DEPARTMENT OF THE AR...
HEADQUARTERS, 3D INFANTRY DIVISION (MECHANIZED) AND FORT STEWART
DIRECTORATE OF PUBLIC WORKS
1550 FRANK COCHRAN DRIVE
FORT STEWART, GEORGIA 31314-4927

14 AUG 2000

REPLY TO
ATTENTION OF

AFZP-PWV-E (200-1a)

MEMORANDUM FOR HEADQUARTERS, FORSCOM, DCSPIM,
ATTN: STEPHANIE SIGLER, 1777 HARDEE AVENUE SW.,
FORT MCPHERSON, GA 30330-1062

SUBJECT: Decision Documents for Fort Stewart and Hunter Army Airfield, Georgia

1. The attached decision documents are provided for your use and convenience in documenting the distribution of fiscal year 99 through 01 funding for the:

a. Interim Remedial Action (IRA) at FST-31, the Former DEH Asphalt Tanks (FY 99).
b. Final Remedial Action (FRA) at FST-01, the Post South Central Landfill (FY00).
c. IRA at HAA-12, the Old Property Disposal Yard (FY99).
d. FRA at HAA-12, the Old Property Disposal Yard (FY00 or FY01).

2. As noted above, the IRA's for FST-31 and HAA-12 were funded in FY99, prior to the requirement to submit a decision document for interim remedial actions. However, at the request of FORSCOM, decision documents (DDs) were prepared for these two sites.

a. The DD for FST-31 summarizes the site conditions prior to implementation of the IRA. In addition, the document provides justification for the actions taken at the site. Implementation of the IRA was conducted April 12-20, 1999, and the site is now pending approval by the Georgia Environmental Protection Division of a "No Further Action Required" status.

b. The DD for HAA-12 incorporates information regarding the FY99 funded IRA into the document for the FRA. The FRA is programmed to be funded 4th QTR FY00 or 1st QTR FY01.

3. Mr. Joe King at the Army Environmental Center has received a copy of these decision documents for review and approval.

4. The point of contact for this memorandum is Ms. Melanie Little or Ms. Tressa Rutland, DPW Environmental Branch, at (405) 364-8461 or (912) 767-7919, respectively.

FOR THE COMMANDER:

GREGORY V. STANLEY
COL, EN
Director, Public Works

Enclosures

DOCUMENT 6.1

# DECISION DOCUMENT FOR INTERIM REMEDIAL ACTION AT THE FORMER DEH ASPHALT TANKS (FST-31) FORT STEWART, GEORGIA

## PURPOSE OF THE INTERIM REMEDIAL ACTION

This decision document describes the selected Interim Remedial Action (IRA) for the former DEH Asphalt Tanks (FST-31) at Fort Stewart, Georgia. The IRA was performed in April 1999 with the approval of GA EPD, and consisted of soil removal and appropriate disposal.

This decision document presents the justification for the selected IRA and specifically provides details on the following:

- Site History
- Nature and Extent of Contamination
- Summary of Site Risk
- Summary
- Summary of Corrective Actions/Technologies
- Public Notification
- Declaration

## SITE HISTORY

The DEH Asphalt Tanks were located in the south garrison area near Utility Street and the railroad tracks. The tanks were used to hold cut-back asphalt for use on the Installation. The history of operations for these tanks is unknown. Originally there were three ASTs located at the site. Two of the tanks were removed in 1993; the third one was a 20,000-gallon steel AST surrounded by an earthen berm that was removed in 1997. A site inspection in November 1993 indicated that the third AST was rusted and the paint was peeling, but there were no visible holes. Also during the site inspection, a smaller AST (with a capacity of less than 5,000 gallons) with rust and peeling paint was identified in the bermed area. This AST was used to hold water for the trains that came into the area. There were no visible holes in the smaller AST, and there was no visible staining of soils. The smaller AST remains at the site; however, it is no longer operational. The waste characterization for this site includes asphalt and its associated by-products.

## NATURE AND EXTENT OF CONTAMINATION

### *Surface Soil*

Six surface soil (SS) samples were collected from three surface soil locations and three monitoring wells (MW). All surface soil samples were analyzed for volatile organic contaminants (VOCs) and semi-volatile organic contaminants (SVOCs). Surface soil samples from the three monitoring wells were also analyzed for RCRA metals. The results of the surface soil analyses are summarized below.

VOCs. Acetone was detected in the surface soil sample collected from SS7 at a concentration of 0.0025 mg/kg. Toluene was detected in all six surface soil samples at concentrations ranging from 0.002 mg/kg to 0.263 mg/kg. Total xylenes were detected in the surface soil sample from MW3 at a concentration of 0.00098 mg/kg. Acetone, toluene, and total xylenes are considered Site Related Contaminants (SRCs).

SVOCs. Thirteen SVOCs were detected in surface soil samples from the surface soil sampling locations. No SVOCs were detected in the surface soil samples collected from the three monitoring wells. Acenaphthylene was detected in only SS9 at a concentration of 1.37 mg/kg. Benzo(a)anthracene was detected in SS8 and SS9 at concentrations of 8.93 mg/kg and 5.77 mg/kg, respectively. Benzo(a)pyrene was detected in SS8 and SS9 at concentrations of 8.65 mg/kg and 5.1 mg/kg, respectively. Benzo(b)fluoranthene was detected in all three surface soil samples at concentrations ranging from 0.198 mg/kg at SS7 to 9.66 mg/kg at SS8. Benzo(g,h,i)perylene was detected in only SS8 and SS9 at concentrations of 4.13 mg/kg and 2.84 mg/kg, respectively. Benzo(k)fluoranthene was detected only in SS8 at a concentration of 4.42 mg/kg. Bis(2-ethylhexyl)anthracene was detected in only SS9 at a concentration of 16.9 mg/kg. Chrysene was detected in SS8 and SS9 at concentrations of 17.7 mg/kg and 10.4 mg/kg, respectively. Dibenzo(a,h)anthracene was detected in only SS9 at a concentration of 0.871 mg/kg. Fluoranthene was detected in all three surface soil samples at concentrations ranging from 0.207 mg/kg at SS7 to 18.9 mg/kg at SS8. Indeno(1,2,3-cd)pyrene was detected in SS8 and SS9 at concentrations of 4.56 mg/kg and 3.09 mg/kg, respectively. Phenanthrene was detected in SS8 and SS9 at concentrations of 29.9 mg/kg and 2.57 mg/kg, respectively. Pyrene was detected in all three surface soil samples at concentrations ranging from 0.283 mg/kg at SS7 to 30.1 mg/kg at SS8. Acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)-perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene are considered SRCs in surface soil.

RCRA Metals. Arsenic, barium, cadmium, chromium, and lead were detected in surface soil samples from the monitoring wells. Arsenic was the only metal detected in surface soil above its reference background criterion. Arsenic was detected at a concentration of 5.1 mg/kg at MW1, the site background location, which is approximately two times the reference background criterion (2.10 mg/kg). No metals were detected above reference background criteria in surface soil from monitoring wells located adjacent to the site; therefore, no RCRA metals are considered SRCs in surface soils.

***Subsurface Soil***

Seven subsurface soil samples were collected from four geoprobe (GP) borings and the three monitoring wells. All subsurface soil samples were analyzed for VOCs and SVOCs. Subsurface soil samples from the three monitoring wells were also analyzed for RCRA metals. The results of the subsurface soil analyses are summarized below.

VOCs. 1,1-Dichloroethene was detected in a subsurface soil sample from GP6 at a concentration of 0.263 mg/kg. 2-Butanone was detected in a subsurface soil sample from GP1 at a concentration of 0.0103 mg/kg. Benzene was detected in subsurface soil samples from GP1, GP2, and GP6 at concentrations ranging from 0.00048 mg/kg to 0.305 mg/kg. Chlorobenzene was detected in subsurface soil samples collected from GP1 and GP6 at concentrations of 0.00046 mg/kg and 0.353 mg/kg, respectively. Ethylbenzene was detected in the subsurface soil sample from GP5 at a concentration of 0.0177 mg/kg. Toluene was detected in four of the seven subsurface soil samples at concentrations ranging from 0.0012 mg/kg at MW1 to 0.412 mg/kg at GP6. Trichloroethene was detected in a subsurface soil sample collected from GP6 at a concentration of 0.311 mg/kg. Total xylenes were detected in the subsurface soil sample from GP5 at a concentration of 0.0943 mg/kg.

1,1-Dichloroethene, 2-butanone, benzene, chlorobenzene, ethylbenzene, toluene, trichloroethene, and total xylenes are considered SRCs in subsurface soils.

SVOCs. Eight SVOCs were detected in one subsurface soil sample, GP1. These eight SVOCs are considered SRCs and are as follows: benzo(*a*)anthracene (1.74 mg/kg), benzo(*a*)pyrene (2.25 mg/kg), benzo(*b*)fluoranthene (2.85 mg/kg), benzo(*g,h,i*)perylene (0.745 mg/kg), chrysene (1.96 mg/kg), fluoranthene (0.786 mg/kg), indeno(*1,2,3-cd*)pyrene (1.05 mg/kg), and pyrene (2.42 mg/kg). No SVOCs were detected at the six other subsurface soil sampling locations.

RCRA Metals. Arsenic, barium, chromium, lead, and mercury were detected in subsurface soil samples from monitoring wells; however, the concentrations of these metals were below the reference background criteria; therefore, no RCRA metals are considered SRCs in subsurface soils.

***Groundwater***

Fifteen groundwater samples were collected from the three monitoring wells, nine geoprobe borings, and one vertical-profile (VP) boring. The groundwater samples from the geoprobe borings and the vertical-profile boring were analyzed for VOCs and total petroleum hydrocarbon (TPH). The groundwater samples from the monitoring wells were analyzed for VOCs, SVOCs, and RCRA metals. The results of the groundwater analyses are summarized below.

VOCs. 2-Butanone was detected in a groundwater sample collected at VP1 (6 feet to 10 feet) at a concentration of 18.6 µg/L. Acetone was detected in seven of 15 groundwater samples at concentrations ranging from 1.7 µg/L to 565 µg/L. Benzene was detected in four of 15 samples at concentrations ranging from 0.35 µg/L to 1.4 µg/L. Ethylbenzene was detected in eight of 15 samples at concentrations ranging from 0.19 µg/L to 27.1 µg/L. Toluene was detected in seven of 15 groundwater samples at concentrations ranging from 0.28 µg/L to 5.1 µg/L. Total xylenes were detected in eight of 15 samples at concentrations ranging from 0.35 µg/L to 105 µg/L.

2-Butanone, acetone, benzene, ethylbenzene, toluene, and total xylenes are considered SRCs in groundwater.

SVOCs. Bis(2-ethylhexyl)phthalate was detected in a groundwater sample from MW3 at a concentration of 18.6 µg/L and is considered an SRC in groundwater.

RCRA Metals. Barium and chromium were detected in three of 15 groundwater samples at concentrations below the reference background criteria; therefore, no RCRA metals are considered SRCs in groundwater.

TPH. TPH analysis was performed on the groundwater screening samples (i.e., nine geoprobe samples and three groundwater samples collected at the vertical-profile boring). TPH was detected at VP1 in concentrations ranging from 1,310 µg/L to 905,000 µg/L 000 µg/L at depth intervals of 26 feet to 30 feet and 6 feet to 10 feet, respectively.

## SUMMARY OF SITE RISK

A qualitative risk evaluation has been completed for the site. Based on the constituents detected during investigation activities, for both soil and groundwater, potential risks to human health and the environment exist. The

following is a summary of both the human health risk assessment and the ecological risk assessment performed for FST-31.

***Human Health Preliminary Risk Evaluation of FST-31***

SRCs were identified for the following media: surface soil, subsurface soil, and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of Human Health Chemicals of Potential Concern (HHCOPCs) are addressed in this section.

Exposure Evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

The site is currently inactive and is covered by grass. The site is located within the garrison area. The site is not secured and is located in a remote area, so juvenile trespassers might visit the site.

The potential receptor populations include:

- occupational populations (individuals occasionally visiting the site),
- construction workers (future populations),
- juvenile trespassers, and
- off-site occupational receptors.

Migration and Exposure Pathway Analysis

The site is vegetated; therefore, release of fugitive dust is not a significant exposure pathway. Bioaccumulation into wildlife is not a viable migration pathway. Wildlife might graze in the area, but given the amount of human activity near this site and the amount of open grazing area, it is unlikely that wildlife would use this site as a primary foraging area.

There were a number of Contaminant Migration Chemicals of Potential Concern (CMCOPCs) identified for this site with the potential to leach into groundwater at significant concentrations. However, groundwater (the surficial aquifer) from this site does not discharge to any surface water bodies; therefore, this is an incomplete migration/exposure pathway.

The on-site resident scenario is not considered to be a viable scenario for this site, however, in accordance with risk based corrective action guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

Risk Evaluation

The results of the human health risk screening are given below.

SRCs for surface soils include three volatile organics (acetone, toluene, and total xylenes), and 12 SVOCs [11 petroleum aromatic hydrocarbons (PAHs) and bis(2-ethylhexyl)phthalate]. The maximum concentrations for acenaphthylene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*a*)anthracene, benzo(*g,h,i*) perylene, dibenzo(*a,h*)anthracene, and indeno(*1,2,3-cd*)pyrene exceeded their respective screening values for soil ingestion. The concentrations of the remaining chemicals were below their respective concentrations for soil ingestion.

Benzo(a)anthracene (8.93 mg/kg), benzo(*b*)fluoranthene (9.66 mg/kg), benzo(*g,h,i*)perylene (4.13 mg/kg), and indeno(*1,2,3-cd*)pyrene (4.56 mg/kg) exceeded the screening value for ingestion of soil of 0.088 mg/kg. Benzo(a)pyrene (8.65 mg/kg) and dibenzo(*a,h*)anthracene (0.87 mg/kg) exceeded the screening value for ingestion of soil of 0.09 mg/kg. No screening value was available for acenaphthylene; therefore, it is an HHCOPC by default. Benzo(a)pyrene, benzo(*b*)fluoranthene, benzo(*a*)anthracene, benzo(*g,h,i*) perylene, dibenzo-(*a,h*)anthracene, indeno(*1,2,3-cd*)pyrene, and acenaphthylene are considered HHCOPCs in surface soil.

SRCs for subsurface soils include eight volatile organics and eight SVOCs (all PAHs). The following SVOCs (PAHs) had maximum concentrations that exceeded their screening values for soil ingestion: benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, and indeno(*1,2,3-cd*)pyrene. The concentrations of the remaining chemicals were below their respective concentrations for soil ingestion.

The maximum concentration of benzo(*a*)pyrene (2.25 mg/kg) was more than an order of magnitude above its screening level for soil ingestion 0.088 mg/kg. The maximum concentrations of benzo(*a*)anthracene, benzo(*b*)fluoranthene, and indeno(*1,2,3-cd*)pyrene were within an order of magnitude of their respective screening concentrations for soil ingestion; therefore, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, and indeno(*1,2,3-cd*)pyrene are considered HHCOPCs in subsurface soil.

SRCs for groundwater include six volatile organics and bis(2-ethylhexyl)phthalate. Maximum concentrations of acetone, benzene, and bis(2-ethylhexyl)phthalate exceeded their respective screening values, while the concentrations of the remaining contaminants were below their respective screening values.

The maximum concentration of the volatile organics acetone (565 µg/L) and benzene (1.4 µg/L) were above their respective screening levels (370 and 0.36 µg/L, respectively). The maximum concentration of bis(2-ethylhexyl)phthalate (18.6 µg/L) was above its screening value (4.8 µg/L). Acetone, benzene, and bis(2-ethylhexyl)phthalate are considered HHCOPCs in groundwater.

Uncertainties

Surrogate values were used for some of the PAHs. The screening value for anthracene was used for phenanthracene, and the screening value for acenaphthene was used for acenaphthylene. Although these compounds are chemically similar, they might have different toxicities; therefore, the actual screening values for these compounds might be greater or less than the value used.

***Ecological Preliminary Risk Evaluation of FST-31***

The Ecological Preliminary Risk Evaluation (EPRE) was conducted in accordance with GA EPD (1996) guidance. At sites where surface water, sediment, or groundwater was collected, an Ecological Screening Value (ESV) comparison was conducted. If Ecological Chemicals of Potential Concern (ECOPCs) for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

Ecological Screening Value Comparison (Step i)
There is no surface water or sediment at the site.

No RCRA metals were detected in groundwater at concentrations exceeding reference background criteria. Six VOCs and one SVOC were detected in groundwater. The ECOPCs identified by the ESV comparison were xylenes and bis(2-ethylhexyl)phthalate because they were detected at concentrations exceeding their respective ESVs.

Because there are no ESVs for soil, all analytes detected in soil were evaluated further in EPRE Steps ii through v.

Preliminary Problem Formulation (Step ii)
The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation adhered to GA EPD approved protocols.

Preliminary Effects (Step iii)
In the EPRE, Toxicity Reference Values (TRVs) were required for shrews and robins ingesting contaminated biota exposed to surface soil at the site and for raccoons ingesting water.

Preliminary Exposure (Step iv)
Ecological receptors are probably exposed by ingestion of contaminated soil or of biota exposed to contaminated soil and by ingestion of drinking water. The exposure parameters for the surrogate species— shrews, raccoons, and robins—were evaluated.

Preliminary Risk Calculation (Step v)
The preliminary risk calculation (Step v) uses Hazard Quotients (HQs), the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate a Hazard Index (HI). Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated only for VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GA EPD 1996).

**Surface Soil.** The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil indicates the maximum detected concentrations, TRVs, and HQs for shrews and robins. There are no ECOPCs present in surface soil at concentrations exceeding the TRVs for the surrogate species. The HI calculated for SVOCs was 1.7 for the shrew, due primarily to the HQs for phenanthrene (0.67) and pyrene (0.67).

**Groundwater.** The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater indicates the maximum detected concentrations, TRVs, and HQs for the receptors. No ECOPCs are present in groundwater at concentrations exceeding the TRVs for the surrogate species.

**SUMMARY**
Therefore, based on all the information provided above, and in accordance with various Federal and State of Georgia regulations (i.e., reference list provided in the *Final Phase II RFI Report for 16 SWMUs*, dated February 1999),

the former FST-31 site must be remediated to the proposed Remedial Levels (RLs) as described below.

***Remedial Levels***

As indicated above, CMCOPCs were identified in soil, and HHCOPCs were identified in both soil and groundwater. Remedial levels for the protection of groundwater and human health are presented below.

The estimated remedial concentrations for soils were based on the concentration of a COPC in the soil that is not likely to have a significant impact upon groundwater. Where possible, maximum contaminant levels (MCLs) were used as the target values for groundwater. For those constituents that do not have MCLs, risk-based target values were derived. The GA EPD guidance states that the remedial levels should ensure that the cumulative risk from the constituent levels present should not exceed either a total HI of 3.0 or an incremental lifetime cancer risk (ILCR) of $1 \times 10^{-4}$. Given that the site had multiple constituents, risk-based target values for individual constituents were based on an HQ of either 1.0 or 0.1 and ILCRs of $1 \times 10^{-5}$ and $1 \times 10^{-6}$. By using target risks levels for individual constituents, the cumulative risk should be within the acceptable range.

Remedial Levels in Soils for Protection of Groundwater

Remedial levels for CMCOPCs in soil were identified based on transport modeling. First, an acceptable groundwater concentration was identified, and second, a leaching model was used to back-calculate a level in soils that ensures that the groundwater goal would be met. For soils that are above the water table, an unsaturated zone contaminant transport model (SESOIL) was used to predict the concentration of contaminants in the percolating rainwater before it reaches the water table. The SESOIL results were then converted into likely average ground water concentrations by using a dilution factor (DF) of 4.7. The DF was developed by using the hydraulic analysis method (EPA 1996a), which involves calculating the rate of flow through the aquifer system and the rate of rainwater percolating into the aquifer. The rate of percolation (16.08 inches/year) and the groundwater flow velocity (49.3 feet/year) were estimated from the conceptual site model (CSM). The thickness of the zone of mixing in the groundwater aquifer was assumed to be 20 feet thick. The site was modeled as a single, unsaturated soil layer of 6.5 feet thick. Soil was assumed to cover a total area of 3,780 square feet, with 60 feet parallel to groundwater flow. Using these parameters, the DF was calculated to be 4.7. Geotechnical parameters used by the model are site-specific and included bulk dry density = 1.51 grams/cubic centimeter, disconnected index 10, porosity 42 percent, and organic carbon content 0.182 percent. The SESOIL results, showing the predicted maximum groundwater concentrations beneath the site, are presented in Table 1.

1,1-Dichloroethane, acenaphthylene, benzene, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthanene, chlorobenzene, and trichloroethene were identified as potential CMCOPCs in soils. Based on SESOIL modeling, benzo(*a*)pyrene and benzo(*b*)fluoranthene will not migrate to groundwater in significant concentrations. One of the constituents, acenaphthylene, does not have a toxicity value; therefore, risk-based remedial levels could not be calculated for this constituent. The target groundwater goal for three of these constituents (1,1-dichloroethane, benzene, and trichloroethene) was calculated based on their respective MCLs. The remaining two chemicals, benzo(*a*)anthracene, a carcinogen, and chlorobenzene, a noncarcinogen, have risk-based remedial levels.

Remedial levels in soil were developed for two noncarcinogens. The remedial levels for chlorobenzene were based on HIs of 0.1 and 1.0 for a drinking water scenario. A remedial level of 0.02 mg/kg for chlorobenzene is recommended, which is based on an HI of 1.0. 1,1-Dichloroethene is the only other constituent present in soil that is likely to contribute significantly to noncarcinogenic risks. The remedial level for 1,1-dichloroethene (0.043 mg/kg) was based on its MCL, which is equivalent to an HI of 1.0. The remaining constituents have remedial levels that are based on carcinogenic risks because these concentrations are lower than the remedial levels based on noncarcinogenic risks or because data were not available to calculate noncarcinogenic risk-based remedial levels. The cumulative risk from exposure to chlorobenzene, 1,1-dichloroethene, and the carcinogens would be less than 3.0.

The remedial level for benzo(*a*)anthracene is greater than its maximum detected concentration. Therefore, this constituent is unlikely to have a significant impact upon groundwater. Benzene, 1,1-dichloroethene, chlorobenzene, and trichloroethene may exceed target groundwater levels directly below the soil and are identified as CMCOPCs for FST-31.

Remedial Levels for Protection of Human Health – Direct Exposure

Remedial levels have been developed for the HHCOPCs in surface soil, subsurface soil, and groundwater. The chemical-specific data (i.e., cancer slope factors, reference doses, and dermal and gastrointestinal absorption factors) are given in Table 2.

**Surface Soil.** The SVOCs (all PAHs) benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*a*)anthracene, benzo(*g,h,i*)perylene, dibenzo(*a,h*)anthracene, indeno(*1,2,3-cd*)pyrene, and acenaphthylene were identified as potential HHCOPCs in surface soil. Five of the SVOCs are carcinogens; the remaining two constituents [benzo(*g,h,i*)perylene and acenaphthylene] do not have toxicity values. Therefore, remedial levels could not be estimated for these compounds. Reference doses were not available for the other SVOCs, so remedial levels were based on carcinogenic risk. An ILCR of $1 \times 10^{-5}$ is recommended for calculating risk-based remedial levels because the additive risk of the potential HHCOPCs at these concentrations would be $5 \times 10^{-5}$, which is below the target risk level of $1 \times 10^{-4}$. The recommended remedial levels are given in Table 3.

Benzo(*a*)pyrene is the only constituent that has a remedial level that is below its maximum detected concentration and is identified as an HHCOC for FST-31. The maximum concentrations of the remaining SVOCs were below their respective remedial levels; therefore, they do not pose a significant threat to human health.

**Subsurface Soil.** Benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*a*)anthracene, benzo(*g,h,i*)perylene, and indeno(*1,2,3-cd*)pyrene were identified as HHCOPCs in subsurface soil. The remedial levels for these constituents were based on exposure of a construction worker. There are no reference doses available for these SVOCs, so remedial levels were based on carcinogenic risk only. The remedial levels are given in Table 4. None of the maximum concentrations of any of these constituents exceeded their respective remedial levels. Therefore, HHCOPCs in subsurface soil are not likely to cause a significant risk to human health.

**Groundwater.** Acetone, benzene, and bis(2-ethylhexyl)phthalate were identified as potential HHCOCs in groundwater. Two of the constituents, benzene, and bis(2-ethylhexyl)phthalate, have MCLs. Acetone does not have an MCL; therefore, risk-based remedial levels were derived for acetone. The risk-based remedial level for acetone was based on the potential systemic risk. The risk-based remedial level should be based on an HI of 1.0, given that this is the only systemic constituent being addressed. The remedial levels are given in Table 5.

The maximum concentrations of acetone and benzene are below their remedial levels; therefore, they do not pose a significant threat to human health and do not require remediation. The maximum concentration of bis(2-ethylhexyl)phthalate was detected above its remedial level (MCL) in only one of three groundwater samples (i.e., MW3) and is considered an HHCOPC for SWMU 31. To confirm the occurrence of bis(2-ethylhexyl)phthalate, MW3 will be resampled using low-flow techniques, and the samples will be analyzed for VOCs and SVOCs. The results will be submitted to GA EPD in a Phase II RFI Addendum with a recommendation for either a corrective action plan or an NFA status, as appropriate.

Remedial Levels for Protection of Environment

ECOPCs were identified in groundwater for aquatic biota; however, no groundwater to surface water migration pathway was identified. Therefore, no remedial levels were developed for protection of aquatic biota in a surface water body. No ECOPCs were identified in surface soil.

**Recommended Remedial Levels**

The recommended remedial levels for the CMCOCs and HHCOCs for each medium are summarized in Table 6. For constituents in which remedial levels were calculated for different exposure and migration pathways [i.e., leaching to groundwater (CMCOCs) and protection of human health (HHCOCs)] and remedial levels were calculated for both, the lesser of the two values was selected. Remedial levels for CMCOCs are applicable to both surface and subsurface soils. Remedial levels for soil HHCOC are specific to the type of soil horizon (i.e., surface versus subsurface soil).

## SUMMARY OF CORRECTIVE ACTIONS/TECHNOLOGIES

Based on the previous studies conducted at the site and conclusions regarding nature and extent of contamination, fate and transport, human health risk, and ecological risk, the Installation recommended to GA EPD and received approval to perform an Interim Remedial Action at FST-31. The IRA was subsequently performed in April 1999 and was justified in the *Final Phase II RFI Report for 16 SWMUs*, dated February 1999, with the following:

Four VOCs (benzene, 1,1-dichloroethene, chlorobenzene, and trichloroethene) were identified as CMCOCs at SWMU 31 based on leaching to groundwater. Two VOCs and 10 SVOCs were identified as HHCOPCs in surface and subsurface soils at SWMU 31. Of these only benzo(a)pyrene was identified as an HHCOC. Groundwater is not used as a source of drinking water in the area. The probability of humans ingesting soil is very low under current land-use conditions due to the location of the area and the general lack of activity in the area. The soil contaminants are essentially confined to surface soil (0 foot to 2 feet bgs) within and along the bermed area and to a depth of 4 feet to 6 feet bgs at GP6. Therefore, to "remove" any potential for human ingestion and migration to groundwater at the site, Fort Stewart performed an

Interim Removal Action (IRA) at SWMU 31. The IRA consisted of (1) removal of the abandoned AST, remaining AST saddles, and utility pole; (2) excavation of the bermed area and its perimeter to approximately 3 feet bgs; and (3) excavation of a 4-foot- to 6-foot-diameter area around GP6 to approximately 7 feet bgs. A total of 10 to 12 confirmatory soil samples were collected in the excavation (two will be designated for the area around GP6). Clean fill material was placed on the entire excavation. TCLP analyses were performed on a composite soil sample collected from SWMU 31 by Earth Tech, Inc., in December 1998, and the material was classified as nonhazardous. Therefore, all excavated soil was disposed of at Fort Stewart's Subtitle D landfill. The 10 to 12 confirmatory soil samples were analyzed for VOCs and SVOCs, and the data was submitted to GA EPD. It should be noted that the proximity of the railroad tracks to the Phase II RFI sampling locations with identified COCs may prohibit Fort Stewart from excavating the area of GP6 to a depth of approximately 7 feet bgs. However, all attempts will be made to achieve the proposed depth. If such attempts are unsuccessful, Fort Stewart will notify GA EPD immediately.

**PUBLIC NOTIFICATION**

Due to the fact that the corrective action taken at FST-31 constituted an IRA, only, GA EPD did not require the Installation to pursue public notification and/or disclosure of the soil removal and associated activities; however, Fort Stewart did receive GA EPD approval to perform the IRA.

**DECLARATION**

The selected remedy was protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate to this interim remedial action, and was cost-effective.

Due to the fact that the selected course of action was implemented in accordance with the Final Phase II RFI Report for 16 SWMUs, and all required reports have been submitted to GA EPD and approved, the five-year review will not apply to this interim remedial action. Final remedial action will not be required at the site, as the Revised Final Phase II RFI Report (April 2000) recommends a "No Further Action Required" for FST-31, and it is fully anticipated that GA EPD will concur with the recommendation.

Please note that the three monitoring wells at this site were resampled in July 1999 and the only HHCOPC in groundwater was acetone. Thus, the Revised Final Phase II RFI Report for 16 SWMUs, dated April 2000, contained a Human Health Baseline Risk Assessment for acetone, which fully supported the recommendation for "No Further Action Required."

This decision document was developed by the Directorate of Public Works at Fort Stewart, with support from the U.S. Army Corps of Engineers, and Science Applications International Corporation.