feet above msl.

Seeps have been reported along the base of the slope but were not observed by IT during a June 1998 site visit; however, the seeps were observed and sampled during the February 1999 sampling event.

8.1.5 Surrounding Land Use and Populations

The Fill Area North of Landfill No. 2, Parcel 230(7), is located in a restricted area that is within the former impact area for UXO. The site is adjacent to the Department of Justice Center for Domestic Preparedness training center, which is a restricted access area. The area is heavily overgrown with vegetation. Cave Creek flows along the eastern base of the fill area. The reuse scenario for Fill Area North of Landfill No. 2 is primarily for a recreational user, with a secondary scenario for residential to provide a comparison.

8.1.6 Sensitive Ecosystems

The ecological setting at the Fill Area North of Landfill No. 2, Parcel 230(7), is largely defined by the topography of the site, which is a result of filling activities that have historically occurred at the site. The original ecological setting has been altered through significant anthropogenic activities. Consequently, the topography and resultant habitat types may not be characteristic of similar areas that have not been altered by man. Although there are no aquatic features within the Fill Area North of Landfill No. 2, Cave Creek and its associated wetlands and floodplain are directly adjacent to the eastern boundary of the site. A complete description of the site environmental setting is presented in Section 8.3.1.

8.1.7 Analytical Data

The summary tables for the Fill Area North of Landfill No. 2, Parcel 230(7), identify compounds that exceed the screening criteria as defined in the *Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000a) and the *Final Background Metals Survey Report, FTMC, Alabama* (SAIC, 1998). Appendix A provides a summary of detected compounds in samples collected at the Fill Area North of Landfill No. 2 and compares analyte concentrations against background values (for metals), SSSLs, and ESVs for the various sample media. Metals that exceed both the background threshold limit (two times background) and SSSLs and organic compounds that exceed SSSLs are summarized for each sample medium in Table 8-1. Groundwater samples indicated high metal concentrations that were associated with the high turbidity of the samples. Appendix E provides a discussion of the impacts of high turbidity on groundwater sample analytical results.

Table 8-1

Site Investigation Analytical Data Summary
Fill Area North of Landfill No. 2, Parcel 230(7)
Fort McClellan, Alabama

Medium Sampled	Metals	VOCs	SVOCs	Pesticides	Explosives	Herbicides	PCBs
Surface and Depositional Soil	< BKG and SSSLs	< SSSLs	< SSSLs	< SSSLs	ND	ND	ND
Subsurface Soil	As, Ba, Cr, Fe, Pb > BKG and SSSLs	< SSSLs	Benzo(a)pyrene > SSSL	< SSSLs	ND	ND	ND
Sediments	< BKG and SSSLs	< SSSLs	Di-n-butyl phthalate > SSSL	< SSSLs	ND	ND	ND
Fill Material	< BKG and SSSLs	< SSSLs	Benzo(a)pyrene >SSSL	4,4'-DDD, Aldrin, Dieldrin > SSSL	ND	ND	ND
Groundwater	Al, Ba, Fe, Mn > BKG and SSSLs	< SSSLs	< SSSLs	ND	ND	ND	ND
Surface Water	Tl > BKG and SSSLs	ND	< SSSLs	ND	ND	ND	ND
Seep Samples	Mn > BKG and SSSLs	< SSSLs	ND	ND	ND	ND	ND

Al - aluminum
As - arsenic
Ba - barium
BKG - Background
Cr - chromium
Fe - iron
Mn - manganese
ND - not detected
NS - not sampled
Pb - lead
PCB - polychlorinated biphenyl
SSSL - site-specific screening level
SVOC - semivolatile organic compound
Tl - thallium
VOC - volatile organic compound

8.1.8 Potential Source of Contaminants

The location of fill material at the site was interpreted from the geophysical data collected to date and from the trench excavations completed by IT in support of the EE/CA. The detail map shown on Figure 8-1 incorporates all of the historical and recent data in defining the extent of waste at the site. Locations for all new sampling points are also provided on Figure 8-1. An estimate of the depth of fill is based on the results of boring FA-230-SB01, drilled to a depth of 18 feet bgs. Fill material was encountered to a depth of 15 feet bgs.

The content of the fill material was observed in each of the five trenches excavated at the Fill Area North of Landfill No. 2, Parcel 230(7). The material included: metal bars/pipes and wiring, glass bottles/jars, red bricks, black clay pipe, a piece of a 100-pound concrete practice bomb, ceramic pieces, cement blocks, metal u-rings, pieces of a 55-gallon metal drum, gravel, asphalt, an empty shotgun shell, burned wood, burned newspaper, burned roots, and tin foil. Groundwater was not encountered during trenching operations conducted at the Fill Area North of Landfill No. 2. All the trenches contained varying amounts of steel/metal material, which correspond to the varying concentrations of "buried metal" anomalies shown in the geophysics interpretation (Figure 8-2). Metals results exceeding SSSLs were identified in subsurface soil, groundwater, surface water, and seep samples. Seeps have been reported at the base of the slope on the eastern side of the fill area and were sampled in the fill area investigation.

8.2 Streamlined Human Health Risk Assessment

The SRA for Fill Area North of Landfill No. 2, Parcel 230(7), evaluated surface soil, surface water, sediment, and groundwater. The recreational site-user and resident were the only receptor scenarios appropriate for the current and future land uses proposed. Subsurface soil was not evaluated for this SRA because neither the recreational site-user nor the resident are anticipated to contact subsurface soil (Figure C-5). SRA tables, figures, and attachments are included in Appendix C.

8.2.1 Surface Soil

Fourteen surface soil samples were collected at the site in 1999; data from these samples were evaluated in the SRA (Table C5-1). Six of these samples were analyzed for chlorinated herbicides and pesticides, organophosphorous pesticides, PCBs, SVOCs, VOCs, explosives, and metals. Four sample locations had four samples that were only analyzed for organophosphorous pesticides, while the remaining four samples at those same locations were analyzed for all of the remaining analyses. Each sample location had the same analyses conducted; however, each individual sample did not.

Eighteen metals, two chlorinated pesticides, six SVOCs (all PAHs), and ten VOCs were detected, as presented in Table C5-2. After the metals were screened against background and the essential nutrients were removed, only the organics, lead, and mercury were determined to be site-related chemicals (Table C5-2).

The chemicals determined to be site-related were compared to residential and recreational site-user soil SSSLs. No COPCs were selected from this screening process; all site-related chemicals had MDCs less than their respective cancer and noncancer SSSLs (Table C5-3).

8.2.2 Surface Water

Six surface water samples were collected at the site in January and February 1999. Three of these samples were collected from seeps, while the three remaining surface water samples were collected from a creek at the site. All of these samples are from locations where surface water is exposed and thus could be accessed by the recreational site-user and the resident. All of the samples were analyzed for chlorinated herbicides and pesticides, metals, SVOCs, VOCs, PCBs, explosives, and organophosphorous pesticides. Table C5-4 presents the surface water samples used in the SRA.

Eight metals and one SVOC were detected in surface water (Table C5-5). After background screening and removal of essential nutrients, all eight metals were determined to not be site-related; thus, only bis(2-ethylhexyl)phthalate was selected as a site-related chemical.

The MDC for bis(2-ethylhexyl)phthalate in surface water (1.3E-3 mg/L) was less than both the cancer (5.2E-2 mg/L) and the noncancer (2.1E-1 mg/L) surface water SSSLs for the recreational site-user and resident (Table C5-6). Therefore, the compound was not selected as a COPC for surface water.

8.2.3 Sediment

The three sediment samples utilized in the SRA were collected in January 1999 (Table C5-7). All of the sediment samples for Fill Area North of Landfill No. 2, Parcel 230(7), were analyzed for chlorinated herbicides and pesticides, metals, SVOCs, VOCs, organophosphorous pesticides, explosives, and PCBs.

Sixteen metals, two chlorinated pesticides, and two VOCs were detected in the three sediment samples. Only mercury and the organics were selected as site-related after the background and nutrient screening (Table C5-8). However, none of these chemicals had MDCs greater than their respective SSSLs. Therefore, no sediment COPC were selected (Table C5-9).

8.2.4 Groundwater

The three groundwater samples utilized in the SRA were collected in April 1999 (Table C5-10). All of the groundwater samples for Fill Area North of Landfill No. 2, Parcel 230(7), were analyzed for chlorinated herbicides and pesticides, metals, SVOCs, VOCs, organophosphorous pesticides, explosives, and PCBs.

Twelve metals, one SVOC (4-methylphenol), and three VOCs were detected in groundwater. Only the organics were selected as site-related chemicals after the metals background and nutrient screening (Table C5-11). However, none of the site-related chemicals had MDCs greater than their respective SSSLs. Therefore, no groundwater COPC were selected (Table C5-12).

8.2.5 Uncertainty Analysis

If land use or receptor scenarios change in the future, it may be necessary to re-evaluate the site media or add subsurface soil to the media evaluated.

8.2.6 SRA Conclusions

Based upon the samples utilized in the SRA, none of the media evaluated at the Fill Area North of Landfill No. 2, Parcel 230(7) (surface soil, surface water, sediment, or groundwater) pose an unacceptable cancer risk or noncancer hazard to either the recreational site-user or the resident.

8.3 Screening-Level Ecological Risk Assessment

This section presents the SLERA for the Fill Area North of Landfill No. 2, Parcel 230(7).

8.3.1 Environmental Setting

The ecological setting at the Fill Area North of Landfill No. 2, Parcel 230(7), is largely defined by the topography of the site, which is a result of filling activities that have historically occurred at the site. The original ecological setting has been altered through significant anthropogenic activities. As such, the topography and resultant habitat types may not be characteristic of similar areas that have not been altered by man.

The Fill Area North of Landfill No. 2, Parcel 230(7), is located in the north-central portion of the Main Post and encompasses a total area of approximately 2 acres. The site is located adjacent to a north-south trending dirt road. The portion of the site directly adjacent to the road is relatively flat. This flat area represents historical fill material. On the eastern edge of this fill material is a steep slope that adjoins the floodplain of Cave Creek, which flows in a southerly direction along the eastern edge of the site.

Refuse and other evidence of past disposal practices are prevalent along the dirt road that forms the western boundary of the Fill Area North of Landfill No. 2, Parcel 230(7), and the adjacent flat area. Refuse is also visible along the steep embankment that is adjacent to the creek floodplain. In some areas the refuse slope is directly adjacent to Cave Creek. The Fill Area North of Landfill No. 2 is bounded on the north by mixed deciduous forest, on the east by Cave Creek, on the south by an asphalt road, and on the west by a dirt road.

Terrestrial habitat at the Fill Area North of Landfill No. 2, Parcel 230(7), is made up of two general types: upland mixed deciduous forest and lowland mixed deciduous forest. The historical fill area and the steep embankment are best characterized as mixed deciduous forest with many of the vegetative species characteristic of disturbed land. Some of the tree species commonly found in this area include mimosa (*Albizia julibrissin*), mockernut hickory (*Carya tomentosa*), white oak (*Quercus alba*), scarlet oak (*Quercus coccinea*), chestnut oak (*Quercus prinus*) red maple (*Acer rubrum*), flowering dogwood (*Cornus florida*), sweetgum (*Liquidambar styraciflua*), and sourwood (*Oxydendrum arboreum*). The shrub layer is dominated by southern low blueberry (*Vaccinium pallidum*), southern wild raisin (*Viburnum nudum*), and yellowroot (*Xanthorhiza simplicissima*). Numerous muscadine grape (*Vitis rotundifolia*) vines, greenbriar (*Smilax rotundifolia*) and poison ivy (*Toxicodendron radicans*) are also present in this area.

The lowland mixed deciduous forest is characteristic of a ravine or stream floodplain. This area may be inundated during periods of significant rainfall and contains vegetative species indicative of wetlands. Some of the plant species most commonly found in this lowland mixed deciduous forest include American beech (*Fagus grandifolia*), tulip tree (*Liriodendron tulipifera*), white ash (*Fraxinus americana*), red maple (*Acer rubrum*), white oak (*Quercus alba*), American holly (*Ilex opaca*), pignut hickory (*Carya glabra*), sweetgum (*Liquidambar styraciflua*), common persimmon (*Diospyros virginiana*), and redbud (*Cercis canadensis*).

Although there are no aquatic features within the Fill Area North of Landfill No. 2, Parcel 230(7), Cave Creek and its associated wetlands and floodplain are directly adjacent to the eastern boundary of the site. Cave Creek in the vicinity of the site flows in a southwesterly direction. The substrate of Cave Creek in this area is mostly gravel and cobbles with small areas of sand and leaf litter. The stream banks are approximately 4 feet high and the width of Cave Creek in this area is approximately 8 feet. The majority of the creek is shallow (less than one foot deep); however, several deeper pool areas are also present in this area. The canopy above Cave Creek in this area is relatively high.

In general, the terrain at FTMC supports large numbers of amphibians and reptiles. Jacksonville State University has prepared a report titled *Amphibians and Reptiles of Fort McClellan, Calhoun County, Alabama* (Cline and Adams, 1997). The report indicated that surveys in 1997 found 16 species of toads and frogs, 12 species of salamanders, 5 species of lizards, 7 species of turtles, and 17 species of snakes. Typical inhabitants of the area surrounding the Fill Area North of Landfill No. 2, Parcel 230(7), are copperhead (*Agkistrodon contortix*), king snake (*Lampropeltis getulus*), black racer (*Coluber constrictor*), fence lizard (*Sceloporour undulatus*), and six-lined racerunner (*Cnemidophorous sexlineatus*).

Terrestrial species that may inhabit the Fill Area North of Landfill No. 2, Parcel 230(7), include opossum, short-tailed shrew, raccoon, white-tail deer, red fox, coyote, gray squirrel, striped skunk, a number of species of mice and rats (e.g., white-footed mouse, eastern harvest mouse, cotton mouse, eastern woodrat, and hispid cotton rat), and eastern cottontail. Approximately 200 avian species reside at FTMC at least part of the year (ACOE, 1997). Common species expected to occur in the vicinity of the Fill Area North of Landfill No. 2 include northern cardinal (*Cardinalis cardinalis*), northern mockingbird (*Mimus polyglottus*), warblers (*Dendroica spp.*), indigo bunting (*Passerina cyanea*), red-eyed vireo (*Vireo olivaceus*), American crow (*Corvus brachyrhynchos*), bluejay (*Cyanocitta cristata*), several species of woodpeckers (*Melanerpes spp., Picoices spp.*), and Carolina chickadee (*Parus carolinensis*). Game birds present in the vicinity of the Fill Area North of Landfill No. 2 may include northern bobwhite (*Colinus virginianus*), mourning dove (*Zenaida macroura*), and eastern wild turkey (*Meleagris gallopavo*). Woodland hawks (e.g., sharp-shinned hawk) were observed in this area during the ecological investigation (September, 2000) and are expected to use this area for a hunting ground. A variety of other raptors (e.g., red-tailed hawk, barred owl, and great horned owl) could also use portions of this area for a hunting ground, particularly the fringe area where the forested areas abut roads and cleared areas. Because of the presence of Cave Creek, piscivorous bird species may also be present in the vicinity of the Fill Area North of Landfill No. 2. These piscivorous birds may include great blue heron (*Ardea herodias*), green-backed heron (*Butorides striatus*), and belted kingfisher (*Ceryle alcyon*).

Although shallow (less than one foot deep) over most of its length in this area, Cave Creek has the potential to support a variety of amphibious species and some small fish species. The bullfrog (*Rana catesbeiana*) and leopard frog (*Rana sphenocephala*) are examples of amphibians that may be found in Cave Creek in the vicinity of the Fill Area North of Landfill No. 2, Parcel 230(7). Fish species that may be found in Cave Creek in the vicinity of the site include blacknose dace (*Rhinichthys atratulus*), creek chub (*Semotilus atromaculatus*), stoneroller

(*Campostoma anomalum*), striped shiner (*Luxilus chrysocephalus*), and various darters (*Etheostoma spp.*).

Cave Creek, in the vicinity of the Fill Area North of Landfill No. 2, Parcel 230(7), provides low-quality gray bat foraging habitat. Two major requirements for gray bat foraging habitat are contiguous forest cover and habitat for aquatic insects (one of the gray bat's preferred dietary items). These two requirements are met by Cave Creek in this area; therefore, gray bats could be expected to utilize this area for foraging.

8.3.2 Chemicals Detected

Chemicals detected in soil, sediment, and surface water at the Fill Area North of Landfill No. 2, Parcel 230(7), are summarized in Appendix A.

8.3.3 Chemicals of Potential Ecological Concern

COPECs are those constituents whose maximum detected concentrations exceed their respective ESVs. The COPECs that have been identified at the Fill Area North of Landfill No.2, Parcel 230(7), are the following:

- Surface Soil – lead, mercury, selenium, zinc, 4,4'-DDE, 4,4'-DDT, and m,p-xylenes
- Surface Water – manganese and bis(2-ethylhexyl)phthalate
- Sediment – mercury.

8.3.4 SLERA Uncertainty Analysis

The following site-related constituents exceeded their respective ESVs in surface soil at the Fill Area North of Landfill No. 2, Parcel 230(7) (Appendix D, Table D-12): lead, mercury, selenium, zinc, m,p-xylene, 4,4'-DDE, and 4,4'-DDT. Manganese and bis(2-ethylhexyl)phthalate exceeded their ESVs in surface water (Table D-13) and mercury exceeded its ESV in sediment (Table D-14).

As described in Section 8.3.1, the historical fill area forms a steep embankment and exhibits vegetation characteristic of disturbed land. Because of the relatively low quality of the terrestrial habitat provided by the historical fill area and the relatively small exceedance of the ESVs (mean HQ values range from 0.33 to 1.97), constituents in soil most likely do not pose significant ecological risks to the terrestrial habitats at FTMC.

Cave Creek flows along the eastern boundary of the site and potentially provides low-quality foraging habitat for the gray bat. Manganese and bis(2-ethylhexyl)phthalate exceeded their

ESVs in surface water (manganese HQ = 10.56, bis[2-ethylhexyl]phthalate HQ = 4.33) and one constituent marginally exceeded its ESV in sediment (mercury HQ = 1.77). Because bis(2-ethylhexyl)phthalate was detected in only a single sample and the resultant hazard quotient was less than ten, this constituent most likely does not pose significant ecological risk. Although manganese was frequently detected in surface water, the arithmetic mean concentration of samples from Cave Creek near the Fill Area North of Landfill No. 2 is less than the naturally occurring background concentration of manganese. Therefore, manganese is most likely not site-related. Mercury was only detected in a single sediment sample at a concentration that exceeded its ESV. The arithmetic mean concentration of mercury in sediment is less than the naturally-occurring background concentration of mercury in sediment. Therefore, it is most likely not site related. Using these additional lines-of-evidence, it could be concluded that there are no COPECs in surface water or sediment associated with the Fill Area North of Landfill No. 2. The various lines-of-evidence used to draw these conclusions are presented in Table D-29.

8.3.5 SLERA Conclusions

The Fill Area North of Landfill No. 2, Parcel 230(7), is located adjacent to a north-south trending dirt road. The portion of the site directly adjacent to the road is relatively flat. This flat area represents historical fill material. On the eastern edge of this fill material is a steep slope that adjoins the floodplain of Cave Creek, which flows in a southerly direction along the eastern edge of the Fill Area North of Landfill No. 2. The historical fill area and the steep embankment are best characterized as mixed deciduous forest with many of the vegetative species characteristic of disturbed land. Cave Creek and its associated wetlands and floodplain are directly adjacent to the eastern boundary of the Fill Area North of Landfill No. 2. Cave Creek, in the vicinity of the Fill Area North of Landfill No. 2, provides low-quality gray bat foraging habitat.

The following site-related constituents exceeded their respective ESVs in surface soil (Table D-12): lead, mercury, selenium, zinc, m,p-xylene, 4,4'-DDE, and 4,4'-DDT. Manganese and bis(2-ethylhexyl)phthalate exceeded their ESVs in surface water (Table D-13) and mercury exceeded its ESV in sediment (Table D-14).

Although the maximum detected concentrations of a number of constituents exceed their respective ESVs in site media, additional lines-of-evidence suggest that these COPECs may not pose significant risks to the terrestrial or aquatic ecosystems at FTMC. These COPECs (Table D-28) have been identified through a very conservative screening process that utilizes ESVs based largely on NOAELs from the scientific literature and maximum detected constituent concentrations. If, based on a risk management decision, the potential ecological risks at the Fill Area North of Landfill No. 2, Parcel 230(7), are determined to be "unacceptable" at this screening-level stage, then a BERA is appropriate. The goal of the BERA, if deemed necessary, will be to reduce the levels of uncertainty and conservatism in the assessment process and to determine the potential for ecological risk at the Fill Area North of Landfill No. 2, Parcel 230(7), through a number of lines of evidence.

8.4 Recommendations

Based on the results of the field investigations, the current and proposed future land use, and the results of the risk assessments completed for Fill Area North of Landfill No. 2, Parcel 230(7), the recommended remedy under CERCLA is No Further Action.

To facilitate reuse of the property the Army proposes, but is not limited to, several non-CERCLA actions for this site. These proposals are presented in Attachment 2.

9.0 Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7)

9.1 Site Location

The Fill Area East of Reilly Airfield, Parcel 227(7), is located in the northern portion of the Main Post, north of the eastern end of Reilly Airfield. Reilly Lake borders the Fill Area East of Reilly Airfield to the west-northwest. The Former Post Garbage Dump, Parcel 126(7), occupies a portion of the northern slope of the Fill Area East of Reilly Airfield, adjacent to and within a wetlands area. The Fill Area East of Reilly Airfield and Former Post Garbage Dump location map is provided on Figure 2-1.

9.1.1 Facility Type and Operational Status

The Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7), contain several potential disposal sites identified in the Environmental Photographic Interpretation Center (EPIC) report (EPA, 1990b). The EPIC aerial photo composite dated 1949 annotates two ground scars with the label "Fill Area." The aerial photo composite dated 1961 annotates one site as "Pit" and another as "TR" (trench). Parcel 227(7) encompasses the four sites identified by EPIC. The parcel also includes an adjacent area of disturbed ground that was not identified in the EPIC report which appears to possibly contain mounded material (ESE, 1998). EPIC aerial photographs identified four sites at the site (over both parcels). Parcel 227(7) encompasses three sites while Parcel 126(7) covers only a portion of the new site.

The original CERFA Parcel mapped as the Fill Area East of Reilly Airfield, Parcel 227(7), the Site Investigation and Fill Area Definition Report (IT, 2001a) Figure 8-3, comprises approximately 22 acres; however, the fill areas identified from the results of geophysical surveys conducted by IT cover approximately 4.5 acres within the Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7). Sampling locations and site features are shown on the detail map (Figure 9-1). The geophysical interpretation map (Figure 9-2) indicates the surrounding area and existing data collection points (i.e., geophysical lines, boreholes, wells, trenches, etc.) that have been used in defining the Fill Area East of Reilly Airfield and Former Post Garbage Dump.

The Former Post Garbage Dump, Parcel 126(7), covers approximately 2 acres and consists of a steep north-facing slope that borders a wetland (Figure 9-1). The crest, slope, and slope toe all face north to north-northwest. The wetland area extends across the toe of the slope toward Reilly Lake. Debris can be observed on the 25-foot exposed slope at Former Post Garbage Dump,

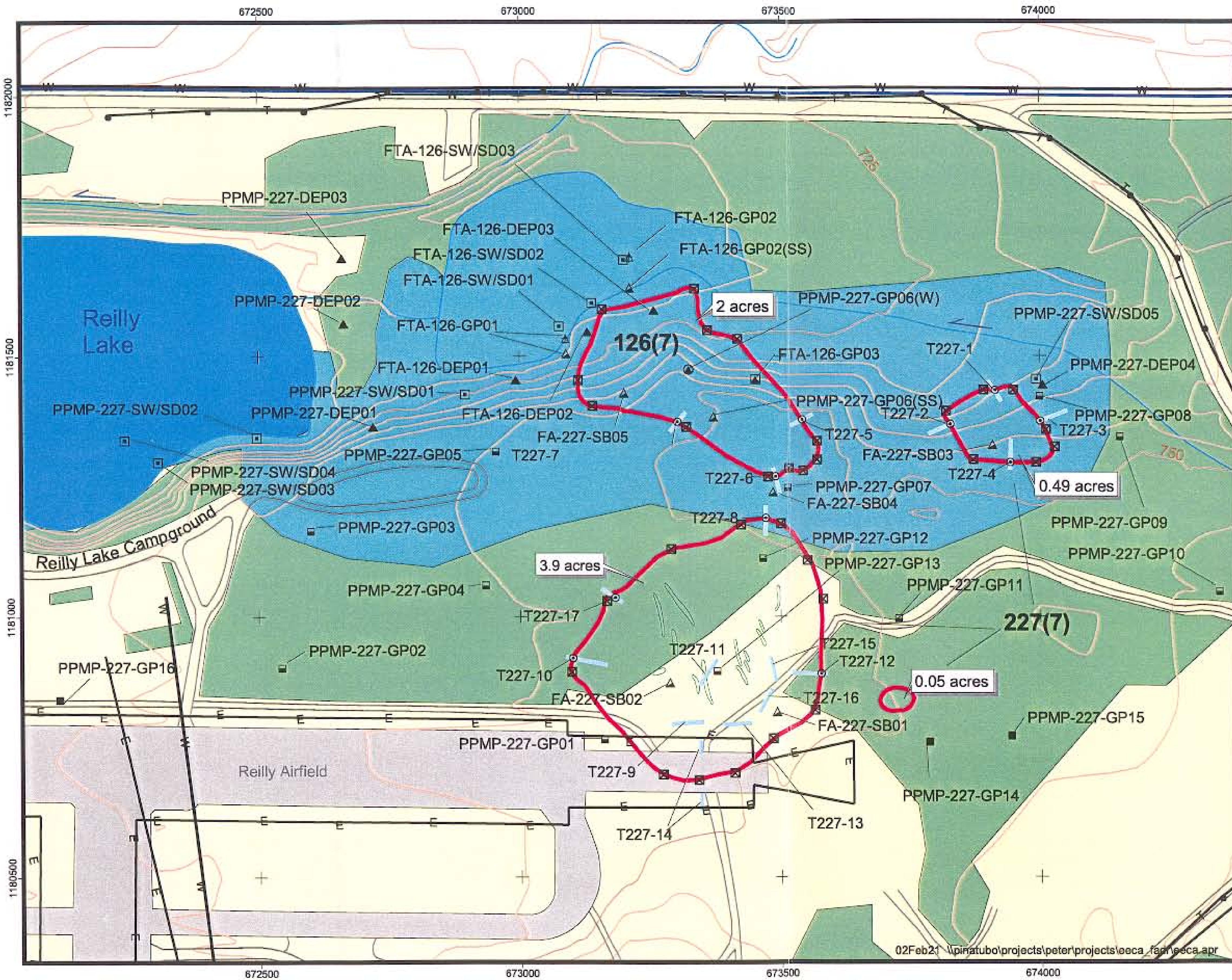

Figure 9-1

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

- Proposed Concrete Monument
- Groundwater and Surface Soil Sample Location (well)
- Groundwater Sample Location (well)
- Surface Soil Sample Location
- Groundwater and Subsurface Soil Sample Location (well)
- Surface Water/Sediment Sample Location
- Depositional Soil Sample Location
- Groundwater, Surface and Subsurface Soil Sample Location (well)
- Surface Soil Sample Location
- Fill Boundary Observed within Trench Excavations
- Exploratory Trench
- Telephone Utility
- Water Utility
- Electric Utility
- Improved Roads
- Linear Depressions
- 5' Topographic Contours
- Surface Drainage/Creek w/ Flow Direction
- Fill Area Boundary Inferred by Surface Geophysics and Trenches
- Lakes
- Wetlands
- Former Runway
- Wooded
- Lawn/Cleared Area

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State Plane feet, NAD83

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August 2001

U.S. Army Corps of Engineers
Mobile District
Fort McClellan
Calhoun County, Alabama
Contract No. DACA21-96-D-0018

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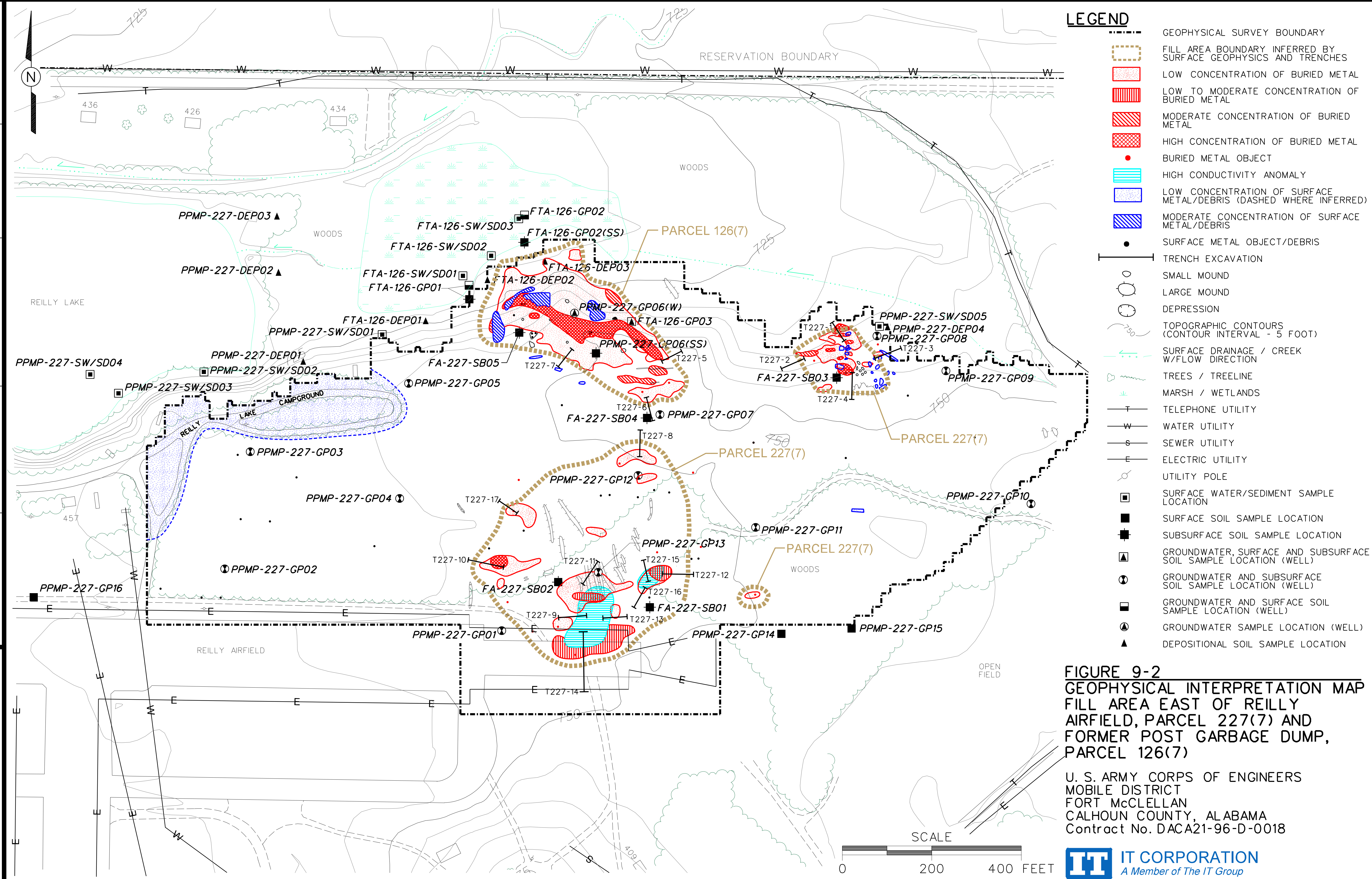

FIGURE 9-2
GEOPHYSICAL INTERPRETATION MAP
FILL AREA EAST OF REILLY AIRFIELD, PARCEL 227(7) AND FORMER POST GARBAGE DUMP, PARCEL 126(7)

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

IT CORPORATION
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DWG. NO.: ...\796886es.054
PROJ. NO.: 796886
INITIATOR: J. RAGSDALE
PROJ. MGR.: J. YACOUB
DRAFT. CHCK. BY:
ENGR. CHCK. BY: J. JENKINS
DATE LAST REV.:
DRAWN BY:
STARTING DATE: 02/16/01
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Parcel 126(7). The contours on the Former Post Garbage Dump detail map show that this slope extends from 750 to 725 feet above msl (Figure 9-1).

9.1.2 Previous Work

Previous environmental work conducted at Parcels 227(7) and 126(7) includes:

- Site-Specific Field Sampling Plan (IT, 1998c)
- Site Investigation and Fill Area Definition Report (IT, 2001a).

9.1.2.1 Investigation

IT conducted a geophysical survey at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump from September 1998 to March 1999. The total area surveyed was approximately 32 acres. The geophysical survey located large-scale disposal areas, landfill pits, anomalous high conductivity areas, isolated buried metallic objects, and surface metallic debris. Geophysical data analysis indicates several landfill pits ranging from low to high concentrations of buried metal, and numerous isolated buried metallic objects exist within site boundaries (Figure 9-2).

Thirteen temporary wells were installed in the residuum groundwater zone at the Fill Area East of Reilly Airfield and three temporary wells were installed at the Former Post Garbage Dump.

Surface soil samples were collected from six locations and depositional soil samples were collected from seven locations at the Former Post Garbage Dump and the Fill Area East of Reilly Airfield. Nineteen metals were detected in the surface and depositional soil samples collected. The concentrations of three metals (arsenic, iron, and manganese) exceeded the SSSLs in most of the surface and depositional soil samples collected; however, the concentrations of arsenic and iron were within the background screening values. Manganese exceeded the background screening values, ESVs, and SSSLs in the sample collected from location PPMP-227-DEP01. The concentrations of five metals (aluminum, chromium, iron, manganese, and vanadium) exceeded the ESVs in the surface and depositional soil samples collected; however, the concentrations of these metals were within the background screening values. Lead and mercury concentrations present in two samples exceeded the background screening values and the ESVs. Selenium concentrations present in seven samples exceeded the background screening values and the ESVs. Zinc concentrations present in one sample exceeded the background screening values and the ESVs.

Nine VOCs were detected in the surface and depositional soil samples collected. None of the detected VOC concentrations exceeded the SSSLs. Two pesticides were detected in surface soil sample collected from location PPMP-227-GP16. Both of the detected pesticides were present at concentrations exceeding the ESVs.

Subsurface soil samples were collected from thirteen locations at the Fill Area East of Reilly Airfield and three locations at the Former Post Garbage Dump for chemical analyses. Subsurface soil samples were collected at various intervals ranging from 1 to 12 feet bgs. Twenty-one metals were detected in the subsurface soil samples collected. All of the subsurface soil samples collected had detectable concentrations of arsenic and iron exceeding the SSSLs and eight of the thirteen subsurface soil samples collected had detectable concentrations of manganese exceeding the SSSLs. The subsurface soil samples collected from location PPMP-227-GP02 had detectable concentrations of chromium exceeding the SSSLs and the background screening values. Arsenic exceeded both the SSSL and background screening value in the sample collected from location PPMP-227-GP01 and manganese exceeded both the SSSL and background screening value at three sample locations.

Groundwater was sampled from the thirteen temporary wells at the Fill Area East of Reilly Airfield and the three wells located at the Former Post Garbage Dump. Nineteen metals were detected in the groundwater samples collected. The groundwater samples collected from locations FTA-126-GP01, FTA-126-GP02, PPMP-227-GP02, PPMP-227-GP03, PPMP-227-GP05, PPMP-227-GP07, PPMP-227-GP08, PPMP-227-GP09, PPMP-227-GP10, PPMP-227-GP11, PPMP-227-GP12, and PPMP-227-GP13 each had detectable concentrations of metals (aluminum, arsenic, barium, beryllium, copper, iron, lead, manganese, thallium, and vanadium) exceeding both the SSSLs and background screening values. The thallium results were flagged with a "B" data qualifier. Metals exceeding the SSSLs and background screening values in four of these samples (PPMP-227-GP02, PPMP-227-GP05, PPMP-227-GP07, and PPMP-227-GP12) are attributed to elevated levels of turbidity at the time of sample collection.

Five surface water samples were collected at the Fill Area East of Reilly Airfield; however, the sample collected from location PPMP-227-SW/SD05 was only analyzed for explosives. Three surface water samples were collected at the Former Post Garbage Dump. Eleven metals were detected in the surface water samples collected. Three surface water samples collected at the Former Post Garbage Dump had detectable concentrations of manganese exceeding the SSSLs, ESVs, and background screening values. One sample collected from location FTA-126-SW/SD02 had iron concentrations that exceeded the SSSLs, ESVs, and background screening values. Several of the surface water samples collected had detectable concentrations of barium exceeding the ESVs; however, all analytical results were within background screening values. The barium results were flagged with a "B" data qualifier. Mercury concentrations were detected at levels exceeding the ESVs at four locations.

Nineteen metals were detected in the sediment samples collected. Of the 19 metals detected, 13 exceeded background screening values in at least one sample. Only one metal (arsenic in FTA-126-SW/SD03) exceeded the SSSL, ESV, and background screening values. Five metals (arsenic, cobalt, copper, lead, and nickel) exceeded both the background screening values and ESVs in various samples. Five metals exceeded the ESVs in at least one sample.

9.1.2.2 EE/CA Fill Area Definition

Seventeen exploratory trenches were excavated at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump to characterize the horizontal and vertical extent of the fill material. Trenches were excavated to depths ranging from 10 to 15 feet bgs. Trench logs do not indicate the presence of groundwater in the trenches. Trench locations T227-1, T227-2, T227-3, T227-4, T227-5, T227-6, T227-7, and T227-9 were selected to determine the horizontal extent of the fill areas. Trench locations T227-8, T227-10, T227-11, T227-12, T227-13, T227-14, T227-15, T227-16, and T227-17 were selected to characterize the horizontal extent of the geophysical anomalies detected during surveying.

Fill material was observed in 16 of the 17 trenches, including: scrap metal, glass bottles/jars, bricks, yellow orange silt and clay, wood, wire coat hangers, metal bucket, plastic sheeting, rubber mat, glass test tubes, syringes, medical bottles, newspaper, concrete rubble, cinder blocks, battery (D-cell), steel cable, black fabric, negative film, paint cans, nails, ash, shingles, coal, light bulbs, broken plates, leather shoes, chicken wire, steel piping, rebar, crushed steel drums, and bones. No fill material was observed in trench T227-3. Glass medical bottles and syringes were observed in trenches T227-9, T227-11, T227-12, and T227-15. A rifle cartridge casing was observed in Trench T227-14. D-cell size batteries were observed in trenches T227-8 and T227-9. The trenches contained varying amounts of steel/metal material that likely caused the anomalies attributed to varying concentrations of buried metal in the geophysics report. The anomalies shown as elevated conductivity in the geophysics report correspond to the trenches containing varying amounts of disturbed clay and low amounts of metal material.

Based on the results of the exploratory trenching at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump, the horizontal extent of the Fill Area has been redefined. The estimated extent of waste fill within these parcels covers approximately 6.44 acres.

Five borings were installed at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump to investigate the depth of fill material and to identify COPCs within the fill material. Fill material borings were installed to depths ranging from 10 to 18 feet bgs.

Nineteen metals were detected in the fill material samples collected. All fill material samples had detectable concentrations of arsenic and iron exceeding the SSSLs; however, neither exceeded the background screening values. Four of the fill material samples collected had detectable concentrations of aluminum and thallium exceeding the SSSLs; however, the aluminum and thallium concentrations did not exceed the background screening values.

IT has estimated the vertical and horizontal extent of the waste fill at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump based on information gathered from the site investigation and trenching and boring activities discussed in this report. The approximate horizontal extent of fill in both parcels covers 6.44 acres. The average depth of fill material estimated from the trench and boring log data is 8 feet at the Fill Area East of Reilly Airfield and 3 feet at the Former Post Garbage Dump.

9.1.3 Structures/Topography

The topography of the Fill Area East of Reilly Airfield, Parcel 227(7), and Former Post Garbage Dump, Parcel 126(7), is mostly flat with a steep slope near the northern boundary of the site, which abuts the forested wetland. Refuse and other evidence of past disposal practices are prevalent along the steep slope adjacent to the wetland area. Numerous mounds are present in the south-central portion of the Fill Area East of Reilly Airfield, and are the result of historical land-filling activities that have taken place at the site. The Fill Area East of Reilly Airfield and Former Post Garbage Dump elevation is approximately 750 feet above msl throughout the site with the toe of the slope in the Former Post Garbage Dump at an elevation of 725 feet above msl. The ground slopes to the north-northwest toward Reilly Lake. The southern portion of Parcel 227(7) underlies the eastern extension of Reilly Airfield.

Parcels 227(7) and 126(7) lie within the Conasauga Formation, as shown on Figure 2-2. The Conasauga Formation is composed of thick-bedded dolomite with minor shale and chert. The creek and wetlands feeding into Reilly Lake are made up of alluvial sediments. Surface water flow is to the north and west as sheet flow. A depression crosses much of the central portion of the site and drains excess water from Parcels 227(7) and 126(7) north into the low-lying wetlands area. An intermittent stream flows from east to west along the northern portion of the site. This feeds an intermittent pond area just north of Parcel 126(7). The pond drains into Reilly Lake.

9.1.4 Hydrogeology

Static groundwater elevations were measured in 15 temporary wells in March 2000. A groundwater elevation map was constructed using the March 2000 data and is presented on Figure 2-3. The general direction of groundwater flow is predominantly north onto the western portion of the Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7), northwest along the northern edge of the site, and almost due west along the eastern side of the site. During soil boring and well installation activities in 1999, groundwater was generally encountered in clayey sand zones at depths ranging from 2 to 35 feet bgs. The March 2000 groundwater elevations at the site ranged from 741.56 to 721.29 feet above msl. Depths to groundwater ranged from 3.3 to 33.8 feet bgs during the March 2000 monitoring event. Groundwater gradient over the parcel varies dramatically from 0.01 to 0.1 ft/ft. The groundwater gradient flattens in proximity to Reilly Lake and is quite steep further east in the stream channel that flows into the wetlands above Reilly Lake. No groundwater was observed in the trenches at this site.

9.1.5 Surrounding Land Use and Populations

The area around the Fill Area East of Reilly Airfield, Parcel 227(7), and the Former Post Garbage Dump, Parcel 126(7), includes wetlands, recreational areas (including campgrounds), and Reilly Lake. The surrounding area is currently used for local recreational use. A campground is located 250 feet southwest of the Former Post Garbage Dump. The wetlands area east of Reilly Lake is located less than 50 feet north and west of the slope containing exposed debris. A recreational user scenario will be used as the primary exposure option with a secondary scenario based on residential use for comparison. The reuse plan is shown on Figure 1-2.

9.1.6 Sensitive Ecosystems

The ecological setting of the site is defined by the physical characteristics of the Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7) and the type of habitats that can be supported. The habitats vary according to local topography, soils, and ecological successional stage. The original ecological setting has been altered in this area through historical anthropogenic activities. Consequently, the topography and resultant habitat types may not be characteristic of similar areas that have not been altered by man. Although there are no permanent aquatic features within the Fill Area East of Reilly Airfield and Former Post Garbage Dump, an area of forested wetland and Reilly Lake form the northern boundary of these sites. A more complete description of the environmental setting is presented in Section 9.3.1.

9.1.7 Analytical Data

The summary tables for the Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7), identify compounds that exceed the screening criteria as defined in the *Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000a) and the *Final Background Metals Survey Report, FTMC, Alabama* (SAIC, 1998). Appendix A includes a summary of detected compounds in samples collected at the site and compares analyte concentrations against background values (for metals only), SSSLs, and ESVs for the various sample media collected at the sites. Metals that exceed both the background threshold limit (two times background) and SSSLs and organic compounds that exceed SSSLs are summarized for each sample medium in Table 9-1.

9.1.8 Potential Source of Contaminants

The location of the fill material in the Fill Area East of Reilly Airfield, Parcel 227(7), and the Former Post Garbage Dump, Parcel 126(7), was interpreted from the geophysical data collected to date and from the trench excavations completed by IT in support of the EE/CA. The Fill Area East of Reilly Airfield and Former Post Garbage Dump detail map (Figure 9-1) incorporates all of the historical and recent data in defining the area of fill extent at the sites.

Fill material was observed in 16 of the 17 trenches and included scrap metal, glass bottles/jars, bricks, yellow-orange silt and clay, wood, wire coat hangers, metal bucket, plastic sheeting, rubber mat, glass test tubes, syringes, medical bottles, newspaper, concrete rubble, cinder blocks, battery (D-cell), steel cable, black fabric, negative film, paint cans, nails, ash, shingles, coal, light bulbs, broken plates, leather shoes, chicken wire, steel piping, rebar, crushed steel drums, and bones. Groundwater was not noted as being encountered; however, two of the trenches included moisture content within the excavated materials that ranged from moist to saturated according to the on site geologist. The two trenches were excavated to a depth of 13 feet bgs.

Multimedia sampling at the Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7) detected metals in both soil and groundwater at concentrations above background values and SSSLs.

9.2 Streamlined Human Health Risk Assessment

Surface soil, surface water, sediment, and groundwater were evaluated for the SRA at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump. The recreational site-user and the resident were determined to be the most appropriate receptor scenarios for current and future

Table 9-1

Site Investigation Analytical Data Summary
Fill Area East of Reilly Airfield and the Former Post Garbage Dump, Parcels 227(7) and 126(7)
Fort McClellan, Alabama

Fill Area East of Reilly Airfield, Parcel 227(7)

Medium Sampled	Metals	VOCs	SVOCs	Pesticides	Explosives	Herbicides	PCBs
Surface and Depositional Soil	Cr, Mn > BKG and SSSLs	< SSSLs	< SSSLs	< SSSLs	NA	ND	ND
Subsurface Soil	As, Cr, Mn > BKG and SSSLs	< SSSLs	< SSSLs	< SSSLs	NA	< SSSLs	ND
Sediments	< BKG and SSSLs	< SSSLs	< SSSLs	ND	NA	ND	ND
Fill Material	< BKG and SSSLs	< SSSLs	< SSSLs	< SSSLs	ND	ND	ND
Groundwater	Al, As, Ba, Be, Cu, Fe, Mn, Pb, Tl, V > BKG and SSSLs	< SSSLs	< SSSLs	ND	ND	< SSSLs	ND
Surface Water	< BKG and SSSLs	< SSSLs	ND	ND	ND	ND	ND

Table 9-1

Site Investigation Analytical Data Summary
Fill Area East of Reilly Airfield and the Former Post Garbage Dump, Parcels 227(7) and 126(7)
Fort McClellan, Alabama

Former Post Garbage Dump, Parcel 126(7)

Medium Sampled	Metals	VOCs	SVOCs	Pesticides	Explosives	Herbicides	PCBs
Surface and Depositional Soil	< BKG and SSSLs	Trichloroethene > SSSL	< SSSLs	ND	NA	ND	ND
Subsurface Soil	< BKG and SSSLs	< SSSLs	ND	ND	NA	ND	ND
Sediments	As > BKG and SSSLs	Acetone > SSSL	Bis(2-ethylhexyl) phthalate SSSL	ND	NA	ND	ND
Fill Material	NS	NS	NS	NS	NS	NS	NS
Groundwater	Mn, Tl > BKG and SSSLs	< SSSLs	ND	ND	NA	ND	ND
Surface Water	Fe, Mn > BKG and SSSLs	< SSSLs	Bis(2-ethylhexyl) phthalate SSSL	ND	NA	ND	ND

Al - aluminum
As - arsenic
Ba - barium
Be - beryillium
BKG - background
Cr - chromium
Cu - copper
Fe - iron
Mn - manganese
NA - not analyzed
ND - not detected
NS - medium not sampled
Pb - lead
PCB - polychlorinated biphenyl
SSSL - site-specific screening level
SVOC - semivolatile organic compounds
Tl - thallium
V - vanadium
VOC - volatile organic compounds

land use. The CSEM is presented on Figure C-6. SRA tables, figures, and attachments are included in Appendix C.

9.2.1 Surface Soil

Thirteen surface soil samples, collected in 1998 and 1999, were evaluated in the SRA (Table C6-1). Eleven of these samples were analyzed for herbicides, pesticides, metals, SVOCs, VOCs, and PCBs. One sample location had two samples, one sample was analyzed for only VOCs, while the other sample was analyzed for chlorinated herbicides and pesticides, organophosphorous pesticides, metals, SVOCs, and PCBs.

Eighteen metals, two chlorinated pesticides, and six VOCs were detected at the site (Table C6-2). After background screening and nutrient removal, only copper, zinc, and the organics were determined to be site-related.

Table C6-3 presents the COPC selection for surface soil. No site-related metals, pesticides, or VOCs had MDCs greater than their respective soil SSSLs; therefore, no surface soil COPC were selected.

9.2.2 Surface Water

Twelve surface water samples, collected in 1998 and 1999, were utilized in the SRA (Table C6-4). Seven samples were analyzed for chlorinated herbicides and pesticides, organophosphorous pesticides, metals, SVOCs, VOCs, and PCBs; the remaining five samples were analyzed for explosives only.

Nine metals, one SVOC, and two VOCs were detected in the surface water samples. All of the organics are common laboratory contaminants and may be artifacts; however, they were carried to the COPC selected step of the SRA. After background screening and nutrient removal, manganese and mercury remained as site-related metals. The site data and background data for iron were determined to draw from the same population by the Mann-Whitney U Test (StatSoft, 1998) and thus were not selected as site-related metals. A summary of the statistical tests is presented in Appendix C, Attachment C-8. The organics were also retained as site-related chemicals (Table C6-5).

Table C6-6 presents the COPC screening for surface water. None of the site-related chemicals were determined to be surface water COPCs for the recreational site-user or the resident.

9.2.3 Sediment

Fifteen sediment samples, collected in 1998 and 1999, were evaluated in the SRA (Table C6-7). Six of the samples were analyzed for chlorinated pesticides and herbicides, organophosphorous pesticides, metals, SVOCs, VOCs, and PCBs. Two samples were analyzed for organophosphorous pesticides only, five for explosives only, and two for chlorinated herbicides and pesticides, metals, SVOCs, VOCs, and PCBs.

Eighteen metals and four VOCs were detected in sediment at the site; however, after background screening, nutrient elimination, and statistical testing using the Mann-Whitney U Test, nine metals remained as site-related chemicals. All of the organics were carried forward as site-related chemicals (Table C6-8). Results of the Mann-Whitney U Test are presented in Appendix C, Attachment C-8.

As presented in Table C6-9, none of the site-related chemicals were selected as sediment COPC for either the resident or the recreational site-user. Therefore, no COPC were selected for sediment.

9.2.4 Groundwater

The twenty-nine groundwater samples, collected in 1999, were evaluated in the SRA (Table C6-10). Sixteen of the samples were analyzed for chlorinated pesticides and herbicides, organophosphorous pesticides, metals, SVOCs, VOCs, and PCBs. Thirteen groundwater samples were analyzed for explosives at groundwater wells previously not analyzed for explosives at those locations.

Eighteen metals, one chlorinated herbicide, one SVOC, and one VOC were detected in groundwater; however, after background screening, nutrient elimination, and statistical testing using the Mann-Whitney U Test, six metals and all organics remained as site-related chemicals (Table C6-11). Results of the Mann-Whitney U Test are presented in Appendix C, Attachment C-8.

As presented in Table C6-12, five metals (aluminum, beryllium, chromium, nickel, and vanadium) were identified as COPC based upon noncancer effects. The resulting total HI for the resident exposed to these five metals in groundwater is 1.9 (Table C6-13). The metals with HIs greater than 0.1 (aluminum, chromium, and vanadium) were separated by affected target organs (Table C6-14); once this separation was made by affected target organs, no metal had a total HI greater than 1, when rounded to one significant figure. Therefore, aluminum, chromium, and vanadium were not selected as COC in groundwater.

9.2.5 Uncertainty Analysis

Subsurface soil was not evaluated in this SRA; if land use changes or receptor scenarios change, especially if construction occurs, it may be necessary to re-evaluate this medium.

A significant source of uncertainty pertains to selecting iron as a COPC in groundwater. Iron is among the metals whose concentrations are one to two orders of magnitude higher in samples with high turbidity. Also, as noted before, EPA Region III considers the oral RfD for iron to be unreliable and does not use it for quantitative risk assessment. Ignoring the potential toxicity contributed by iron may impart a slight non-conservative bias to the SRA.

A very significant source of uncertainty pertains to the oral RfD for chromium with a valence of +6 (chromium VI), on which the SSSL for chromium is based. The oral RfD for chromium VI is 500-fold smaller (more restrictive) than the oral RfD for chromium with a valence of +3 (chromium III). As explained in the toxicity profile for chromium, the oral RfD for chromium VI is probably unnecessarily conservative because virtually all chromium VI in drinking water is reduced to chromium III in the acid milieu of the stomach before absorption occurs. Furthermore, it is unlikely that all the chromium in groundwater exists as chromium VI. In other words, the HI for chromium of 5.34E-1 probably should be closer to 1E-3, in which case the residential scenario would pass. Also, chromium is among the chemicals identified in groundwater samples with high turbidity, but not in samples with low turbidity.

9.2.6 SRA Conclusions

The surface soil, surface water, sediment, and groundwater at this site pose no unacceptable cancer risk or noncancer hazard to the resident or the recreational site-user (Table C6-15).

9.3 Screening-Level Ecological Risk Assessment

This section presents the SLERA for Parcels 227(7) and 126(7).

9.3.1 Environmental Setting

The ecological setting of the Fill Area East of Reilly Airfield, Parcel 227(7), and the Former Post Garbage Dump, Parcel 126(7), is defined by the physical characteristics of the sites and the type of habitats that can be supported. The habitats vary according to local topography, soils, and ecological successional stage. The original ecological setting has been altered in this area through historical anthropogenic activities. As such, the topography and resultant habitat types may not be characteristic of similar areas that have not been altered by man.

The sites are located in the northwest corner of the Main Post and encompass a total area of approximately 22 acres. The northern boundary of this area is a forested wetland area and Reilly Lake. The eastern and southern boundaries of this area are comprised of grassland and the asphalt-paved airfield (Reilly Airfield). The western boundary of this area is the campground at Reilly Lake. The fill areas comprise approximately 6.5 acres of the total area.

The topography of the Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7), is mostly flat with a steep slope near the northern boundary of the sites, which abuts the forested wetland. Refuse and other evidence of past disposal practices are prevalent along the steep slope adjacent to the wetland area. Numerous mounds are present in the south-central portion of the Fill Area East of Reilly Airfield and are the result of historical landfilling activities that have taken place at the site.

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

The majority of the western half of the Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7), is best characterized as typic mesophytic forest. The canopy species characteristic of this area are tulip tree (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), shortleaf pine (*Pinus echinata*), loblolly pine (*Pinus taeda*), white oak (*Quercus alba*), and northern red *oak (Quercus rubra*). The dominant understory species of this area are red maple (*Acer rubrum*), flowering dogwood (*Cornus florida*), witch hazel (*Hamamelis virginia*), sweetgum (*Liquidambar styraciflua*), and sourwood (*Oxydendrum arboreum*). The shrub layer is dominated by mountain laurel (*Kalmia latifolia*), southern low blueberry *(Vaccinium pallidum*), southern wild raisin (*Viburnum nudum*), and yellowroot *(Xanthorhiza simplicissima*). Numerous muscadine grape (*Vitis rotundifolia*) vines are also present in this area.

The majority of the eastern half of the Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7), is best characterized as dry Virginia pine-oak forest. Virginia pine (*Pinus virginiana*) is the dominant species in this area by a large margin. Other canopy species that occur infrequently are southern red oak (*Quercus falcata*), blackjack oak (*Quercus* *marilandica*), chestnut oak (*Quercus prinis*), and post oak (*Quercus stellata*). Understory and shrub species are virtually nonexistent in this area. The majority of the forest floor in this area is blanketed with pine needles, with the false jessamine (*Gelsemium sempervirens*) vine and the little bluestem (*Schizachyrium scoparium*) and black oat grass (*Stipa avenacea*) occasionally encountered.

Although there are no permanent aquatic features within the Fill Area East of Reilly Airfield, Parcel 227(7), and Former Post Garbage Dump, Parcel 126(7), an area of forested wetland and Reilly Lake form the northern boundary of the site. The forested wetland area is the remnant of an old beaver dam that has apparently been abandoned by beavers for several years, as there is no evidence of recent beaver activity. This wetland area is approximately 5 acres in size and is adjacent to Reilly Lake to the west. All of the trees in the wetland area are dead because of the ponding caused by the beaver dam. The vegetation surrounding the former beaver pond is characteristic of forested wetlands and is dominated by willow oak (*Quercus phellos*), overcup oak (*Quercus lyrata*), swamp oak (*Quercus bicolor*), sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), hackberry (*Celtis laevigata*), American elm (*Ulmus procera*), and tulip tree (*Liriodendron tulipifera*). The understory is characterized by box elder (*Acer negundo*), ironwood (*Carpinus caroliniana*), and alder (*Alnus spp.*).

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

Terrestrial species that may inhabit the upland areas of the Fill Area East of Reilly Airfield, Parcel 227(7), and Former Post Garbage Dump, Parcel 126(7), include opossum, short-tailed shrew, raccoon, white-tail deer, red fox, coyote, gray squirrel, striped skunk, a number of species of mice and rats (e.g., white-footed mouse, eastern harvest mouse, cotton mouse, eastern woodrat, and hispid cotton rat), and eastern cottontail. Approximately 200 avian species reside at FTMC at least part of the year (ACOE, 1997). Common species expected to occur in the vicinity of the site include northern cardinal (*Cardinalis cardinalis*), northern mockingbird (*Mimus polyglottus*), warblers (*Dendroica spp.*), indigo bunting (*Passerina cyanea*), red-eyed vireo (*Vireo olivaceus*), American crow (*Corvus brachyrhynchos*), bluejay (*Cyanocitta cristata*), several species of woodpeckers (*Melanerpes spp., Picoices spp.*), and Carolina chickadee (*Parus carolinensis*). Game birds present in the vicinity of the Fill Area East of Reilly Airfield and Former Post Garbage Dump may include northern bobwhite (*Colinus virginianus*), mourning dove (*Zenaida macroura*), and eastern wild turkey (*Meleagris gallopavo*). A variety of raptors (e.g., red-tailed hawk, sharp-shinned hawk, barred owl, and great horned owl) could also use portions of this area for a hunting ground, particularly the fringe area where the forested areas abut roads and cleared areas. Because of the presence of the forested wetland and Reilly Lake, piscivorous bird species may also be present in the vicinity of Fill Area East of Reilly Airfield and Former Post Garbage Dump. These piscivorous birds may include great blue heron (*Ardea herodias*), green-backed heron (*Butorides striatus*), and belted kingfisher (*Ceryle alcyon*).

The wetland area north of the Fill Area East of Reilly Airfield, Parcel 227(7), and Former Post Garbage Dump, Parcel 126(7), provides habitat for muskrat, beaver, and other aquatic mammals. This wetland area and the adjoining streams and Reilly Lake provide moderate quality gray bat foraging habitat. Two major requirements for gray bat foraging habitat are contiguous forest cover and habitat for aquatic insects (one of the gray bat's preferred dietary items). These two requirements are met by the wetland area, streams, and Reilly Lake; therefore, gray bats could be expected to utilize these areas for foraging. Reilly Lake also provides habitat to support a number of aquatic amphibians including the bullfrog (*Rana catesbeiana*) and leopard frog (*Rana sphenocephala*). Fish species that may be found in Reilly Lake include largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis machrochirus*), and other sunfish, crappie (*Pomoxis spp.*), and catfish (*Ictalurus spp.*).

9.3.2 Chemicals Detected

Chemicals detected in soil, sediment, and surface water at the Fill Area East of Reilly Airfield and the Former Post Garbage Dump, Parcels 227(7) and 126(7), are summarized in Appendix A.

9.3.3 Chemicals of Potential Ecological Concern

COPECs are those constituents whose maximum detected concentrations exceed their respective ESVs. The COPECs that have been identified at the Fill Area East of Reilly Airfield, Parcel 227(7), and the Former Post Garbage Dump, Parcel 126(7), are the following:

- Surface Soil – chromium, copper, lead, manganese, mercury, selenium, zinc, 4,4'-DDE, and 4,4'-DDT

- Surface Water – manganese, mercury, and bis(2-ethylhexyl)phthalate

- Sediment – aluminum, arsenic, barium, beryllium, cobalt, copper, lead, manganese, nickel, selenium, and acetone.

9.3.4 SLERA Uncertainty Analysis

The site-related surface soil constituents that exceeded their respective ESVs at the site were chromium, copper, lead, manganese, mercury, selenium, zinc, 4,4'-DDE, and 4,4'-DDT (Appendix D, Table D-15). Manganese, mercury, and bis(2-ethylhexyl)phthalate exceeded their ESVs in surface water (Table D-16), and aluminum, arsenic, barium, beryllium, cobalt, copper, lead, manganese, nickel, selenium, and acetone exceeded their ESVs in sediment (Table D-17) at the Fill Area East of Reilly Airfield and Former Post Garbage Dump.

As described in Section 9.3.1, the Fill Area East of Reilly Airfield and Former Post Garbage Dump exhibit vegetation characteristic of disturbed land. The constituents in soil from this area that exceed their respective ESVs do so by less than an order of magnitude (HQs between 1.48 and 4.8), except for chromium and manganese (HQ = 119.8 and 18.2, respectively). Additionally, the arithmetic mean concentrations of all of the constituents that exceed their respective ESVs and are less than their respective naturally occurring background concentrations, which indicates that these constituents may not be site-related. Because of the relatively low quality of the terrestrial habitat provided by the historical fill area, the relatively small exceedance of the ESVs for most of the constituents detected in soil, and the fact that mean concentrations of metals are within the range of naturally occurring background concentrations, constituents in soil at the site most likely do not pose significant ecological risks to the terrestrial habitats at Fort McClellan. The various lines-of-evidence used to draw these conclusions are presented in Table D-29.

The sediment in the wetland area just north of the Fill Area East of Reilly Airfield exhibits relatively small exceedance of several ESVs (HQs range from 1.06 to 8.29). Because these HQs are less than ten and these constituents do not appreciably bioaccumulate, constituents in sediment most likely do not pose significant ecological risk. One surface water sample from this wetland exhibits manganese, mercury, and bis(2-ethylhexyl)phthalate concentrations greater than their ESVs. These elevated concentrations are isolated and most likely not indicative of widespread contamination. Therefore, constituents in surface water most likely do not pose adverse ecological risks to aquatic receptors or other receptors that use this surface water. The various lines-of-evidence used to draw these conclusions are presented in Table D-29.

9.3.5 SLERA Conclusions

Terrestrial habitat at the Fill Area East of Reilly Airfield and Former Post Garbage Dump is comprised of grasslands, typic mesophytic forest, and dry Virginia pine-oak forest. Although there are no permanent aquatic features within the Fill Area East of Reilly Airfield and Former Post Garbage Dump, an area of forested wetland and Reilly Lake form the northern boundary of the site. The forested wetland area is the remnant of an old beaver dam that has apparently been abandoned by beavers for several years, as there is no evidence of recent beaver activity.

The site-related surface soil constituents that exceeded their respective ESVs at the Former Post Garbage Dump and Fill Area East of Reilly Airfield were chromium, copper, lead, manganese, mercury, selenium, zinc, 4,4'-DDE, and 4,4'-DDT (Table D-15). Manganese, mercury, and bis(2-ethylhexyl)phthalate exceeded their ESVs in surface water (Table D-16), and aluminum, arsenic, barium, beryllium, cobalt, copper, lead, manganese, nickel, selenium, and acetone exceeded their ESVs in sediment (Table D-17).

Although the maximum detected concentrations of a number of constituents exceed their respective ESVs in site media, additional lines-of-evidence suggest that these COPECs may not pose significant risks to the terrestrial or aquatic ecosystems at Fort McClellan. These COPECs (Table D-28) have been identified through a very conservative screening process that utilizes ESVs based largely on NOAELs from the scientific literature and maximum detected constituent concentrations. If additional lines-of-evidence are considered, it could be concluded that there are no COPECs in surface soil, surface water, or sediment. If, based on a risk management decision, the potential ecological risks at the Fill Area East of Reilly Airfield, Parcel 227(7), and the Former Post Garbage Dump, Parcel 126(7), are determined to be "unacceptable" at this screening-level stage, then a BERA is appropriate. The goal of the BERA, if deemed necessary, will be to reduce the levels of uncertainty and conservatism in the assessment process and to determine the potential for ecological risk at the Fill Area East of Reilly Airfield, Parcel 227(7), and the Former Post Garbage Dump, Parcel 126(7), through a number of lines of evidence.

9.4 Recommendations

Based on the results of the field investigations, the current and proposed future land use, and the results of the risk assessments completed for Fill Area East of Reilly Airfield and Former Post Garbage Dump, Parcels 227(7) and 126(7), the recommended remedy under CERCLA is No Further Action.

To facilitate reuse of the property, the Army proposes, but is not limited to, several non-CERCLA actions for this site. These proposals are presented in Attachment 2.