

REVISED FINAL

**PHASE II RCRA FACILITY INVESTIGATION  
REPORT FOR 16 SOLID WASTE MANAGEMENT UNITS**

**AT**

**FORT STEWART, GEORGIA  
VOLUME I OF III**

**REGULATORY AUTHORITY  
RESOURCE CONSERVATION AND RECOVERY ACT  
40 CFR 264, TITLE II, SUBPART C, SECTION 3004;  
42 USC 6901 ET SEQ.**

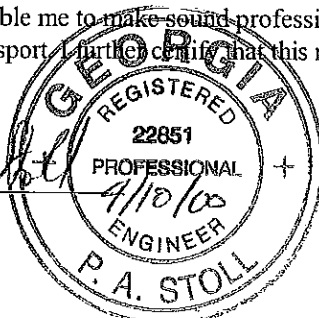
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The undersigned certifies that I am a qualified groundwater scientist who has received a baccalaureate or postgraduate degree in the natural sciences or engineering and have sufficient training and experience in groundwater hydrology and related fields, as demonstrated by state registration and completion of accredited university courses, to enable me to make sound professional judgments regarding groundwater monitoring and contaminant fate and transport. I further certify that this report was prepared by myself or a subordinate working under my direction.

  
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**DOCUMENT 6**

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be considered an eligible contractor for its review.

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## ACRONYMS

|         |                                                                       |
|---------|-----------------------------------------------------------------------|
| ADA     | Air Defense Artillery                                                 |
| ADD     | average daily dose                                                    |
| amsl    | above mean sea level                                                  |
| ARAR    | applicable or relevant and appropriate requirement                    |
| Army    | U.S. Army                                                             |
| AST     | aboveground storage tank                                              |
| ASTM    | American Society for Testing and Materials                            |
| AT123D  | Analytical Transient 1-, 2-, 3-Dimensional                            |
| AUF     | area use factor                                                       |
| AWQC    | Ambient Water Quality Criteria                                        |
| BAF     | bioaccumulation factor                                                |
| BCF     | bioconcentration factor                                               |
| bgs     | below ground surface                                                  |
| BHC     | benzene hexachloride                                                  |
| BN      | battalion                                                             |
| BTEX    | benzene, toluene, ethylbenzene, and xylenes                           |
| CAP     | Corrective Action Plan                                                |
| CB      | chemical/biological                                                   |
| CERCLA  | Comprehensive Environmental Response, Compensation, and Liability Act |
| CMCOC   | contaminant migration chemical of concern                             |
| CMCOPC  | contaminant migration constituent of potential concern                |
| COC     | contaminant of concern                                                |
| COPC    | contaminant of potential concern                                      |
| CSM     | Conceptual Site Model                                                 |
| DAF     | dilution attenuation factor                                           |
| DEH     | Directorate of Engineering and Housing                                |
| DF      | dilution factor                                                       |
| DO      | dissolved oxygen                                                      |
| DOL     | Directorate of Logistics                                              |
| DPT     | direct-push technology                                                |
| DPW     | Directorate of Public Works                                           |
| DQO     | data quality objective                                                |
| DRMO    | Defense Reutilization and Marketing Organization                      |
| ECOPC   | ecological contaminant of potential concern                           |
| EOD     | Explosive Ordnance Disposal                                           |
| EPA     | U.S. Environmental Protection Agency                                  |
| EPRE    | ecological preliminary risk evaluation                                |
| EP Tox  | Extraction Procedure Toxicity                                         |
| ERA     | Ecological Risk Assessment                                            |
| ESV     | ecological screening value                                            |
| FR      | <u>Federal Register</u>                                               |
| FSMR    | Fort Stewart Military Reservation                                     |
| GAF     | gastrointestinal absorption factor                                    |
| GEPD    | Georgia Environmental Protection Division                             |
| GSSL    | generic soil screening level                                          |
| HAZWRAP | Hazardous Waste Remedial Actions Program                              |
| HELP    | Hydrologic Evaluation of Landfill Performance                         |

## ACRONYMS (continued)

|        |                                                  |
|--------|--------------------------------------------------|
| HHCOC  | human health chemical of concern                 |
| HHCOPC | human health contaminant of potential concern    |
| HHPRE  | human health preliminary risk evaluation         |
| HI     | hazard index                                     |
| HMX    | octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine |
| HQ     | hazard quotient                                  |
| IDW    | investigation-derived waste                      |
| IEUBK  | Integrated Exposure Uptake Biokinetic            |
| ILCR   | incremental lifetime cancer risk                 |
| IRA    | Interim Removal Action                           |
| IWTP   | Industrial Wastewater Treatment Plant            |
| LAS    | Land Application System                          |
| LOAEL  | lowest observed adverse effect level             |
| MCL    | maximum contaminant level                        |
| MOGAS  | motor gasoline                                   |
| NFA    | no further action                                |
| NGTC   | National Guard Training Center                   |
| NGVD   | National Geodetic Vertical Datum                 |
| NOAEL  | no observed adverse effect level                 |
| NPDES  | National Pollutant Discharge Elimination System  |
| NTU    | nephelometric turbidity unit                     |
| OB     | open burn                                        |
| OD     | open detonation                                  |
| ODAST  | One-dimensional Analytical Solute Transport      |
| OWS    | oil/water separator                              |
| PAH    | polycyclic aromatic hydrocarbon                  |
| PCB    | polychlorinated biphenyl                         |
| PETN   | pentaerythrite tetranitrate                      |
| PID    | photoionization detector                         |
| POL    | petroleum, oil, and lubricants                   |
| POTW   | publicly owned treatment works                   |
| PVC    | polyvinyl chloride                               |
| QA     | quality assurance                                |
| QAPP   | Quality Assurance Project Plan                   |
| QC     | quality control                                  |
| QCSR   | Quality Control Summary Report                   |
| RBC    | risk-based concentration                         |
| RBCA   | Risk-based Corrective Action                     |
| RCRA   | Resource Conservation and Recovery Act           |
| RDX    | hexahydro-1,3,5-trinitro-1,3,5-triazine          |
| Redox  | oxidation-reduction                              |
| RFA    | RCRA Facility Assessment                         |
| RFI    | RCRA Facility Investigation                      |
| SAIC   | Science Applications International Corporation   |
| SAP    | Sampling and Analysis Plan                       |
| SDWA   | Safe Drinking Water Act                          |
| SESOIL | Seasonal Soil Compartment Model                  |
| SMCL   | secondary maximum contaminant level              |

## ACRONYMS (continued)

|        |                                            |
|--------|--------------------------------------------|
| SPT BN | Support Battalion                          |
| SRC    | site-related contaminant                   |
| SSL    | soil screening level                       |
| SQB    | sediment quality benchmark                 |
| SVOC   | semivolatile organic compound              |
| SWMU   | Solid Waste Management Unit                |
| TAC    | Tactical Air Command                       |
| TC     | toxicity characteristic                    |
| TCLP   | Toxicity Characteristic Leaching Procedure |
| TDS    | total dissolved solids                     |
| TEF    | toxicity equivalence factor                |
| TOC    | total organic carbon                       |
| TPH    | total petroleum hydrocarbons               |
| TRPH   | total recoverable petroleum hydrocarbons   |
| TRV    | toxicity reference value                   |
| USACE  | U.S. Army Corps of Engineers               |
| USGS   | U.S. Geological Survey                     |
| UST    | underground storage tank                   |
| UXO    | unexploded ordnance                        |
| VOC    | volatile organic compound                  |
| WQS    | water quality standard                     |



## EXECUTIVE SUMMARY

This report summarizes the results of the Phase II Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) for the 16 Solid Waste Management Units (SWMUs) at Fort Stewart, Georgia. The 16 SWMUs include: Camp Oliver Landfill, SWMU 2; TAC-X Landfill, SWMU 3; Inactive EOD Area in Red Cloud Range, Hotel Area, SWMU 9; Inactive EOD Area North of Garrison Area, SWMU 10; Inactive EOD Area Located Approximately Three Miles Northeast of Garrison Area, SWMU 11; Active EOD Containing Open Detonation Unit and Open Burn Unit, SWMU 12A; Old Fire Training Area, SWMU 14; DRMO Hazardous Waste Storage Area, SWMU 17; Industrial Wastewater Treatment Plant, SWMU 18; Old Sludge Drying Beds, SWMU 19; Old Radiator Shop/Paint Booth, SWMU 24B; Motorpools, SWMUs 27A through 27V; Evans Army Heliport POL Storage Facility, SWMU 29; DEH Asphalt Tanks, SWMU 31; Supply Diesel Tank, SWMU 32; DEH Equipment Wash Rack, SWMU 34; and NGTC Equalization Basin, SWMU 37. Four of the 16 sites—Old Sludge Drying Beds, SWMU 19; Old Radiator Shop/Paint Booth, SWMU 24B; Motorpools, SWMUs 27A through 27V; and NGTC Equalization Basin, SWMU 37—had not been investigated previously and were investigated as Phase I RFIs. This report has been prepared by Science Applications International Corporation (SAIC) for the U.S. Army Corps of Engineers (USACE), Savannah District, under Contract DACA21-95-D-0022, Delivery Order No. 0009. The RFI was conducted in accordance with USACE Guidance EM 200-1-3 and the Georgia Environmental Protection Division (GEPD)-approved Sampling and Analysis Plan (SAP) (SAIC 1997).

The 16 SWMUs investigation consisted of 38 SWMU sites (including 22 motorpool sites) as designated under Hazardous Waste Permit HW-045. The sites were divided into 45 distinct geographic areas for investigation. Seven (SWMUs 2, 3, 9, 10, 11, 12A, and 29) of the 38 SWMUs are located outside the garrison area. The remaining 31 (SWMUs 14, 17, 18, 19, 24B, 27A through 27V, 31, 32, 34, and 37) are located within the garrison area.

### OBJECTIVES AND SCOPE OF THE INVESTIGATION

The specific objectives of the Phase I and Phase II RFIs for the 16 SWMUs at Fort Stewart, Georgia, as defined in the Phase II RFI SAP (SAIC 1997) (approved by the GEPD in October 1997) are listed below.

#### *Phase I RFI*

- Determine if contamination of the environment has occurred.
- Determine whether contaminants, if present, constitute a threat to human health or the environment.
- Determine the need for future action and/or no further action (NFA).

#### *Phase II RFI*

- Determine the horizontal and vertical extent of contamination.
- Determine whether contaminants present a threat to human health or the environment.

- Determine the need for future action and/or NFA.
- Gather data necessary to support a Corrective Action Plan (CAP), if warranted.

The information provided in this report is based upon data collected previously during the Phase I RFI (if available) and data collected as part of the Phase II field sampling and analysis. At some of the sites, the Phase II sampling program incorporated an observational approach to sampling, as defined in the Phase II RFI SAP (SAIC 1997). This observational approach used field screening techniques to determine the horizontal and vertical extent of contamination at the SWMU and to identify suitable locations for installation of permanent monitoring wells. The scope of the fieldwork for the Phase I and Phase II sites included the activities listed below.

#### ***Phase I Sites***

- Collection of direct-push soil samples using a push probe.
- Collection of direct-push groundwater samples using a push probe.
- Installation of permanent groundwater monitoring points or monitoring wells to confirm the nature of potential contamination at a specific push-probe location.
- Collection of surface water and sediment samples at SWMUs at which surface water and sediment were available.
- Surveying of the positions of all sample locations.

#### ***Phase II Sites***

- Collection of direct-push soil samples using a push probe.
- Collection of direct-push groundwater samples using a push probe, including vertical-profile probes.
- Installation of permanent groundwater monitoring wells both upgradient and downgradient of the site.
- Groundwater sampling at existing monitoring wells (if available) and sampling of newly installed wells around the SWMUs.
- Collection of surface water and sediment samples at SWMUs at which surface water and sediment were available.
- Surveying of the positions of all sample locations.

#### **Nature and Extent of Contamination**

Site-related contaminants (SRCs) were identified for each site by comparing the analytical results obtained from soil, groundwater, surface water, and sediment against the reference background criteria. Contaminants with concentrations above the reference background criteria were identified as SRCs. The results of the chemical analyses on surface soil, subsurface soil, and groundwater were screened against the reference

background criteria for the Fort Stewart Military Reservation. Surface water and sediment were screened against site-specific background criteria.

In general, reference background samples were collected from each medium at locations upgradient or upstream of each site so as to be representative of naturally occurring conditions at sites under investigation. Upgradient or upstream samples were not collected at sites under a Phase I RFI (i.e., SWMUs 19, 24B, 27A through 27V and 37). The reference background concentrations for surface soil, subsurface soil, and groundwater were calculated as two times the average concentration of all of the locations selected to be in the background data set. If a chemical was not detected at a site, then one-half the detection limit was used as the concentration when calculating the reference mean background concentration. Surface water and sediment background samples were collected during the Phase II RFI and applied to the SWMUs on a site-specific basis.

Inorganics were considered to be SRCs if their concentrations were above the reference background concentrations, while organics were considered SRCs if they were simply detected because organic constituents are considered to potentially be man-made. SRCs from the nature and extent of contamination evaluation were further evaluated as potential concerns based upon fate and transport characteristics and upon their potential risk to human health and ecological receptors. A summary of SRCs by medium for each SWMU is presented in Table ES-1.

### **Fate and Transport Analysis**

Fate and transport analysis was performed on each SWMU. This analysis included developing a site-specific Conceptual Site Model (CSM) identifying potential contaminant release and migration pathways and determining the potential for SRCs in surface soil, subsurface soil, and/or sediment to migrate to groundwater.

The maximum concentrations of the SRCs determined from nature and extent analysis were compared to U.S. Environmental Protection Agency (EPA) Generic Soil Screening Levels (GSSLs). Generally, if contaminant concentrations in soil fall below the GSSLs and there are no significant ecological receptors of concern, then no further study or action is warranted. SRCs were identified as contaminant migration constituents of potential concern (CMCOPCs) if they were detected at concentrations that exceeded their respective GSSLs. To evaluate leaching of CMCOPCs from soil to groundwater at the 16 SWMUs, groundwater concentrations of CMCOPCs were compared to maximum contaminant levels (MCLs). If an MCL for a chemical was not available, the groundwater concentration was compared to the risk-based concentration, as established by EPA Region III (EPA 1999b). A summary of the results of the fate and transport analysis (CMCOPCs) is presented in Table ES-2.

A weight-of-evidence approach was used to evaluate each CMCOPC identified based on leaching to groundwater. In some instances, the potential impact of CMCOPCs to groundwater, and possibly to surface water, was evaluated (modeled concentrations were compared to risk-based criteria) in a human health baseline risk assessment. CMCOPCs that indicated a potential risk to human health (i.e., that exceeded risk-based screening criteria) from modeling were identified as contaminant migration chemicals of concern, and remedial levels were developed based on protection of groundwater. SWMUs for which a human health baseline risk assessment was performed are identified in Table ES-2.

### **Human Health Preliminary Risk Evaluation**

A human health preliminary risk evaluation (HHPRE) using a Step i risk evaluation approach based on guidance from GEPD was performed for each SWMU to determine the potential human health risks associated with the maximum concentrations of identified SRCs. The Step i risk evaluation involves the components listed below.

- For inorganics, compare detected concentrations to naturally occurring background levels to determine if detected inorganics are naturally occurring or are associated with past activities at the site.
- Identify potential migration and exposure pathways associated with the site and identify potential exposure scenarios to determine appropriate action levels.
- Identify available risk-based action levels for each contaminant detected above background levels or develop levels if they do not exist.
- Compare sample concentrations to action levels to determine if site conditions warrant further evaluation.

Chemicals that exceeded action levels were identified as human health contaminants of potential concern (HHCOPCs). A summary of the HHPRE results (HHCOPCs) is presented in Table ES-2.

A weight-of-evidence approach was used to evaluate each HHCOPC identified in the preliminary risk assessment. In some instances, HHCOPCs were evaluated further in a human health baseline risk assessment. HHCOPCs and/or CMCOPCs (see previous section) that either had hazard indices of 0.1 or incremental lifetime cancer risks of  $1 \times 10^{-6}$  were identified as human health contaminants of concern. Remedial levels were developed that were protective of the most sensitive receptor population, based on a minimum risk level of 3.0 for the total hazard index and  $1 \times 10^{-4}$  for the total incremental lifetime cancer risk. SWMUs for which a human health baseline risk assessment was performed are identified in Table ES-2.

### Ecological Preliminary Risk Evaluation

An ecological preliminary risk evaluation (EPRE) based on guidance from GEPD was performed to determine the potential risk to ecological receptors associated with the maximum concentrations of the identified SRCs. The EPRE compared measured concentrations of detected substances to conservative ecological screening values to identify substances detected at the facility that pose a potential hazard to ecological receptors and that are identified as ecological contaminants of potential concern (ECOPCs). A summary of the results of the EPRE (ECOPCs) is presented in Table ES-2.

A weight-of-evidence approach was used to evaluate each ECOPC identified in the preliminary risk evaluation. In some instances, ECOPCs were evaluated further in a supplemental preliminary risk evaluation (SPRE). The SPRE presented a comparison of more realistic exposure estimates to toxicity reference values based on the lowest observed adverse effects levels. The exposure estimates were calculated using measured concentrations and more realistic exposure assumptions such as diets, absorption efficiencies, and area use factors. SWMUs for which an SPRE was performed are identified in Table ES-2.

### Conclusions and Recommendations

A weight-of-evidence approach was used with the results from the fate and transport evaluation, HHPRE, human health baseline risk assessment (if performed), EPRE, and SPRE (if performed) to determine the recommendation for each SWMU. The recommendations fell into the following three categories:

- **No Further Action:** NFA was recommended for a SWMU if: (1) the contaminant levels in soil, groundwater, surface water, and sediment were below the reference background criteria, fate and transport values (GSSLs), and/or human health or ecological screening criteria or (2) significant uncertainty was evident, indicating minimal potential risk of migration to groundwater and/or a surface water body and/or to human health and ecological receptors.

- **Additional Investigation (Phase II RFI or additional monitoring):** A Phase II RFI or additional monitoring was recommended if the nature and extent of potential contaminants had not been determined, and further investigation or additional monitoring was required to evaluate extent or potential migration in the future.
- **Corrective Action Plan:** A CAP was recommended if the nature and extent of contamination at a SWMU was determined by the Phase II RFI, there was a potential risk of migration of contaminants to groundwater and/or surface water bodies or a potential risk to human health and ecological receptors, or institutional controls need to be applied to protect the health and safety of humans coming in contact with the site (i.e., inactive EOD areas). Such a site requires a CAP to evaluate appropriate remedial actions to eliminate or minimize these potential risks.

The recommendations for each SWMU are presented in Table ES-3.

Table ES-1. Summary of Site-related Contaminants

| SWMU                 | Type of Investigation | Site-related Contaminants              |                                      |                                         |                                                                    |
|----------------------|-----------------------|----------------------------------------|--------------------------------------|-----------------------------------------|--------------------------------------------------------------------|
|                      |                       | Surface Soil                           | Subsurface Soil                      | Groundwater                             | Surface Water                                                      |
| 2                    | Phase II              | 2 VOCs, 14 pest., 1 SVOC, and 6 metals | 1 VOC, 3 pest., 1 SVOC, and 3 metals | 3 VOCs and 3 metals                     | None                                                               |
| 3                    | Phase II              | 4 pest., BEHP, As, Cr, and Pb          | 2 VOCs, BEHP, 3 pest., Cr, and Cd    | 3 VOCs, 3 pest., Ba, Cd, Cr, Pb, and Hg | 1 SVOC, As, Ba, Cr, and Pb                                         |
| 9                    | Phase I <sup>a</sup>  | As, Cr, and Ag                         | NC                                   | NC                                      | NP                                                                 |
| 10                   | Phase II              | As, Ba, Cr, and Pb                     | NC <sup>b</sup>                      | None                                    | Cd, Cr, and Hg                                                     |
| 11                   | Phase II              | As, Ba, Cr, Pb, and Ag                 | NC <sup>b</sup>                      | None                                    | NP                                                                 |
| 12A                  | Phase II              | 3 SVOCs, 4 exp., and 16 metals         | Al, As, Ba, Cr, Fe, Pb, and V        | BEHP, 1 exp., and 8 metals              | 1 SVOC, 1 exp., and 9 metals                                       |
| 14                   | Phase I               | 2 VOCs, BEHP, and Hg                   | 5 VOCs, Cr, and Hg                   | 1 VOC, Pb, and Hg                       | NP                                                                 |
| 17                   | Phase II              | 1 VOC                                  | 3 VOCs                               | 3 VOCs and Pb                           | None                                                               |
| 18                   | Phase II              | 1 VOC, Pb, and Hg                      | 5 VOCs, 2 SVOCs, Ba, Cr, Pb, and Hg  | 9 VOCs, Ba, Cd, and Pb                  | (6 VOCs, 4 SVOCs, As, Ba, Cd, Cr, Pb, Hg, Se, and Ag) <sup>f</sup> |
| 19                   | Phase I               | 4 VOCs, 7 pest., and 5 metals          | 6 VOCs, 9 pest., and 5 metals        | BEHP, 7 pest., and 3 metals             | NP                                                                 |
| 24B                  | Phase I               | 1 VOC, 10 SVOCs, and 6 metals          | 2 VOCs                               | 1 VOC, 11 SVOCs, and Hg                 | NP                                                                 |
| 27A<br>(Bldg. 1339A) | Phase I               | None                                   | 2 VOCs and 3 SVOCs                   | 2 VOCs and BEHP                         | NP                                                                 |
| 27A<br>(Bldg. 1339B) | Phase I               | BEHP and Pb                            | 2 VOCs                               | 1 VOC                                   | NP                                                                 |
| 27A<br>(Bldg. 1322)  | Phase I               | 3 VOCs and Pb                          | 3 VOCs                               | Acetone                                 | NP                                                                 |
| 27B                  | Phase I               | None                                   | 1 VOC                                | ND                                      | NP                                                                 |
| 27C                  | Phase I               | 1 VOC                                  | 2 VOCs and 1 SVOC                    | 4 VOCs                                  | NP                                                                 |
| 27D                  | Phase I               | 3 VOCs                                 | 1 VOC                                | None                                    | NP                                                                 |
| 27E<br>(Bldg. 1628)  | Phase I               | None                                   | 1 VOC                                | None                                    | NP                                                                 |

Note: Footnotes appear on page ES-8.

Table ES-1. Summary of Site-related Contaminants (continued)

| SWMU                   | Type of Investigation | Site-related Contaminants |                              |                     |                 |                 |
|------------------------|-----------------------|---------------------------|------------------------------|---------------------|-----------------|-----------------|
|                        |                       | Surface Soil              | Subsurface Soil              | Groundwater         | Surface Water   | Sediment        |
| 27E<br>(Bldg. 1720)    | Phase I               | NC                        | 2 VOCs and BEHP              | 1 SVOC              | NP              | NP              |
| 27F<br>(NW Bldg. 1340) | Phase I               | NC                        | 3 VOCs and Pb                | 10 VOCs and 4 SVOCs | NP              | NP              |
| 27F<br>(NE Bldg. 1340) | Phase I               | 3 VOCs                    | 8 VOCs and 4 SVOCs           | None                | NP              | NP              |
| 27G                    | Phase I               | NC                        | 3 VOCs                       | 1 SVOC              | NP              | NP              |
| 27H<br>(Bldg. 1071)    | Phase I               | NC                        | 2 VOCs, 11 SVOCs, Pb, and Hg | 1 VOC and 9 SVOCs   | NP              | NP              |
| 27H<br>(Bldg. 1056)    | Phase I               | NC                        | 1 VOC, 1 SVOC, Cd, and Pb    | 2 VOCs and 4 SVOCs  | NP <sup>d</sup> | NP <sup>d</sup> |
| 27I<br>(Block 9900)    | Phase I               | NC                        | 1 VOC and Pb                 | None                | NC              | 1 VOC and Pb    |
| 27I<br>(Block 10300)   | Phase I               | NC                        | None                         | None                | Pb              | None            |
| 27J<br>(Bldg. 10535)   | Phase I               | None                      | None                         | 1 VOC and 1 SVOC    | NP              | NP              |
| 27J<br>(Bldg. 10531)   | Phase I               | 1 VOC and 1 SVOC          | NC                           | 2 SVOCs             | NP              | NP              |
| 27K                    | Phase I               | NC                        | 4 VOCs                       | 1 VOC               | NP              | NP              |
| 27L<br>(Block 10200)   | Phase I               | None                      | 1 VOC and 1 SVOC             | 8 VOCs and 2 SVOCs  | Acetone         | None            |
| 27M<br>(Block 10100)   | Phase I               | 1 VOC and Pb              | 2 SVOCs and Pb               | 1 VOC               | NC              | Pb              |
| 27N<br>(Block 9800)    | Phase I               | NC                        | 2 SVOCs and Pb               | None                | NC              | 5 SVOCs         |
| 27O<br>(Block 9700)    | Phase I               | Pb                        | None                         | 1 SVOC              | 1 VOC           | Pb              |
| 27P<br>(Block 9500)    | Phase I               | 1 VOC and 1 SVOC          | 1 VOC, 6 SVOCs, and Pb       | None                | NC              | 1 VOC and Pb    |

Note: Footnotes appear on page ES-8.

Table ES-1. Summary of Site-related Contaminants (continued)

| SWMU                | Type of Investigation | Site-related Contaminants           |                           |                                 |               |                                                   |
|---------------------|-----------------------|-------------------------------------|---------------------------|---------------------------------|---------------|---------------------------------------------------|
|                     |                       | Surface Soil                        | Subsurface Soil           | Groundwater                     | Surface Water | Sediment                                          |
| 27Q<br>(Block 9400) | Phase I               | Pb                                  | None                      | None                            | NC            | Pb                                                |
| 27R                 | Phase I               | None                                | 1 VOC and 2 SVOCs         | None                            | NP            | NP                                                |
| 27S                 | Phase I               | NC                                  | 6 VOCs                    | None                            | NP            | NP                                                |
| 27T                 | Phase I               | 4 SVOCs                             | None                      | 1 VOC and 1 SVOC                | NC            | 4 VOCs, 9 SVOCs, and Cd                           |
| 27U                 | Phase I               | 1 VOC and Pb                        | 2 VOCs and Pb             | 4 VOCs                          | NP            | NP                                                |
| 27V                 | Phase I               | 1 VOC and Pb                        | 1 VOC and Pb              | None                            | NP            | NP                                                |
| 29                  | Phase II              | 8 VOCs and Ag                       | 16 VOCs and 14 SVOCs      | 3 VOCs, 3 SVOCs, As, Ba, and Cr | NP            | NP                                                |
| 31                  | Phase II and IRA      | None                                | 6 VOCs and 17 SVOCs       | 4 VOCs                          | NP            | NP                                                |
| 32                  | Phase II              | 2 VOCs, Ba, Cd, Cr, Pb, and Hg      | 2 VOCs, Pb, and Hg        | 4 VOCs and 2 SVOCs              | NP            | NP                                                |
| 34                  | Phase II              | 4 VOCs, 2 SVOCs, Ba, Cd, Pb, and Hg | 1 VOC, Ba, Cd, Cr, and Pb | 3 VOCs                          | NP            | NP                                                |
| 37                  | Phase I               | 1 VOC and Hg                        | 2 VOCs and Hg             | 4 VOCs                          | NP            | (4 VOCs, Ba, Cd, Cr, Pb, Hg, and Se) <sup>f</sup> |

<sup>a</sup>Phase II RFI was not required at this time. The Phase II RFI will be conducted upon closure of the Red Cloud Range, Hotel Area.

<sup>b</sup>Per the GEPD-approved SAP, subsurface soil was not collected because subsurface soil sampling in an EOD area requires approval by the Secretary of the Army.

<sup>c</sup>Results from sediment within the NGTC Equalization Basin.

<sup>d</sup>Sediment was collected; however, the oil/water separator does not discharge to the drainage ditch.

BEHP = Bis(2-ethylhexyl)phthalate.

NA = Not applicable.

NC = Not collected based on field screening results or because no medium (i.e., surface water) was available during the RFI.

ND = Not detected.

NP = No pathway exists.

SVOC = Semivolatile organic compound.

VOC = Volatile organic compound.

Table ES-2. Summary of CMCOPCs, HHCOPCs, and ECOPCs

| SWMU              | CMCOPCs                                |                                                          | HHCOPCs             |                 |                        |                        |                 | ECOPCs                   |                             |                    |                        | HHBRA or SPRE Performed? |
|-------------------|----------------------------------------|----------------------------------------------------------|---------------------|-----------------|------------------------|------------------------|-----------------|--------------------------|-----------------------------|--------------------|------------------------|--------------------------|
|                   | Soil                                   | Sediment                                                 | Surface Soil        | Subsurface Soil | Groundwater            | Surface Water          | Sediment        | Surface Soil             | Groundwater                 | Surface Water      | Sediment               |                          |
| 2                 | 2 pest., Ar, Ca, and Hg                | None                                                     | As and Cr           | None            | None                   | None                   | None            | 4,4'-DDE, Cd, Cr, and Pb | 1 VOC, Pb, and Hg           | None               | None                   | HHBRA and SPRE           |
| 3                 | None                                   | As                                                       | As                  | None            | 1 pest. and Hg         | 1 SVOC, As, Cr, and Pb | As              | Pb and Cr                | 2 pest., Ba, Cd, Pb, and Hg | 1 SVOC, Ba, and Pb | 2 VOCs, As, Ba, and Se | HHBRA and SPRE           |
| 9 <sup>a</sup>    | NA <sup>a</sup>                        | NA <sup>a</sup>                                          | NA <sup>a</sup>     | NC <sup>a</sup> | NC <sup>a</sup>        | NP                     | NP              | NA <sup>a</sup>          | NC <sup>a</sup>             | NP                 | NP                     |                          |
| 10                | NA <sup>b</sup>                        | NA <sup>b</sup>                                          | NA <sup>b</sup>     | NC              | NA <sup>b</sup>        | NA <sup>b</sup>        | NA <sup>b</sup> | NA <sup>b</sup>          | NA <sup>b</sup>             | NA <sup>b</sup>    | NA <sup>b</sup>        |                          |
| 11                | NA <sup>b</sup>                        | NA <sup>b</sup>                                          | NA <sup>b</sup>     | NC              | NA <sup>b</sup>        | NA <sup>b</sup>        | NA <sup>b</sup> | NA <sup>b</sup>          | NA <sup>b</sup>             | NP                 | NP                     |                          |
| 12A               | Ar, Cd, Cr, Pb, Ag, 1 SVOC, and 2 exp. | None                                                     | As and Pb           | As              | BEHP                   | Hg                     | None            | 1 SVOC, Cd, Cr, and Pb   | BEHP                        | Pb and Hg          | Ba                     | HHBRA and SPRE           |
| 14                | 1 VOC                                  | NA                                                       | None                | None            | None                   | NP                     | NP              | None                     | Pb, Hg, and 1 VOC           | NP                 | NP                     |                          |
| 17                | None                                   | None                                                     | None                | None            | 1 VOC                  | None                   | None            | None                     | 1 VOC and Pb                | None               | None                   | HHBRA                    |
| 18                | Cr and Hg                              | (1 VOC, 1 SVOC, Ar, Ba, Cd, Cr, Hg, and Se) <sup>c</sup> | None                | None            | 3 VOCs and Pb          | 1 SVOC                 | As              | Pb                       | 4 VOCs, Ba, and Pb          | Ba and BEHP        | None                   | HHBRA and SPRE           |
| 19                | 2 pest.                                | NA                                                       | None                | None            | BEHP, 2 pest., and As  | NP                     | NP              | Cd, Pb, and 1 pest.      | BEHP, 5 pest., Ba, and Hg   | NP                 | NP                     | HHBRA and SPRE           |
| 24B               | 1 VOC, 3 SVOCs, and Pb                 | NA                                                       | 4 SVOCs, As, and Pb | None            | 1 VOC, 9 SVOCs, and Hg | NP                     | NP              | NP                       | Hg and 9 SVOCs              | NP                 | NP                     |                          |
| 27A (Bldg. 1339A) | None                                   | NA                                                       | None                | None            | BEHP                   | NP                     | NP              | None                     | 1 VOC and BEHP              | NP                 | NP                     |                          |
| 27A (Bldg. 1339B) | None                                   | NA                                                       | None                | None            | Benzene                | NP                     | NP              | Pb                       | Xylenes                     | NP                 | NP                     |                          |
| 27A (Bldg. 1322)  | None                                   | NA                                                       | None                | None            | Acetone                | NA                     | NA              | Pb                       | None                        | NP                 | NP                     | HHBRA                    |

Note: Footnotes appear on page ES-11.

Table ES-2. Summary of CMCOPCs, HHCOPCs, and ECOPCs (continued)

| SWMU                   | CMCOPCs |          | HHCOPCs      |                 |                       |               |          | ECOPCs       |                       |               |          | HHBRA or SPRE Performed? |
|------------------------|---------|----------|--------------|-----------------|-----------------------|---------------|----------|--------------|-----------------------|---------------|----------|--------------------------|
|                        | Soil    | Sediment | Surface Soil | Subsurface Soil | Groundwater           | Surface Water | Sediment | Surface Soil | Groundwater           | Surface Water | Sediment |                          |
| 27B                    | None    | NP       | None         | None            | None                  | NP            | NP       | None         | None                  | NP            | NP       |                          |
| 27C                    | None    | NP       | None         | None            | None                  | NP            | NP       | None         | 2 VOCs                | NP            | NP       |                          |
| 27D                    | None    | NP       | None         | None            | None                  | NP            | NP       | None         | None                  | NP            | NP       |                          |
| 27E<br>(Bldg. 1628)    | None    | NP       | None         | None            | None                  | NP            | NP       | None         | None                  | NP            | NP       |                          |
| 27E<br>(Bldg. 1720)    | None    | NP       | NA           | None            | None                  | NP            | NP       | NA           | 1 SVOC                | NP            | NP       |                          |
| 27F (NW<br>Bldg. 1340) | None    | NP       | NA           | None            | 4 VOCs and<br>4 SVOCs | NP            | NP       | NA           | 2 VOCs and<br>4 SVOCs | NP            | NP       |                          |
| 27F (NE<br>Bldg. 1340) | 1 VOC   | NP       | None         | None            | None                  | NP            | NP       | None         | None                  | NP            | NP       |                          |
| 27G                    | None    | NP       | NA           | None            | 1 SVOC                | NP            | NP       | NA           | None                  | NP            | NP       | HHBRA                    |
| 27H<br>(Bldg. 1071)    | 2 SVOCs | NP       | NC           | 1 SVOC          | 1 VOC and<br>7 SVOCs  | NP            | NP       | NC           | 8 SVOCs               | NP            | NP       |                          |
| 27H<br>(Bldg. 1056)    | None    | NP       | NC           | None            | 3 SVOCs               | NP            | NP       | NC           | 2 SVOCs               | NP            | NP       |                          |
| 27I<br>(Block 9900)    | None    | None     | NC           | None            | None                  | NC            | None     | NC           | None                  | NC            | Pb       |                          |
| 27I<br>(Block 10300)   | None    | NA       | NC           | None            | None                  | Pb            | None     | NC           | None                  | Pb            | None     |                          |
| 27J<br>(Bldg. 10535)   | None    | NP       | None         | None            | None                  | NP            | NP       | None         | 1 VOC and<br>1 SVOC   | NP            | NP       |                          |
| 27J<br>(Bldg. 10531)   | None    | NP       | None         | NC              | 1 SVOC                | NP            | NP       | None         | 2 SVOCs               | NP            | NP       |                          |
| 27K                    | None    | NP       | NA           | None            | None                  | NP            | NP       | NA           | None                  | NP            | NP       |                          |
| 27L<br>(Block 10200)   | None    | None     | None         | None            | 4 VOCs and<br>2 SVOCs | Acetone       | None     | None         | 2 VOCs and<br>1 SVOC  | None          | None     |                          |
| 27M<br>(Block 10100)   | 1 VOC   | None     | None         | None            | 1 VOC                 | NC            | None     | Pb           | None                  | NC            | Pb       |                          |
| 27N<br>(Block 9800)    | None    | None     | NA           | None            | None                  | NC            | 1 SVOC   | NA           | None                  | NC            | None     | HHBRA                    |

Note: Footnotes appear on page ES-11.

Table ES-2. Summary of CMCOPCs, HHCOPCs, and ECOPCs (continued)

| SWMU                | CMCOPCs          |                           | HHCOPCs      |                 |                        |               |          | ECOPCs         |                        |               |          | HHBRA or SPRE Performed? |
|---------------------|------------------|---------------------------|--------------|-----------------|------------------------|---------------|----------|----------------|------------------------|---------------|----------|--------------------------|
|                     | Soil             | Sediment                  | Surface Soil | Subsurface Soil | Groundwater            | Surface Water | Sediment | Surface Soil   | Groundwater            | Surface Water | Sediment |                          |
| 27O<br>(Block 9700) | None             | None                      | None         | NA              | None                   | None          | None     | Pb             | 1 SVOC                 | None          | Pb       |                          |
| 27P<br>(Block 9500) | None             | None                      | None         | None            | None                   | NC            | None     | None           | None                   | NC            | Pb       |                          |
| 27Q<br>(Block 9400) | None             | None                      | None         | NA              | None                   | NC            | None     | Pb             | None                   | NC            | Pb       |                          |
| 27R                 | None             | NP                        | None         | None            | None                   | NP            | NP       | None           | None                   | NP            | NP       |                          |
| 27S                 | None             | NP                        | NA           | None            | None                   | NP            | NP       | NA             | None                   | NP            | NP       |                          |
| 27T                 | None             | Cd                        | 1 SVOC       | None            | None                   | NA            | 4 SVOCs  | None           | 1 SVOC                 | NA            | Cd       | HHBRA                    |
| 27U                 | None             | NP                        | None         | None            | Benzene                | NP            | NP       | Pb             | None                   | NP            | NP       |                          |
| 27V                 | None             | NP                        | None         | None            | None                   | NP            | NP       | None           | None                   | NP            | NP       |                          |
| 29                  | 7 VOCs           | NP                        | None         | None            | 1 VOC, 2 SVOCs, and As | NP            | NP       | None           | 1 VOC, 2 SVOCs, and Ba | NP            | NP       | HHBRA                    |
| 31                  | 1 VOC and 1 SVOC | NP                        | None         | None            | Acetone                | NP            | NP       | None           | Xylenes                | NP            | NP       | HHBRA                    |
| 32                  | 1 VOC            | NP                        | None         | None            | Acetone                | NP            | NP       | Cd, Pb, and Cr | 1 VOC and 1 SVOC       | NP            | NP       | HHBRA                    |
| 34                  | 2 VOCs           | NP                        | None         | None            | Acetone                | NP            | NP       | Cd and Pb      | 1 VOC                  | NP            | NP       | HHBRA                    |
| 37                  | 1 VOC            | 1 VOC <sup>b</sup> and Cd | None         | None            | Benzene                | NP            | NP       | None           | Xylenes                | NP            | NA       |                          |

<sup>a</sup>Phase II RFI was not required at this time. The Phase II RFI will be conducted upon closure of the Red Cloud Range, Hotel Area.

<sup>b</sup>With the concurrence of GEPD, fate and transport analysis and human health and ecological preliminary risk assessments were deemed unnecessary. SRCs were determined solely on comparison to background criteria (see Table ES-1).

<sup>c</sup>Results from sediment within the NGTC Equalization Basin.

BEHP = Bis(2-ethylhexyl)phthalate.

HHBRA = Human health baseline risk assessment.

NA = Not applicable.

NC = Sample not collected based on field screening results or because no medium (i.e., surface water) was available during the RFI.

NP = No pathway exists.

SVOC = Semivolatile organic compound.

VOC = Volatile organic compound.

Table ES-3. SWMU-specific Recommendations

| SWMU                      | Recommendation                          |
|---------------------------|-----------------------------------------|
| 2                         | CAP                                     |
| 3                         | CAP                                     |
| 9                         | CAP                                     |
| 10                        | CAP                                     |
| 11                        | CAP                                     |
| 12A                       | Long-term compliance monitoring and CAP |
| 14                        | NFA                                     |
| 17                        | NFA                                     |
| 18                        | Long-term monitoring and CAP            |
| 19                        | NFA                                     |
| 24B                       | Phase II RFI                            |
| 27A<br>(Building 1339A)   | NFA                                     |
| 27A<br>(Building 1339B)   | NFA                                     |
| 27A<br>(Building 1322)    | NFA                                     |
| 27B                       | NFA                                     |
| 27C                       | NFA                                     |
| 27D                       | NFA                                     |
| 27E<br>(Building 1628)    | NFA                                     |
| 27E<br>(Building 1720)    | NFA                                     |
| 27F<br>(NW Building 1340) | Phase II RFI                            |
| 27F<br>(NE Building 1340) | NFA                                     |
| 27G                       | NFA                                     |
| 27H<br>(Building 1071)    | Phase II RFI                            |

| SWMU                    | Recommendation |
|-------------------------|----------------|
| 27H<br>(Building 1056)  | Phase II RFI   |
| 27I<br>(Block 9900)     | NFA            |
| 27I<br>(Block 10300)    | NFA            |
| 27J<br>(Building 10535) | NFA            |
| 27J<br>(Building 10531) | Phase II RFI   |
| 27K                     | NFA            |
| 27L<br>(Block 10200)    | Phase II RFI   |
| 27M<br>(Block 10100)    | NFA            |
| 27N<br>(Block 9800)     | NFA            |
| 27O<br>(Block 9700)     | NFA            |
| 27P<br>(Block 9500)     | NFA            |
| 27Q<br>(Block 9400)     | NFA            |
| 27R                     | NFA            |
| 27S                     | NFA            |
| 27T                     | Phase II RFI   |
| 27U                     | NFA            |
| 27V                     | NFA            |
| 29                      | CAP            |
| 31                      | NFA            |
| 34                      | NFA            |
| 32                      | NFA            |
| 37                      | NFA            |

## **10.5 SWMU 11: INACTIVE EOD AREA LOCATED THREE MILES NORTH OF THE GARRISON AREA**

### **10.5.1 History and Description of SWMU 11, Inactive EOD Area Located Three Miles North of the Garrison Area**

SWMU 11 is located 3 miles northeast of the garrison area, about 2 miles south of State Road 144, and 1 mile northeast of Wright Army Airfield. This EOD area is located in an area designated as A-16 on the Fort Stewart Installation Map. The EOD area operated from 1953 to 1975, with open detonation of UXO taking place. Numerous blast craters are spread out over nearly 1 acre. This site is difficult to distinguish from the surrounding forest because it has become overgrown with trees and bushes. There are no surface water features located at this site. A site reconnaissance in November 1993 observed spent ammunition near the trenches/blast craters. Another site reconnaissance in September 1996 indicated evidence of previous EOD activities; however, no evidence of recent activities was observed.

The waste disposed of included excess artillery powder bags, small arms rounds, artillery and mortar rounds, illuminating projectiles, pyrotechnics, bulk explosives, rockets, propellant, and regular smoke grenades. There are no records or information indicating any disposal of CB agents, acids, solvents, or other hazardous or toxic substances (Environmental Science and Engineering 1982). Previous investigations at the site are summarized below in sequential order.

#### **10.5.1.1 1987 RCRA Facility Assessment**

In 1987, as part of the initial RFA for the Installation, 10 surface soil samples were collected at 40-foot intervals along a transect that was oriented so as to intersect as many blast craters as possible. Samples were collected from 0 foot to 1 foot bgs and analyzed for metals and EP Tox.

**Surface Soil.** The analysis for metals showed the existence of various levels of arsenic, barium, mercury, and lead in all the samples. These metals were also found in the background samples at approximately the same concentrations. Selenium, chromium, and cadmium were also detected in some of the samples. None of the metals were leachable as defined by EP Tox.

#### **10.5.1.2 1993 Phase I RCRA Facility Investigation**

In 1993, as part of the Phase I RFI, six surface soil samples were collected from various locations within each blast crater at depths of 1 foot to 1.5 feet bgs and analyzed for VOCs, total RCRA metals, and explosives residue. Analytical results for the Phase I RFI are presented in Table 10.5-1.

#### ***Surface Soil***

**VOCs.** Concentrations of VOCs were not reported above the detection limits in surface soil.

**RCRA Metals.** Arsenic, barium, chromium, lead, mercury, and silver were detected in surface soil. Arsenic was detected at levels above the reference background criterion in four of six samples at concentrations ranging from 2.81 mg/kg at SS3 to 13.7 mg/kg at SS2. Barium was detected at concentrations that exceeded the reference background criterion in three of six samples at concentrations ranging from 15.7 mg/kg at SS2 to 19.6 mg/kg at SS1. Silver was detected in SS5 and SS6 at concentrations of 2.6 mg/kg and 15.8 mg/kg, respectively, both of which exceeded the reference background criterion (0.15 mg/kg). Lead was detected at SS2 and SS3 at concentrations of 45.7 mg/kg and 9.29 mg/kg, respectively, both of which exceeded the reference background criterion (8.81 mg/kg). Chromium was detected at a concentration of 7.3 mg/kg at SS6.

The remaining metal, mercury, was detected below the respective reference background criterion at all sampling locations. Arsenic, barium, silver, chromium, and lead are considered to be SRCs in surface soil from the Phase I RFI.

**Explosives.** No explosives residue concentrations were detected in the surface soil samples.

### **10.5.2 Summary of Phase II RCRA Facility Investigation Activities**

Initial screening consisted of using DPT techniques to collect groundwater samples from Geoprobe borings for explosives analysis. Eight Geoprobos were installed around the perimeter of the EOD area, as indicated in Figure 10.5-1. The results of the Geoprobe screening were used to determine the extent of potential contamination and to select a location for a vertical-profile boring. Because no explosives or contamination was observed in the Geoprobe borings, a vertical-profile boring was not installed at the site. In addition, no monitoring wells were installed at the site during the Phase II RFI activities (as approved by GEPD).

Three surface soil samples were collected from within the SWMU's boundary and analyzed for explosives and RCRA metals. Phase II RFI sampling locations are presented in Figure 10.5-1.

No surface water bodies are located in close proximity to the site; therefore, no surface water or sediment samples were collected.

### **10.5.3 Physical Characteristics of the Site**

#### **10.5.3.1 Topography**

There are approximately 14 feet of relief across the site. The elevation of the site is approximately 43 feet amsl along the western boundary and slopes gently downward to approximately 29 feet amsl at the southeastern corner.

#### **10.5.3.2 Surface drainage**

There are no surface water bodies near the site. Based on topography, the overland surface water flow direction is to the south.

#### **10.5.3.3 Soils**

Site-specific subsurface soil characterization was not performed at this site. There were no soil cuttings associated with the Geoprobe installation for classification. However, the soils present at the site are expected to be similar to those at other sites at Fort Stewart, which consist of silty and clayey sands.

#### **10.5.3.4 Hydrogeology**

Groundwater was encountered from approximately 17.2 feet bgs or 23.9 feet amsl along the northern boundary of the site to approximately 14.5 feet bgs or 19.3 feet amsl along the southern boundary. The shallow groundwater flow direction across the site is estimated to be toward the south.

#### **10.5.3.5 Ecology**

As stated in Section 8.2, this site is classified as "unmanaged grasslands." The SWMU is approximately 1 acre in size, with pine-oak forest bordering it. To the east lies a large food plot that is managed for wild game and

that contains native and planted grasses. No surface hydrology is present; however, runoff drains toward the south.

#### **10.5.4 Nature and Extent of Contamination**

##### **10.5.4.1 Surface soil**

Surface soil samples were collected from three locations within the boundary of the EOD area and were analyzed for explosives and RCRA metals. The results of the surface soil analyses are presented in Table 10.5-2 and Figure 10.5-2.

**Explosives.** No explosives were detected in the surface soil samples.

**RCRA Metals.** Arsenic, barium, cadmium, chromium, and lead were detected in surface soil samples. Arsenic and barium were detected above the reference background criteria. Arsenic was detected above the reference background criterion at one location (SS8) at a concentration of 2.2 mg/kg. Barium was detected at all three locations at concentrations ranging from 28 mg/kg at SS7 to 40.4 mg/kg at SS8. Arsenic and barium are considered to be SRCs in surface soil from the Phase II RFI.

##### **10.5.4.2 Subsurface soil**

In accordance with the approved Work Plan (SAIC 1997), no subsurface soil samples were collected. Approval is required from the Department of the Army before subsurface drilling can be implemented at a former EOD site. In addition, potential contamination would primarily be associated with the surface soil at a former EOD site.

##### **10.5.4.3 Groundwater**

Groundwater samples were collected from eight Geoprobe locations and were screened for explosives. No explosives were detected in any of the groundwater samples. The horizontal and vertical extent of contamination was determined from the Geoprobe groundwater data; therefore, in accordance with the GEPD-approved Work Plan and with GEPD concurrence, the proposed vertical-profile boring and three monitoring wells were not installed. No additional sampling or analysis was performed on groundwater.

##### **10.5.4.4 Surface water**

No surface water bodies are located near the site; therefore, no surface water samples were collected.

##### **10.5.4.5 Sediment**

No surface water bodies are located near the site; therefore, no sediment samples were collected.

##### **10.5.4.6 Site-related contaminant summary**

SRCs from the Phase I and Phase II RFIs and the corresponding maximum concentrations are presented in Table 10.5-3.

## **10.5.5 Conclusions and Risk Management and Site Recommendations for SWMU 11**

### **10.5.5.1 Conclusions**

#### ***Nature and Extent of Contamination***

- No explosives were detected in groundwater or surface soil.
- Arsenic, barium, chromium, lead, and silver were detected above reference background criteria and are SRCs in surface soil.
- The maximum concentrations of arsenic, barium, chromium, lead, and silver in surface soil were above the respective reference background criteria; therefore, these metals are considered to be SRCs in surface soils. However, with the exception of silver, the maximum detected concentrations of metals are within the range established by the USGS for element concentrations in soils in the eastern United States (USGS 1984). The maximum concentration of arsenic (13.7 mg/kg) is within the range of arsenic soil concentrations less than 0.1 mg/kg to 73 mg/kg (USGS 1984). Chromium concentrations, with only one detection that was slightly above background (7.3 mg/kg as compared to a reference value of 6.21 mg/kg), are within the background range for the eastern United States (1 mg/kg to 1,000 mg/kg) (USGS 1984). Similarly, the maximum concentrations of barium and lead (40.4 mg/kg and 45.7 mg/kg, respectively) are within their respective ranges of 10 mg/kg to 1,500 mg/kg and less than 10 mg/kg to 300 mg/kg (USGS 1984). Silver was detected in only two samples, and with the exception of the maximum concentration, all of the silver concentrations were within the USGS range (below detection to 3.0 mg/kg). Given that the concentrations of these metals are within the range for naturally occurring concentrations, the potential impacts to human health and the environment are likely to be minimal, and further investigation and/or evaluation is not warranted.

#### **10.5.5.2 Site recommendations**

- Based on the information presented in this section and the potential health and safety risks associated with the site (i.e., a former EOD area), an NFA status is recommended for SWMU 11 regarding further investigation of the site. With the concurrence of GEPD, Fort Stewart recommends a CAP evaluating institutional controls be prepared for this site and SWMUs 8, 9, 10, and 12A that will provide/establish institutional controls to ensure the protection of human health and the continued safety of all personnel using the FSMR, specifically the former EOD areas. Institutional controls that are protective of human health against potential UXO risks will also be protective against risks from the potential SRCs identified for SWMU 11; therefore, further investigation and/or remediation of the identified SRCs is not warranted. It is anticipated that the CAP will be submitted to GEPD in the fourth fiscal quarter (July through September) of 2000.

Table 10.5-1. Summary of Phase I RFI Results, SWMU 11

| SURFACE SOIL       |                               |                  |        |        |        |        |        |
|--------------------|-------------------------------|------------------|--------|--------|--------|--------|--------|
| Depth (feet)       | Reference Background Criteria | Sample Location  |        |        |        |        |        |
|                    |                               | 0 to 1           | 0 to 1 | 0 to 1 | 0 to 1 | 0 to 1 | 0 to 1 |
| Analyte            |                               | SS1 <sup>a</sup> | SS2    | SS3    | SS4    | SS5    | SS6    |
| Metals (mg/kg)     |                               |                  |        |        |        |        |        |
| Arsenic            | 2.10                          | <2.5             | 13.7   | 2.81   | 4.22   | <2.5   | 2.93   |
| Barium             | 14.70                         | 19.6             | 15.7   | 15.9   | 11.74  | 3.0    | 11.0   |
| Chromium           | 6.21                          | <2.5             | 4.74   | 5.3    | 6.17   | <2.5   | 7.3    |
| Lead               | 8.81                          | 4.52             | 45.7   | 9.29   | 5.33   | <2.5   | 4.18   |
| Mercury            | 0.03                          | <0.02            | <0.02  | <0.02  | <0.02  | <0.02  | 0.02   |
| Silver             | 0.15                          | <2.5             | <2.5   | <2.5   | <2.5   | 2.6    | 15.8   |
| Explosives (mg/kg) |                               |                  |        |        |        |        |        |
| Explosives         | NA                            | ND               | ND     | ND     | ND     | ND     | ND     |

<sup>a</sup>Site-specific background location.

NA = Not available.

ND = Not detected.

**Bold** indicates concentrations above reference background criteria.

Table 10.5-2. Summary of Analytes Detected in Phase II RFI Surface Soil, SWMU 11

| Station        | Reference<br>Background<br>Criteria | 11-SS7   | 11-SS8   | 11-SS9   |
|----------------|-------------------------------------|----------|----------|----------|
| Sample ID      |                                     | 117711   | 117811   | 117911   |
| Date           |                                     | 02/01/98 | 02/01/98 | 02/01/98 |
| Depth (feet)   |                                     | 0 to 1   | 0 to 1   | 0 to 1   |
| Sample Type    |                                     | Grab     | Grab     | Grab     |
| Metals (mg/kg) |                                     |          |          |          |
| Arsenic        | 2.10                                | 1.1      | 2.2      | 1.5      |
| Barium         | 14.70                               | 28       | 40.4     | 39.7     |
| Cadmium        | 0.18                                | 0.08     | 0.12     | 0.1      |
| Chromium       | 6.21                                | 3.8      | 5.8      | 5.5      |
| Lead           | 8.81                                | 5.3      | 5.3      | 6.3      |

**Bold** indicates concentrations above reference background criteria.

Table 10.5-3. Summary of Site-related Contaminants, SWMU 11

| Analyte       | Maximum Concentration (mg/kg) |                    |          | Maximum Concentration (µg/L) |                  |
|---------------|-------------------------------|--------------------|----------|------------------------------|------------------|
|               | Surface<br>Soil               | Subsurface<br>Soil | Sediment | Groundwater                  | Surface<br>Water |
| <i>Metals</i> |                               |                    |          |                              |                  |
| Arsenic       | 13.7 <sup>a</sup>             | NC                 | NP       | NA                           | NP               |
| Barium        | 40.4                          | NC                 | NP       | NA                           | NP               |
| Chromium      | 7.3 <sup>a</sup>              | NC                 | NP       | NA                           | NP               |
| Lead          | 45.7 <sup>a</sup>             | NC                 | NP       | NA                           | NP               |
| Silver        | 15.8 <sup>a</sup>             | NC                 | NP       | NA                           | NP               |

<sup>a</sup>Phase I RFI data.

NA = Not analyzed.

NC = Not collected.

NP = No pathway exists.

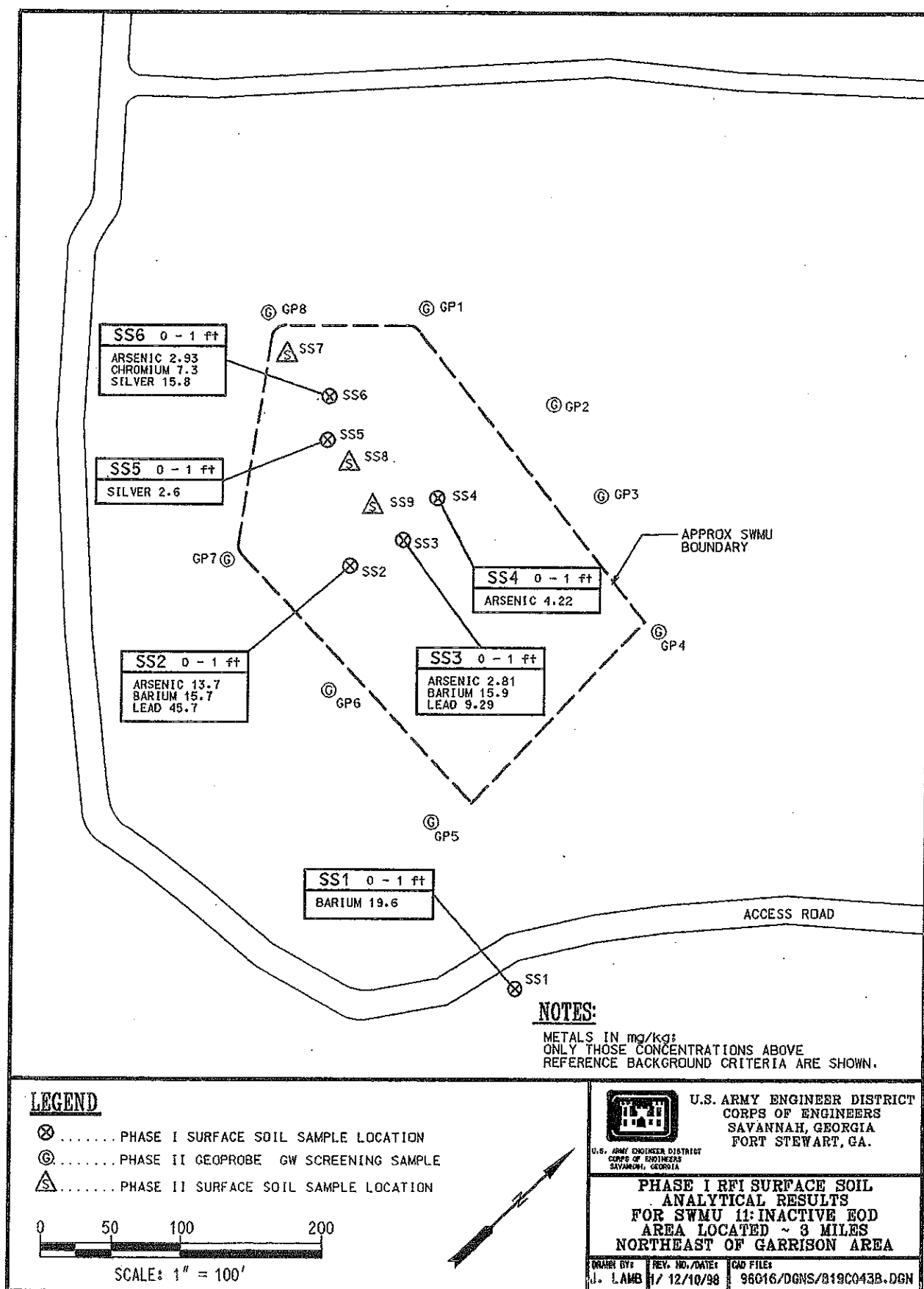


Figure 10.5-1. Sampling Locations and Phase I RFI Analytical Results for Surface Soil, SWMU 11

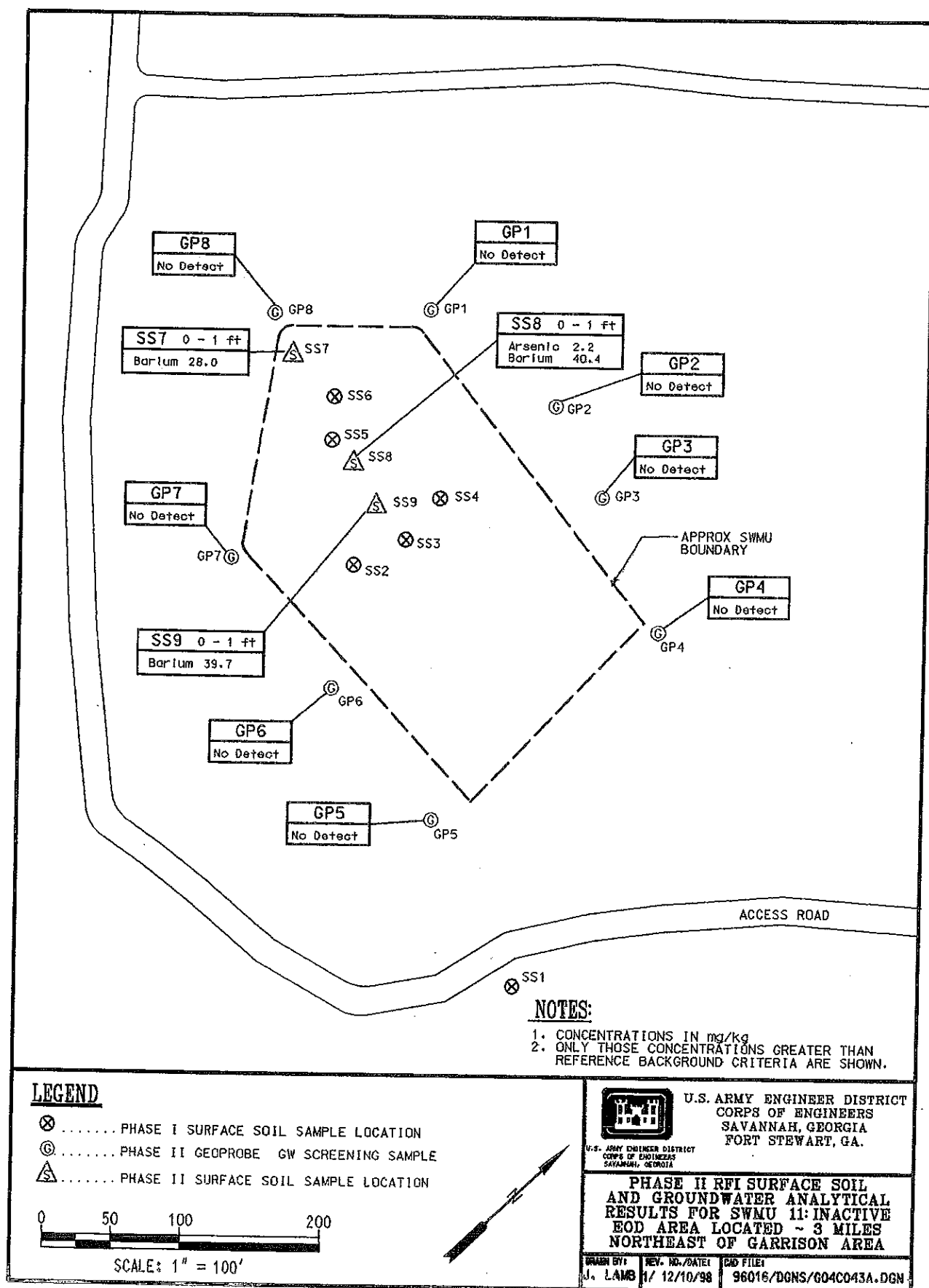


Figure 10.5-2. Summary of Phase II RFI Analytical Results in Surface Soil and Groundwater, SWMU 11