The Vint Hill Farms Station (VHFS) is located approximately 40 miles southwest of Washington, DC, in Fauquier County, Virginia. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites. Land use in the immediate vicinity of VHFS consists mainly of agriculture (mostly horse farms) and residential areas. With the exception of a few residences to the north, the majority of residential development is located to the south of VHFS. A small county recreational park is located adjacent to VHFS along South Run.

VHFS is part of the U.S. Army Communications-Electronics Command (CECOM) and, while active, primarily functioned as an
Army installation engaged in communications intelligence. VHFS was designated for closure in March 1993, under the Base Realignment and Closure (BRAC) Act. Pursuant to decision to close the installation, and Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May 1994, respectively. The ENPA identified 42 areas requiring environmental evaluation (AREEs) from the review of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation. These 27 AREEs were investigated from September 1994, to June 1995, as part of the Site Inspection (SI) conducted by SAIC. The final SI Report, which was completed in June 1996, identified 24 AREEs which required further investigation. In addition, four new AREEs were determined to warrant further investigation subsequent to the SI. AREEs that were determined to warrant further investigation were investigated as part of the Phase I and Phase II reuse areas Remedial Investigation (RI) and the supplemental RI conducted by ICF Kaiser Engineers, Inc. The final RI reports for the Phase I and Phase II reuse areas were completed in April 1998, and January 1999, respectively.

OU 2:

As part of the RI, sediment samples were collected from the western South Run tributary and the other site drainages. Sediment in the western South Run tributary was found to be contaminated by metals, pesticides, and polynuclear aromatic hydrocarbons (PAHs).

Remedy:

All sediment exceeding the established cleanup levels would be dredged, solidified as needed to eliminate free liquids, transported offsite by truck, and disposed using a combination of permitted off-site hazardous waste and/or municipal landfills or incinerators, as appropriate based on analytical results. The area to be dredged is approximately 2,500 ft. x 3 ft. x 1 ft. Following dredging of the impacted sediments, confirmation sampling would be conducted to assure adequate removal of all sediment exceeding the cleanup levels. During dredging operations, silt fences or other control techniques would be used to minimize the impacts to water quality in the western South run tributary. Upon completion of the sediment dredging, disturbed areas of the western South run tributary would be backfilled with
sand, and the impacted wetlands would be restored in accordance with army corp of engineers national permit program. There will be no five year review at this OU because all hazardous substances above-risk based cleanup levels would not remain on site.

Under this remedy, all contaminated sediment exceeding the established cleanup levels would be dredged, solidified as needed to eliminate free liquids, transported off-site by truck, and disposed using a combination of permitted offsite non-hazardous waste and/or municipal landfills, as appropriate based on analytical results. The area to be dredged is approximately 2,500 ft x 3 ft x 1 ft deep. Following dredging of the impacted sediments, confirmation sampling would be conducted to assure adequate removal of all sediment exceeding the cleanup levels. During the dredging operations, silt fences or other control techniques would be used to minimize the impacts to water quality in the western South Run tributary. Upon completion of the sediment dredging, disturbed areas of the western South Run tributary would be backfilled with sand, and the impacted wetlands would be restored in accordance with the US Army Corps of Engineers Nationwide Permit Program. The 5 year review does not apply to this alternative because hazardous substances above risk-based cleanup levels would not remain on site.

Estimated Capital Costs: $350,000
Estimated Annual O&M Cost: Not Provided
Estimated Present Worth Cost: Not Provided

The national oil and hazardous substance pollution contingency plan and CERCLA, as amended by SARA, required that a no action alternative be considered as a baseline for comparison to other alternatives. No action be taken to address site contamination under this alternative. The sediment in the western South Run Tributary would be reviewed at least once every 5 years to re-evaluate site conditions and to determine the need for remedial action to protect human health and the environment.

Text: Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

USA VINT HILL FARMS STATION
EPA ID:  VA8210020931
OU 02
WARRENTON, VA
07/01/1999
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2.0 SITE BACKGROUND</td>
<td>1</td>
</tr>
<tr>
<td>3.0 SITE CHARACTERISTICS</td>
<td>1</td>
</tr>
<tr>
<td>3.1 Site Topography</td>
<td>1</td>
</tr>
<tr>
<td>3.2 Adjacent Land Use</td>
<td>4</td>
</tr>
<tr>
<td>3.3 Surface Water Hydrology</td>
<td>4</td>
</tr>
<tr>
<td>3.4 Geology/Hydrogeology</td>
<td>4</td>
</tr>
<tr>
<td>4.0 DESCRIPTION OF WESTERN SOUTH RUN TRIBUTARY</td>
<td>4</td>
</tr>
<tr>
<td>5.0 SITE HISTORY AND INVESTIGATION FINDINGS</td>
<td>4</td>
</tr>
<tr>
<td>6.0 SUMMARY OF SITE RISKS</td>
<td>6</td>
</tr>
<tr>
<td>7.0 REMEDIAL ACTION OBJECTIVES</td>
<td>8</td>
</tr>
<tr>
<td>8.0 CLEANUP LEVELS ESTABLISHED FOR THE SELECTED ALTERNATIVE</td>
<td>8</td>
</tr>
<tr>
<td>9.0 SUMMARY OF REMEDIAL ALTERNATIVES</td>
<td>8</td>
</tr>
<tr>
<td>9.1 Alternative 1 - No Action</td>
<td>8</td>
</tr>
<tr>
<td>9.2 Alternative 2 - Sediment Removal</td>
<td>8</td>
</tr>
<tr>
<td>10.0 EVALUATION OF ALTERNATIVES</td>
<td>10</td>
</tr>
<tr>
<td>10.1 Overall Protection of Human Health and the Environment</td>
<td>11</td>
</tr>
<tr>
<td>10.2 Compliance with ARARs</td>
<td>11</td>
</tr>
<tr>
<td>10.3 Long-term Effectiveness and Permanence</td>
<td>11</td>
</tr>
<tr>
<td>10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment</td>
<td>11</td>
</tr>
<tr>
<td>10.5 Short-term Effectiveness</td>
<td>11</td>
</tr>
<tr>
<td>10.6 Implementability</td>
<td>12</td>
</tr>
<tr>
<td>10.7 Cost</td>
<td>12</td>
</tr>
<tr>
<td>10.8 Regulator Acceptance</td>
<td>12</td>
</tr>
<tr>
<td>10.9 Community Acceptance</td>
<td>12</td>
</tr>
<tr>
<td>11.0 SELECTED REMEDY AND STATUTORY DETERMINATIONS</td>
<td>12</td>
</tr>
<tr>
<td>11.1 Selected Remedy</td>
<td>12</td>
</tr>
<tr>
<td>11.2 Statutory Determinations</td>
<td>12</td>
</tr>
<tr>
<td>11.2.1 Protection of Human Health and the Environment</td>
<td>13</td>
</tr>
<tr>
<td>11.2.2 Compliance with ARARs</td>
<td>13</td>
</tr>
<tr>
<td>11.2.3 Cost-Effectiveness</td>
<td>13</td>
</tr>
<tr>
<td>11.2.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable</td>
<td>13</td>
</tr>
<tr>
<td>11.2.5 Preference for Treatment as a Principal Element</td>
<td>14</td>
</tr>
<tr>
<td>12.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION</td>
<td>14</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>13.0 RESPONSIVENESS SUMMARY</td>
<td>14</td>
</tr>
<tr>
<td>13.1 Selected Newspaper Notices</td>
<td>15</td>
</tr>
<tr>
<td>13.2 Comments Raised During the Public Meeting on February 5,1998</td>
<td>15</td>
</tr>
<tr>
<td>13.3 Public Meeting Attendance Roster</td>
<td>16</td>
</tr>
<tr>
<td>13.4 Restoration Advisory Board Members</td>
<td>16</td>
</tr>
<tr>
<td>13.5 Written Comments Received from Citizens During the Public Comment Period</td>
<td>17</td>
</tr>
<tr>
<td>14.0 REFERENCES</td>
<td>17</td>
</tr>
</tbody>
</table>
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Location of VHFS</td>
</tr>
<tr>
<td>2</td>
<td>Location of Western South Run Tributary at VHFS</td>
</tr>
<tr>
<td>3</td>
<td>Site-wide Surface Water and Sediment Sample Locations</td>
</tr>
</tbody>
</table>

## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cleanup Levels Established for Sediment in the Western South Run Tributary</td>
</tr>
</tbody>
</table>

## LIST OF ATTACHMENTS

- Attachment 1: Proposed Plan
- Attachment 2: Cleanup Level Development Documents
- Attachment 3: Public Notice
- Attachment 4: Written Comments from Public and U.S. Army Responses
## ABBREVIATIONS AND ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARAR</td>
<td>applicable or relevant and appropriate requirement</td>
</tr>
<tr>
<td>AREE</td>
<td>Area Requiring Environmental Evaluation</td>
</tr>
<tr>
<td>BRA</td>
<td>Baseline Risk Assessment</td>
</tr>
<tr>
<td>BRAC</td>
<td>Base Realignment and Closure</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>CECOM</td>
<td>Communications-Electronics Command</td>
</tr>
<tr>
<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation, and Liability Act</td>
</tr>
<tr>
<td>CERFA</td>
<td>Community Environmental Response Facilitation Act</td>
</tr>
<tr>
<td>DD</td>
<td>Decision Document</td>
</tr>
<tr>
<td>EEQ</td>
<td>environmental effects quotient</td>
</tr>
<tr>
<td>ENPA</td>
<td>Enhanced Preliminary Assessment</td>
</tr>
<tr>
<td>EPIC</td>
<td>Environmental Photographic Interpretation Center</td>
</tr>
<tr>
<td>ERA</td>
<td>Ecological Risk Assessment</td>
</tr>
<tr>
<td>ER-L</td>
<td>Effects Range-Low</td>
</tr>
<tr>
<td>FS</td>
<td>Feasibility Study</td>
</tr>
<tr>
<td>FUDS</td>
<td>Formerly Used Defense Sites</td>
</tr>
<tr>
<td>HHRA</td>
<td>Human Health Risk Assessment</td>
</tr>
<tr>
<td>HI</td>
<td>Hazard Index</td>
</tr>
<tr>
<td>HQ</td>
<td>Hazard Quotient</td>
</tr>
<tr>
<td>ICF KE</td>
<td>ICF Kaiser Engineers, Inc.</td>
</tr>
<tr>
<td>MSL</td>
<td>mean sea level</td>
</tr>
<tr>
<td>NCP</td>
<td>National Oil and Hazardous Substances Pollution Contingency Plan</td>
</tr>
<tr>
<td>PAH</td>
<td>polynuclear aromatic hydrocarbon</td>
</tr>
<tr>
<td>ppm</td>
<td>parts per million</td>
</tr>
<tr>
<td>PQL</td>
<td>practical quantitation limit</td>
</tr>
<tr>
<td>RI</td>
<td>Remedial Investigation</td>
</tr>
<tr>
<td>SAIC</td>
<td>Science Applications International Corporation</td>
</tr>
<tr>
<td>SARA</td>
<td>Superfund Amendments and Reauthorization Act</td>
</tr>
<tr>
<td>SDWA</td>
<td>Safe Drinking Water Act</td>
</tr>
<tr>
<td>SI</td>
<td>Site Inspection</td>
</tr>
<tr>
<td>TRV</td>
<td>toxicity reference value</td>
</tr>
<tr>
<td>USACE</td>
<td>U.S. Army Corps of Engineers</td>
</tr>
<tr>
<td>USAEC</td>
<td>U.S. Army Environmental Center</td>
</tr>
<tr>
<td>USEPA</td>
<td>U.S. Environmental Protection Agency</td>
</tr>
<tr>
<td>VAC</td>
<td>Virginia Administrative Code</td>
</tr>
<tr>
<td>VDEQ</td>
<td>Virginia Department of Environmental Quality</td>
</tr>
<tr>
<td>VHFS</td>
<td>Vint Hill Farms Station</td>
</tr>
</tbody>
</table>
Site Name and Location

Western South Run Tributary
Vint Hill Farms Station
Warrenton, Virginia

Statement of Basis and Purpose

This Decision Document (DD) presents the selected remedial action for the western South Run tributary at Vint Hill Farms Station (VHFS), Warrenton, Virginia, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and, to the extent possible, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This document was prepared as a joint effort between the U.S. Army, the Virginia Department of Environmental Quality (VDEQ), and the U.S. Environmental Protection Agency (USEPA). The remedial action decision is based on documents contained in the Information Repository.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the remedial action selected in this DD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

This action addresses the principle threat at the site by the dredging of contaminated sediment and off-site disposal at a permitted facility.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. However, because treatment of the principal threat at the site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. A five-year review will not be necessary for the western South Run tributary since the selected remedy involves the removal of contaminated sediment to risk-based cleanup levels.

ROBERT L. NABORS
Major General, USA
Commanding
U.S. Army Communications-Electronics Command

7/1/99

Date
1.0 INTRODUCTION

The remedial action decision is based on the Phase I Reuse Area Remedial Investigation (RI) Report (USAEC, 1998) which includes a Baseline Risk Assessment (BRA) documenting the risks from contamination in the western South Run tributary sediment. In the BRA, it was determined that the sediment in western South Run tributary poses unacceptable risks to human health and the environment. Therefore, the conditions in western South Run tributary require remedial action to be protective of human health and the environment.

A feasibility study (FS), which develops and examines remedial action alternatives for a site, was performed for the western South Run tributary and presented in the Proposed Plan (see Attachment 1).

2.0 SITE BACKGROUND

Vint Hill Farms Station (VHFS) is part of the U.S. Army Communications - Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence. VHFS is located approximately 40 miles southwest of Washington, D.C., in Fauquier County, Virginia, as shown on Figure 1. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites.

VHFS was designated for closure in March, 1993, under the Base Realignment and Closure (BRAC) Act. Pursuant to the decision to close the installation, an Enhanced Preliminary Assessment (ENPA), a Community Environmental Response Facilitation Act (CERFA) investigation, and a Site Inspection (SI) of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May, 1994, respectively. The field work for the SI was conducted from September, 1994, to June, 1995. The objective of the SI was to determine the presence or absence of contamination and the chemical nature of any detected contamination. A single sediment sample was collected from the western South Run tributary as part of the SI. The final SI Report (USAEC, 1996) was completed in June, 1996. A Remedial Investigation (RI) was conducted for the Phase I reuse area (shown on Figure 2) by ICF Kaiser Engineers, Inc. (ICF KE) to evaluate: 1) the nature and extent of contamination; and 2) the level of risk posed to human health and the environment. The field work for the RI was conducted between April and June, 1996, and included the collection of nine sediment samples from the western South Run tributary. The final RI Report for the Phase I reuse area (USAEC, 1998) was completed in April, 1998.

3.0 SITE CHARACTERISTICS

3.1 Site Topography

VHFS is located within the Piedmont Plateau physiographic province, approximately 20 miles west of the Fall Line. The Fall Line is a physiographic boundary that separates the folded and faulted crystalline rocks of the Piedmont Plateau physiographic province from the unconsolidated sediments of the Atlantic Coastal Plain physiographic province. The topography of the Piedmont Plateau in the vicinity of VHFS consists of gently rolling hills with slopes generally less than 10%. Surface elevations on the installation vary from 335 to 430 feet (ft) above mean sea level (MSL).
3.2 Adjacent Land Use

Land use in the immediate vicinity of VHFS consists mainly of agriculture (mostly horse farms) and residential areas. With the exception of a few residences to the north, the majority of residential development is located to the south of VHFS. A small county recreation park is located adjacent to VHFS along South Run.

3.3 Surface Water Hydrology

VHFS is located in the Occoquan watershed. Most of VHFS drains to South Run via intermittent tributaries and drainage ditches, as shown on Figure 2. South Run is a small Class III Virginia stream which discharges into Lake Manassas, a recreation and drinking water reservoir built on Broad Run for the City of Manassas. Lake Manassas discharges to Broad Run, which drains to the Occoquan Reservoir. Drainage for the southern portion of the installation flows south and east to Kettle Run. Kettle Run converges with Broad Run approximately 10 miles downstream from Lake Manassas.

3.4 Geology/Hydrogeology

The central portion of VHFS is underlain by folded sedimentary rocks of the Catharpin Creek Member which consists of sandstone, arkosic sandstone, siltstone, shale, and claystone. Intrusions of basalt, oriented northeast to southwest, cut the bedrock in the central and western portions of the VHFS installation. The northeastern flank of VHFS is underlain by intrusions of diabase. Quaternary alluvium is present along the major drainage channels within the installation.

The overburden is thickest (20-40 ft) in the southern regions of the site and thins to 0-10 ft in the northern areas. The overburden consists primarily of saprolite (a chemical and physical weathering product of the underlying bedrock) which underlies lesser amounts of clayey and silty soils.

Groundwater at VHFS occurs in fractured bedrock and to a lesser extent in the overburden. The bedrock aquifer is semi-confined, with the unfractured bedrock and saprolite acting as confining units. Recharge to the fractured bedrock aquifer occurs at outcrop areas and from percolation from the overburden along fractures. In the overburden, the aquifer is unconfined.

4.0 DESCRIPTION OF WESTERN SOUTH RUN TRIBUTARY

The primary site drainage is the western South Run tributary (see Figure 2). The western South Run tributary is fed by the discharge of several stormwater collection systems. Infiltration of groundwater into the stormwater drainage system and ongoing activities at VHFS are reported to provide water to this tributary. Because of these sources, the western South Run tributary contains water throughout the year and is capable of supporting a number of different aquatic invertebrate and amphibian species, and a limited number of small fish.

5.0 SITE HISTORY AND INVESTIGATION FINDINGS

The RI was conducted to evaluate the nature and extent of contamination associated with past site activities. Environmental samples collected and analyzed during the RI were used in conjunction with the results from the SI to assess the condition of VHFS. As part of the RI, sediment samples were collected from the western South Run tributary and the other site drainages, as shown on Figure 3. Analytical results were compared to background concentrations and regulatory screening levels for the protection of benthic organisms (referred to Effects Range-Lows or ER-Ls) to determine if sediment had been adversely impacted by site activities.
Sediment in the western South Run tributary has been impacted from past industrial (photographic wastewater) and stormwater discharges. Sediment in the western South Run tributary was found to be contaminated by metals, pesticides, and polynuclear aromatic hydrocarbons (PAHs). In general, the highest concentrations of the contaminants were detected at RISED1 (at the primary headwaters of the tributary). The second highest concentrations were detected at RISED5 (at the secondary headwaters of the tributary). Chlordane (a pesticide) was the most predominant contaminant, exceeding the ER-L (5x10^{-4} parts per million [ppm]) in all but one of the sediment samples collected from the western South Run tributary. The highest chlordane concentration was at RISED1 (21.5 ppm), and the second highest chlordane concentration was at RISED5 (1.25 ppm). In general, contamination decreases substantially along the flow path of the western South Run tributary. Silver was the only contaminant detected at significant concentrations downstream in the western South Run tributary, specifically at sample location RISED9 near the property boundary. The most probable source of silver contamination was the discharge of photographic wastewater to the Former Photographic Wastewater Lagoon (Area Requiring Environmental Evaluation [AREE] 10). The majority of the silver contamination in the tributary was removed during dredging operations to recover silver from the sediments at the Former Photographic Wastewater Lagoon in 1968.

A detailed presentation of the sediment samples collected and the analytical results can be found in the Phase I Reuse Area RI Report (USAEC, 1998), available in the information Repository.

6.0 SUMMARY OF SITE RISKS

A BRA was conducted as part of the RI to assess the human health and ecological problems that could result if the sediment contamination in the western South Run tributary was not remediated. The Human Health Risk Assessment (HHRA) was prepared to evaluate the magnitude of potential adverse effects on human health associated with current industrial/commercial and potential future residential exposures to site-related chemicals in sediment. The Ecological Risk Assessment (ERA) was conducted to characterize the potential threats to ecological receptors posed by contaminants in sediment.

The HHRA follows a four-step process:

• **Selection of Chemicals of Potential Concern** - identifies the contaminants of potential concern based on their toxicity, frequency of occurrence, and concentration;

• **Exposure Assessment** - identifies the potential pathways of exposure, and estimates the concentrations of contaminants to which people may be exposed as well as the frequency and duration of these exposures;

• **Toxicity Assessment** - determines the toxic effects of the contaminants; and

• **Risk Characterization** - provides a quantitative assessment of the overall current and future risk to people from site contaminants based on the exposure and toxicity information.

The HHRA evaluated health effects which could result from exposure to sediment contamination in the Phase I reuse area of VHFS. The HHRA evaluated potential risks to current trespassers and hypothetical future child residents who could be exposed to contaminants in sediment.

Potential carcinogenic (cancer-related) effects and noncarcinogenic effects (including various impacts on different organ systems, such as lungs, liver, etc.) were evaluated in the HHRA. Carcinogenic effects are expressed as the probability that an individual will develop cancer from exposure to the contaminants in the sediment. The evaluation of noncarcinogenic effects is based on the hazard index (HI), which is the summation of the hazard quotients (HQs) for individual chemicals. The HQ is a comparison of chemical-specific chronic exposure doses with the corresponding protective doses derived from health criteria. The U.S. Environmental Protection Agency (USEPA) recommends that remedial actions may be warranted at sites where the carcinogenic risk to any person is greater than 1x10^{-4} or the HI is greater than 1. A carcinogenic risk of 1x10^{-4}
means that there is a potential of one additional person in a population of 10,000 developing cancer from exposure to contaminants in sediment if the sediment is not remediated. A HI greater than 1 indicates a potential for noncancerous, health effects if the sediment is not remediated.

The ERA also follows a four-step process:

- **Problem Formulation** - develops information that characterizes habitats and potentially exposed species and identifies contaminants of concern, exposure pathways, and receptors;
- **Exposure Assessment** - estimates exposure point concentrations for selected indicator species;
- **Ecotoxicologic Effects Assessment** - identifies concentrations or doses of contaminants that are protective of indicator species; and
- **Risk Characterization** - estimates potential adverse effects from exposure to contaminants based on exposure and toxicity information.

The ERA evaluated ecological effects which could result from exposure to sediment contamination in the Phase I reuse area of VHFS. The ERA evaluated potential adverse ecological effects to aquatic life from exposure to contaminants in sediment. The evaluation of significant potential adverse ecological effects is based on the Environmental Effects Quotient (EEQ). The EEQ is the ratio of the estimated exposure concentrations/doses for the chemicals of potential concern and the toxicity reference values (TRVs) for the ecological receptors. If the EEQ is greater than 1, there is a potential for adverse ecological effects to occur. As the magnitude of the EEQ becomes greater than 1, the potential for adverse ecological effects becomes more significant.

The HHRA concluded that, under current industrial/commercial land-use conditions, the risks to trespassers are acceptable for exposure to contaminants in sediment. However, under potential future residential land-use conditions, assuming that the western South Run tributary is not remediated, the risks to potential child residents are unacceptable for exposure to contaminants in sediment. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk for child residents exposed to contaminants in sediment is by incidental ingestion; this risk is $1 \times 10^{-4}$ (i.e., one in 10,000 residents may develop cancer caused by contaminants in the sediment). The highest noncancerous risk is for child residents exposed to contaminants in sediment by incidental ingestion and dermal contact; the HIs are estimated to be 10 for the incidental ingestion route of exposure and 10 for the dermal contact route of exposure. The organ system impacted by noncancerous contaminants in sediment is the liver. The unacceptable human health risks result primarily from chlordane.

The ERA determined that contaminants in sediment in the western South Run tributary pose significant potential adverse ecological effects. The primary organics with potential to adversely affect aquatic resources in the western South Run tributary are pesticides (primarily chlordane, with an EEQ of 3,100), and, to a much lesser extent, PAHs (primarily 2-methylnaphthalene, with an EEQ of 19). Other significant pesticides, including alpha-chlordane, gamma-chlordane, DDT, endrin, and heptachlor, have EEQs ranging from 60 to 300. The inorganic chemicals detected in sediment with the greatest potential for adverse ecological effects on aquatic resources in the western South Run tributary are copper, chromium, lead, and silver.

The primary locations at which chemical concentrations drove potential adverse ecological effects are the headwaters of the western South Run tributary (sample locations RISED1, RISED2, RISED3, and RISED5, as shown on Figure 3). In general, pesticide and PAH contamination was highest at sediment sample location RISED1 and decreased along the flow path of the western South Run tributary. For example, the EEQ for chlordane at RISED1 was 3,100, while the EEQs for chlordane at RISED4 and RISED6 through RISED9 were less than or equal to 12. Silver was the only contaminant detected at significant concentrations downstream in the western South Run tributary (specifically at sediment sample location RISED9, with an EEQ of 35).
A detailed presentation of the BRA can be found in the Phase I Reuse Area RI Report (USAEC, 1998), which is available in the Information Repository.

7.0 REMEDIAL ACTION OBJECTIVES

Remedial action objectives are specific goals to protect human health and the environment. The remedial action objective for western South Run tributary is to minimize the potential for contaminated sediment to pose unacceptable risks to human or ecological receptors.

8.0 CLEANUP LEVELS ESTABLISHED FOR THE SELECTED ALTERNATIVE

USEPA has established sediment cleanup levels for the contaminants that contribute to the unacceptable risk determination in the western South Run tributary. The sediment cleanup levels are presented in Table 1. Although the contaminated sediment in the western South Run tributary poses an unacceptable risk to both human health and the environment, the potential adverse ecological effects are more significant than the human health risks. Therefore, the sediment cleanup levels for the western South Run tributary are based on concentrations which are protective of aquatic life. The sediment cleanup levels provide a balance between protection of aquatic life from chemical exposure with protection of aquatic life from disturbance of habitat resulting from remediation. Attachment 2 provides backup documentation supporting the establishment of the cleanup levels.

9.0 SUMMARY OF REMEDIAL ALTERNATIVES

Two remedial alternatives were evaluated to address sediment contamination in the western South Run tributary. The range of remedial alternatives considered was limited by the nature and extent of the contamination. Since the amount of sediment requiring remediation is relatively small (approximately 280 cubic yards), it was not practical to consider active treatment or containment options in terms of cost-effectiveness and implementability. The following remedial alternatives were evaluated:

• Alternative 1 - No Action; and
• Alternative 2 - Sediment Removal.

9.1 Alternative 1 - No Action

The National Oil and Hazardous Substance Pollution Contingency Plan (NCP) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), require that a No Action alternative be considered as a baseline for comparison to other alternatives. No action would be taken to address site contamination under this alternative. In accordance with Section 121 of CERCLA, the sediment in the western South Run tributary would be reviewed at least once every five years to re-evaluate site conditions and to determine the need for remedial action to protect human health and the environment.

9.2 Alternative 2 - Sediment Removal

Under this alternative, all contaminated sediment exceeding the established cleanup levels (i.e., in the vicinity of RISED1, RISED2, RISED3, RISED5, and RISED9) would be dredged, solidified as needed to eliminate free liquids, transported off site by truck, and disposed usinga combination of permitted off-site nonhazardous waste and/or municipal landfills, as appropriate based on analytical results. The area to be dredged is approximately 2,500 ft x 3 ft x 1 ft deep (see Figure 3). Following dredging of the impacted sediments,
### Table 1

Cleaning Levels Established for Sediment in the Western South Run Tributary

<table>
<thead>
<tr>
<th>Constituents</th>
<th>Cleanup Levels (ppm) (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrin (Ecological risk) (b)</td>
<td>0.03</td>
</tr>
<tr>
<td>Chlordane (Human Health &amp; Ecological risk)</td>
<td>0.105</td>
</tr>
<tr>
<td>alpha-Chlordane (Human Health &amp; Ecological risk)</td>
<td>0.105</td>
</tr>
<tr>
<td>gamma-Chlordane (Human Health &amp; Ecological risk)</td>
<td>0.105</td>
</tr>
<tr>
<td>Chromium (Ecological risk) (b)</td>
<td>390</td>
</tr>
<tr>
<td>Copper (Ecological risk)</td>
<td>240</td>
</tr>
<tr>
<td>4,4'-DDE (Ecological risk) (b)</td>
<td>0.075</td>
</tr>
<tr>
<td>4,4'-DDT (Ecological risk)</td>
<td>0.015</td>
</tr>
<tr>
<td>Endrin (Ecological risk)</td>
<td>0.045</td>
</tr>
<tr>
<td>Heptachlor (Ecological risk)</td>
<td>0.005 (c)</td>
</tr>
<tr>
<td>Lead (Ecological risk) (b)</td>
<td>465</td>
</tr>
<tr>
<td>2-Methylnaphthalene (Ecological risk) (b)</td>
<td>1.05</td>
</tr>
<tr>
<td>Silver (Ecological risk)</td>
<td>15</td>
</tr>
</tbody>
</table>

(a) Based on concentrations (EEQ = 15) which balance protection of aquatic life from chemical exposure with protection of aquatic life from disturbance of habitat resulting from remediation (e.g., dredging of the tributary).

(b) These compounds contribute to but do not drive unacceptable risk.

(c) The cleanup level listed is the Practical Quantitation Limit (PQL) for the contract laboratory which is slightly higher than the calculated cleanup level of 0.0045 ppm.
confirmation sampling would be conducted to assure adequate removal of all sediment exceeding the cleanup levels. During dredging operations, silt fences or other control techniques would be used to minimize the impacts to water quality in the western South Run tributary. Upon completion of the sediment dredging, disturbed areas of the western South Run tributary would be backfilled with sand, and the impacted wetlands would be restored in accordance with the U.S. Army Corps of Engineers (USACE) Nationwide Permit Program. The five-year review does not apply to this alternative because hazardous substances above risk-based cleanup levels would not remain on site.

10.0 EVALUATION OF ALTERNATIVES

CERCLA requires a comparison of the alternatives by using nine evaluation criteria: overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements (ARARs); long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; cost; and regulator and community acceptance. The first two criteria are considered by USEPA to be threshold criteria which must be met by each alternative. The nine evaluation criteria are described below:

- **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with ARARs** addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and requirements or provides grounds for invoking a waiver.

- **Long-term effectiveness and permanence** refers to the ability of a remedy to maintain reliable protection of human health over time, once cleanup goals have been met.

- **Reduction of toxicity, mobility, or volume through treatment** is the anticipated performance of the treatment technologies a remedy may employ.

- **Short-term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

- **Implementability** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- **Cost** includes estimated capital and operation and maintenance costs, and net present worth costs.

- **Regulator acceptance** indicates whether, based on their review of the RI and Proposed Plan, the regulators (the Virginia Department of Environmental Quality [VDEQ] and USEPA) concur, oppose, or have no comment on the selected alternative.

- **Community acceptance** is assessed in the Responsiveness Summary which summarizes the public comments received on the RI and the Proposed Plan.

The comparative analysis of the alternatives was conducted based upon these evaluation criteria, and is described below.
10.1 Overall Protection of Human Health and the Environment

The no action alternative (Alternative 1) is not protective of human health or the environment because the risks to potential future child residents and the potential adverse effects to ecological receptors remain unchanged, which is unacceptable. Therefore, the no action alternative was eliminated from further consideration and will not be discussed further.

Alternative 2 provides adequate protection of human health and the environment by removing contaminated sediment, thereby eliminating the potential for exposure.

10.2 Compliance with ARARs

Alternative 2 has been designed to achieve or comply with ARARs. This alternative will satisfy the established cleanup levels since all sediment that is contaminated above applicable cleanup levels will be removed. In addition, the removal and disposition of contaminated sediment during implementation of Alternative 2 would be done in accordance with federal and Virginia solid waste management regulations. Alternative 2 would also be conducted in compliance with the Virginia Erosion and Sedimentation Control Regulations. The impacted wetlands would be restored following dredging operations in accordance with USACE’s Nationwide Permit Program. During sediment dredging, the Regulations of the Virginia Air Pollution Control Board may apply. Ambient air conditions would be monitored during dredging activities to assure acceptable air quality. As necessary based on the ambient air monitoring, water sprays would be used to keep dust levels down.

10.3 Long-term Effectiveness and Permanence

Alternative 2 would provide for the permanent removal of contaminated sediment to an off-site location designed to prevent contaminant migration and exposures to human and ecological receptors.

10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 2 provides reduction of contamination in the western South Run tributary by removing contaminated sediment. The toxicity and volume of the contaminated sediment would not be affected by this alternative; however, the mobility of the contaminants would be reduced because the off-site disposal facilities used would be designed to prevent contaminant migration.

Because treatment of the contaminated sediment in the western South Run tributary was not found to be practicable due to the small volume of impacted soil, Alternative 2 does not satisfy the statutory preference for treatment as a principal element of the remedy.

10.5 Short-term Effectiveness

Alternative 2 is considered to be effective in the short term because the volume of sediment to be dredged is relatively small and would result in limited negative impacts to human health or the environment. Dust exposure to workers and adjacent residents would be controlled during dredging activities by water sprays as needed. The dredging of sediment may impact the quality of the wetland ecosystem. Dredging operations would use silt fences and other erosion control techniques to minimize: 1) the migration of contaminated sediment downstream; and 2) the impact to water quality during dredging operations. In addition, stormwater flow from the stormwater drainage system which discharges into the western South Run tributary would be temporarily diverted around the areas to be dredged to prevent stormwater from entering the segments being dredged and prevent movement of sediment from contaminated areas. After dredging, the stream bed would be restored and the exposed banks revegetated to stabilize the stream and minimize future impacts to the
wetland ecosystem. Although truck traffic would be increased during implementation of Alternative 2, the implementation period (approximately one month) is short and the number of trucks per day would be less than 20.

10.6 Implementability

Alternative 2 is considered readily implementable. Licensed transporters and permitted disposal facilities are currently available.

10.7 Cost

The cost to implement Alternative 2 is estimated at $350,000.

10.8 Regulator Acceptance

VDEQ and USEPA concur with the selected remedy.

10.9 Community Acceptance

A public meeting on the Proposed Plan was held on February 5, 1998, in Warrenton, Virginia. Comments received during the public meeting and the public comment period are referenced in the Responsiveness Summary (Section 13 of this DD).

11.0 SELECTED REMEDY AND STATUTORY DETERMINATIONS

11.1 Selected Remedy

Following review and consideration of the information in the Information Repository, requirements of CERCLA and the NCP, and the review of public comments on the Proposed Plan, the U.S. Army, in coordination with VDEQ and USEPA, has selected Alternative 2, Sediment Removal, as the remedy for the contaminated sediment in the western South Run tributary.

Under this remedy, all contaminated sediment exceeding the established cleanup levels (i.e., in the vicinity of RISED1, RISED2, RISED3, RISED5, and RISED9) would be dredged, solidified as needed to eliminate free liquids, transported off site by truck, and disposed using a combination of permitted off-site nonhazardous waste and/or municipal landfills, as appropriate based on analytical results. The area to be dredged is approximately 2,500 ft x 3 ft x 1 ft deep. Following dredging of the impacted sediments, confirmation sampling would be conducted to assure adequate removal of all sediment exceeding the cleanup levels (see Table 1). During dredging operations, silt fences or other control techniques would be used to minimize the impacts to water quality in the western South Run tributary. Upon completion of the sediment dredging, disturbed areas of the western South Run tributary would be backfilled with sand, and the impacted wetlands would be restored in accordance with the USACE Nationwide Permit Program.

The estimated cost to implement this remedy is $350,000, and the on-site activities would require approximately one month to complete.

11.2 Statutory Determinations

Under CERCLA Section 121, selected remedies must be protective of human health and the environment, must comply with ARARs (unless a statutory waiver is justified), must be cost-effective, and must utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment
that permanently and significantly reduces the volume, toxicity, or mobility of hazardous waste as their principal element. The following sections discuss the remedy in light of these statutory requirements.

11.2.1 Protection of Human Health and the Environment

The selected remedy would protect human health and the environment. All contaminated sediment exceeding the established cleanup levels will be removed and disposed of in permitted, off-site facilities. The cleanup levels listed in Table 1 were developed to be protective of human health and the environment.

Short-term risks would be present as a result of dust exposure to workers and adjacent residents, migration of contaminated sediment during dredging activities, and transport of contaminated sediment off site. These risks would be acceptable as a result of control measures which would be implemented during the remedial action. These control measures include use of water sprays during dredging operations to control dust, and use of silt fences and other erosion control techniques to control sediment migration. The increase in truck traffic would be minimal, with the addition of less than 20 trucks per day over the course of approximately one month.

11.2.2 Compliance with ARARs

The selected remedy will be in full compliance with ARARs:

- 9 Virginia Administrative Code (VAC) 20-80-10 et seq.: Virginia Solid Waste Management Regulations -- the disposal of any soil, debris, sludge or any other solid waste must be done in compliance with the regulations;
- 4 VAC 50-30-10, et seq.: Virginia Erosion and Sedimentation Control Regulations -- an erosion and sedimentation control plan that complies with the minimum design and implementation standards of the regulations will be prepared before engaging in any land disturbing activity;
- 33 Code of Federal Regulations (CFR) 330: USACE Nationwide Permit Program -- restoration of the impacted wetlands will be conducted in accordance with the regulations; and
- 9 VAC 5-10-10 through 9 VAC 5-80-350: Regulations of the Virginia Air Pollution Control Board -- ambient air monitoring will be used to determine the need for water sprays to control dust generation in order to comply with ambient air quality standards for particulate matter.

11.2.3 Cost-Effectiveness

The selected remedy affords overall effectiveness proportional to its costs. All contaminated sediment exceeding the established cleanup levels will be removed from the site. The entire remedy will be achieved for approximately $350,000.

11.2.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The selected remedy utilizes permanent solutions to the maximum extent practicable while providing the best balance among the other evaluation criteria. It achieves the best balance of tradeoffs with respect to the primary balancing criteria of long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; short-term effectiveness; implementability; and cost; while also considering regulator and community acceptance.

The selected remedy provides a high degree of long-term effectiveness and permanence as the removal and off-site disposal of the contaminated sediment would be permanent and irreversible. The variety of contaminants present on site and the relatively small volume of contaminated sediment cause on-site treatment technologies to be impracticable and not cost-effective. The selected remedy is easily
implementable, with a relatively short time frame needed for design development. There is minimal risk to the community during the implementation of the selected remedy, and the slight risks to the environment can be reduced by implementing standard procedures, such as erosion and sedimentation controls.

11.2.5 Preference for Treatment as a Principal Element

Because treatment of the principal threat at the site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy.

12.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Proposed Plan for western South Run tributary was released to the public on January 22, 1998 (see Attachment 1). This document was made available for public review in the Information Repository at the following location:

Fauquier County Library
Warrenton Branch - Reference Section
11 Winchester Street, Warrenton, VA
(540) 347-8750
Monday - Wednesday: 10:00 a.m. to 9:00 p.m.
Thursday - Saturday: 9:00 a.m. to 5:00 p.m.
Sunday: 1:00 p.m. to 5:00 p.m.

The notice of availability of the Proposed Plan (see Attachment 3) was published in The Fauquier Citizen, the Fauquier Times-Democrat, and the Manassas Journal Messenger during the week of January 19, 1998. A public comment period was held from January 22, 1998, through February 20, 1998. In addition, a public meeting was held on February 5, 1998, to present the Proposed Plan for the western South Run tributary and to answer questions and receive public comments. The public meeting minutes have been transcribed, and a copy of the transcript is available to the public at the aforementioned location. A Responsiveness Summary, included as part of this Decision Document (DD), has been prepared to respond to the significant comments, criticisms, and new relevant information received during the comment period. Upon signing the DD, the U.S. Army will publish a notice of availability of this DD in The Fauquier Citizen, the Fauquier Times-Democrat, and the Manassas Journal Messenger and place the DD in the Information Repository.

13.0 RESPONSIVENESS SUMMARY

The purpose of this Responsiveness Summary is to provide the public with a summary of citizen comments, concerns, and questions about western South Run tributary. A public meeting was held on February 5, 1998, to present the Proposed Plan and to answer questions and receive comments. At the public meeting, several citizens had questions regarding the Proposed Plan. Several written public comments were received during the January 22, 1998, through February 20, 1998, comment period.

The Responsiveness Summary is divided into the following sections:

- Selected newspaper notices announcing dates of the public comment period and location and time of the public meeting;
- Comments raised during the public meeting on February 5, 1998;
- Public meeting attendance roster;
- Restoration Advisory Board Members; and
Written comments received from citizens during the public comment period.

All comments and concerns summarized in this document have been considered by the U.S. Army in making a decision regarding the selected alternative.

13.1 Selected Newspaper Notices

A public notice announcing the availability of the Proposed Plan and the public meeting was published in The Fauquier Citizen, the Fauquier Times-Democrat, and the Manassas Journal Messenger during the week of January 19, 1998. This public notice is provided in Attachment 3.

13.2 Comments Raised During the Public Meeting on February 5, 1998

Several citizens raised comments during the public meeting. The citizens’ questions and the U.S. Army’s responses are presented below:

**CONCERNED CITIZEN:** Are the contaminants present typically found with photochemical processes? Is photoprocessing the sole source?

**ARMY RESPONSE:** The silver comes from photoprocessing activities. The pesticides are from a different source. Pesticides are presumed to have entered western South Run tributary through the storm sewer system and from storm water runoff since the pesticides were applied to the ground during use of the property as a farm and during the U.S. Army’s operation of the installation.

**CONCERNED CITIZEN:** How come silver is present all the way up to where the western South Run tributary enters South Run when the Former Photographic Wastewater Lagoon (AREE 10) is located closer to the headwaters of the western South Run tributary?

**ARMY RESPONSE:** The silver that is present downstream was either transported there over the years when the Former Photographic Wastewater Lagoon was in operation or was stirred up and transported downstream during dredging operations.

**CONCERNED CITIZEN:** When the Former Photographic Wastewater Lagoon was dredged, was the dredging performed all the way to the confluence of the western South Run tributary and South Run?

**ARMY RESPONSE:** No, only the Former Photographic Wastewater Lagoon itself was dredged to recover silver.

**CONCERNED CITIZEN:** If the Former Photographic Wastewater Lagoon was dredged, how come there is still silver in the headwaters of the western South Run tributary?

**ARMY RESPONSE:** Silver in the headwaters of western South Run tributary probably resulted from overflow of the Former Photographic Wastewater Lagoon during its operation.

**CONCERNED CITIZEN:** Although the cleanup being proposed is acceptable, how come there is contamination at the headwaters and at the confluence of western South Run tributary and South Run but not in between.

**ARMY RESPONSE:** There is contamination between these two points; however the concentrations of silver and pesticides are at levels found to be acceptable to human health and the environment. For environmental risks, the balance between the risk posed by the contaminants and the risk posed by habitat destruction during remediation was considered in this determination.

**CONCERNED CITIZEN:** It was indicated that five-year reviews would not be required because the contamination would be removed. If the same contaminants are found to reappear in the future, would the U.S. Army come back and remediate again?
**ARMY RESPONSE:** It would have to be determined whether the contamination could be attributed to U.S. Army activities. As part of the ongoing investigation efforts, effluent from the Environmental Photographic Interpretation Center (EPIC) Building industrial sewerline and the storm sewer system that discharge into the western South Run tributary are being sampled to determine if they are ongoing sources of contamination to the tributary. Based on analytical results for the EPIC Building industrial sewerline effluent, this pipeline is not an ongoing source of contamination to the tributary. As of the date of the public meeting, the results of the effluent sampling from the storm sewer system had not yet been obtained. In the interim, however, results have become available which indicate that these pipelines contain residual contamination and could be an ongoing source of contamination to the tributary. Therefore, the pipelines will be cleaned as part of the remedial action.

**CONCERNED CITIZEN:** What if there was construction out there that turned up some contamination that was not detected before?

**ARMY RESPONSE:** This would not be covered by the remedial action for western South Run tributary, but rather would be covered by the Formerly Used Defense Sites (FUDS) program or the like. If the contamination is traceable back to the U.S. Army, they are still responsible for any cleanup.

13.3 Public Meeting Attendance Roster

The public meeting was held on February 5, 1998, at the Warrenton Middle School. The members of the community that attended the public meeting included Owen Bludau and Debra Reedy.

13.4 Restoration Advisory Board Members

1. Debra Reedy, Community Co-Chair
2. Richard Reisch, U.S. Army Co-Chair
3. Dean Eckelberry
4. John Mayhugh
5. Jeff Lippincott
6. Owen Bludau
7. Tim Tarr
8. Norris Goff
9. Erich Meding
10. Kevin Bell
11. Mark Stevens
12. Nancy Inger
13. Joanne Smith
14. Henry Ross
15. Steve Mihalko
16. Robert Stroud
17. Steve Maddox
18. William Downey
19. Gina Tyo
20. Joe Phelan
21. Gary Clare
22. Mike Molloy
23. Denny Adams
24. Joe Wiltse
25. Bob Root
26. Georgia Herbert
27. Robert Kube
28. Kimberly Davis
29. George Rosenberger
13.5 Written Comments Received from Citizens During the Public Comment Period

Written comments received from citizens during the public comment period are provided in Attachment 4. The U.S. Army's response to these comments are also provided in Attachment 4. In summary, issues raised by the public involved impacts on the drinking water in Lake Manassas and the cost of the remedial action. The following information was provided regarding these issues:

**Impacts on the Drinking Water in Lake Manassas:** There is no indication that contaminants at VHFS are affecting the drinking water supply in Lake Manassas. The City of Manassas regularly tests their drinking water for conformance with the Safe Drinking Water Act (SDWA).

**Cost of the Remedial Action:** Approximately 280 cubic yards (or 500 tons) of sediment would be dredged and disposed as part of the selected alternative, and a corresponding amount of soil would be replaced. Related activities include the grubbing out of trees lining the stream bed, diverting stream flow while work is being done, and then restoring the site once the stream is returned to its original bed. An additional cost for laboratory analysis to prove cleanup is complete would also be incurred.

14.0 REFERENCES


ATTACHMENT 1
PROPOSED PLAN
INTRODUCTION

The U.S. Army has identified a preferred alternative to address contaminated sediment in the western South Run tributary located on Vint Hill Farms Station (VHFS). The major characteristics of the U.S. Army’s preferred alternative (Alternative 2 in this Proposed Plan) include dredging of contaminated sediment and offsite disposal at a permitted facility.

This Proposed Plan is based on site-related documents contained in the VHFS Information Repository. The Information Repository can provide you with important information about the site and the western South Run tributary. The Information Repository is located at:

Fauquier County Library
Warrenton Branch - Reference Section
11 Winchester Street, Warrenton, VA
(540) 347-8750
Monday - Wednesday: 10:00 a.m. to 9:00 p.m.
Thursday - Saturday: 9:00 a.m. to 5:00 p.m.
Sunday: 1:00 p.m. to 5:00 p.m.

The U.S. Army needs your comments and suggestions. The U.S. Army, the U.S. Environmental Protection Agency (USEPA) Region III, and the Virginia Department of Environmental Quality (VDEQ) encourage the public to review and comment on both of the alternatives presented in the Proposed Plan. The public comment period begins on January 22, 1998, and closes on February 20, 1998. Please send your comments, postmarked no later than February 20, 1998, to:

Kevin Bell, Public Affairs Officer
Public Affairs Office (Bldg. 2500)
Vint Hills Farm Station
Warrenton, VA 20187-5001

In addition, you are invited to a public meeting regarding the investigation and cleanup of contamination in the western South Run tributary at VHFS. Representatives from the U.S. Army will report on cleanup alternatives considered and the U.S. Army’s preferred alternative. The meeting is scheduled for:

Thursday, February 5, 1998 at 7:00 p.m.
Warrenton Middle School
244 Waterloo Street, Warrenton, VA

Special provisions will be made for the handicapped and hearing impaired.

The remedy described in this Proposed Plan is the U.S. Army’s preferred alternative for the sediment in the western South Run tributary. The U.S. Army may modify the preferred alternative or select another remedial alternative if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The U.S. Army, in consultation with USEPA and VDEQ, will make a remedy selection for the
western South Run tributary in a Decision Document after the public comment period has ended and the comments and information submitted during that time have been reviewed and considered.

The U.S. Army is issuing this Proposed Plan as part of its public participation responsibilities under Sections 113(k) and 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, commonly known as the “Superfund Program”, and the National Environmental Policy Act of 1969 (NEPA). This Proposed Plan focuses on the western South Run tributary. Other areas of VHFS that the U.S. Army plans to remediate are addressed by separate Proposed Plans.

SITE BACKGROUND

VHFS is part of the U.S. Army Communications - Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence. VHFS is located approximately 40 miles southwest of Washington, D.C., in Fauquier County, Virginia, as shown on Figure 1. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites.

VHFS is located in the Occoquan watershed. Most of VHFS drains to South Run via intermittent tributaries and drainage ditches, as shown on Figure 2. South Run is a small Class III Virginia stream which discharges into Lake Manassas, a recreation and drinking water reservoir built on Broad Run for the City of Manassas. Lake Manassas discharges to Broad Run, which drains to the Occoquan Reservoir.

The primary site drainage is the western South Run tributary (see Figure 2). The western South Run tributary is fed by the discharge of several stormwater collection systems. Infiltration of groundwater into the stormwater drainage system and ongoing activities at VHFS are reported to provide water to this tributary. Because of these sources, the western South Run tributary contains water throughout the year and is capable of supporting a number of different aquatic invertebrate and amphibian species, and a limited number of small fish.

The facility was designated for closure in March, 1993, under the Base Realignment and Closure (BRAC) Act. Pursuant to the decision to close the installation, an Enhanced Preliminary Assessment (ENPA), a Community Environmental Response Facilitation Act (CERFA) investigation, and a Site Inspection (SI) of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May, 1994, respectively. The field work for the SI was conducted from September, 1994, to June, 1995. The objective of the SI was to determine the presence or absence of contamination and the chemical nature of any detected contamination. A single sediment sample was collected from the western South Run tributary as part of the SI. The final SI Report was completed in June, 1996. A Remedial Investigation (RI) was conducted for the Phase I reuse area (shown on Figure 2) by ICF Kaiser Engineers, Inc. (ICF KE) to evaluate: 1) the nature and extent of contamination; and 2) the level of risk posed to human health and the environment. The field work for the RI was conducted between April and June, 1996, and included the collection of nine sediment samples from the western South Run tributary. The draft RI Report for the Phase I reuse area was completed in April, 1997, and is currently being revised per regulatory comments.

RESULTS OF THE REMEDIAL INVESTIGATION

The RI was conducted to evaluate the nature and extent of contamination associated with past site activities. Environmental samples collected and analyzed during the RI were used in conjunction with the results from the SI to assess the condition of VHFS. As part of the RI, sediment samples were collected from the western
Vint Hill
Farms Station

FIGURE 1
GENERAL LOCATION
OF VHFS
South Run tributary and the other site drainages, as shown on Figure 3. Analytical results were compared to background concentrations and regulatory screening levels for the protection of benthic organisms (referred to as Effects Range-Lows or ER-Ls) to determine if sediment had been adversely impacted by site activities.

Sediment in the western South Run tributary has been impacted from past industrial (photographic wastewater) and stormwater discharges. Sediment in the western South Run tributary was found to be contaminated by metals, pesticides, and polynuclear aromatic hydrocarbons (PAHs). In general, the highest concentrations of the contaminants were detected at RISED1 (at the primary headwaters of the tributary). The second highest concentrations were detected at RISED5 (at the secondary headwaters of the tributary). Chlordane (a pesticide) was the most predominant contaminant, exceeding the ER-L (5x10^{-4} parts per million [ppm]) in all but one of the sediment samples collected from the western South Run tributary. The highest chlordane concentration was at RISED1 (21.5 ppm), and the second highest chlordane concentration was at RISED5 (1.25 ppm). In general, contamination decreases substantially along the flow path of the western South Run tributary. Silver was the only contaminant detected at significant concentrations downstream in the western South Run tributary, specifically at sample location RISED9 near the property boundary. The most probable source of silver contamination was the discharge of photographic wastewater to the Former Photographic Wastewater Lagoon (AREE 10). The majority of the silver contamination in the tributary was removed during dredging operations to recover silver from the sediments at the Former Photographic Wastewater Lagoon in 1968.

A detailed presentation of the sediment samples collected and the analytical results can be found in the draft RI Report, now available in the Information Repository at the Fauquier County Library.

HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

A Baseline Risk Assessment (BRA) was conducted as part of the RI to assess the human health and ecological problems that could result if the sediment contamination in the western South Run tributary was not remediated. The Human Health Risk Assessment (HHRA) was prepared to evaluate the magnitude of potential adverse effects on human health associated with current and potential future (assuming residential development of the property) exposures to site-related chemicals in sediment. The Ecological Risk Assessment (ERA) was conducted to characterize the potential threats to ecological receptors posed by contaminants in sediment.

The HHRA follows a four-step process:

- **Selection of Chemicals of Potential Concern** - identifies the contaminants of potential concern based on their toxicity, frequency of occurrence, and concentration;
- **Exposure Assessment** - identifies the potential pathways of exposure, and estimates the concentrations of contaminants to which people may be exposed as well as the frequency and duration of these exposures;
- **Toxicity Assessment** - determines the toxic effects of the contaminants; and
- **Risk Characterization** - provides a quantitative assessment of the overall current and future risk to people from site contaminants based on the exposure and toxicity information.

The HHRA evaluated health effects which could result from exposure to sediment contamination in the Phase I reuse area of VHFS. The HHRA evaluated potential risks to current trespassers and hypothetical future child residents who could be exposed to contaminants in sediment.
Potential carcinogenic (cancer-related) effects and noncarcinogenic effects (including various impacts on different organ systems, such as lungs, liver, etc.) were evaluated in the HHRA. Carcinogenic effects are expressed as the probability that an individual will develop cancer from exposure to the contaminants in the sediment. The evaluation of noncarcinogenic effects is based on the hazard index (HI), which is the summation of the hazard quotients for individual chemicals. The hazard quotient is a comparison of chemical-specific chronic exposure doses with the corresponding protective doses derived from health criteria. The USEPA recommends that remedial actions may be warranted at sites where the carcinogenic risk to any person is greater than $1 \times 10^{-4}$ or the HI is greater than 1. A carcinogenic risk of $1 \times 10^{-4}$ means that there is a potential of one additional person in a population of 10,000 developing cancer from exposure to contaminants in sediment if the sediment is not remediated. A HI greater than 1 indicates a potential for noncarcinogenic health effects if the sediment is not remediated.

The ERA also follows a four-step process:

- **Problem Formulation** - develops information that characterizes habitats and potentially exposed species and identifies contaminants of concern, exposure pathways, and receptors;
- **Exposure Assessment** - estimates exposure point concentrations for selected indicator species;
- **Ecotoxicologic Effects Assessment** - identifies concentrations or doses of contaminants that are protective of indicator species; and
- **Risk Characterization** - estimates potential adverse effects from exposure to contaminants based on exposure and toxicity information.

The ERA evaluated ecological effects which could result from exposure to sediment contamination in the Phase I reuse area of VHFS. The ERA evaluated potential adverse ecological effects to aquatic life from exposure to contaminants in sediment.

The evaluation of significant potential adverse ecological effects is based on the Environmental Effects Quotient (EEQ). The EEQ is the ratio of the estimated exposure concentrations/doses for the chemicals of potential concern and the toxicity reference values (TRVs) for the ecological receptors. If the EEQ is greater than 1, there is a potential for adverse ecological effects to occur. As the magnitude of the EEQ becomes greater than 1, the potential for adverse ecological effects becomes more significant.

The HHRA concluded that, under current land-use conditions, the risks to trespassers are acceptable for exposure to contaminants in sediment. However, under future land-use conditions, assuming that the western South Run tributary is not remediated, the risks to potential child residents are unacceptable for exposure to contaminants in sediment. The highest estimated upper-bound excess lifetime cancer risk for child residents exposed to contaminants in sediment is by dermal contact; this risk is $2 \times 10^{-4}$ (i.e., two in 10,000 residents may develop cancer caused by contaminants in the sediment). The highest noncarcinogenic risk is for child residents exposed to contaminants in sediment by incidental ingestion and dermal contact; the HIs are estimated to be 9 for the incidental ingestion route of exposure and 8 for the dermal contact route of exposure. The organ system impacted by noncarcinogenic contaminants in sediment is the liver. The unacceptable human health risks result primarily from chlordane.

The ERA determined that contaminants in sediment in the western South Run tributary pose significant potential adverse ecological effects. The primary organics with potential to adversely affect aquatic resources in the western South Run tributary are pesticides (primarily chlordane, with an EEQ of 3,100), and, to a much lesser extent, PAHs (primarily 2-methylnaphthalene, with an EEQ of 19). Other significant pesticides, including alpha-chlordane, gamma-chlordane, DDT, endrin, and heptachlor, have EEQs ranging
from 60 to 300. The inorganic chemicals detected in sediment with the greatest potential for adverse ecological effects on aquatic resources in the western South Run tributary are copper, chromium, lead, and silver.

The primary locations at which chemical concentrations drove potential adverse ecological effects are the headwaters of the western South Run tributary (sample locations RISED1, RISED2, RISED3, and RISED5, as shown on Figure 3). In general, pesticide and PAH contamination was highest at sediment sample location RISED1 and decreased along the flow path of the western South Run tributary. For example, the EEQ for chlordane at RISED1 was 3,100, while the EEQs for chlordane at RISED4 and RISED6 through RISED9 were less than or equal to 12. Silver was the only contaminant detected at significant concentrations downstream in the western South Run tributary (specifically at sediment sample location RISED9, with an EEQ of 35).

A detailed presentation of the BRA can be found in the draft RI Report, now available in the Information Repository at the Fauquier County Library.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives are specific goals to protect human health and the environment. The remedial action objective for the western South Run tributary is to minimize the potential for contaminated sediment to pose unacceptable risks to human or ecological receptors.

CLEANUP LEVELS ESTABLISHED FOR THE PREFERRED ALTERNATIVE

USEPA has established sediment cleanup levels for the contaminants that contribute to the unacceptable risk determination in the western South Run tributary. The sediment cleanup levels are presented in Table 1. Although the contaminated sediment in the western South Run tributary poses an unacceptable risk to both human health and the environment, the potential adverse ecological effects are more significant than the human health risks. Therefore, the sediment cleanup levels for the western South Run tributary are based on concentrations which are protective of aquatic life. The sediment cleanup levels provide a balance between protection of aquatic life from chemical exposure with protection of aquatic life from disturbance of habitat resulting from remediation.

SUMMARY OF REMEDIAL ALTERNATIVES

Two remedial alternatives were evaluated to address sediment contamination in the western South Run tributary. The range of remedial alternatives considered was limited by the nature and extent of the contamination. Since the amount of sediment requiring remediation is relatively small (approximately 280 cubic yards), it was not practical to consider active treatment or containment options in terms of cost-effectiveness and implementability. The following remedial alternatives were evaluated:

- Alternative 1 - No Action and
- Alternative 2 - Sediment Removal.

**Alternative 1 - No Action**

The National Contingency Plan (NCP) and CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA), require that a No Action alternative be considered as a baseline for comparison to other alternatives. No action would be taken to address site contamination under this alternative. In accordance with Section 121 of CERCLA, the sediment in the western South Run tributary would be
Table 1

Cleanup Levels Established for Sediment In the Western South Run Tributary

<table>
<thead>
<tr>
<th>Constituents</th>
<th>Cleanup Levels (ppm) (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrin (Ecological risk) (b)</td>
<td>0.03</td>
</tr>
<tr>
<td>Chlordane (Human Health &amp; Ecological risk)</td>
<td>0.105</td>
</tr>
<tr>
<td>alpha-Chlordane (Human Health &amp; Ecological risk)</td>
<td>0.105</td>
</tr>
<tr>
<td>gamma-Chlordane (Human Health &amp; Ecological risk)</td>
<td>0.105</td>
</tr>
<tr>
<td>Chromium (Ecological risk) (b)</td>
<td>390</td>
</tr>
<tr>
<td>Copper (Ecological risk)</td>
<td>240</td>
</tr>
<tr>
<td>4,4’-DDE (Ecological risk) (b)</td>
<td>0.075</td>
</tr>
<tr>
<td>4,4’-DDT (Ecological risk)</td>
<td>0.015</td>
</tr>
<tr>
<td>Endrin (Ecological risk)</td>
<td>0.045</td>
</tr>
<tr>
<td>Heptachlor (Ecological risk)</td>
<td>0.005 (c)</td>
</tr>
<tr>
<td>Lead (Ecological risk) (b)</td>
<td>465</td>
</tr>
<tr>
<td>2-Methylnaphthalene (Ecological risk) (b)</td>
<td>1.05</td>
</tr>
<tr>
<td>Silver (Ecological risk)</td>
<td>15</td>
</tr>
</tbody>
</table>

(a) Based an concentrations (EEQ = 15) which balance protection of aquatic life from chemical exposure with protection of aquatic life from disturbance of habitat resulting from remediation (e.g., dredging of the tributary).

(b) These compounds contribute to but do not drive unacceptable risk.

(c) The cleanup level listed is the Practical Quantitation Limit (PQL) for the contract laboratory which is slightly higher than the calculated cleanup level of 0.0045 ppm.
reviewed at least once every five years to re-evaluate site conditions and to determine the need for remedial action to protect human health and the environment.

Alternative 2 - Sediment Removal

Under this alternative, all contaminated sediment exceeding the established cleanup levels (i.e., in the vicinity of RISED1, RISED2, RISED3, RISED5, and RISED9) would be dredged, solidified as needed to eliminate free liquids, transported off site by truck, and disposed using a combination of permitted off-site hazardous waste and/or municipal landfills or incinerators, as appropriate based on analytical results. The area to be dredged is approximately 2,500 ft x 3 ft x 1 ft deep (see Figure 3). Following dredging of the impacted sediments, confirmation sampling would be conducted to assure adequate removal of all sediment exceeding the cleanup levels. During dredging operations, silt fences or other control techniques would be used to minimize the impacts to water quality in the western South Run tributary. Upon completion of the sediment dredging, disturbed areas of the western South Run tributary would be backfilled with sand, and the impacted wetlands would be restored in accordance with the U.S. Army Corps of Engineers (USACE) Nationwide Permit Program. The five-year review does not apply to this alternative because hazardous substances above risk-based cleanup levels would not remain on site.

EVALUATION OF ALTERNATIVES

CERCLA requires a comparison of the alternatives by using nine evaluation criteria: overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements (ARARs); long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; cost; and regulator and community acceptance. The first two criteria are considered by USEPA to be threshold criteria which must be met by each alternative. The nine evaluation criteria are described below:

- **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with ARARs** addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and requirements or provides grounds for involving a waiver.

- **Long-term effectiveness and permanence** refers to the ability of a remedy to maintain reliable protection of human health over time, once cleanup goals have been met.

- **Reduction of toxicity, mobility, or volume through treatment** is the anticipated performance of the treatment technologies a remedy may employ.

- **Short-term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

- **Implementability** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- **Cost** includes estimated capital and operation and maintenance costs, and net present worth costs.
• **Regulator acceptance** indicates whether, based on their review of the RI and Proposed Plan, the regulators (VDEQ and USEPA) concur, oppose, or have no comment on the preferred alternative at this present time.

• **Community acceptance** will be assessed in the Decision Document following a review of the public comments received on the RI and the Proposed Plan.

The comparative analysis of the alternatives was conducted based upon these evaluation criteria, and is described below.

**Overall Protection of Human Health and the Environment**

The no action alternative (Alternative 1) is not protective of human health or the environment because the risks to potential future child residents and the potential adverse effects to ecological receptors remain unchanged, which is unacceptable. Therefore, the no action alternative was eliminated from further consideration and will not be discussed further.

Alternative 2 provides adequate protection of human health and the environment by removing contaminated sediment, thereby eliminating the potential for exposure.

**Compliance with ARARs**

Alternative 2 has been designed to achieve or comply with ARARs. This alternative will satisfy the established cleanup levels since all sediment that is contaminated above applicable cleanup levels will be removed. In addition, the removal and disposition of contaminated sediment during implementation of Alternative 2 would be done in accordance with federal and Virginia solid and hazardous waste regulations. Alternative 2 would be conducted in compliance with the Federal Clean Water Act, Federal Fish and Wildlife Coordination Act, Virginia Water Quality Standards, Virginia Water Protection Permit Regulations, and Virginia Erosion and Sedimentation Control Law. The impacted wetlands would be restored following dredging operations in accordance with USACE’s Nationwide Permit Program. During sediment dredging, Virginia Regulations for the Control and Abatement of Air Pollution may apply. Ambient air conditions would be monitored during dredging activities to assure acceptable air quality. As necessary based on the ambient air monitoring, water sprays would be used to keep dust levels down.

**Long-term Effectiveness and Permanence**

Alternative 2 would provide for the permanent removal of contaminated sediment to an off-site location designed to prevent contaminant migration and exposures to human and ecological receptors.

**Reduction of Toxicity, Mobility, or Volume Through Treatment**

Alternative 2 provides reduction of contamination in the western South Run tributary by removing contaminated sediment. The toxicity and volume of the contaminated sediment would not be affected by this alternative; however, the mobility of the contaminants would be reduced because the off-site disposal facilities used would be designed to prevent contaminant migration.

Because treatment of the contaminated sediment in the western South Run tributary was not found to be practicable due to the small volume of impacted soil, Alternative 2 does not satisfy the statutory preference for treatment as a principal element of the remedy.
**Short-term Effectiveness**

Alternative 2 is considered to be effective in the short term because the volume of sediment to be dredged is relatively small and would result in limited negative impacts to human health or the environment. Dust exposure to workers and adjacent residents would be controlled during dredging activities, by water sprays as needed. The dredging of sediment may impact the quality of the wetland ecosystem. Dredging operations would use slit fences and other erosion control techniques to minimize: 1) the migration of contaminated sediment downstream; and 2) the impact to water quality during dredging operations. In addition, stormwater flow from the stormwater drainage system which discharges into the western South Run tributary would be temporarily diverted around the areas to be dredged to prevent stormwater from entering the segments being dredged and prevent movement of sediment from contaminated areas. After dredging, the stream bed would be restored and the exposed banks revegetated to stabilize the stream and minimize future impacts to the wetland ecosystem. Although truck traffic would be increased during implementation of Alternative 2, the implementation period (approximately one month) is short and the number of trucks per day would be less than 20.

**Implementability**

Alternative 2 is considered readily implementable. Licensed transporters and permitted disposal facilities are currently available.

**Cost**

The cost to implement Alternative 2 is estimated at $350,000.

**Regulator Acceptance**

VDEQ and USEPA are currently reviewing this Proposed Plan. VDEQ and USEPA comments will be addressed in the Decision Document.

**Community Acceptance**

Community acceptance of the preferred alternative will be evaluated at the close of the public comment period by considering both oral and written comments received during the public comment period.

**PREFERRED ALTERNATIVE**

Alternative 2 Sediment Removal, is recommended by the U.S. Army as the preferred alternative for the contaminated sediment in the western South Run tributary. This remedial alternative is a permanent solution that offers long-term effectiveness since the contaminated sediment is removed to cleanup levels and transported off site for proper disposal. This remedial alternative would be designed to comply with ARARs. The dredging and disposal of contaminated sediment would be done in accordance with federal and Virginia solid and hazardous waste regulations. The estimated cost to implement this alternative is $350,000, and the on-site activities would require approximately one month to complete.
The United States Army at Vint Hill Farms Station, Virginia invites public comment on a proposed environmental cleanup concerning Western South Run Tributary.

Please Come to Our
PUBLIC MEETING

Thursday, February 5, 1998 • 7:00 p.m.*
Warrenton Middle School Auditorium • Warrenton, VA
(*Sign Language Interpreter will be present)

Purpose: To discuss and present the remedial alternatives for the Western South Run Tributary.

The U.S. Army, in consultation with the U.S. Environmental Protection Agency (USEPA) Region III and the Virginia Department of Environmental Quality (VDEQ), invites public comment on its proposed plan for remediating contaminated sediment in the western South Run tributary on Vint Hill Farms Station (VHFS), Virginia. Before selecting a final remedy, VHFS will consider all written and oral comments received during the public comment period.

The U.S. Army will be accepting comments during a 30-day public comment period which begins Thursday, January 22, 1998 and ends Friday, February 20, 1998.

Written comments may be submitted to the following address:

Kevin Bell, Public Affairs Officer
Public Affairs Office (Bldg. 2500)
Vint Hill Farms Station
Warrenton, VA 20187-5001

Kevin Bell, Public Affairs Officer
Public Affairs Office (Bldg. 2500)
Vint Hill Farms Station
Warrenton, VA 20187-5001
ATTACHMENT 2

CLEANUP LEVEL DEVELOPMENT DOCUMENTS
HUMAN HEALTH RISK-BASED REMEDIATION GOALS  
WESTERN SOUTH RUN TRIBUTARY  
VINT HILL FARMS STATION (VHFS)

Risk-based remediation goals for VHFS based on human exposures at the site were calculated for selected chemicals detected in sediment in the western South Run tributary. Based on a review of the exposure pathways evaluated in the risk assessment, risk-based remediation goals were calculated for chemicals contributing to pathway upper-bound excess lifetime cancer risks greater than $1 \times 10^{-4}$ and/or hazard indices (HI$s$) greater than or equal to 1. The development of risk-based remediation goals focused on the incidental ingestion exposure pathway only. Although cancer risks exceeding $1 \times 10^{-4}$ were associated with dermal contact exposure to sediment in the western South Run tributary, risk-based remediation goals did not incorporate exposures through this route due to the great uncertainties associated with assessing dermal exposures. For example, major uncertainties exist in the extent to which chemicals are percutaneously absorbed and in the extent to which chemicals partition from soil to skin leading to uncertainty in the use of default dermal absorption factors in the evaluation of risk. Uncertainties also exist in the use of adjusted oral toxicity criteria to evaluate dermal exposure pathways depending on how closely the factors used to adjust oral toxicity criteria reflect the difference between the oral and dermal routes.

Child resident exposures to sediment in the western South Run tributary yielded upper-bound excess lifetime cancer risks greater than $1 \times 10^{-4}$ and/or HI$s$ greater than or equal to 1 in the human health risk assessment, while trespasser exposures to sediment in the western South Run tributary did not exceed these criteria. Therefore, risk-based remediation goals for selected chemicals in sediment in the western South Run tributary were developed using child resident exposure parameters.

Once the relevant exposure media and receptor were identified, risk-based remediation goals were calculated for carcinogenic chemicals associated with chemical-specific risks greater than or equal to $1 \times 10^{-6}$ and noncarcinogenic chemicals contributing to a HI of 1 for a specific target organ. For selected carcinogenic chemicals, risk-based remediation goals were developed using a target risk level of $1 \times 10^{-6}$, which is at the low end of USEPA’s target risk range for health-protectiveness at Superfund sites. For selected noncarcinogenic chemicals, risk-based remediation goals were calculated to correspond to a target hazard quotient of 1. If any of the noncarcinogenic compounds for which remediation goals were calculated had similar target organs/critical effects, then the risk-based remediation goal for that noncarcinogenic compound was divided by the number of compounds having the same target organ/critical effect (i.e., if three noncarcinogenic compounds had “liver” as the target organ, the individual remediation goals would be divided by three). For chemicals that exhibit both carcinogenic and noncarcinogenic effects (e.g., chlordane), the selected remediation goals represent the lower of the calculated carcinogenic and noncarcinogenic remediation goals.

The following section presents the exposure assumptions and equations used to calculate the risk-based remediation goals for chemicals in sediment. Table 1 presents the toxicity criteria used to calculate the risk-based remediation goals for chemicals in sediment.

**Sediment Risk-Based Remediation Goals**

Risk-based remediation goals were calculated for chemicals in sediment assuming a child resident's exposure via incidental ingestion, and using the equations and exposure assumptions presented below. Equations are presented separately for chemicals exhibiting carcinogenic and noncarcinogenic effects.

The equation used to calculate risk-based remediation goals for chemicals exhibiting carcinogenic effects, using the child resident exposure parameters obtained from USEPA (1991), is as follows:
<table>
<thead>
<tr>
<th>Chemical</th>
<th>Oral Slope Factor (mg/kg-day)</th>
<th>Weight-of-Evidence Class (a)</th>
<th>Slope Factor Source</th>
<th>Chronic Oral Reference Dose (mg/kg-day)</th>
<th>Uncertainty Factor (b)</th>
<th>Target Organ/ Critical Effect (c)</th>
<th>RfD Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlordane</td>
<td>1.3E+00</td>
<td>B2</td>
<td>IRIS</td>
<td>6E-05</td>
<td>1,000</td>
<td>Liver</td>
<td>IRIS</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
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<td>B2</td>
<td>IRIS</td>
<td>6E-05</td>
<td>1,000</td>
<td>Liver</td>
<td>IRIS</td>
</tr>
<tr>
<td>gamma-Chlordane</td>
<td>1.3E+00</td>
<td>B2</td>
<td>IRIS</td>
<td>6E-05</td>
<td>1,000</td>
<td>Liver</td>
<td>IRIS</td>
</tr>
</tbody>
</table>

(a) USEPA weight-of-evidence classification scheme for carcinogens:
A = Human Carcinogen, sufficient evidence of carcinogenicity in humans:
B1 = Probable Human Carcinogen, limited human data are available:
B2 = Probable Human Carcinogen, sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans;
C = Possible Human Carcinogen, limited evidence from animal studies in the absence of human studies; and
D = Not classified as to human carcinogenicity, inadequate or no evidence.

(b) Uncertainty factors presented are the products of specific uncertainty factors and modifying factors. Uncertainty factors used to develop reference doses generally consist of multiples of 10, with each factor representing a specific area of uncertainty in the data available. The standard uncertainty factors include:
- a 10-fold factor to account for the variation in sensitivity among the members of the human population;
- a 10-fold factor to account for the uncertainty in extrapolating animal data to the case of humans;
- a 10-fold factor to account for the uncertainty in extrapolating from less-than-chronic NOAELs to chronic NOAELs; and
- a 10-fold factor to account for the uncertainty in extrapolating from LOAELs to NOAELs.
Modifying factors are applied at the discretion of RfD reviewer to cover other uncertainties in the data and range from 1 to 10.

(c) A target organ or critical effect is the organ/effect most sensitive to the chemical exposure. RfDs are based on toxic effects in the target organ or critical effects. If an RfD is based on a study in which a target organ or critical effect was not identified, the organ/effect listed is one known to be affected by the chemical.

NOTE:
\[ C_s = \frac{TR \times BW \times ATc \times 365 \text{ days / year}}{IR \times EF \times ED \times SFo \times 10^{-6} \text{ kg / mg}} \]

where:

- \( C_s \) = chemical concentration in sediment (mg/kg),
- \( TR \) = target excess individual lifetime cancer risk \((1 \times 10^{-6})\),
- \( BW \) = body weight (15 kg),
- \( ATc \) = averaging time for carcinogenic effects (70 years),
- \( IR \) = ingestion rate (200 mg/day),
- \( EF \) = exposure frequency (350 days/year),
- \( ED \) = exposure duration (6 years), and
- \( SFo \) = oral cancer slope factor \([(mg/kg-day)^-1]\) (see Table 1).

The equation used to calculate risk-based remediation goals for chemicals exhibiting noncarcinogenic effects, using the child resident exposure parameters obtained from USEPA (1991), is as follows:

\[ C_s = \frac{THI \times BW \times ATnc \times 365 \text{ days / year}}{IR \times EF \times ED \times (1 / RfDo) \times 10^{-6} \text{ kg / mg}} \]

where:

- \( C_s \) = chemical concentration in sediment (mg/kg),
- \( THI \) = target hazard index (1),
- \( BW \) = body weight (15 kg),
- \( ATnc \) = averaging time for noncarcinogenic effects (6 years),
- \( IR \) = ingestion rate (200 mg/day),
- \( EF \) = exposure frequency (350 days/year),
- \( ED \) = exposure duration (6 years), and
- \( RfDo \) = oral chronic reference dose (mg/kg-day) (see Table 1).

**Summary of Risk-Based Remediation Goals**

Risk-based remediation goals for sediment in the western South Run tributary were calculated to be protective of child residents incidentally ingesting sediment and are presented in Table 2.

**References**


<table>
<thead>
<tr>
<th>Chemical</th>
<th>Carcinogenic (mg/kg-day)</th>
<th>Noncarcinogenic (mg/kg-day)</th>
<th>Carcinogenic (b)</th>
<th>Noncarcinogenic (c)</th>
<th>Selected Remediation Goal (mg/kg) (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorodane</td>
<td>1.3E+00</td>
<td>6E-05</td>
<td>0.70</td>
<td>1.6</td>
<td>0.70</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td>1.3E+00</td>
<td>6E-05</td>
<td>0.70</td>
<td>1.6</td>
<td>0.70</td>
</tr>
<tr>
<td>gamma-Chlordane</td>
<td>1.3E+00</td>
<td>6E-05</td>
<td>0.70</td>
<td>1.6</td>
<td>0.70</td>
</tr>
</tbody>
</table>

SEDIMENT - WESTERN SOUTH RUN TRIBUTARY.

(a) Remediation goals were calculated for predominant chemicals (i.e., chemicals with risks exceeding 1x10^-6 or chemicals contributing to a Hi greater than or equal to 1 for a specific target organ) for incidental ingestion pathways with a total excess lifetime cancer risk exceeding 1x10^-4 or a Hi greater than or equal to 1.

(b) The calculated remediation goals for carcinogenic chemicals were based on a target risk level of 1x10^-6, and were calculated using child resident exposure parameters.

(c) The calculated remediation goals for noncarcinogenic chemicals were based on a hazard quotient of 1, and were calculated using child resident exposure parameters. The remediation goals for chlorodane, alpha-chlordane, and gamma-chlordane were divided by three since they all have the liver as the target organ.

(d) The selected remediation goal represents the lower of the calculated carcinogenic and noncarcinogenic remediation goals.
ECOLOGICALLY-BASED CLEANUP LEVELS  
WESTERN SOUTH RUN TRIBUTARY SEDIMENT  
VINT HILL FARMS STATION (VHFS)

Results of the VHFS Ecological Risk Assessment (ERA) for the Phase I Reuse Area indicate the potential for adverse effects to aquatic life in the western South Run tributary. The potential for adverse effects to aquatic life results largely from the presence of pesticides (primarily chlordane) and silver, and to a lesser extent, polynuclear aromatic hydrocarbons (PAHs) and several other inorganic chemicals in the sediments of this tributary. These chemicals have the potential to adversely affect the limited aquatic community capable of being supported by the habitat in this water body. Chemicals in the tributary sediments also could be transported to South Run where they could adversely affect a broader range of aquatic species. Based on the exceedance of ecological toxicity values, areas around sample locations RISED1, RISED2, RISED3, RISED5, and RISED9 have been identified for remediation. These areas have the highest chemical concentrations relative to ecological toxicity values and were determined to have the greatest potential to adversely affect aquatic life.

The objective of this document is to define sediment cleanup levels for chemicals having the potential to adversely affect aquatic life in the western South Run tributary. These cleanup levels must be adequate to: 1) reduce or eliminate the potential for adverse effects to aquatic life from the presence of chemicals in the western South Run tributary; and 2) reduce the potential for chemicals to be transported to South Run where they could adversely affect a broader range of aquatic species. Ecologically-based cleanup levels for soil at VHFS have been developed based on an Environmental Effects Quotient (EEQ)\(^1\) of 10. The implications of basing cleanup levels on an EEQ of 10 for sediment in the western South Run tributary are reviewed in this document in the context of the concentration/distribution of chemicals in the western South Run tributary to establish cleanup levels for this drainage.

Table 1 summarizes EEQs by sample location for chemicals of potential concern (COPCs) having EEQs of 10 or greater at one or more sample locations. As shown in Table 1, the highest EEQs occur at the sample locations already identified for remediation (i.e., RISED1, RISED2, RISED3, RISED5, and RISED9), most of which are located at the headwaters of the western South Run tributary where the storm sewer discharges. Chlordane was the primary chemical driving risks to aquatic life, although silver drove the risk to aquatic life at RISED9. The EEQs ranged from 53 to 3,071 for chlordane in the area identified for remediation (i.e., RISED1, RISED2, RISED3, and RISED5), while the EEQ for silver was 35 at RISED9, which is also an area identified for remediation. Chemical concentrations were much lower at all other sample locations, as reflected by the lower EEQs (see Table 1). In fact, EEQs remained below 14 for all chemicals occurring at sample locations not identified for remediation (i.e., RISED4, RISED6, RISED7, and RISED8).

Adherence to an EEQ of 10 as a basis for developing cleanup levels would require dredging of nearly the entire length of the western South Run tributary, disturbing the existing drainage basin and aquatic community throughout the tributary. As discussed above, however, chemical concentrations are markedly higher at the sample locations already identified for remediation as compared to other sample locations, where many of the detected concentrations result in EEQs just above 10. Accordingly, the remediation goal used to develop cleanup levels was increased from an EEQ of 10 to an EEQ of 15. Increasing the remediation goal from an EEQ of 10 to an EEQ of 15 still triggers remediation at areas determined to have the greatest potential to adversely affect ecological receptors based on chemical data. However, increasing the

---

\(^1\) The EEQ is the ratio of the estimated exposure concentration/dose for chemical of concern and the toxicity reference value (TRV) for aquatic life.
remediation goal reduces the overall area needing remediation, thus decreasing the disturbance of the habitat in this drainage. A summary of cleanup levels based on an EEQ of 15 is presented in Table 2.

Additional investigation using sediment bioassays will be conducted in the portion of the western South Run tributary not identified for remediation (i.e., RISED4, RISED6, RISED7 and RISED8). The objective of the sediment bioassays will be to ensure that the established cleanup levels are protective of aquatic life. Bioassays provide a direct measure of the toxicity of chemicals in sediment, accounting for the synergistic/antagonistic effects of complex chemical mixtures and the influence of physical/chemical variables in the environment. Bioassay results and corresponding chemical data will be considered together using a weight-of-evidence approach as defined by Chapman (1990) to evaluate the overall potential for adverse effects to benthic organisms. Revision of the cleanup levels established herein will be considered if the bioassay and chemical results suggest the potential for adverse effects to aquatic life in any area not currently identified for remediation.

References


Table 1
Environmental Effects Quotients (EEQs) for COPCs in Western South Run Tributary Sediment (a)

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Sediment TRV</th>
<th>RISED1</th>
<th>RISED2</th>
<th>RISED3</th>
<th>RISED4</th>
<th>RISED5</th>
<th>RISED6</th>
<th>RISED7</th>
<th>RISED8</th>
<th>RISED9</th>
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<tr>
<td>2-Methylnaphthalene</td>
<td>0.07 (c)</td>
<td>19</td>
<td>—</td>
<td>15</td>
<td>—</td>
<td>7.3</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
<td>Aldrin</td>
<td>0.002 (d)</td>
<td>22</td>
<td>3.3</td>
<td>4.3</td>
<td>—</td>
<td>5.6</td>
<td>—</td>
<td>2.1</td>
<td>—</td>
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<tr>
<td>alpha-Chlordane</td>
<td>0.007 (d,e)</td>
<td>229</td>
<td>7.7</td>
<td>—</td>
<td>—</td>
<td>13</td>
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<td>—</td>
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<tr>
<td>gamma-Chlordane</td>
<td>0.007 (d,e)</td>
<td>300</td>
<td>5.6</td>
<td>—</td>
<td>—</td>
<td>14</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
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<td>3071</td>
<td>118</td>
<td>53</td>
<td>6.4</td>
<td>179</td>
<td>12</td>
<td>5.7</td>
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<td>6.4</td>
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<tr>
<td>4,4'-DDD</td>
<td>0.008 (d)</td>
<td>13</td>
<td>—</td>
<td>—</td>
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<td>4,4'-DDE</td>
<td>0.005 (d)</td>
<td>16</td>
<td>1.7</td>
<td>1.7</td>
<td>0.9</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
<td>4,4'-DDT</td>
<td>0.001 (c)</td>
<td>89</td>
<td>—</td>
<td>—</td>
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<td>—</td>
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<td>Dieldrin</td>
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<td>3.1</td>
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<tr>
<td>Endrin</td>
<td>0.003 (d)</td>
<td>223</td>
<td>—</td>
<td>—</td>
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<tr>
<td>Heptachlor</td>
<td>0.0003 (d)</td>
<td>60</td>
<td>—</td>
<td>—</td>
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<td>—</td>
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<tr>
<td>Chromium</td>
<td>26 (d)</td>
<td>17</td>
<td>0.8</td>
<td>4.2</td>
<td>0.8</td>
<td>11</td>
<td>2.3</td>
<td>1.5</td>
<td>1.7</td>
<td>0.9</td>
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<tr>
<td>Copper</td>
<td>16 (d)</td>
<td>13</td>
<td>2.8</td>
<td>2.2</td>
<td>0.9</td>
<td>33</td>
<td>2.4</td>
<td>1.4</td>
<td>1.6</td>
<td>1.2</td>
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<tr>
<td>Lead</td>
<td>31 (d)</td>
<td>24</td>
<td>10</td>
<td>1.8</td>
<td>0.5</td>
<td>4.2</td>
<td>0.6</td>
<td>0.5</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>silver</td>
<td>1 (c)</td>
<td>57</td>
<td>—</td>
<td>10</td>
<td>13</td>
<td>—</td>
<td>11</td>
<td>6.1</td>
<td>6.5</td>
<td>35</td>
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</tbody>
</table>

--- = Chemical not detected at this sampling location.

COPC - Chemical of Potential Concern
EEQ - Environmental Effects Quotient
TRV - Toxicity Reference Value

(a) EEQs greater than 10 are indicated with boldface type.
(b) Chemicals listed have EEQs of 10 or greater at one or more sample locations.
(c) Effects range-low (ER-L) from Long et al. (1995) or Long and Morgan (1990).
(d) Value represents lowest effect level from Persaud et al. (1993).
(e) Value for chlordane.
### Table 2
Cleanup Levels for Chemicals in Sediment

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Cleanup Levels (mg/kg)</th>
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<tbody>
<tr>
<td>2-Methylnaphthalene</td>
<td>1.05</td>
</tr>
<tr>
<td>Aldrin</td>
<td>0.03</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td>0.105</td>
</tr>
<tr>
<td>gamma-Chlordane</td>
<td>0.105</td>
</tr>
<tr>
<td>Chlordane</td>
<td>0.105</td>
</tr>
<tr>
<td>4,4’-DDE</td>
<td>0.075</td>
</tr>
<tr>
<td>4,4’-DDT</td>
<td>0.015</td>
</tr>
<tr>
<td>Endrin</td>
<td>0.045</td>
</tr>
<tr>
<td>Heptachlor</td>
<td>0.005 (a)</td>
</tr>
<tr>
<td>Chromium</td>
<td>390</td>
</tr>
<tr>
<td>Copper</td>
<td>240</td>
</tr>
<tr>
<td>Lead</td>
<td>465</td>
</tr>
<tr>
<td>Silver</td>
<td>15</td>
</tr>
</tbody>
</table>

(a) The cleanup level listed is the Practical Quantitation Limit (PQL) for the contract laboratory which is slightly higher than the calculated cleanup level of 0.0045 mg/kg.
ATTACHMENT 3

PUBLIC NOTICE
The United States Army
at Vint Hill Farms Station, Virginia

Invites Public Comment
ON A PROPOSED ENVIRONMENTAL CLEANUP
Concerning
Western South Run Tributary

Please Come To Our
○ PUBLIC MEETING ○
Thursday, February 5, 1998 ○ 7:00 p.m.*
○ Warrenton Middle School Auditorium ○
244 Waterloo Street ○ Warrenton, VA
(*Sign Language interpreter will be present)

PURPOSE: TO DISCUSS AND PRESENT THE REMEDIAL ALTERNATIVES FOR
THE WESTERN SOUTH RUN TRIBUTARY.

The U.S. Army, in consultation with the U.S. Environmental Protection Agency
(USEPA) Region III and the Virginia, Department of Environmental Quality (VDEQ),
invites public comment on its Proposed Plan for remediating contaminated sediment
in the western, South Run tributary on Vint Hill Farms Station (VHFS), Virginia. Before
selecting a final remedy, VHFS will consider all written and oral comments received
during on public comment period.

The U.S. Army will be accepting comments during a
30-day PUBLIC COMMENT PERIOD which
begins Thursday, January 27, 1998 and ends Friday, February 20, 1998

WRITTEN COMMENTS MAY BE SUBMITTED TO THE FOLLOWING ADDRESS:
Kevin Bell, Public Affairs Officer
Public Affairs Office (Bldg. 2500)
Vint Hill Farms Station
Warrenton, VA 20187-5001

BACKGROUND
VHFS is part of the U.S. Army Communications - Electronics Command (CECOM)
and, while active, primarily functioned as an Army installation engaged in
communications intelligence. VHFS is located approximately 40 miles southwest of
Washington, D.C., in Fauquier County, Virginia. The installation occupies
approximately 701 acres of land in the town of Warrenton, Virginia. Approximately 150
acres of the installation are on improved grounds in the southern portions of the
property, used for industrial operations, administration buildings, and residential
housing. Approximately 94 acres on the eastern portion of the property are mature
hardwood forest, and the majority of the remaining 457 unimproved and
semi-improved acres in the northern portion of the property are used for stationary
and mobile antenna operation sites. The facility was designated for closure in March, 1993,
under the Base Realignment and Closure (BRAC) Act.

PROPOSAL
VHFS evaluated two remedial alternatives to address sediment contamination in the
western South Run tributary.

ALTERNATIVE 1: No Action; and
ALTERNATIVE 2: Sediment Removal.

Based on available information, VHFS prefers Alternative 2 which includes dredging
and off-site disposal of contaminated sediment from the western South Run tributary. This remedial alternative is a permanent solution that offers long-term effectiveness
since the contaminated sediment is removed to cleanup levels and transported off site
for proper disposal. Since the amount of sediment requiring remediation is relatively
small (approximately 280 cubic yards), it was not practical to consider active treatment
or containment options in terms of cost-effectiveness and implementability. The
dredging and disposal of contaminated sediment would be done in accordance with
federal and Commonwealth of Virginia solid and hazardous waste regulations.

FOR MORE INFORMATION
You can review the Proposed Plan and related technical documents at the
Information Repository at the following location:
Fauquier County Library
Warrenton Branch - Reference Section
11 Winchester Street
Warrenton, VA 22186
Hours: M-W 10 a.m. - 9 p.m. and Th-Sat 9 a.m. - 5 p.m. and
Sun: 1 p.m. - 5 p.m.
Phone: (540)347-8750
ATTACHMENT 4
WRITTEN COMMENTS FROM PUBLIC AND U.S. ARMY RESPONSES
Vint Hill Farms Station
PROPOSED REMEDIAL ACTION PLAN
Public Comment Period
January 22, 1998 - February 20, 1998

We invite you to send in your comments or questions regarding the Vint Hill Farms Station Proposed Remedial Action Plan for western South Run tributary. The complete document is available at the library listed below.

Name: OREN BL ODN
Address: 29 FAIRFAX ST.
City: WARRENTON State: VA Zip: 20186
Phone: 540-341-0332

Comments/Questions: I think the Army is doing an excellent job in identifying potential environmental contamination in the PhedT area. The studies along western South Run tributary are indicative of that thoroughness.
I support the proposed remediation actions.

Thank you for your time and opinions.

Please fold this self-mailer and staple or tape it together and return it to the address on back.

Vint Hill Farms Station Information Repository
Fauquier County Library, Warrenton Branch - Reference Section
11 Winchester Street, Warrenton, VA (540) 347-8750
Mon. - Wed.: 10 a.m. to 9 p.m., Thur. - Sat.: 9 a.m. to 5 p.m., Sun. 1 p.m. to 5 p.m.
Mr. and Mrs. Ross:

In response to your questions regarding the proposed environmental cleanup of the Western South Run Tributary, please see the enclosed attachment. I hope my comments adequately address your concerns. Thank you for your interest in Vint Hill Farms Station and I hope to see you at next week's public meeting.

Sincerely,

Kevin Bell
Public Affairs Officer
## USA VINT HILL FARMS STATION

### Site Information:

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<tr>
<td>EPA ID</td>
<td>VA8210020931</td>
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<td>EPA Region</td>
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### Site Alias Name(s):

VINT HILL FARMS STATION

### Record of Decision (ROD):

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**Media:** Soil

**Contaminant:** Dioxins/Dibenzofurans, Metals, Pesticides, Petroleum Hydrocarbon

### Abstract:

The Vint Hill Farms Station (VHFS) is located approximately 40 miles southwest of Washington, DC, in Fauquier County, Virginia. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites. Land use in the immediate vicinity of VHFS consists mainly of agriculture (mostly horse farms) and residential areas. With the exception of a few residences to the north, the majority of residential development is located to the south of VHFS. A small county recreational park is located adjacent to VHFS along South Run.

VHFS is part of the U.S. Army Communications-Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence. VHFS was designated for closure in March 1993, under the Base
Realignment and Closure (BRAC) Act. Pursuant to decision to close the installation, and Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May 1994, respectively. The ENPA identified 42 areas requiring environmental evaluation (AREEs) from the review of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation. These 27 AREEs were investigated from September 1994, to June 1995, as part of the Site Inspection (SI) conducted by SAIC. The final SI Report, which was completed in June 1996, identified 24 AREEs which required further investigation. In addition, four new AREEs were determined to warrant further investigation subsequent to the SI. AREEs that were determined to warrant further investigation were investigated as part of the Phase I and Phase II reuse areas Remedial Investigation (RI) and the supplemental RI conducted by ICF Kaiser Engineers, Inc. The final RI reports for the Phase I and Phase II reuse areas were completed in April 1998, and January 1999, respectively.

OU 3:

AREE 9, the Vehicle Maintenance Area, is an area used for general maintenance of military, government, and private vehicles. Small spills of oil, grease, gasoline, and cleaning solvents have been reported on the asphalt areas within the AREE. Neutralization pits (approximately 3 feet by 3 feet by 4 feet deep) which receive wastewater from the sinks within the Civilian Motor Pool (Building 288) and the Military Motor Pool (Building 290) are located outside each building. The Civilian Motor Pool neutralization pit has a cement bottom, and the Military Motor Pool neutralization pit has an earthen bottom.

AREE 11 is the Former Sewage Treatment Plant (STP). The former STP was active from 1948 to 1981, and was used to treat wastewaters from VHFS activities, including industrial wastewaters from photographic, painting, laboratory, vehicle washing, and metal etching operations. The sludges from the treatment process were dried on drying beds and stored in sludge piles.

AREE 19, the Pistol Range, has been used since 1961 for limited target practice using .22, .32, .38, and .45 caliber handguns. The firing fan is directed southward toward a horseshoe-shaped impact berm, which captures the bullets.
Remedy:
All contaminated soil exceeding the risk based cleanup levels would be excavated, transported offsite by truck, and disposed using a combination of offsite hazardous waste, construction debris, and/or municipal landfills or incinerators, as appropriate based on analytical results. Approximately 300 cubic yards of contaminated soil would be excavated as part of this alternative, followed by confirmation sampling to assure adequate removal of soil exceeding the cleanup levels. Upon completion of the removal actions, disturbed areas would be backfilled, regraded, and either vegetatively stabilized or paved. The five year review would not be conducted at this OU because all contaminated soil will not remain on site.

Alternative 2, Soil Removal, as the remedy for the contaminated soil at Areas Requiring Environmental Evaluation (AREEs) 9, 11, and 19. No action is the selected remedy for the soil at AREE 21 because the cleanup level is higher than the maximum detected contaminant concentration. Under the selected remedy for AREEs 9, 11, and 19, all contaminated soil exceeding the established cleanup levels would be excavated, transported off site by truck, and disposed using a combination of permitted off-site hazardous waste, construction debris, and/or municipal landfills, as appropriate based on analytical results. Less than 300 cubic yards of impacted soil would be excavated as part of this alternative, followed by confirmation sampling to assure adequate removal of all soil exceeding the cleanup levels. Upon completion of the soil excavation, disturbed areas would be backfilled, regraded, and either vegetatively stabilized or paved (AREE 9).

Estimated Capital Cost: $360,000
Estimated Annual O&M Costs: Not Provided
Estimated Present Worth Costs: Not Provided

The NCP and CERCLA require a no action alternative to be considered as a baseline for comparison to other alternatives. No action would be taken to address site contamination under this alternative. Each AREE would be reviewed at least once every 5 years to re-evaluate site conditions and to determine the need for remedial action to protect human health and the environment.

This alternative includes the excavation and disposal of all contaminated soil exceeding the established cleanup levels, using a combination of permitted off-site hazardous waste, construction debris and/or municipal landfills. Upon completion of the soil excavation, disturbed areas would be backfilled, regraded and either vegetatively stabilized or paved. The 5 year review does not apply to
this alternative.

Text: Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

USA VINT HILL FARMS STATION
EPA ID: VA8210020931
OU 03
WARRENTON, VA
07/01/1999
FINAL DECISION DOCUMENT AREEs 9, 11, 19, AND 21 VINT HILL FARMS STATION WARRENTON, VIRGINIA

Prepared for:
U.S. Army Communications-Electronics Command

Prepared by:
IT Corporation
Edgewood, Maryland

June 1999
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<tr>
<td>2.0 SITE BACKGROUND</td>
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<td>3.1 Site Topography</td>
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<tr>
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<td>9.0 EVALUATION OF ALTERNATIVES</td>
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</tr>
<tr>
<td>9.1 Overall Protection of Human Health and the Environment</td>
<td>16</td>
</tr>
<tr>
<td>9.2 Compliance with ARARs</td>
<td>16</td>
</tr>
<tr>
<td>9.3 Long-term Effectiveness and Permanence</td>
<td>17</td>
</tr>
<tr>
<td>9.4 Reduction of Toxicity, Mobility, or Volume Through Treatment</td>
<td>17</td>
</tr>
<tr>
<td>9.5 Short-term Effectiveness</td>
<td>17</td>
</tr>
<tr>
<td>9.6 Implementability</td>
<td>17</td>
</tr>
<tr>
<td>9.7 Cost</td>
<td>17</td>
</tr>
<tr>
<td>9.8 Regulator Acceptance</td>
<td>17</td>
</tr>
<tr>
<td>9.9 Community Acceptance</td>
<td>18</td>
</tr>
<tr>
<td>10.0 SELECTED REMEDY AND STATUTORY DETERMINATIONS</td>
<td>18</td>
</tr>
<tr>
<td>10.1 Selected Remedy</td>
<td>18</td>
</tr>
<tr>
<td>10.2 Statutory Determinations</td>
<td>18</td>
</tr>
<tr>
<td>10.2.1 Protection of Human Health and the Environment</td>
<td>18</td>
</tr>
<tr>
<td>10.2.2 Compliance with ARARs</td>
<td>19</td>
</tr>
<tr>
<td>10.2.3 Cost-Effectiveness</td>
<td>19</td>
</tr>
<tr>
<td>10.2.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable</td>
<td>19</td>
</tr>
<tr>
<td>10.2.5 Preference for Treatment as a Principal Element</td>
<td>19</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>11.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION</td>
<td>19</td>
</tr>
<tr>
<td>12.0 RESPONSIVENESS SUMMARY</td>
<td>20</td>
</tr>
<tr>
<td>12.1 Selected Newspaper Notices</td>
<td>20</td>
</tr>
<tr>
<td>12.2 Comments Raised During the Public Meeting on September 18, 1997</td>
<td>20</td>
</tr>
<tr>
<td>12.3 Public Meeting Attendance Roster</td>
<td>21</td>
</tr>
<tr>
<td>12.4 Restoration Advisory Board Members</td>
<td>21</td>
</tr>
<tr>
<td>13.0 REFERENCES</td>
<td>22</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Location of VHFS</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>General Locations of AREEs at VHFS</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>SI and RI Sampling Locations for AREE 9 - Vehicle Maintenance Area</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>SI and RI Sampling Locations for AREE 11 - Former Sewage Treatment Plant</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>SI and RI Sampling Locations for AREE 19 - Pistol Range</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>SI and RI Sampling Locations for AREE 21 - Sand Filter Beds</td>
<td>10</td>
</tr>
</tbody>
</table>

LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cleanup Levels Established for Soils at the Four AREES</td>
<td>15</td>
</tr>
</tbody>
</table>

LIST OF ATTACHMENTS

<table>
<thead>
<tr>
<th>Attachment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Proposed Plan</td>
</tr>
<tr>
<td>2</td>
<td>Cleanup Level Development Documents</td>
</tr>
<tr>
<td>3</td>
<td>Public Notice</td>
</tr>
</tbody>
</table>
**ABBREVIATIONS AND ACRONYMS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARAR</td>
<td>applicable or relevant and appropriate requirement</td>
</tr>
<tr>
<td>AREE</td>
<td>Area Requiring Environmental Evaluation</td>
</tr>
<tr>
<td>bgs</td>
<td>below ground surface</td>
</tr>
<tr>
<td>BRA</td>
<td>Baseline Risk Assessment</td>
</tr>
<tr>
<td>BRAC</td>
<td>Base Realignment and Closure</td>
</tr>
<tr>
<td>CECOM</td>
<td>Communications-Electronics Command</td>
</tr>
<tr>
<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation, and Liability Act</td>
</tr>
<tr>
<td>CERFA</td>
<td>Community Environmental Response Facilitation Act</td>
</tr>
<tr>
<td>DD</td>
<td>Decision Document</td>
</tr>
<tr>
<td>EEQ</td>
<td>environmental effects quotient</td>
</tr>
<tr>
<td>ENPA</td>
<td>Enhanced Preliminary Assessment</td>
</tr>
<tr>
<td>ERA</td>
<td>Ecological Risk Assessment</td>
</tr>
<tr>
<td>FS</td>
<td>Feasibility Study</td>
</tr>
<tr>
<td>ft</td>
<td>feet</td>
</tr>
<tr>
<td>HHRA</td>
<td>Human Health Risk Assessment</td>
</tr>
<tr>
<td>HI</td>
<td>Hazard Index</td>
</tr>
<tr>
<td>HQ</td>
<td>Hazard Quotient</td>
</tr>
<tr>
<td>ICF KE</td>
<td>ICF Kaiser Engineers, Inc.</td>
</tr>
<tr>
<td>IEUBK</td>
<td>Integrated Exposure Uptake Biokinetic</td>
</tr>
<tr>
<td>MSL</td>
<td>mean sea level</td>
</tr>
<tr>
<td>NCP</td>
<td>National Oil and Hazardous Substances Pollution Contingency Plan</td>
</tr>
<tr>
<td>PAH</td>
<td>polynuclear aromatic hydrocarbon</td>
</tr>
<tr>
<td>ppm</td>
<td>parts per million</td>
</tr>
<tr>
<td>RBC</td>
<td>risk-based concentration</td>
</tr>
<tr>
<td>RI</td>
<td>Remedial Investigation</td>
</tr>
<tr>
<td>SAIC</td>
<td>Science Applications International Corporation</td>
</tr>
<tr>
<td>SARA</td>
<td>Superfund Amendments and Reauthorization Act</td>
</tr>
<tr>
<td>SI</td>
<td>Site Inspection</td>
</tr>
<tr>
<td>STP</td>
<td>sewage treatment plant</td>
</tr>
<tr>
<td>TPH</td>
<td>total petroleum hydrocarbon</td>
</tr>
<tr>
<td>TRV</td>
<td>toxicity reference value</td>
</tr>
<tr>
<td>USAEC</td>
<td>U.S. Army Environmental Center</td>
</tr>
<tr>
<td>USEPA</td>
<td>U.S. Environmental Protection Agency</td>
</tr>
<tr>
<td>UST</td>
<td>underground storage tank</td>
</tr>
<tr>
<td>VAC</td>
<td>Virginia Administrative Code</td>
</tr>
<tr>
<td>VDEQ</td>
<td>Virginia Department of Environmental Quality</td>
</tr>
<tr>
<td>VHFS</td>
<td>Vint Hill Farms Station</td>
</tr>
</tbody>
</table>
DECLARATION FOR THE DECISION DOCUMENT
REMEDIAL ALTERNATIVE SELECTION

Site Name and Location

Areas Requiring Environmental Evaluation (AREEs) 9, 11, 19, and 21
Vint Hill Farms Station
Warrenton, Virginia

Statement of Basis and Purpose

This Decision Document (DD) presents a determination that no action is necessary to protect human health and the environment for soil at AREE 21. In addition, this DD presents the selected remedial action for soil at AREEs 9, 11, and 19 at Vint Hill Farms Station (VHFS), Warrenton, Virginia, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This document was prepared as a joint effort between the U.S. Army, the Virginia Department of Environmental Quality (VDEQ), and the U.S. Environmental Protection Agency (USEPA). The no action and remedial action decisions are based on documents contained in the Information Repository.

Assessment of the AREEs

Actual or threatened releases of hazardous substances from AREEs 9, 11, and 19, if not addressed by implementing the remedial action selected in this DD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The selected remedial action addresses the principal threat at AREEs 9, 11, and 19 by the excavation of contaminated soil and off-site disposal at a permitted facility. No action is the selected remedy for AREE 21 since the established soil cleanup level is higher than the maximum detected contaminant concentration.

Statutory Determinations

The selected remedy (i.e., no action for AREE 21; and remedial action for AREEs 9, 11, and 19) is protective of human health and the environment, complies with Federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for AREEs 9, 11, and 19. However, because treatment of the principal threat at AREEs 9, 11, and 19 was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. A five-year review will not be necessary for AREEs 9, 11, 19, and 21 since the selected remedy will result in levels of contamination at or below risk-based cleanup levels.

ROBERT L. NABORS
Major General, USA
Commanding
U.S. Army Communications-Electronics Command

7/1/99
Date
DECISION SUMMARY

1.0 INTRODUCTION

The remedial action decision is based on the Phase I Reuse Area Remedial Investigation (RI) Report (USAEC, 1998) which includes a Baseline Risk Assessment (BRA) documenting the risks from contamination in the soils at Areas Requiring Environmental Evaluation (AREEs) 9, 11, 19, and 21. In the BRA, it was determined that the soils at AREEs 11, 19, and 21 pose unacceptable risks to human health and/or the environment. In addition, total petroleum hydrocarbon (TPH) concentrations in soil at AREE 9 exceed the Virginia TPH soil action level for underground storage tanks (USTs). Therefore, the soils at AREEs 9, 11, and 19 require remedial action to be protective of human health and the environment. However, upon establishing cleanup levels, it was determined that no action is necessary to protect human health and the environment for soil at AREE 21 because the cleanup level is higher than the maximum detected contaminant concentration.

A feasibility study (FS), which develops and examines remedial action alternatives for a site, was performed for AREEs 9, 11, and 19 and presented in the Proposed Plan (see Attachment 1).

2.0 SITE BACKGROUND

Vint Hill Farms Station (VHFS) is part of the U.S. Army Communications - Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence. VHFS is located approximately 40 miles southwest of Washington, D.C., in Fauquier County, Virginia, as shown on Figure 1. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites.

VHFS was designated for closure in March, 1993, under the Base Realignment and Closure (BRAC) Act. Pursuant to the decision to close the installation, an Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May, 1994, respectively. The ENPA identified 42 AREEs from the review of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation.

These 27 AREEs were investigated from September, 1994, to June, 1995, as part of the Site Inspection (SI) conducted by SAIC. The objective of the SI was to determine the presence or absence of contamination and the chemical nature of any detected contamination. The final SI Report (USAEC, 1996), which was completed in June, 1996, identified 24 AREEs which required further investigation. In addition, four new AREEs were identified during site reconnaissance to warrant further investigation subsequent to the SI. AREEs that were determined to warrant further investigation and are located in the Phase I reuse area (shown on Figure 2) were investigated between April and June, 1996, as part of the Phase I reuse area RI conducted by ICF Kaiser Engineers, Inc. (ICF KE). The purposes of the RI were to evaluate: 1) the nature and extent of contamination; and 2) the level of risk posed to human health and the environment. The final RI Report for the Phase I reuse area (USAEC, 1998) was completed in April, 1998.

Four AREEs were identified in the RI as having soil contamination which poses unacceptable human health risks and/or significant adverse ecological effects:
FIGURE 1
GENERAL LOCATION OF VHFS
• AREE 9 - Vehicle Maintenance Area;
• AREE 11 - Former Sewage Treatment Plant;
• AREE 19 - Pistol Range; and
• AREE 21 - Sand Filter beds.

The locations of these AREEs are shown on Figure 2.

3.0 SITE CHARACTERISTICS

3.1 Site Topography

VHFS is located within the Piedmont Plateau physiographic province, approximately 20 miles west of the Fall Line. The Fall Line is a physiographic boundary that separates the folded and faulted crystalline rocks of the Piedmont Plateau physiographic province from the unconsolidated sediments of the Atlantic Coastal Plain physiographic province. The topography of the Piedmont Plateau in the vicinity of VHFS consists of gently rolling hills with slopes generally less than 10%. Surface elevations on the installation vary from 335 to 430 feet (ft) above mean sea level (MSL).

3.2 Adjacent Land Use

Land use in the immediate vicinity of VHFS consists mainly of agriculture (mostly horse farms) and residential areas. With the exception of a few residences to the north, the majority of residential development is located to the south of VHFS. A small county recreation park is located adjacent to VHFS along South Run.

3.3 Surface Water Hydrology

VHFS is located in the Occoquan watershed. Most of VHFS drains to South Run via intermittent tributaries and drainage ditches, as shown on Figure 2. South Run is a small Class III Virginia stream which discharges into Lake Manassas, a recreation and drinking water reservoir built on Broad Run for the City of Manassas. Lake Manassas discharges to Broad Run, which drains to the Occoquan Reservoir. Drainage for the southern portion of the installation flows south and east to Kettle Run. Kettle Run converges with Broad Run approximately 10 miles downstream from Lake Manassas.

3.4 Geology/Hydrogeology

The central portion of VHFS is underlain by folded sedimentary rocks of the Catharpin Creek Member which consists of sandstone, arkosic sandstone, siltstone, shale, and claystone. Intrusions of basalt, oriented northeast to southwest, cut the bedrock in the central and western portions of the VHFS installation. The northeastern flank of VHFS is underlain by intrusions of diabase. Quaternary alluvium is present along the major drainage channels within the installation.

The overburden, is thickest (20-40 ft) in the southern regions of the site and thins to 0-10 ft in the northern areas. The overburden consists primarily of saprolite (a chemical and physical weathering product of the underlying bedrock) which underlies lesser amounts of clayey and silty soils.

Groundwater at VHFS occurs in fractured bedrock and to a lesser extent in the overburden. The bedrock aquifer is semi-confined, with the unfractured bedrock and saprolite acting as confining units. Recharge to the fractured bedrock aquifer occurs at outcrop areas and from percolation from the overburden along fractures. In the overburden, the aquifer is unconfined.
4.0 SITE HISTORY AND INVESTIGATION FINDINGS

The RI for these four AREEs was conducted to evaluate the nature and extent of contamination associated with past site activities. Environmental samples collected and analyzed during the RI were used in conjunction with the results from the SI to assess the condition of each of the AREEs. The environmental media investigated included surface soil (0 to 2 ft below ground surface [bgs]), subsurface soil (2 ft to approximately 12 ft bgs), surface water, sediment, and groundwater. Analytical results were compared to background concentrations and regulatory screening levels to determine if environmental media had been adversely impacted by site activities. A brief description of each of the four AREEs and the significant findings of the RI and SI are presented in the following paragraphs. A detailed presentation of the samples collected and the analytical results can be found in the Phase I Reuse Area RI Report (USAEC, 1998), available in the Information Repository.

4.1 AREE 9 - Vehicle Maintenance Area

AREE 9 is an area used for general maintenance of military, government, and private vehicles. Small spills of oil, grease, gasoline, and cleaning solvents have been reported on the asphalt areas within the AREE. Neutralization pits (approximately 3 ft x 3 ft x 4 ft deep) which receive wastewater from the sinks within the Civilian Motor Pool (Building 288) and the Military Motor Pool (Building 290) are located outside each building. The Civilian Motor Pool neutralization pit has a cement bottom, and the Military Motor Pool neutralization pit has an earthen bottom.

Surface soil, subsurface soil, sediment, surface water, and groundwater samples were collected at AREE 9 as shown on Figure 3. TPH contamination, exceeding the Virginia TPH soil action level for USTs of 100 parts per million (ppm), is present in subsurface soil beneath the Military Motor Pool neutralization pit (which has an earthen bottom). The highest TPH concentration (8,440 ppm) was detected at the base of the neutralization pit. The TPH contamination extends to bedrock at approximately 8.5 ft bgs, and decreases with depth.

4.2 AREE 11 - Former Sewage Treatment Plant

AREE 11 is the site of the former Sewage Treatment Plant (STP). The former STP was active from 1948 to 1981, and was used to treat wastewaters from VHFS activities, including industrial wastewaters from photographic, painting, laboratory, vehicle washing, and metal etching operations. The sludges from the treatment process were dried on drying beds and stored in sludge piles. The locations of these areas are shown on Figure 4.

Shallow and deep surface soil samples were collected in the vicinity of the drying beds and sludge piles. Groundwater samples were collected downgradient of these areas. Polynuclear aromatic hydrocarbon (PAH) contamination, exceeding residential soil Risk-based Concentrations (RBCs) established by the U.S. Environmental Protection Agency (USEPA) Region III for screening of analytical results, is present in the surface soil in the drying bed area and the sludge pile area. Pesticide contamination, exceeding residential soil RBCs, is present in the surface soil in the drying bed area and the sludge pile area. Mercury contamination, exceeding the residential soil RBC, is present in the surface soil in the sludge pile area.

4.3 AREE 19 - Pistol Range

AREE 19, the Pistol Range, has been in use since 1961 for limited target practice using .22, .32, .38, and .45 caliber handguns. The firing fan is directed southward toward a horseshoe-shaped impact berm, which captures the bullets. The layout of the Pistol Range is shown on Figure 5. Spent ammunition was not recovered, but shelf casings were collected and returned to the fixed ammunition magazine.
NOTE: R1 SURFACE SOIL SAMPLES (RNS11-1 THROUGH RISS11-9) ARE CO-LOCATED WITH THE R1 SOIL BORING LOCATION (RISS11-1 THROUGH RISS11-9). NOTE: A SUBSURFACE SOIL SAMPLE WAS NOT COLLECTED AT RISS11-10 DUE TO REFUSAL AT 0.5' BGS.

LEGEND:
- BUILDING
- FENCE
- ROAD
- STREAM
- TOPOGRAPHIC CONTOUR (FT MSL)
- R1 SURFACE SOIL SAMPLE LOCATION
- R1 SOIL BORING LOCATION
- GROUNDWATER MONITORING WELL
- IMPACTED SOIL AREA (APPROXIMATE)

FIGURE 4
SI AND RI SAMPLING LOCATIONS FOR AREE 11 - FORMER SEWAGE TREATMENT PLANT
SI AND RI SAMPLING LOCATIONS FOR AREE 19
PISTOL RANGE

NOTE: RI SURFACE SOIL SAMPLES (RISS19-1, 2, 3, 5, AND 6) ARE CO-LOCATED WITH THE RI SOIL BORING LOCATIONS (RISS19-1, 2, 3, 5, AND 6).
Surface soil, subsurface soil, and sediment samples were collected from the impact berm and surrounding area. Lead contamination, exceeding USEPA’s screening level of 400 ppm for lead in soil for residential use, is confined to the surface soil of the impact berm. The highest concentrations of lead (up to 5,850 ppm) were detected within the first six inches of the impact berm. Lead concentrations in the samples collected deeper into the impact berm were generally one to two orders of magnitude lower than those at the surface and were all less than 400 ppm.

4.4 AREE 21 - Sand Filter Beds

The Sand Filter Beds (AREE 21) were used to filter ash wastewaters from the wet scrubber, which was used for particulate control in the installation incinerator smokestack. The two beds, constructed with concrete walls and an unlined bottom, utilized coarse sand and filter gravel to filter particulates from the wastewater. An underdrain system in the gravel drained the effluent to a distribution box. The effluent then discharged through a perforated pipe to an absorption field north of the Sand Filter Beds.

Surface soil samples were collected from the Sand Filter Beds and along the absorption field. Groundwater samples were collected in the vicinity and downgradient of the Sand Filter Beds and absorption field as shown on Figure 6. Dioxin/furan contamination, exceeding residential soil RBCs, is present in surface soil near the Sand Filter Beds and along the absorption field.

5.0 SUMMARY OF SITE RISKS

A BRA was conducted as part of the RI to assess the human health and ecological problems that could result if the contamination at the AREEs was not remediated. The Human Health Risk Assessment (HHRA) was prepared to evaluate the magnitude of potential adverse effects on human health associated with current industrial/commercial and potential future residential exposures to site-related chemicals at the AREEs. The Ecological Risk Assessment (ERA) was conducted to characterize the potential threats to ecological receptors posed by contaminants at the AREEs.

The HHRA follows a four-step process:

- **Selection of Chemicals of Potential Concern** - identifies the contaminants of potential concern based on their toxicity, frequency of occurrence, and concentration by comparing the maximum concentrations of detected chemicals with RBCs which are health-protective chemical concentrations that are back-calculated using toxicity criteria, a $1 \times 10^{-6}$ target carcinogenic risk or a 0.1 hazard quotient (HQ, defined below), and conservative exposure parameters;

- **Exposure Assessment** - identifies the potential pathways of exposure, and estimates the concentrations of contaminants to which people may be exposed as well as the frequency and duration of these exposures;

- **Toxicity Assessment** - determines the toxic effects of the contaminants; and

- **Risk Characterization** - provides a quantitative assessment of the overall current and future risk to people from site contaminants based on the exposure and toxicity information.

The HHRA evaluated health effects which could result from exposure to soil, groundwater, surface water, and sediment contamination in the Phase I reuse area of VHFS. The HHRA evaluated potential risks to current workers who could be exposed to contaminants in surface soil, and to current trespassers who could be exposed to contamination in surface soil, surface water, and sediment. In addition, the HHRA evaluated potential risks to hypothetical future adult residents who could be exposed to contaminants in groundwater and surface soil and to hypothetical future child residents who could be exposed to contaminants in groundwater,
surface soil, surface water, and sediment. Potential risks to future excavation workers who could be exposed to contaminants in subsurface soil were also evaluated in the HHRA. Subsurface soil was only evaluated for excavation workers and not residents since residents would be unlikely to be exposed to subsurface soil. In addition, the concentrations of contaminants currently present in subsurface soil would not be representative of the concentrations that might be present if landscaping activities were to occur which would involve mixing of subsurface soils with surface soil, clean topsoil, and other soil amendments. Therefore, it would not be appropriate to evaluate risks to residents using available subsurface soil data.

Potential carcinogenic (cancer-related) effects and noncarcinogenic effects (including various impacts on different organ systems, such as lungs, liver, etc.) were evaluated in the HHRA. Carcinogenic effects are expressed as the probability that an individual will develop cancer from exposure to the contaminants from each AREE. The evaluation of noncarcinogenic effects is based on the hazard index (HI), which is the summation of the HQs for individual chemicals. The HQ is a comparison of chemical-specific chronic exposure doses with the corresponding protective doses derived from health criteria. The USEPA recommends that remedial actions may be warranted at sites where the carcinogenic risk to any person is greater than $1 \times 10^{-4}$ or the HI is greater than 1. A carcinogenic risk of $1 \times 10^{-4}$ means that there is a potential of one additional person in a population of 10,000 developing cancer from exposure to contaminants at an AREE if the AREE is not remediated. A HI greater than 1 indicates a potential for noncarcinogenic health effects if the AREE is not remediated.

The ERA also follows a four-step process:

- **Problem Formulation** - develops information that characterizes habitats and potentially exposed species and identifies contaminants of concern, exposure pathways, and receptors;
- **Exposure Assessment** - estimates exposure point concentrations for selected indicator species;
- **Ecotoxicologic Effects Assessment** - identifies concentrations or doses of contaminants that are protective of indicator species; and
- **Risk Characterization** - estimates potential adverse effects from exposure to contaminants based on exposure and toxicity information.

The ERA evaluated ecological effects which could result from exposure to surface soil, surface water, and sediment contamination in the Phase I reuse area of VHFS. The ERA evaluated potential adverse ecological effects to terrestrial plants and terrestrial invertebrates (represented by earthworms) exposed to contaminants in surface soil. In addition, potential adverse ecological effects to mammals (represented by shrews) and birds (represented by robins) through bioaccumulation in the food web and exposure to contaminants in surface soil were evaluated. Potential adverse ecological effects to aquatic life from exposure to contaminants in surface water and sediment were also evaluated in the ERA.

The evaluation of significant potential adverse ecological effects is based on the Environmental Effects Quotient (EEQ). The EEQ is the ratio of the estimated exposure concentrations/doses for the chemicals of potential concern and the toxicity reference values (TRVs) for the ecological receptors. If the EEQ is greater than 1, there is a potential for adverse ecological effects to occur. As the magnitude of the EEQ becomes greater than 1, the potential for adverse ecological effects becomes more significant.

The results of the BRA for the four AREEs are presented in the following paragraphs. A detailed presentation of the BRA can be found in the Phase I Reuse Area RI Report (USAEC, 1998), available in the Information Repository.
5.1 AREE 9 - Vehicle Maintenance Area

The BRA determined that site-related contamination at AREE 9 does not pose an unacceptable human health risk or significant potential adverse ecological effects under either current industrial/commercial or potential future residential land-use conditions. In fact, since all the chemicals of potential concern in surface soil identified for AREE 9 in the HHRA are naturally-occurring metals that were statistically determined to be within background concentrations, the estimated upper-bound excess lifetime cancer risks and noncarcinogenic risks for site-related contaminants are less than 1x10^-6 and a HI of 0.1, respectively. However, risks associated with exposures to TPH could not be assessed in the BRA because this analytical parameter represents a mixture of chemical constituents. Since TPH measurements give no indication of the chemical constituents present or their respective concentrations, they cannot be used to predict risks. Although risks associated with TPH cannot be estimated, TPH contamination in subsurface soil beneath the Military Motor Pool neutralization pit is recommended for remediation because TPH concentrations exceed the Virginia TPH soil action level for USTs. The impacted area is approximately 3 ft x 3 ft, extending from the base of the neutralization pit at 4 ft bgs to bedrock at 8.5 ft bgs.

5.2 AREE 11 - Former Sewage Treatment Plant

The HHRA concluded that, under current industrial/commercial land-use conditions, the risks to workers are unacceptable for exposure to site-related contaminants in surface soil at AREE 11. Under potential future residential land-use conditions, assuming that AREE 11 is not remediated, the risks to potential adult and child residents are also unacceptable for exposure to site-related contaminants in surface soil. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk is for adult residents exposed to site-related contaminants in surface soil by dermal contact; this risk is 3x10^-6 (i.e., three in 10,000 residents may develop cancer caused by contaminants in the AREE 11 surface soil). Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest noncarcinogenic risk is for child residents exposed to site-related contaminants in surface soil by incidental ingestion and dermal contact; the HI is estimated to be 10 for each of these routes of exposure. The organ systems impacted by noncarcinogenic contaminants at AREE 11 are the liver, kidney, blood, and gastrointestinal tract. The unacceptable human health risks result primarily from chlordane (a pesticide) and mercury. Although the concentrations of PAHs (specifically benzo[a]pyrene and dibenz[a,h]anthracene) at AREE 11 contribute to the unacceptable risks posed by incidental ingestion exposure to contaminants in surface soil, they do not drive the unacceptable risks. The highest estimated upper-bound excess lifetime cancer risk for a PAH is 7x10^-6 (seven in 1,000,000 people) for potential future child residents from incidental ingestion exposure to benzo(a)pyrene.

The ERA determined that contaminants in surface soil at AREE 11 pose significant potential adverse ecological effects. The significant potential adverse ecological effects result primarily from DDT (a pesticide), mercury, and silver. Mercury results in significant potential adverse ecological effects for terrestrial plants, terrestrial invertebrates, robins, and shrews, with the greatest potential adverse ecological effects occurring to robins (EEQ of 573). Silver and DDT result in significant potential, adverse ecological effects to terrestrial plants (EEQ of 60) and robins (EEQ of 51), respectively.

The most significant contamination is in the sludge pile area, which is recommended for remediation. The impacted area has dimensions of 45 ft in diameter and 0.5 ft deep, with contamination extending to 1.5 ft bgs In an isolated location near the center of the sludge pile area. The drying bed area, which has dimensions of 25 ft x 40 ft x 1.5 ft deep, is less contaminated. One isolated surface soil location in the drying bed area (sample location SS-11-004 as shown on Figure 4) is recommended for remediation.

5.3 AREE 19 - Pistol Range

The HHRA concluded that, under both current industrial/commercial and potential future residential land-use conditions, the risks to workers, trespassers, adult residents, and excavation workers are acceptable
for exposure to site-related contaminants in soil at AREE 19. However, the risks to potential future child residents are unacceptable for exposure to site-related contaminants in soil at AREE 19. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk ($3 \times 10^{-5}$) is for potential future child residents exposed to site-related contaminants in surface soil by incidental ingestion, while the highest noncarcinogenic risk (HI = 2) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion. The organ system impacted by the noncarcinogenic contaminants at AREE 19 is the vascular system. The unacceptable human health risks result primarily from antimony and arsenic which are found in conjunction with the lead contamination.

The human health risks associated with exposure to lead in surface soil at AREE 19 were evaluated using the Integrated Exposure Uptake Biokinetic (IEUBK) Model recommended by USEPA for evaluating lead exposures for young children in residential settings. The IEUBK Model calculates blood lead levels which result from exposures to lead which may then be compared to blood lead levels of toxicological significance for purposes of risk evaluation. The IEUBK Model run for AREE 19 predicted a geometric mean blood lead level of 9.6 µg/dL, with 42.7 percent of the population exceeding the level of concern (10µg/dL). The USEPA currently finds 5 percent of the population exceeding the level of concern as acceptable. Therefore, the IEUBK model results indicate that if AREE 19 was developed for residential use in the future, the lead concentrations in the surface soil may be a potential problem for young children.

The ERA determined that lead in surface soil at AREE 19 poses a significant potential adverse ecological effect for terrestrial plants (EEQ of 117).

The lead contamination in the impact berm surface soil is recommended for remediation. The approximate dimensions of the impacted area are 100 ft x 15 ft high x 2 ft deep.

**5.4 AREE 211 - Sand Filter Beds**

The HHRA concluded that, under both current industrial/commercial and potential future residential land-use conditions, the risks to workers, trespassers, residents, and excavation works are acceptable for exposure to site-related contaminants in surface soil at AREE 21. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk ($9 \times 10^{-6}$) is for adult residents exposed to site-related contaminants in surface soil by dermal absorption, and the highest noncarcinogenic risk (HI = 0.2) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion.

The ERA determined that contaminants in surface soil at AREE 21 pose significant potential adverse ecological effects. The significant potential adverse ecological effects result primarily from 2,3,7,8-TCDF (a furan). 2,3,7,8-TCDF results in significant potential adverse ecological effects for robins (EEQ of 38).

The primary-compound of concern, 2,3,7,8-TCDF, was detected in the absorption field area but not in the Sand Filter Beds themselves. Surface soil along the absorption field is recommended for possible remediation pending establishment of soil cleanup levels. The approximate dimensions of the impacted soil area are 375 ft x 3 ft x 3 ft deep.

**6.0 REMEDIAL ACTION OBJECTIVES**

Remedial action objectives are specific goals to protect human health and the environment. The remedial action objective for the four AREESs is to minimize the potential for contaminated soil to pose unacceptable risks to human or ecological receptors.
7.0 CLEANUP LEVELS ESTABLISHED FOR THE SELECTED ALTERNATIVE

USEPA has established soil cleanup levels for the contaminants that contribute to the unacceptable risk determination at each of the four AREEs. The soil cleanup levels are presented in Table 1. The soil cleanup level for AREE 9 is based on the Virginia TPH soil action level for USTs of 100 ppm. In general, USEPA established the soil cleanup levels for AREE 11 based on either a $1 \times 10^{-6}$ (one in 1,000,000 people) excess lifetime cancer risk for carcinogens or a hazard quotient of 1 for noncarcinogens, whichever was more stringent for the potential future residential use scenario. However, the soil cleanup levels for DDT, mercury, and silver at AREE 11 are based on concentrations which are protective of ecological receptors. The soil cleanup level for AREE 19 is based on a level recommended for the protection of ecological receptors by the U.S. Fish and Wildlife Service. The soil cleanup level for AREE 21 is based on concentrations which are protective of ecological receptors. The cleanup level for 2,3,7,8-TCDF ($1.12 \times 10^{-4}$ ppm) is higher than the maximum detected concentration at AREE 21 of $8.71 \times 10^{-6}$ ppm; therefore, no action is required at AREE 21.

8.0 SUMMARY OF REMEDIAL ALTERNATIVES

Two remedial alternatives were evaluated to address soil contamination at AREEs 9, 11, and 19. As discussed above, no action is required for AREE 21 because the cleanup level is higher than the maximum detected contaminant concentration. The range of remedial alternatives considered was limited by the nature and extent of the contamination. Since the amount of soil requiring remediation is relatively small (less than 300 cubic yards combined), it was not practical to consider active treatment or containment options in terms of cost effectiveness and implementability. The following remedial alternatives were evaluated:

- Alternative 1 - No Action; and
- Alternative 2 - Soil Removal.

8.1 Alternative 1 - No Action

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), require that a No Action alternative be considered as a baseline for comparison to other alternatives. No action would be taken to address site contamination under this alternative. In accordance with Section 121 of CERCA, each AREE would be reviewed at least once every five years to re-evaluate site conditions and to determine the need for remedial action to protect human health and the environment.

8.2 Alternative 2 - Soil Removal

Under this alternative, all contaminated soil exceeding the established cleanup levels would be excavated, transported off site by truck, and disposed using a combination of permitted off-site hazardous waste, construction debris, and/or municipal landfills, as appropriate based on analytical results. Less than 300 cubic yards of impacted soil would be excavated as part of this alternative, followed by confirmation sampling to assure adequate removal of all soil exceeding the cleanup levels. Upon completion of the soil excavation, disturbed areas would be backfilled, regraded, and either vegetatively stabilized or paved (AREE 9). The five year review does not apply to this alternative because hazardous substances above risk-based cleanup levels would not remain on site.

The soil cleanup levels for AREE 11 presented in the Proposed Plan (Attachment 1) were based on a $1 \times 10^{-6}$ (one in 100,000 people) excess lifetime cancer risk for carcinogens. The basis for the soil cleanup levels was made more stringent per the request of USEPA.
<table>
<thead>
<tr>
<th>Constituents</th>
<th>Cleanup Levels (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AREE 9 - VEHICLE MAINTENANCE AREA</strong></td>
<td></td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons</td>
<td>100 (a)</td>
</tr>
<tr>
<td><strong>AREE 11 - FORMER SEWAGE TREATMENT PLANT</strong></td>
<td></td>
</tr>
<tr>
<td>Aldrin (Human Health risk) (b)</td>
<td>0.038 (c)</td>
</tr>
<tr>
<td>Cadmium (Human Health risk) (b)</td>
<td>39 (c)</td>
</tr>
<tr>
<td>Chlordane (Human Health risk)</td>
<td>0.49 (c)</td>
</tr>
<tr>
<td>alpha-Chlordane (Human Health risk) (b)</td>
<td>0.49 (c)</td>
</tr>
<tr>
<td>gamma-Chlordane (Human Health risk) (b)</td>
<td>0.49 (c)</td>
</tr>
<tr>
<td>DDT (Ecological risk)</td>
<td>0.26 (d)</td>
</tr>
<tr>
<td>Mercury (Human Health &amp; Ecological risk)</td>
<td>0.29 (d)</td>
</tr>
<tr>
<td>Silver (Ecological risk)</td>
<td>20 (d)</td>
</tr>
<tr>
<td><strong>AREE 19 - PISTOL RANGE</strong></td>
<td></td>
</tr>
<tr>
<td>Lead (Human Health &amp; Ecological risk)</td>
<td>200 (e)</td>
</tr>
<tr>
<td><strong>AREE 21 - SAND FILTER BEDS</strong></td>
<td></td>
</tr>
<tr>
<td>2,3,7,8-TCDF (Ecological risk)</td>
<td>1.12x10^4 (d)</td>
</tr>
</tbody>
</table>

DDT, - Total concentration of DDD, DDE, and DDT

(a) Virginia total petroleum hydrocarbon soil action level for underground storage tanks.

(b) These compounds contribute to but do not drive unacceptable risk.

(c) Based on either a 1x10^6 upper-bound excess lifetime cancer risk for carcinogens or a hazard quotient of 1 for noncarcinogens, whichever is more stringent, for the potential future residential use scenario.

(d) Based on a concentration which is protective of ecological receptors (EEQ = 10).

(e) Cleanup level for lead in surface soil recommended by the U.S. Fish and Wildlife Service for the protection of ecological receptors.
9.0 EVALUATION OF ALTERNATIVES

CERLCA requires a comparison of the alternatives using nine evaluation criteria: overall protection of human health and the environment, compliance with applicable or relevant and appropriate requirements (ARARs); long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; cost; and regulator and community acceptance. The first two criteria are considered by USEPA to be threshold criteria which must be met by each alternative. The nine evaluation criteria are described below.

- **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with ARARs** addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and requirements or provides grounds for invoking a waiver.

- **Long-term effectiveness and permanence** refers to the ability of a remedy to maintain reliable protection of human health over time, once cleanup goals have been met.

- **Reduction of toxicity, mobility, or volume through treatment** is the anticipated performance of the treatment technologies a remedy may employ.

- **Short-term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

- **Implementability** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- **Cost** includes estimated capital and operation and maintenance costs, and net present worth costs.

- **Regulator acceptance** indicates whether, based on their review of the RI and Proposed Plan, the regulators (the Virginia Department of Environmental Quality [VDEQ] and USEPA) concur, oppose, or have no comment on the selected alternative.

- **Community acceptance** is assessed in the Responsiveness Summary which summarizes the public comments received on the RI and the Proposed Plan.

The comparative analysis of the alternatives was conducted based upon these evaluation criteria, and is described below.

9.1 Overall Protection of Human Health and the Environment

The no action alternative (Alternative 1) is not protective of human health or the environment because the risks to potential future residents and the potential adverse effects to ecological receptors remain unchanged, which is unacceptable. Therefore, the no action alternative was eliminated from further consideration and will not be discussed further.

Alternative 2 provides adequate protection of human health and the environment by removing contaminated soil, thereby eliminating the potential for exposure.
9.2 Compliance with ARARs

Alternative 2 has been designed to achieve or comply with ARARs. This alternative will satisfy the established cleanup levels since all soil that is contaminated above applicable cleanup levels will be removed. In addition, the removal and disposition of contaminated soil during implementation of Alternative 2 would be done in accordance with federal and Virginia solid and hazardous waste regulations. During soil excavation, the Regulations of the Virginia Air Pollution Control Board may apply. Ambient air conditions would be monitored during excavation activities to assure acceptable air quality. As necessary based on the ambient air monitoring, water sprays would be used to keep dust levels down.

9.3 Long-term Effectiveness and Permanence

Alternative 2 would provide for the permanent removal of contaminated soil to a permitted off-site location designed to prevent contaminant migration and exposures to human and ecological receptors.

9.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 2 provides reduction of contamination at the AREEs by removing contaminated soil. The toxicity and volume of the contaminated soil would not be affected by this alternative; however, the mobility of the contaminants would be reduced because the off-site disposal facilities used would be designed to prevent contaminant migration.

Because treatment of the contaminated soil at the AREEs was not found to be practicable due to the small volume of impacted soil, Alternative 2 does not satisfy the statutory preference for treatment as a principal element of the remedy.

9.5 Short-term Effectiveness

Alternative 2 is considered to be effective in the short term because the volume of soil to be excavated is relatively small and would result in limited negative impacts to human health or the environment. Dust exposure to workers and adjacent residents would be controlled during excavation activities by water sprays as needed. Prior to excavation operations, temporary erosion control structures would be installed to prevent entry of storm water into the soil excavation areas and prevent erosion and movement of soil from contaminated areas. Although truck traffic would be increased during implementation of Alternative 2, the implementation period (approximately one month) is short and the number of trucks per day would be less than 20.

9.6 Implementability

Alternative 2 is considered readily implementable. Licensed transporters and permitted disposal facilities are currently available.

9.7 Cost

The cost to implement Alternative 2 is estimated at $360,000.

9.8 Regulator Acceptance

VDEQ and USEPA concur with the selected remedy.
9.9 Community Acceptance

A public meeting on the Proposed Plan was held on September 18, 1997, in Warrenton, Virginia. Comments received during the public meeting and the public comment period are referenced in the Responsiveness Summary (Section 12 of this DD).

10.0 SELECTED REMEDY AND STATUTORY DETERMINATIONS

10.1 Selected Remedy

Following review and consideration of the information in the Information Repository, requirements of CERCLA and the NCP, and the review of public comments on the Proposed Plan, the U.S. Army, in coordination with VDEQ and USEPA, has selected Alternative 2, Soil-Removal, as the remedy for the contaminated soil at AREEs 9, 11, and 19. No action is the selected remedy for the soil at AREE 21 because the cleanup level is higher than the maximum detected contaminant concentration.

Under the selected remedy for AREEs 9, 11, and 19, all contaminated soil exceeding the established cleanup levels would be excavated, transported off site by truck, and disposed using a combination of permitted off-site hazardous waste, construction debris, and/or municipal landfills, as appropriate based on analytical results. Less than 300 cubic yards of impacted soil would be excavated as part of this alternative, followed by confirmation sampling to assure adequate removal of all soil exceeding the cleanup levels (refer to Table 1). Upon completion of the soil excavation, disturbed areas would be backfilled, regraded, and either vegetatively stabilized or paved (AREE 9).

The estimated cost to implement this alternative is $360,000, and the on-site activities would require approximately one month to complete.

10.2 Statutory Determinations

Under CERCLA Section 121, selected remedies must be protective of human health and the environment must comply with ARARs (unless a statutory waiver is justified), must be cost-effective, and must utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous waste as their principal element. The following sections discuss the remedy in light of these statutory requirements.

10.2.1 Protection of Human Health and the Environment

The selected remedy (i.e., no action for AREE 21; and remedial action for AREEs 9, 11, and 19) would protect human health and the environment. All contaminated soil exceeding the established cleanup levels will be removed and disposed of in permitted, off-site facilities. The cleanup levels listed in Table 1 were developed to be protective of human health and the environment.

Short-term risks would be present as a result of dust exposure to workers and adjacent residents, soil erosion and sedimentation during excavation activities, and transport of contaminated soil off site. These risks would be acceptable as a result of control measures which would be implemented during the remedial action. These control measures include use of water sprays during excavation operations to control dust, and use of silt fences and other erosion control techniques to control erosion and soil movement from contaminated areas. The increase in truck traffic would be minimal, with the addition of less than 20 trucks per day over the course of approximately one month.
10.2.2 Compliance with ARARs

The selected remedy will be in full compliance with ARARs:

- 9 Virginia Administrative Code (VAC) 20-80-10 et seq: Virginia Solid Waste Management Regulations - the disposal of any soil, debris, sludge or any other solid waste must be done in compliance with the regulations;
- 9 VAC 20-60-10 et seq: Virginia Hazardous Waste Management Regulations - the disposal of any hazardous waste must be done in compliance with the regulations;
- 4 VAC 50-30-10, et seq: Virginia Erosion and Sedimentation Control Regulations - an erosion and sedimentation control plan that complies with the minimum design and implementation standards of the regulations will be prepared before engaging in any land disturbing activity;
- 9 VAC 5-10-10 through 9 VAC 5-80-350: Regulations of the Virginia Air Pollution Control Board ambient air monitoring will be used to determine the need for water sprays to control dust generation in order to comply with ambient air quality standards for particulate matter.

10.2.3 Cost-Effectiveness

The selected remedy affords overall effectiveness proportional to its costs. All contaminated soil exceeding the established cleanup levels will be removed from AREEs 9, 11, and 19. No action is required for AREE 21 based on the established soil cleanup level. The entire remedy will be achieved for approximately $360,000.

10.2.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The selected remedy utilizes permanent solutions to the maximum extent practicable while providing the best balance among the other evaluation criteria. It achieves the best balance of tradeoffs with respect to the primary balancing criteria of long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; short-term effectiveness; implementability; and cost; while also considering regulator and community acceptance.

The selected remedy provides a high degree of long-term effectiveness and permanence as the removal and off-site disposal of the contaminated soil would be permanent and irreversible. The variety of contaminants present in the soil at AREEs 9, 11, and 19 and the relatively small volume of contaminated soil cause on-site treatment technologies to be impracticable and not cost-effective. The selected remedy is easily implementable, with a relatively short time frame needed for design development. There is minimal risk to the community during the implementation of the selected remedy, and the slight risks to the environment can be reduced by implementing standard procedures, such as erosion and sedimentation controls.

10.2.5 Preference for Treatment as a Principal Element

Because treatment of the principal threat at AREEs 9, 11, and 19 was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy.

11.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Proposed Plan for AREEs 9, 11, 19, and 21 was released to the public on September 11, 1997 (see Attachment 1). This document was made available for public review in the Information Repository at the following location:
The notice of availability of the Proposed Plan (see Attachment 3) was published in The Fauquier Citizen, The Fauquier Times-Democrat and the Manassas Journal Messenger during the week of September 8, 1997. A public comment period was held from September 11, 1997 through October 10, 1997. In addition, a public meeting was held on September 18, 1997, to present the Proposed Plan for AREEs 9, 11, 19, and 21 and to answer questions and receive public comments. The public meeting minutes have been transcribed, and a copy of the transcript is available to the public at the aforementioned location. A Responsiveness Summary, included as part of this Decision Document (DD), has been prepared to respond to the significant comments, criticisms, and new relevant information received during the comment period. Upon signing the DD, the U.S. Army will publish a notice of availability of this DD in The Fauquier Citizen, The Fauquier Times-Democrat, and the Manassas Journal Messenger, and place the DD in the Information Repository.

12.0 RESPONSIVENESS SUMMARY

The purpose of this Responsiveness Summary is to provide the public with a summary of citizen comments, concerns, and questions about AREEs 9, 11, 19, and 21. A public meeting was held on September 18, 1997, to present the Proposed Plan and to answer questions and receive comments. At the public meeting, several citizens had questions regarding the Proposed Plan. No written public comments were received during the September 11, 1997, through October 10, 1997, comment period.

The Responsiveness Summary is divided into the following sections:

- Selected newspaper notices announcing dates of the public comment period and location and time of the public meeting;
- Comments raised during the public meeting on September 18, 1997;
- Public meeting attendance roster; and
- Restoration Advisory Board Members.

All comments and concerns summarized in this document have been considered by the U.S. Army in making a decision regarding the selected alternative.

12.1 Selected Newspaper Notices

A public notice announcing the availability of the Proposed Plan and the public meeting was published in The Fauquier Citizen, The Fauquier Times-Democrat and the Manassas Journal Messenger the week of September 8, 1997. This public notice is provided in Attachment 3.

12.2 Comments Raised During the Public Meeting on September 18, 1997

Several citizens raised questions during the public meeting. The citizens’ questions and the U.S. Army’s responses are presented below:

CONCERNED CITIZEN: Is there any risk that the $360,000 of required funding may not being available?
**ARMY RESPONSE:** No, the project is fully funded.

**CONCERNED CITIZEN:** For AREE 21, how can the cleanup level be higher than the maximum detected concentration? Are there still ecological risks to wildlife?

**ARMY RESPONSE:** Based on the BRA, it was determined that there was unacceptable ecological risks posed by the contamination at AREE 21. However, the BRA uses conservative assumptions such as the assumption that the entire foraging ground for robins is contaminated at the maximum detected contaminant concentration present at AREE 21. This is an unrealistic assumption because AREE 21 is only a thin strip of land, which represents a very small percentage of a robin's foraging ground. When the size of AREE 21 is considered in the calculation of a cleanup level, a cleanup level greater than the maximum detected contaminant concentration at AREE 21 is calculated. The BRA uses conservative assumptions so that sites that may need to be remediated are not overlooked; while the cleanup level is a level that brings the site into acceptable risk limits under realistic conditions. The need for remediation at AREE 21 was ultimately based on a risk management decision using the more realistic risk-based cleanup level. Since a robin would not just consume earthworms from the small strip of land contaminated at AREE 21, the risk posed by AREE 21 is acceptable.

**CONCERNED CITIZEN:** Once these sites are cleaned up, will sampling be conducted to ensure that the sites are safe?

**ARMY RESPONSE:** Yes, confirmation sampling will be conducted to ensure that the cleanup levels are achieved, and then a post-remediation risk assessment will be conducted to ensure that the risk posed by the residual contamination is acceptable.

**CONCERNED CITIZEN:** Would any restrictions be placed on AREE 21 that it not be disturbed? AREE 21 is located in the area currently designated for the golf course. Could the soil in that area be moved around to accommodate desired terrain changes?

**ARMY RESPONSE:** There would be no restrictions on the future use of AREE 21.

**CONCERNED CITIZEN:** What is the name of the facility and its location where the contaminated soil will be disposed? Will it be a hazardous waste facility? Will it be hauled to the local landfill?

**ARMY RESPONSE:** The disposal facility has not been determined yet, but acceptably permitted facilities will be used. If warranted based on waste characterization sampling, a permitted hazardous waste disposal facility will be used. Given the levels of contamination at these AREEs, the excavated soil even if non-hazardous will probably not be acceptable for disposal at the local landfill; however, that determination will be made once the waste characterization sampling results are received and reviewed. The waste will have to satisfy the selected landfill's permit requirements before it can be disposed therein.

12.3 Public Meeting Attendance Roster

The public meeting was held on September 18, 1997, at the Warrenton Middle School. The members of the community that attended the public meeting included Owen Bludau, Debra Reedy, and Dean Eckelberry.

12.4 Restoration Advisory Board Members

1. Debra Reedy, Community Co-Chair
2. Richard Reisch, U.S. Army Co-Chair
3. Dean Eckelberry
4. John Mayhugh
5. Jeff Lippincott
6. Owen Bludau
7. Tim Tarr
8. Norris Goff
9. Erich Meding
10. Kevin Bell
11. Mark Stevens
12. Nancy Inger
13. Joanne Smith
14. Henry Ross
15. Steve Mihalko
16. Robert Stroud
17. Steve Maddox
18. William Downey
19. Gina Tyo
20. Joe Phelan
21. Gary Clare
22. Mike Molloy
23. Denny Adams
24. Joe Wittse
25. Bob Root
26. Georgia Herbert
27. Robert Kube
28. Kimberly Davis
29. George Rosenberger
30. Adrienne Garreau
31. Susan Dove
32. James Tucker
33. John Williams

13.0 REFERENCES


ATTACHMENT 1

Proposed Plan
INTRODUCTION

The U.S. Army has identified a preferred alternative to address contaminated soil at selected Areas Requiring Environmental Evaluation (AREEs) located on Vint Hill Farms Station (VHFS). The major characteristics of the U.S. Army's preferred alternative (Alternative 2 in this Proposed Plan) include excavation of contaminated soil and off-site disposal at a permitted facility.

This Proposed Plan is based on site-related documents contained in the VHFS Information Repository. The Information Repository can provide you with important information about the site and the AREEs. The Information Repository is located at:

Fauquier County Library
Warrenton Branch - Reference Section
11 Winchester Street, Warrenton, VA
(540) 347-8750
Monday - Wednesday: 10:00 a.m. to 9:00 p.m.
Thursday - Saturday: 9:00 a.m. to 5:00 p.m.
Sunday: 1:00 p.m. to 5:00 p.m.

The U.S. Army needs your comments and suggestions. The U.S. Army, the U.S. Environmental Protection Agency (USEPA) Region III, and the Virginia Department of Environmental Quality (VDEQ) encourage the public to review and comment on both of the alternatives presented in the Proposed Plan. The public comment period begins on September 11, 1997, and closes on October 10, 1997. Please send your comments, postmarked no later than October 10, 1997, to:

Kevin Bell, Public Affairs Officer
Public Affairs Office (Bldg. 101)
Vint Hill Farms Station
Warrenton, VA 20187-5010

In addition, you are invited to a public meeting regarding the investigation and cleanup of contamination at the AREEs. Representatives from the U.S. Army will report on cleanup alternatives considered and the U.S. Army's preferred alternative. The meeting is scheduled for:

Thursday, September 18, 1997 at 7:00 p.m.
Warrenton Middle School Auditorium
244 Waterloo Street, Warrenton, VA

The remedy described in this Proposed Plan is the U.S. Army's preferred alternative for the selected AREEs. The U.S. Army may modify the preferred alternative or select another remedial alternative if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The U.S. Army, in consultation with USEPA and VDEQ, will make a remedy selection for the AREEs in a Decision Document after the public comment period has ended and the comments and information submitted during that time have been reviewed and considered.
The U.S. Army is issuing this Proposed Plan as part of its public participation responsibilities under Sections 113(k) and 117(a) of the Comprehensive Response, Compensation, and Liability Act (CERCLA) as amended, commonly known as the "Superfund Program", and the National Environmental Policy Act of 1969 (NEPA).

SITE BACKGROUND

VHFS is part of the U.S. Army Communications - Electronics Command (CECOM) and primarily functions as an Army installation engaged in communications intelligence. VHFS is located approximately 40 miles southwest of Washington, D.C., in Fauquier County, Virginia, as shown on Figure 1. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres on the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites. The facility was designated for closure in March, 1993, under the Base Realignment and Closure (BRA) Act.

Pursuant to the decision to close the installation, an Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May, 1994, respectively. The ENPA identified 42 AREEs from the review of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation.

These 27 AREEs were investigated from September, 1994, to June, 1995, as part of the Site Inspection (SI) conducted by SAIC. The objective of the SI was to determine the presence or absence of contamination and the chemical nature of any detected contamination. The final SI Report, which was completed in June, 1996, identified 24 AREEs which required further investigation. AREEs that were determined under the SI to warrant further investigation and are located in the Phase I reuse area (shown on Figure 2) were investigated between April and June, 1996, as part of the Phase I reuse area Remedial Investigation (RI conducted by ICF Kaiser Engineers, Inc. (ICF KE). The purpose of the RI was to evaluate: 1) the nature and extent of contamination; and 2) the level of risk posed to human health and the environment. The draft RI Report for the Phase I reuse area was completed in April, 1997, and is currently undergoing regulatory review.

Four AREEs were identified in the RI as having soil contamination which poses unacceptable human health risks and/or significant adverse ecological effects:

- AREE 9 - Vehicle Maintenance Area;
- AREE 11 - Former Sewage Treatment Plant;
- AREE 19 - Pistol Range; and
- AREE 21 - Sand Filter Beds.

The locations of these AREEs are shown on Figure 2.

RESULTS OF THE REMEDIAL INVESTIGATION

The RI for these four AREEs was conducted to evaluate the nature and extent of contamination associated with past site activities. Environmental samples collected and analyzed during the RI were used in conjunction with the results from the SI to assess the condition of each of the AREEs. The environmental media investigated included surface soils (0 to 2 feet below ground surface), subsurface soils (2 feet to
approximately 12 feet below ground surface), surface water, sediment, and groundwater. Analytical results were compared to background concentrations and regulatory screening levels to determine if environmental media had been adversely impacted by site activities. A brief description of each of the four AREEs and the significant findings of the RI and S1 are presented in the following paragraphs. A detailed presentation of the samples collected and the analytical results can be found in the draft RI Report, now available in the Information Repository at the Fauquier County Library.

**AREE 9 - Vehicle Maintenance Area**

AREE 9 is an area used for general maintenance of military, government, and private vehicles. Small spills of oil, grease, gasoline, and cleaning solvents have been reported on the asphalt areas within the AREE. Neutralization pits (approximately 3 ft x 3 ft x 4 ft deep) which receive wastewater from the sinks within the Civilian Motor Pool (Building 288) and the Military Motor Pool (Building 290) are located outside each building. The Civilian Motor Pool neutralization pit has a cement bottom, and the Military Motor Pool neutralization pit has an earthen bottom.

Surface soil, subsurface soil, sediment, surface water, and groundwater samples were collected at AREE 9 as shown on Figure 3. Total Petroleum Hydrocarbon (TPH) contamination, exceeding the Virginia TPH soil action level for underground storage tanks (USTs) of 100 parts per million (ppm), is present in subsurface soil beneath the Military Motor Pool neutralization pit (which has an earthen bottom). The highest TPH concentration (8,440 ppm) was detected at the base of the neutralization pit. The TPH contamination extends to bedrock at approximately 8.5 feet below ground surface, and decreases with depth.

**AREE 11 - Former Sewage Treatment Plant**

AREE 11 is the site of the former Sewage Treatment Plant (STP). The former STP was active from 1948 to 1981, and was used to treat wastewaters from VHFS activities, including industrial wastewaters from photographic, painting, laboratory, vehicle washing, and metal etching operations. The sludges from the treatment process were dried on drying beds and stored in sludge piles. The locations of these areas are shown on Figure 4.

Surface and subsurface soil samples were collected in the vicinity of the drying beds and sludge piles. Groundwater samples were collected downgradient of these areas. Polynuclear aromatic hydrocarbon (PAH) contamination, exceeding residential soil Risk-based Concentrations (RBCs) established by USEPA Region III for screening of analytical results, is present in the surface and subsurface soil in the drying bed area and the sludge pile area. Pesticide contamination, exceeding residential soil RBCs, is present in the surface and subsurface soil in the sludge pile area. Mercury contamination, exceeding the residential soil RBC, is present in the surface soil in the sludge pile area.

**AREE 19 - Pistol Range**

AREE 19, the Pistol Range, has been in use since 1961 for limited target practice using .22-32-38, and .45 caliber handguns. The firing fan is directed southward toward a horseshoe-shaped impact berm, which captures the bullets. The layout of the Pistol Range shown on Figure 5. Spent ammunition was not recovered, but shell casings were collected and returned to the fixed ammunition magazine.

Surface soil, subsurface soil, and sediment samples were collected from the impact berm and surrounding area. Lead contamination, exceeding USEPA’s screening level of 400 ppm for lead in soil for residential use, is confined to the surface soil of the impact berm. The highest concentrations of lead (up to 5,850 ppm) were detected within the first six inches of the impact berm. Lead concentrations in the samples collected deeper into the impact berm were generally one to two orders of magnitude lower than those at the surface and were all less than 400 ppm.
NOTE: RI SURFACE SOIL SAMPLES (RISS11-1 THROUGH RISS11-9) ARE CO-LOCATED WITH THE RI SOIL BORING LOCATIONS (RISB11-1 THROUGH RISB11-9)
NOTE: A SUBSURFACE SOIL SAMPLE WAS NOT COLLECTED AT RISS11-10 DUE TO REFUSAL AT 0.5' BGS

LEGEND:

- BUILDING
- FENCE
- ROAD
- STREAM
- 380 TOPOGRAPHIC CONTOUR (FT VSL)
- SI SURFACE SOIL SAMPLE LOCATION
- RI SOIL BORING LOCATION
- GROUNDWATER MONITORING WELL
- IMPACTED SOIL AREA (APPROXIMATE)

FIGURE 4
SI AND RI SAMPLING LOCATIONS FOR AREE 11 - FORMER SEWAGE TREATMENT PLANT
LEGEND:

- BUILDING
- FENCE
- WMFS BOUNDARY
- PAVED ROAD
- STREAM
- TOPOGRAPHIC CONTOUR (FT MSL)
- SI SURFACE SOIL SAMPLE LOCATION
- SI SEDIMENT SAMPLE LOCATION
- RI SURFACE SOIL/SOIL BORING LOCATION
- RI HORIZONTAL SOIL BORING LOCATION
- IMPACTED SOIL AREA (APPROXIMATE)

NOTE: RI SURFACE SOIL SAMPLES (RIS19-1,2,3,5, AND 6) ARE CO-LOCATED WITH THE RI SOIL BORING LOCATIONS (RISB19-1,2,3,5 AND 6).

FIGURE 5
SI AND RI SAMPLING LOCATIONS FOR AREE 19
PISTOL RANGE
**AREE 21 - Sand Filter Beds**

The Sand Filter Beds (AREE 21) were used to filter ash wastewaters from the wet scrubber, which was used for particulate control in the installation incinerator smokestack. The two beds, constructed with concrete walls and an unlined bottom, utilized coarse sand and filter gravel to filter particulates from the wastewater. An underdrain system in the gravel drained the effluent to a distribution box. The effluent then discharged through a perforated pipe to an absorption field north of the Sand Filter Beds.

Surface soil samples were collected from the Sand Filter Beds and along the absorption field. Groundwater samples were collected in the vicinity and downgradient of the Sand Filter Beds and absorption field as shown on Figure 6. Dioxin/furan contamination, exceeding residential soil RBCs, is present in surface soil near the Sand Filter Beds and along the absorption field.

**HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT**

A Baseline Risk Assessment (BRA) was conducted as part of the RI to assess the potential human health and ecological problems that could result if the contamination at the AREEs was not remediated. The Human Health Risk Assessment (HHRA) was prepared to evaluate the magnitude of potential adverse effects on human health associated with current and potential future (assuming residential development of the property) exposures to site-related chemicals at the AREEs. The Ecological Risk Assessment (ERA) was conducted to characterize the potential threats to ecological receptors posed by contaminants at the AREEs.

The HHRA follows a four-step process:

- **Selection of Chemicals of Potential Concern** - identifies the contaminants of potential concern based on their toxicity, frequency of occurrence, and concentration by comparing the maximum concentrations of detected chemicals with RBCs which are health-protective chemical concentrations that are back-calculated using toxicity criteria, a $1 \times 10^{-6}$ target carcinogenic risk or a 0.1 hazard quotient (defined below), and conservative exposure parameters;

- **Exposure Assessment** - identifies the potential pathways of exposure, and estimates the concentrations of contaminants to which people may be exposed as well as the frequency and duration of these exposures;

- **Toxicity Assessment** - determines the toxic effects of the contaminants; and

- **Risk Characterization** - provides a quantitative assessment of the overall current and future risk to people from site contaminants based on the exposure and toxicity information.

The HHRA evaluated health effects which could result from exposure to soil, groundwater, surface water, and sediment contamination in the Phase I, reuse area of VHFS. The HHRA evaluated potential risks to current workers who could be exposed to contaminants in surface soil, and to current trespassers who could be exposed to contaminants in surface soil, sediment, and surface water. In addition, the HHRA evaluated potential risks to hypothetical future adult and child residents who could be exposed to contaminants in surface soil, groundwater, surface water, and sediment. Potential risks to future excavation workers who could be exposed to contaminants in subsurface soil were also evaluated in the HHRA.
Potential carcinogenic (cancer-related) effects and noncarcinogenic effects (including various impacts on different organ systems, such as lungs, liver, etc.) were evaluated in the HHRA. Carcinogenic effects are expressed as the probability that an individual will develop cancer from exposure to the contaminants from each of the AREEs. The evaluation of noncarcinogenic effects is based on the hazard index (HI), which is the summation of the hazard quotients for individual chemicals. The hazard quotient is a comparison of chemical-specific chronic exposure doses with the corresponding protective doses derived from health criteria. The USEPA recommends that remedial actions may be warranted at sites where the carcinogenic risk to any person is greater than $1 \times 10^{-4}$ or the HI is greater than 1. A carcinogenic risk of $1 \times 10^{-4}$ means that there is a potential of one additional person in a population of 10,000 developing cancer from exposure to contaminants at an AREE if the AREE is not remediated. A HI greater than 1 indicates a potential for noncarcinogenic health effects if the AREE is not remediated.

The ERA also follows a four-step process:

- **Problem Formulation** - develops information that characterizes habitats and potentially exposed species and identifies contaminants of concern, exposure pathways, and receptors;
- **Exposure Assessment** - estimates exposure point concentrations for selected indicator species;
- **Ecotoxicologic Effects Assessment** - identifies concentrations or doses of contaminants that are protective of indicator species; and
- **Risk Characterization** - estimates potential adverse effects from exposure to contaminants based on exposure and toxicity information.

The ERA evaluated ecological effects which could result from exposure to surface soil, surface water, and sediment contamination in the Phase I reuse area of VHFS. The ERA evaluated potential adverse ecological effects to terrestrial plants and terrestrial invertebrates exposed to contaminants in surface soil. In addition, potential adverse ecological effects to mammals (represented by shrews) and birds (represented by robins) through bioaccumulation in the food web and exposure to contaminants in surface soil were evaluated. Potential adverse ecological effects to aquatic life from exposure to contaminants in surface water and sediment were also evaluated in the ERA.

The evaluation of significant potential adverse ecological effects is based on the Environmental Effects Quotient (EEQ). The EEQ is the ratio of the estimated exposure concentrations/doses for the chemicals of potential concern and the toxicity reference values (TRVs) for the ecological receptors. If the EEQ is greater than 1, there is a potential for adverse ecological effects to occur. As the magnitude of the EEQ becomes greater than 1, the potential for adverse ecological effects become more significant.

The results of the BRA for the four AREEs are presented in the following paragraphs. A detailed presentation of the BRA can be found in the draft RI Report, now available in the Information Repository at the Fauquier County Library.

**AREE 9 - Vehicle Maintenance Area**

The BRA determined that contamination at AREE 9 does not pose an unacceptable human health risk or significant potential adverse ecological effects under either current or potential future land-use conditions. In fact, since all the chemicals of potential concern in surface soil identified for AREE 9 in the HHRA are naturally-occurring metals that were statistically determined to be within background concentrations, the estimated upper-bound excess lifetime cancer risks and noncarcinogenic risks for site-related contaminants are less than $1 \times 10^{-6}$ and a HI of 0.1, respectively. However, risks associated with exposures to TPH could not be assessed in the BRA because this analytical parameter represents a mixture of chemical constituents. Since TPH measurements give no indication of the chemical
constituents present or their respective concentrations, they cannot be used to predict risks. Although risks associated with TPH cannot be estimated, TPH contamination in subsurface soil beneath the Military Motor Pool neutralization pit is recommended for remediation because TPH concentrations exceed the Virginia TPH soil action level for USTs. The impacted area is approximately 3 ft x 3 ft, extending from the base of the neutralization pit at 4 ft below ground surface to bedrock at 8.5 ft below ground surface.

**AREE 11 - Former Sewage Treatment Plant**

The HHRA concluded that, under current land-use conditions, the risks to workers are unacceptable for exposure to contaminants in surface soil at AREE 11. Under future land-use conditions, assuming that AREE 11 is not remediated, the risks to potential adult and child residents are also unacceptable for exposure to contaminants in surface soil. The highest estimated upper-bound excess lifetime cancer risk is for adult residents exposed to contaminants in surface soil by dermal contact; this risk is $6 \times 10^{-4}$ (i.e., six in 10,000 residents may develop cancer caused by contaminants in the AREE 11 surface soil). The highest non-carcinogenic risk is for child residents exposed to contaminants in surface soil by incidental ingestion and dermal contact; the HI is estimated to be 20 for each of these routes of exposure. The organ systems impacted by noncarcinogenic contaminants at AREE 11 are the liver and kidney. The unacceptable human health risks result primarily from chlordane (a pesticide) and mercury. Although the concentrations of PAHs (specifically benzo[a]pyrene and dibenz[a,h]anthracene) at AREE 11 contribute to the unacceptable risks posed by dermal contact exposure to contaminants in surface soil, they do not drive the unacceptable risks. The highest estimated upper-bound excess lifetime cancer risk for a PAH is $2 \times 10^{-5}$ (two in 100,000 people) for potential future adult residents from dermal contact exposure to benzo(a)pyrene. It should be noted that major uncertainties exist regarding the assessment of dermal contact exposures (particularly associated with dermal absorption factors); therefore, estimated risks are likely to be over-estimated for the dermal contact exposure route.

The ERA determined that contaminants in surface soil at AREE 11 pose significant potential adverse ecological effects. The significant potential adverse ecological effects result primarily from DDT (a pesticide), mercury, and silver. Mercury results in significant potential adverse ecological effects for terrestrial plants, terrestrial invertebrates, robins, and shrews, with the greatest potential adverse ecological effects occurring to robins (EEQ of 573). Silver and DDT result in significant potential adverse ecological effects to terrestrial plants (EEC of 60) and robins (EEQ of 51), respectively.

The most significant contamination is in the sludge pile area, which is recommended for remediation. The impacted area has dimensions of 45 ft in diameter and 0.5 ft deep, with contamination extending to 1.5 ft below ground surface in an isolated location near the center of the sludge pile area. The drying bed area, which has dimensions of 25 ft x 40 ft x 1.5 ft deep, is less contaminated. One isolated surface soil location in the drying bed area (sample location SS-11-004 as shown on Figure 4) is recommended for remediation.

**AREE 19 - Pistol Range**

The HHRA concluded that, under both current and future land-use conditions, the risks to workers, trespassers, residents, and excavation workers are acceptable for exposure to site-related contaminants, except for possibly lead, in soil at AREE 19. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the estimated upper-bound excess lifetime cancer risks from exposure to site-related contaminants in surface soil for all potential receptors and routes of exposure are less than $1 \times 10^{-6}$ the highest noncancerous risk (HI = 0.8) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion. Although the HHRA determined that lead concentrations in surface soil at AREE 19 are below background levels based on statistical comparisons of site and background concentrations, the lead contamination at AREE 19 is known to be site-related. The human health risks associated with exposure to lead in surface soil at AREE 19 were evaluated using the integrated Exposure Uptake Biokinetic (IEUBK) Model recommended by USEPA for evaluating lead exposures for young children in residential settings. The IEUBK Model calculates blood lead levels which result from exposures to lead which may then be compared to blood
lead levels of toxicological significance for purposes of risk evaluation. The IEUBK Model run for AREE 19 predicted a geometric mean blood lead level of 9.6 µg/dL, with 42.7 percent of the population exceeding the level of concern (10 µg/dL). The USEPA currently finds 5 percent of the population exceeding the level of concern as acceptable. Therefore, the IEUBK model results indicate that if AREE 19 was developed for residential use in the future, the lead concentrations in the surface soil may be a potential problem for young children.

The ERA determined that lead in surface soil at AREE 19 poses a significant potential adverse ecological effect for terrestrial plants (EEQ of 117).

The lead contamination in the impact berm surface soil is recommended for remediation. The approximate dimensions of the impacted area are 100 ft x 15 ft high x 2 ft deep.

**AREE 21 - Sand Filter Beds**

The HHRA concluded that, under both current and future land-use conditions, the risks to workers, trespassers, residents, and excavation works are acceptable for exposure to site-related contaminants in surface soil at AREE 21. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk ($9 \times 10^{-6}$) is for adult residents exposed to site-related contaminants in surface soil by dermal absorption, and the highest noncarcinogenic risk ($HI = 0.2$) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion.

The ERA determined that contaminants in surface soil at AREE 21 pose significant potential adverse ecological effects. The significant potential adverse ecological effects result primarily from 2,3,7,8-TCDF (a furan). 2,3,7,8-TCDF results in significant potential adverse ecological effects for robins (EEQ of 38).

The primary compound of concern, 2,3,7,8-TCDF, was detected in the absorption field area but not in the Sand Filter Beds themselves. Surface soil along the absorption field is recommended for possible remediation pending establishment of soil cleanup levels. The approximate dimensions of the impacted soil area are 375 ft x 3 ft x 3 ft deep.

**REMEDIAL ACTION OBJECTIVES**

Remedial action objectives are specific goals to protect human health and the environment. The remedial action objective for the four AREEs is to minimize the potential for contaminated soils to pose unacceptable risks to human or ecological receptors.

**CLEANUP LEVELS ESTABLISHED FOR THE PREFERRED ALTERNATIVE**

USEPA has established soil cleanup levels for the contaminants that contribute to the unacceptable risk determination at each of the four AREEs. The soil cleanup levels are presented in Table 1. The soil cleanup level for AREE 9 is based on the Virginia TPH soil action level for USTs of 100 ppm. In general, USEPA established the soil cleanup levels for AREE 11 based on either a $1 \times 10^6$ (one in 100,000 people) excess lifetime cancer risk for carcinogens or a hazard quotient of 1 for noncarcinogens, whichever was more stringent, for the potential future residential use scenario. However, the soil cleanup levels for DDT, mercury, and silver at AREE 11 are based on concentrations which are protective of ecological receptors. The soil cleanup level for AREE 19 is based on a level recommended for the protection of ecological receptors by the U.S. Fish and Wildlife Service. The soil cleanup level for AREE 21 is based on concentrations which are protective of ecological receptors. The cleanup level for 2,3,7,8-TCDF ($1.2 \times 10^{-4}$ ppm) is higher than the maximum detected concentration at AREE 21 of $8.71 \times 10^6$ ppm; therefore, no further action is required at AREE 21.
Table 1
Cleanup Levels Established for Soils at the Four AREEs

<table>
<thead>
<tr>
<th>Constituents</th>
<th>Cleanup Levels (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AREE 9 - VEHICLE MAINTENANCE AREA</strong></td>
<td></td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons</td>
<td>100 (a)</td>
</tr>
<tr>
<td><strong>AREE 11 - FORMER SEWAGE TREATMENT PLANT</strong></td>
<td></td>
</tr>
<tr>
<td>Aldrin (Human Health risk) (b)</td>
<td>0.54 (c)</td>
</tr>
<tr>
<td>Cadmiumn (Human Health risk) (b)</td>
<td>78 (c)</td>
</tr>
<tr>
<td>Chlordane (Human Health risk)</td>
<td>5 (c)</td>
</tr>
<tr>
<td>alpha-Chlordane (Human Health risk) (b)</td>
<td>5 (c)</td>
</tr>
<tr>
<td>gamma-Chlordane (Human Health risk) (b)</td>
<td>5 (c)</td>
</tr>
<tr>
<td>DDT, (Ecological risk only)</td>
<td>0.26 (d)</td>
</tr>
<tr>
<td>Mercury (Human Health &amp; Ecological risk)</td>
<td>0.29 (d)</td>
</tr>
<tr>
<td>Silver (Ecological risk only)</td>
<td>20 (d)</td>
</tr>
<tr>
<td><strong>AREE 19 - PISTOL RANGE</strong></td>
<td></td>
</tr>
<tr>
<td>Lead (Human Health &amp; Ecological risk)</td>
<td>200 (e)</td>
</tr>
<tr>
<td><strong>AREE 21 - SAND FILTER BEDS</strong></td>
<td></td>
</tr>
<tr>
<td>2,3,7,8-TCDF (Ecological risk only)</td>
<td>$1.12 \times 10^4$ (d)</td>
</tr>
</tbody>
</table>

(a) Virginia total petroleum hydrocarbon soil action level for underground storage tanks.
(b) These compounds contribute to but do not drive unacceptable risk.
(c) Based on either a $1 \times 10^5$ upper-bound excess lifetime cancer risk for carcinogens or a hazard quotient of 1 for noncarcinogens, whichever is more stringent, for the potential future residential use scenario.
(d) Based on a concentration which is protective of ecological receptors (EEQ = 10).
(e) Cleanup level for lead in surface soil recommended by the U.S. Fish and Wildlife Service for the protection of ecological receptors.
SUMMARY OF REMEDIAL ALTERNATIVES

Two remedial alternatives were evaluated to address soil contamination at AREEs 9, 11, and 19. As discussed above, no further action is required for AREE 21 based on the established soil cleanup level. The range of remedial alternatives considered was limited by the nature and extent of the contamination. Since the amount of soil requiring remediation is relatively small (less than 300 cubic yards combined), it was not practical to consider active treatment or containment options in terms of cost-effectiveness and implementability. The following remedial alternatives were evaluated:

- Alternative 1 - No Action; and
- Alternative 2 - Soil Removal.

Alternative 1 - No Action

The NCP and CERCLA, as amended by SARA, require that a No Action alternative be considered as a baseline for comparison to other alternatives. No action would be taken to address site contamination under this alternative. In accordance with Section 121 of CERCLA, each AREE would be reviewed at least once every five years to re-evaluate site conditions and to determine the need for remedial action to protect human health and the environment.

Alternative 2 - Soil Removal

Under this alternative, all contaminated soil exceeding the established cleanup levels would be excavated, transported off site by truck, and disposed using a combination of permitted off-site hazardous waste, construction debris, and/or municipal landfills or incinerators, as appropriate based on analytical results. Less than 300 cubic yards of impacted soil would be excavated as part of this alternative, followed by confirmation sampling to assure adequate removal of all soil exceeding the cleanup levels. Upon completion of the soil excavation, disturbed areas would be backfilled, regraded, and either vegetatively stabilized or paved (AREE 9). The five-year review does not apply to this alternative because hazardous substances would not remain on site.

EVALUATION OF ALTERNATIVES

CERCLA requires a comparison of the alternatives using nine evaluation criteria: overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements (ARARs); long-term effectiveness and permanence; reduction of toxic, mobility or volume through treatment; short-term effectiveness; implementability, cost; and regulator and community acceptance. The first two criteria are considered by USEPA to be threshold criteria which must be met by each alternative. The nine evaluation criteria are described below:

- Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- Compliance with ARARs addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and requirements or provides grounds for invoking a waiver.

- Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health over time, once cleanup goals have been met.

- Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies a remedy may employ.
• **Short-term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

• **Implementability** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

• **Cost** includes estimated capital and operation and maintenance costs, and net present worth costs.

• **Regulator acceptance** indicates whether, based on their review of the RI and Proposed Plan, the regulators (VDEQ and USEPA) concur, oppose, or have no comment on the preferred alternative at this present time.

• **Community acceptance** will be assessed in the Decision Document following a review of the public comments received on the RI and the Proposed Plan.

The comparative analysis of the alternatives was conducted based upon these evaluation criteria, and is described below.

**Overall Protection of Human Health and the Environment**

The no action alternative (Alternative 1) is not protective of human health or the environment because the risks to potential future residents and the potential adverse effects to ecological receptors remain unchanged, which is unacceptable. Therefore, the no action alternative was eliminated from further consideration and will not be discussed further.

Alternative 2 provides adequate protection of human health and the environment by removing contaminated soils, thereby eliminating the potential for exposure.

**Compliance with ARARs**

Alternative 2 has been designed to achieve or comply with ARARS. This alternative will satisfy the established cleanup levels since all soil that is contaminated above applicable cleanup levels will be removed. In addition, the removal and disposition of contaminated soil during implementation of Alternative 2 would be done in accordance with federal and Virginia solid and hazardous waste regulations. During soil excavation, Virginia Regulations for the Control and Abatement of Air Pollution may apply. Ambient air conditions would be monitored during excavation activities to assure acceptable air quality. As necessary based on the ambient air monitoring, water sprays would be used to keep dust levels down.

**Long-term Effectiveness and Permanence**

Alternative 2 would provide for the permanent removal of contaminated sod to a permitted off-site location designed to prevent contamination migration and exposures to human and ecological receptors.

**Reduction of Toxicity, Mobility, or Volume Through Treatment**

Alternative 2 provides reduction of contamination at the AREEs by removing contaminated soils. The toxicity and volume of the contaminated soil would not be affected by this alternative; however, the mobility of the contaminants would be reduced because the off-site disposal facilities used would be designed to prevent contaminant migration.
Because treatment of the contaminated soil at the AREES was not found to be practicable due to the small volume of impacted soil, Alternative 2 does not satisfy the statutory preference for treatment as a principal element of the remedy.

**Short-term Effectiveness**

Alternative 2 is considered to be effective in the short term because the volume of soil to be excavated is relatively small and would result in limited negative impacts to human health or the environment. Dust exposure to workers and adjacent residents would be controlled during excavation activities by water sprays. Prior to excavation operations, temporary erosion control structures would be installed to prevent entry of storm water into the soil excavation areas and prevent erosion and movement of soil from contaminated areas. Although truck traffic would be increased during implementation of Alternative 2, the implementation period (approximately one month) is short and the number of trucks per day would be less than 20.

**Implementability**

Alternative 2 is considered readily implementable. Licensed transporters and permitted disposal facilities are currently available.

**Cost**

The cost to implement Alternative 2 is estimated at $360,000.

**Regulator Acceptance**

VDEQ and USEPA are currently reviewing this Proposed Plan. VDEQ and USEPA comments will be addressed in the Decision Document.

**Community Acceptance**

Community acceptance of the preferred alternative will be evaluated at the close of the public comment period by considering both oral and written comments received during the public comment period.

**PREFERRED ALTERNATIVE**

Alternative 2, Soil Removal, is recommended by the U.S. Army as the preferred alternative for AREEs 9, 11, and 19. No further action is required for AREE 21 based on the established soil cleanup level. This remedial alternative is a permanent solution that offers long-term effectiveness since the contaminated soil is removed to cleanup levels and transported off site for proper disposal. This remedial alternative would be designed to comply with ARARs. The excavation and disposal of contaminated soil would be done in accordance with federal and Virginia solid and hazardous waste regulations. The estimated cost to implement this alternative is $360,000, and the on-site activities would require approximately one month to complete.
The United States Army at Vint Hill Farms Station, Virginia invites Public Comment on a PROPOSED ENVIRONMENTAL CLEANUP Concerning Four Areas Requiring Environmental Evaluation: 9, 11, 19, & 21.

Please Come To Our
• PUBLIC MEETING •
Thursday, September 18, 1997 • 7:00 p.m.
• Warrenton Middle School Auditorium •
• 244 Waterloo Street • Warrenton, VA
(*Sign Language Interpreter will be present)

PURPOSE: TO DISCUSS AND PRESENT THE REMEDIAL ALTERNATIVES FOR THE SITES IDENTIFIED ABOVE.

The U.S. Army, in consultation with the U.S. Environmental Protection Agency (USEPA) Region III and the Virginia Department of Environmental Quality (DEQ), invites public comment on its proposed plan for remediating contaminated soil at the following Areas Requiring Environmental Evaluation (AREEs) on Vint Hill Farms Station (VHFS), Virginia: AREE 9 - Vehicle Maintenance Area; AREE 11 - Former Sewage Treatment Plant; AREE 19 - Pistol Range; and AREE 21 - Sand Filter Beds. Before selecting a final remedy, VHFS will consider all written and oral comments received during the public comment period.

The U.S. Army will be accepting comments during a 30-DAY PUBLIC COMMENT PERIOD which begins Thursday, September 11 and ends Friday, October 10, 1997.

WRITTEN COMMENTS MAY BE SUBMITTED TO THE FOLLOWING ADDRESS:

Kevin Bell, Public Affairs Officer
Public Affairs Office (Bldg. 101)
Vint Hill Farms Station
Warrenton, VA 20187-5010
ATTACHMENT 2

CLEANUP LEVEL DEVELOPMENT DOCUMENTS
HUMAN HEALTH RISK-BASED REMEDIATION GOALS
AREAS REQUIRING ENVIRONMENTAL EVALUATION (AREE's) 11 AND 19
VINT HILL FARM STATION (VHFS)

Risk-based remediation goals for VHFS based on human exposures at the site were calculated for selected chemicals detected in surface soil in areas proposed for remediation (i.e., surface soil at AREE's 11 [Former Sewage Treatment Plant] and 19 [Pistol Range]). Based on a review of the exposure pathways evaluated in the risk assessment, risk-based remediation goals were calculated for chemicals contributing to pathway upper-bound excess lifetime cancer risks greater than 1x10^{-4} and/or hazard indices (HIs) greater than or equal to 1. The development of risk-based remediation goals focused on the incidental ingestion exposure pathway only. Although cancer risks exceeding 1x10^{-4} were associated with dermal contact exposure to surface soil at AREE 11, risk-based remediation goals did not incorporate exposures through this route due to the great uncertainties associated with assessing dermal exposures. For example, major uncertainties exist in the extent to which chemicals are percutaneously absorbed and in the extent to which chemicals partition from soil to skin leading to uncertainty in the use of default dermal absorption factors in the evaluation of risk. Uncertainties also exist in the use of adjusted oral toxicity criteria to evaluate dermal exposure pathways depending on how closely the factors used to adjust oral toxicity criteria reflect the difference between the oral and dermal routes.

In the VHFS human health risk assessment (HHRA), surface soil incidental ingestion pathways with upper-bound excess lifetime cancer risks greater than 1x10^{-4} and/or HIs greater than or equal to 1 were associated with adult and child resident exposures at AREE 11. Therefore, risk-based remediation goals for selected chemicals in surface soil at AREE 11 were developed based on the more conservative residential receptor, consistent with USEPA Region III methodology for calculating risk-based concentrations (i.e., using combined child/adult residential exposure parameters for carcinogenic compounds and using child residential exposure parameters for noncarcinogenic compounds).

Once the relevant exposure media and receptor were identified, risk-based remediation goals were calculated for carcinogenic chemicals associated with chemical-specific risks greater than or equal to 1x10^{-6} and noncarcinogenic chemicals contributing to a HI of 1 for a specific target organ. Risk-based remediation goals were not calculated for inorganic compounds that were statistically determined to be within background levels in the risk assessment. For selected carcinogenic chemicals, risk-based remediation goals were developed using a target risk level of 1x10^{-6}, which is at the low end of USEPA's target risk range for health-protectiveness at Superfund sites. For selected noncarcinogenic chemicals, risk-based remediation goals were calculated to correspond to a target hazard quotient of 1. If any of the noncarcinogenic compounds for which remediation goals were calculated had similar target organs/critical effects, then the risk-based remediation goal for that noncarcinogenic compound was divided by the number of compounds having the same target organ/critical effect (i.e., if two noncarcinogenic compounds had "liver" as the target organ, the individual remediation goals would be divided by two). For chemicals that exhibit both carcinogenic and noncarcinogenic effects (e.g., chlordane), the selected remediation goals represent the lower of the calculated carcinogenic and noncarcinogenic remediation goals.

The following sections present the exposure assumptions and equations used to calculate the risk-based remediation goals for chemicals in surface soil. Table 1 presents the toxicity criteria used to calculate the risk-based remediation goals for chemicals in surface soil.

Surface Soil Risk-Based Remediation Goals

Risk-based remediation goals were calculated for chemicals in surface soil based on combined child/adult resident exposures for carcinogens and on child resident exposures for noncarcinogens for the incidental soil ingestion pathway. The equations and exposure assumptions used to calculate risk-based remediation goals for surface soil are presented below. Equations are presented separately for chemicals exhibiting carcinogenic and noncarcinogenic effects.
## TABLE I

### CHRONIC ORAL TOXICITY CRITERIA

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Oral Slope Factor (mg/kg-day)$^{-1}$</th>
<th>Weight-of-Evidence Class (a)</th>
<th>Slope Factor Source</th>
<th>Chronic Oral Reference Dose (mg/kg-day)</th>
<th>Uncertainty Factor (b)</th>
<th>Target Organ/ Critical Effect (c) Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Aldrin</td>
<td>1.7E-01</td>
<td>B2</td>
<td>IRIS</td>
<td>3E-05</td>
<td>1.000</td>
<td>Liver</td>
</tr>
<tr>
<td>Chlordane</td>
<td>1.3E+00</td>
<td>B2</td>
<td>IRIS</td>
<td>6E-05</td>
<td>1.000</td>
<td>Liver</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td>1.3E+00</td>
<td>B2</td>
<td>IRIS</td>
<td>6E-05</td>
<td>1.000</td>
<td>Liver</td>
</tr>
<tr>
<td>gamma-Chlordane</td>
<td>1.3E+00</td>
<td>B2</td>
<td>IRIS</td>
<td>6E-05</td>
<td>1.000</td>
<td>Liver</td>
</tr>
<tr>
<td><strong>Inorganics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cadmium</td>
<td>--</td>
<td>B1</td>
<td>IRIS</td>
<td>1E-03</td>
<td>(d)</td>
<td>Kidney</td>
</tr>
<tr>
<td>Lead</td>
<td>--</td>
<td>B2</td>
<td>IRIS</td>
<td>--</td>
<td>--</td>
<td>CNS</td>
</tr>
<tr>
<td>Mercury</td>
<td>--</td>
<td>D</td>
<td>IRIS</td>
<td>3E-04</td>
<td>1.000</td>
<td>Kidney</td>
</tr>
</tbody>
</table>

(a) USEPA weight-of-evidence classification scheme for carcinogens:
- **A** = Human Carcinogen, sufficient evidence of carcinogenicity in humans;
- **B1** = Probable Human Carcinogen, limited human data are available;
- **B2** = Probable Human Carcinogen, sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans;
- **C** = Possible Human Carcinogen, limited evidence from animal studies in the absence of human studies; and
- **D** = Not classified as to human carcinogenicity, inadequate or no evidence.

(b) Uncertainty factors presented are the products of specific uncertainty factors and modifying factors. Uncertainty factors used to develop reference doses generally consist of multiples of 10, with each factor representing a specific area of uncertainty in the data available. The standard uncertainty factors include:
- a 10-fold factor to account for the variation in sensitivity among the members of the human population;
- a 10-fold factor to account for the uncertainty in extrapolating animal data to the case of humans;
- a 10-fold factor to account for the uncertainty in extrapolating from less-than-chronic NOAELs to chronic NOAELs; and
- a 10-fold factor to account for the uncertainty in extrapolating from LOAELs to NOAELs.

Modifying factors are applied at the discretion of the RfD reviewer to cover other uncertainties in the data and range from 1 to 10.

(c) A target organ or critical effect is the organ/effect most sensitive to the chemical exposure. RfDs are based on toxic effects in the target organ or critical effects. If an RfD is based on a study in which a target organ or critical effect was not identified, the organ/effect listed is one known to be affected by the chemical.

(d) For exposures to cadmium in food.

**NOTE:**
- -- = No information available.
- CNS = Central Nervous System.
The equation used to calculate risk-based remediation goals for chemicals exhibiting carcinogenic effects, using the combined child/adult exposure parameters based on USEPA (1991), is as follows:

\[
C_s = \frac{TR \times AT_c \times 365 \text{ days/year}}{EF \times IFA \times SF_o \times 10^6 \text{ kg/mg}}
\]

where:
- \(C_s\) = chemical concentration in surface soil (mg/kg),
- \(TR\) = target excess individual lifetime cancer risk \((1 \times 10^{-6})\),
- \(AT_c\) = averaging time for carcinogenic effects (70 years),
- \(EF\) = exposure frequency (350 days/year),
- \(IFA\) = adjusted integrated factor (see below) \((114.3 \text{ mg-year/kg-day})\), and
- \(SF_o\) = oral cancer slope factor \([\text{mg/kg-day}]^{-1}\) (see Table 1).

The combined child/adult resident exposure parameters used to calculate carcinogenic risk-based remediation goals for incidental ingestion of surface soil incorporate an age-adjusted factor, which approximates the integrated exposure from birth until age 30 by combining contact rates, body weights, and exposure duration for both children and young adults (USEPA, 1997). The age-adjusted factor was calculated as follows, using exposure parameters from USEPA (1991):

\[
IFA = \frac{ED_c \times IR_c}{BW_c} + \frac{(ED_{tot} - ED_c) \times IR_a}{BW_a}
\]

where:
- \(IFA\) = age-adjusted integrated factor \((\text{mg-year/kg-day})\),
- \(ED_c\) = child’s exposure duration \((6 \text{ years})\),
- \(IR_c\) = child’s soil ingestion rate \((200 \text{ mg/day})\),
- \(BW_c\) = child’s body weight \((15 \text{ kg})\),
- \(ED_{tot}\) = total exposure duration \((30 \text{ years})\),
- \(IR_a\) = adults soil ingestion rate \((100 \text{ mg/day})\), and
- \(BW_a\) = adult’s body weight \((70 \text{ kg})\).

The equation used to calculate risk-based remediation goals for chemicals exhibiting noncarcinogenic effects, using the child exposure parameters obtained from USEPA (1991), is as follows:

\[
C_s = \frac{THI \times BW \times AT_{nc} \times 365 \text{ days/year}}{EF \times ED \times (1/RfD_o) \times 10^6 \text{ kg/mg} \times IR_{soil}}
\]

where:
- \(C_s\) = chemical concentration in soil (mg/kg),
- \(THI\) = target hazard index \((1)\),
- \(BW\) = body weight \((15 \text{ kg})\),
- \(AT_{nc}\) = averaging time for noncarcinogenic effects \((6 \text{ years})\),
- \(EF\) = exposure frequency \((350 \text{ days/year})\),
- \(ED\) = exposure duration \((6 \text{ years})\),
- \(RfD_o\) = oral chronic reference dose \((\text{mg/kg-day})\) (see Table 1), and
- \(IR_{soil}\) = soil ingestion rate \((200 \text{ mg/day})\).
**Summary of Risk-Based Remediation Goals**

Risk-based remediation goals for AREEs 11 and 19 were calculated for selected chemicals in surface soil. Specifically, risk-based remediation goals were calculated for all chemicals associated with chemical-specific risks greater than or equal to $1 \times 10^{-6}$ or chemicals contributing to a HI greater than or equal to 1 for a specific target organ for the incidental ingestion exposure pathway. Risk-based remediation goals were not calculated for inorganic compounds that were statistically determined to be within background levels. Risk-based remediation goals for all selected chemicals in surface soil were developed based on conservative child/adult resident receptors for carcinogens and on child resident receptors for noncarcinogens. Risk-based remediation goals for surface soil are presented in Table 2.

Based on a review of the chemicals and pathways evaluated in the risk assessment, risk-based remediation goals for surface soil were calculated for: aldrin, chlordane, alpha-chlordane, gamma-chlordane, cadmium, and mercury detected at AREE 11; and lead detected at AREE 19. At AREE 19, the maximum lead concentration (5,850 mg/kg) was approximately 14 times greater than USEPA's 400 mg/kg residential soil screening level for lead, and the arithmetic mean concentration (949 mg/kg) was approximately twice the screening level. USEPA's residential soil screening level for lead was developed using the Integrated Exposure Uptake Biokinetic (IEUBK) model (USEPA, 1994) and is based on residential exposures by the most sensitive members of the population (i.e., young children). Since a risk-based remediation goal cannot be calculated for lead due to a lack of available quantitative carcinogenic and noncarcinogenic toxicity criteria, the 400 mg/kg residential soil screening level for lead is presented in Table 2 as the remediation goal for lead in surface soil.

**References**


## TABLE 2
REMEDIATION GOALS FOR CHEMICALS IN SURFACE SOIL (a)

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Toxicity Criterion</th>
<th>Calculated Remediation Goal (mg/kg)</th>
<th>Selected Remediation Goal (mg/kg) (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Carcinogenic (mg/kg-day)</td>
<td>Noncarcinogenic (mg/kg-day)</td>
<td>Carcinogenic (b)</td>
</tr>
<tr>
<td>AREE 11</td>
<td>Resident Ingestion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ardrin</td>
<td>1.7E+01</td>
<td>3E-05</td>
<td>0.038</td>
</tr>
<tr>
<td>Chlordane</td>
<td>1.3E+00</td>
<td>6E-05</td>
<td>0.49</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td>1.3E+00</td>
<td>6E-05</td>
<td>0.49</td>
</tr>
<tr>
<td>gamma-Chlordane</td>
<td>1.3E+00</td>
<td>6E-05</td>
<td>0.49</td>
</tr>
<tr>
<td>Cadmium</td>
<td>--</td>
<td>1E-03</td>
<td>--</td>
</tr>
<tr>
<td>Mercury</td>
<td>--</td>
<td>3E-04</td>
<td>--</td>
</tr>
<tr>
<td>AREE 119</td>
<td>Child Resident Ingestion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

(a) Remediation goals were calculated for predominant chemicals (i.e., chemicals with risks exceeding $1 \times 10^{-6}$ or chemicals contributing to a HI greater than or equal to 1 for a specific target organ) for the incidental ingestion pathways associated with a total excess lifetime cancer risk exceeding $1 \times 10^{-4}$ or a HI greater than or equal to 1.

(b) The calculated remediation goals for carcinogenic chemicals were based on a target risk level of $1 \times 10^{-6}$ and were calculated using combined child/adult exposure parameters.

(c) The calculated remediation goals for noncarcinogenic chemicals were calculated using child resident exposure parameters, and were based on a hazard quotient of 1. The remediation goals for ardrin, chlordane, alpha-chlordane, and gamma-chlordane were divided by four since they all have the liver as the target organ; the remediation goals for cadmium and mercury were divided by two since both have the kidney as the target organ.

(d) The selected remediation goal represents the lower of the calculated carcinogenic and noncarcinogenic remediation goals.

(e) The selected remediation goal is USEPA’s residential soil screening level for lead (USEPA, 1994).
The Environmental Effects Quotient (EEQ) is the ratio of the estimated exposure concentration/dose for the chemical of concern and the toxicity reference value (TRV) for the ecological receptor of concern.

ECOLOGICALLY-BASED CLEANUP LEVELS
AREAS REQUIRING ENVIRONMENTAL EVALUATION (AREEs) 11, 19, AND 21
VINT HILL FARMS STATION (VHFS)

Results of the Ecological Risk Assessment (ERA) conducted as part of the Phase I Reuse Area Remedial Investigation (RI) at VHFS (USAEC, 1997) indicate the potential for adverse effects to ecological resources at several on-site locations. Surface soils at AREEs 11, 19, and 21 were identified as having the greatest potential to adversely affect ecological resources and were selected for remediation. The following ecological receptors were identified as having the greatest potential to be adversely affected in each of these areas:

• AREE 11 (Former Sewage Treatment Plant)
  – Terrestrial plants from the presence of silver in surface soil; and
  – Robins from the presence of mercury and DDTr in surface soil.

• AREE 19 (Pistol Range)
  – Terrestrial plants from the presence of lead in surface soil.

• AREE 21 (Sand Filter Beds)
  – Robins from the presence of 2,3,7,8-TCDF in surface soil.

The objective of this document is to identify the reduction in chemical concentrations necessary to be protective of these ecological resources. Because of the conservative nature of the toxicological values and exposure estimates, cleanup levels were derived based on an EEQ of 10. The following sections derive cleanup levels for each of these areas based on the ecological resources at risk.

AREE 11 (Former Sewage Treatment Plant)

Terrestrial Plants

Results of the ERA indicate the potential for adverse effects to terrestrial plants from the presence of silver in surface soil at AREE 11. A literature-based toxicity value of 2 mg/kg derived by Will and Suter (1994) and used in the ERA to evaluate the potential for adverse effects to terrestrial plants was used to derive the cleanup level for silver in surface soil. Using this toxicity value and a target EEQ of 10, the cleanup level for silver in surface soil at AREE 11 is 20 mg/kg.

Terrestrial Wildlife

Results of the ERA indicate the potential for adverse effects to robins from the presence of mercury and DDTr in surface soil at AREE 11. Attachment A outlines the screening model and input parameters used in the ERA to estimate the potential for adverse effects to robins. Assumptions in this model were designed to provide a highly conservative estimate of the potential for adverse effects to robins. One of the most conservative assumptions in the model is that robins would be exposed to the estimated average mercury and DDTr concentrations detected in the VHFS Phase I reuse area (1.14 mg/kg and 0.0918 mg/kg, respectively). However, as discussed in the RI, samples were biased towards areas of likely contamination, and samples from these areas are likely to over-estimate actual levels of

The Environmental Effects Quotient (EEQ) is the ratio of the estimated exposure concentration/dose for the chemical of concern and the toxicity reference value (TRV) for the ecological receptor of concern.
contamination throughout the facility. Further, the highest mercury and DDTr concentrations were detected within very localized areas of AREE 11. The areas of mercury and DDTr contamination in surface soil at AREE 11 are the sludge pile, which is 45 feet in diameter, and the drying bed, which is 25 feet by 40 feet in size. Mercury and DDTr detected in these areas are the primary drivers of the estimated risks to robins at VHFS. Accordingly, robins are likely to be exposed to mercury or DDTr in only a limited proportion of their total foraging area and, because of the biased sampling methodology, using an average of the Phase I reuse area concentrations detected in surface soil will likely over-estimate the potential for exposure and adverse effects.

Cleanup levels were determined by backcalculating through the risk model used in the ERA. Two approaches were used to develop cleanup levels for robins. The first approach assumes the total area to which robins would be exposed is equal to the entire VHFS Phase I reuse area. This approach is consistent with that used in the ERA and simply requires determining, by backcalculating through the equations presented in Attachment A, an average exposure concentration which is equal to 10 times the toxicity value used in the ERA (i.e., an EEQ of 10). However, this approach is likely to over-estimate risks because it assumes the average Phase I reuse area exposure concentration, estimated by averaging the concentrations of chemical detected at surface soil sample locations, is an accurate indicator of chemical concentrations throughout the Phase I reuse area. The second approach applies a spatial factor to adjust for the area of actual contamination. This latter approach is expected to provide a more realistic estimate of exposure.

The spatial factor used for the second approach was derived by first estimating the total area over which a robin is likely to forage. Pitts (1984) estimated an average territory size of 0.42 hectares (equal to 45,208 square feet) for robins on a college campus in Tennessee. Based on this territory size and the assumption that robins would forage in a roughly circular area around their nests, a robin foraging in AREE 11 could also be exposed to mercury and DDTr in surface soil at AREE 24 (Transformer Storage Area). Although the mercury and DDTr concentrations detected at AREE 24 are lower than those detected at AREE 11, the chemicals detected in AREE 24 could affect the overall potential for adverse effects to robins. Accordingly, cleanup levels for AREE 11 were calculated assuming robins could be exposed to mercury and DDTr at both AREEs 11 and 24. Mercury and DDTr were not detected at any other AREEs within the foraging range of robins at AREE 11.

The total area of potential mercury and DDTr contamination to which a robin foraging at AREE 11 could be exposed was estimated to be 2,990 square feet by summing the potentially contaminated areas in AREE 11 (2590 square feet) and the potentially contaminated area in AREE 24 (400 square feet). The proportion of the total foraging area at which a robin associated with AREE 11 could be exposed to mercury or DDTr was then estimated by dividing the estimated total area contaminated with mercury and DDTr by the robin’s estimated territory size. Using this approach, a proportion of 0.066 was estimated. This proportion was then used as a multiplier in equations (2) and (5) of Attachment A.

Cleanup levels derived using the approaches described above are presented in Table 1. The approach which accounts for the limited distribution of mercury and DDTr in the territorial range of robins results in higher cleanup levels. However, these cleanup levels are expected to be more realistic and are recommended for use as the final cleanup levels. Consistent with the ERA, cleanup levels were also derived for both inorganic and organic mercury (methylmercury). Although it is likely only a proportion of the mercury detected in surface soil is present in the organic form, it is recommended that the more conservative methylmercury cleanup level be selected as the cleanup level for AREE 11.
Table 1
Surface Soil Cleanup Levels for the Protection of Terrestrial Wildlife

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Cleanup Levels Based on Average Site-wide Concentrations (mg/kg)</th>
<th>Cleanup Levels Based on Spatially-Adjusted Estimates of Contamination (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDTr</td>
<td>0.018</td>
<td>0.26 (a)</td>
</tr>
<tr>
<td>Mercury (inorganic)</td>
<td>0.36</td>
<td>5.19 (a)</td>
</tr>
<tr>
<td>Methylmercury</td>
<td>0.02</td>
<td>0.29 (a)</td>
</tr>
<tr>
<td>2,3, 7,8-TCDF</td>
<td>2.9E-06</td>
<td>1.12E-04 (b)</td>
</tr>
</tbody>
</table>

(a) Cleanup level for AREE 11.
(b) Cleanup level for AREE 21.
AREE 19 (Pistol Range)

Terrestrial Plants

Results of the ERA indicate the potential for adverse effects to terrestrial plants from the presence of lead in surface soil. A literature-based toxicity value of 50 mg/kg derived by Will and Suter (1994) was used in the ERA to evaluate the potential for adverse effects to terrestrial plants. Using this toxicity value and a target EEQ of 10, the cleanup level for lead in surface soil at AREE 19 is 500 mg/kg.

AREE 21 (Sand Filter Beds)

Terrestrial Wildlife

Results of the ERA indicate the potential for adverse effects to robins from the presence of 2,3,7,8-TCDF in surface soil at AREE 21. Attachment A outlines the screening model and input parameters used in the ERA to estimate the potential for adverse effects to robins. Assumptions in this model were designed to provide a highly conservative estimate of the potential for adverse effects to robins. The most conservative assumption in the model is that robins would be exposed to the average of the 2,3,7,8-TCDP concentrations detected in the VHFS Phase I reuse area (1.11E-05 mg/kg). However, as discussed in the RI, the highest 2,3,7,8-TCDF concentration was detected in a very localized area of AREE 21. The area of 2,3,7,8-TCDF contamination in surface soil that is driving the risk to terrestrial wildlife is the absorption bed area of AREE 21 which is approximately 375 feet by 3 feet in size. Accordingly, robins are likely to be exposed to this chemical in only a very limited proportion of their total foraging area, and the use of an average Phase I reuse area exposure concentration will likely overestimate the potential for exposure and adverse effects to robins.

Cleanup levels for 2,3,7,8-TCDF were calculated for AREE 21 using the same methods described earlier to derive cleanup levels for mercury and DDTr at AREE 11. The contaminated proportion of the total territory size was estimated to be 0.025 assuming the contaminated area of AREE 21 is 1,125 square feet in size. Only AREE 21 was factored into the calculation because no other areas of 2,3,7,8-TCDF contamination occur within the range of a robin foraging in AREE 21. The cleanup levels derived for 2,3,7,8-TCDF are summarized in Table 1. It is recommended that the cleanup level derived using the approach which accounts for the spatial distribution of 2,3,7,8-TCDF be used as the cleanup level for AREE 21.

Summary of Cleanup Levels

Table 2 presents the cleanup levels for chemicals of significant ecological concern in surface soil for AREEs 11, 19, and 21. It should be noted that the cleanup level derived for 2,3,7,8-TCDF (1.12E-04 mg/kg) is higher than the maximum detected concentration at AREE 21 of 8.71E-06 mg/kg, indicating that remediation of AREE 21 may not be required when its areal extent is considered.

References


<table>
<thead>
<tr>
<th>Chemical</th>
<th>Cleanup Level (mg/kg)</th>
</tr>
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<tbody>
<tr>
<td><strong>AREE 11</strong></td>
<td></td>
</tr>
<tr>
<td>DDTr</td>
<td>0.26</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.29</td>
</tr>
<tr>
<td>Silver</td>
<td>20</td>
</tr>
<tr>
<td><strong>AREE 19</strong></td>
<td></td>
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<tr>
<td>Lead</td>
<td>500</td>
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<tr>
<td><strong>AREE 21</strong></td>
<td></td>
</tr>
<tr>
<td>2,3,7,8-TCDF</td>
<td>1.12E-04</td>
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</tbody>
</table>
ATTACHMENT A
ESTIMATION OF ROBIN EXPOSURE TO CHEMICALS FOR THE DERIVATION OF CLEANUP LEVELS

The following sections present the methods used to calculate the potential ingestion low by robins from the ingestion of food (i.e., earthworms) and surface soil. The equations given by were derived based on equations presented by USEPA (1989). Table A-1 presents specific exposure parameter values used in these equations.

Total Dose

The total dietary exposure levels for robins to chemicals was determined using the following equation:

\[
Dose_{total} = Dose_{worm} + Dose_{soil} \quad (1)
\]

where:
Dose\(_{worm}\) = amount of chemical ingested per day via ingestion of earthworms (in mg/kg bw-d, use equations 2, 3, and 4 to calculate); and
Dose\(_{soil}\) = amount of chemical ingested per day from soil (in mg/kg bw-d, use equation 5 to calculate).

Dose From Earthworms

The following equation was used to calculate the dose of chemicals that a robin would be expected to obtain from the ingestion of earthworms:

\[
Dose_{worm} = FI \times C_{diet} \quad (2)
\]

where:
FI = food ingestion rate (kg/kg bw-d); and
C\(_{diet}\) = estimated chemical concentration in diet (in mg/kg, use equation 3 to calculate).

The estimated dietary concentration (C\(_{diet}\)) was calculated using the following equation:

\[
C_{diet} = P_e \times C_e \quad (3)
\]

where:
P\(_e\) = proportion of diet consisting of earthworms (unitless); and
C\(_e\) = estimated concentration of chemical in earthworms (in mg/kg, use equation 4 to calculate).
# Table A-1
Summary of Exposure Parameters Used In the Robin Food Ingestion Model

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food ingestion rate (Fl; kg/kg bw-d)</td>
<td>1.52</td>
<td>a</td>
</tr>
<tr>
<td>Proportion of diet consisting of earthworms (Pₑ; unitless)</td>
<td>0.18</td>
<td>b,c</td>
</tr>
</tbody>
</table>
| Bioconcentration factor for chemical in earthworms (BCF; unitless) | DDTr = 1.4  
  inorganic mercury = 0.96  
  methylmercury = 27  
  2,3,7,8-TCDF = 14.5 | d,e     |
| Soil ingestion rate (Sl; kg/kg bw-d)                | 0.158                                                                | i      |

(c) Howell (1942) as cited in USEPA (1993).
(d) Beyer (1990).
(e) Tyler (1973).
(f) Beyer and Stafford (1993).
(g) Eisler (1987).
(h) Eisler (1986).
(i) Beyer et al. (1994).
The concentration of chemical in an earthworm ($C_e$) fresh weight was determined using the following equation:

$$C_e = C_{soil} \times BCF \quad (4)$$

where:

- $C_{soil}$ = average concentration of chemical detected in surface soil (mg/kg); and
- BCF = bioconcentration factor for chemical in earthworms (unitless).

**Dose From Soil**

The following equation was used to calculate the dose of chemicals that a robin would be expected to obtain from the ingestion of surface soil:

$$Dose_{soil} = SI \times C_{soil} \quad (5)$$

where:

- SI = soil ingestion rate (kg/kg bw-d); and
- $C_{soil}$ = average chemical concentration in surface soil (mg/kg).

**References**


ATTACHMENT 3

PUBLIC NOTICE
The United States Army at Vint Hill Farms, Stanly, Virginia Invites Public Comment
ON A PROPOSED ENVIRONMENTAL CLEANUP
Concerning Eosin Atixa
Requiring Environmental Evaluation:
5, 11,19 & 21
Please Come To Our
PUBLIC MEETING
Thursday, September 18, 1997 7:00 p.m.
Warrenton Middle School Auditorium
244 Water Street - Warrenton, VA
( Sign Language Interpreter will be present)
PURPOSE TO DISCUSS AND PRESENT THE REMEDIAL ALTERNATIVES FOR THE SITES IDENTIFIED ABOVE:

The U.S. Army, in consultation with the U.S. Environmental Protection Agency (USEPA) Region III and the Virginia Department of Environmental Quality (VDEQ), invites public comment on its proposed plan for remediating contaminated soil at the following Areas requiring Environmental Evaluation (ARES) on Vint Hill Farms Station (VHFS), Virginia AREE 9 - Vehicle Maintenance Area, AREE 11 - Farm Service Implement Plant, and AREE 21 - Sand Filter Beds: Before selecting a final remedy, VHFS will consider all written and oral comments received during the public comment period.

The U.S. Army will be accepting comments during a 30-DAY PUBLIC COMMENT PERIOD which begins Thursday, September 11 and ends Friday, October 10, 1997.
Writt en comments may be submitted to the following address:
Kevin Belt, Public Affairs Officer
Public Affairs Office (Bldg 121)
Vint Hill Farms Station
Warrenton, VA 20187-5010

BACKGROUND

VHFS is part of the U.S. Army Communications - Electronics Command (CECOM) and primarily functions as an Army installation engaged in communications intelligence (C2I). VHFS is located approximately 40 miles southwest of Washington, DC, in Fauquier County, Virginia. The installation occupies approximately 500 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds and the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 34 acres on the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operations sites. The facility was designed for closure in March, 1992, under the Base Realignment and Closure (BRAC) Act.

PROPOSAL

VHFS evaluates two remedial alternatives to address soil contamination at ARES 9, 11, and 19:

ALTERNATIVE 1: No Action; and
ALTERNATIVE 2: Soil Removal

Based on available information, VHFS prefers Alternative 2 which includes excavation and off-site disposal of contaminated soil at ARES 9, 11, and 19. This remedial alternative is a permanent solution that offers long-term effectiveness since the contaminated soil is removed to cleanup levels and transported off-site for proper disposal. Since the amount of soil requiring remediation is relatively small (less than 300 cubic yards combined), it was not practical to consider active treatment or containment options in terms of cost effectiveness and implementability. The excavation and disposal of contaminated soil would be done in accordance with federal and Commonwealth of Virginia soil and hazardous waste regulations.

*Based on the soil cleanup criteria established by USEPA for the protection of human health and the environment; no further action is required for AREE 21.

FOR MORE INFORMATION

You can review the Proposed Plan and related technical documents at the information repository at the following location:

Fauquier County Library
Warrenton Branch - Reference Section
11 Winchester Street
Warrenton, VA 20186

Office:
M-W 9 a.m. - 9 p.m.
Th-Sat 9 a.m. - 5 p.m. and
Sun 1 p.m. - 5 p.m.

Phone: (540) 347-8700
Site Information:

**Site Name:** USA VINT HILL FARMS STATION  
**Address:** WARRENTON, VA  
**EPA ID:** VA8210020931  
**EPA Region:** 03

Site Alias Name(s):

VINT HILL FARMS STATION

Record of Decision (ROD):

**ROD Date:** 07/01/1999  
**Operable Unit:** 04  
**ROD ID:** EPA/ROD/R03-99/017

**Media:** Soil

**Contaminant:** Dioxins/Dibenzofurans, Metals, PAH, Petroleum Hydrocarbon

**Abstract:** The Vint Hill Farms Station (VHFS) is located approximately 40 miles southwest of Washington, DC, in Fauquier County, Virginia. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites. Land use in the immediate vicinity of VHFS consists mainly of agriculture (mostly horse farms) and residential areas. With the exception of a few residences to the north, the majority of residential development is located to the south of VHFS. A small county recreational park is located adjacent to VHFS along South Run.

VHFS is part of the U.S. Army Communications-Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence. VHFS was designated for closure in March 1993, under the Base
Realignment and Closure (BRAC) Act. Pursuant to decision to close the installation, and Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May 1994, respectively. The ENPA identified 42 areas requiring environmental evaluation (AREEs) from the review of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation. These 27 AREEs were investigated from September 1994, to June 1995, as part of the Site Inspection (SI) conducted by SAIC. The final SI Report, which was completed in June 1996, identified 24 AREEs which required further investigation. In addition, four new AREEs were determined to warrant further investigation subsequent to the SI. AREEs that were determined to warrant further investigation were investigated as part of the Phase I and Phase II reuse areas Remedial Investigation (RI) and the supplemental RI conducted by ICF Kaiser Engineers, Inc. The final RI reports for the Phase I and Phase II reuse areas were completed in April 1998, and January 1999, respectively.

**Remedy:** No action is selected by U.S. Army for Areas Requiring Environmental Evaluation 13, 14, 16-1, 27, and 29-4 because these sites do not pose unacceptable human health or ecological risks.

- Estimated Capital Cost: $0
- Estimated Annual O&M Costs: $0
- Estimated Present Worth Costs: $0

**Text:** Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

USA VINT HILL FARMS STATION
EPA ID: VA8210020931
OU 04
WARRENTON, VA
07/01/1999
FINAL
DECISION DOCUMENT
AREEs 13, 14, 16-1, 27, AND 29-4
VINT HILL FARMS STATION
WARRENTON, VIRGINIA

Prepared for:
U.S. Army Communications-Electronics Command

Prepared by:
IT Corporation
Edgewood, Maryland

June 1999
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2.0 SITE BACKGROUND</td>
<td>1</td>
</tr>
<tr>
<td>3.0 SITE CHARACTERISTICS</td>
<td>3</td>
</tr>
<tr>
<td>3.1 Site Topography</td>
<td>3</td>
</tr>
<tr>
<td>3.2 Adjacent Land Use</td>
<td>3</td>
</tr>
<tr>
<td>3.3 Surface Water Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>3.4 Geology/Hydrogeology</td>
<td>3</td>
</tr>
<tr>
<td>4.0 SITE HISTORY AND INVESTIGATION FINDINGS</td>
<td>5</td>
</tr>
<tr>
<td>4.1 AREE 13 — Sludge Disposal Area</td>
<td>5</td>
</tr>
<tr>
<td>4.2 AREE 14 — Skeet Range</td>
<td>5</td>
</tr>
<tr>
<td>4.3 AREE 16-1 — Possible Firefighter Training Pit</td>
<td>5</td>
</tr>
<tr>
<td>4.4 AREE 27 — AAFES Service Station</td>
<td>6</td>
</tr>
<tr>
<td>4.5 AREE 29-4 — Disposal Area</td>
<td>6</td>
</tr>
<tr>
<td>5.0 SUMMARY OF SITE RISKS</td>
<td>7</td>
</tr>
<tr>
<td>5.1 AREE 13 - Sludge Disposal Area</td>
<td>8</td>
</tr>
<tr>
<td>5.2 AREE 14 — Skeet Range</td>
<td>9</td>
</tr>
<tr>
<td>5.3 AREE 16-1 — Possible Firefighter Training Pit</td>
<td>9</td>
</tr>
<tr>
<td>5.4 AREE 27 — AAFES Service Station</td>
<td>10</td>
</tr>
<tr>
<td>5.5 AREE 29-4 — Disposal Area</td>
<td>10</td>
</tr>
<tr>
<td>6.0 SELECTED ALTERNATIVE</td>
<td>10</td>
</tr>
<tr>
<td>7.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION</td>
<td>10</td>
</tr>
<tr>
<td>8.0 RESPONSIVENESS SUMMARY</td>
<td>11</td>
</tr>
<tr>
<td>8.1 Selected Newspaper Notices</td>
<td>11</td>
</tr>
<tr>
<td>8.2 Comments Raised During the Public Meeting on April 15, 1999</td>
<td>12</td>
</tr>
<tr>
<td>8.3 Public Meeting Attendance Roster</td>
<td>12</td>
</tr>
<tr>
<td>8.4 Active Restoration Advisory Board Members</td>
<td>12</td>
</tr>
<tr>
<td>8.5 Written Comments Received During the Public Comment Period</td>
<td>12</td>
</tr>
<tr>
<td>9.0 REFERENCES</td>
<td>12</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

General Location of VHFS

General Locations of AREE at VHFS

LIST OF ATTACHMENT

Attachment 1 Response to USEPA Comments on the Final Phase I Reuse Area RI Repor
Attachment 2 Response to USEPA Comments on the AREE 14 Investigation Summary Report.
Attachment 3 Proposed Plan
Attachment 4 Public Notice
Attachment 5 Public Meeting Roster
Attachment 6 Written Comments From Regulators and U.S. Army Responses
**ABBREVIATIONS AND ACRONYMS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAFES</td>
<td>Army, Air Force Exchange Service</td>
</tr>
<tr>
<td>AREE</td>
<td>Area Requiring Environmental Evaluation</td>
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<tr>
<td>bgs</td>
<td>below ground surface</td>
</tr>
<tr>
<td>BRA</td>
<td>Baseline Risk Assessment</td>
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<tr>
<td>BRAC</td>
<td>Base Realignment and Closure</td>
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<td>CECOM</td>
<td>Communications-Electronics Command</td>
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<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation and Liability Act</td>
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<td>CERFA</td>
<td>Community Environmental Response Facilitation Act</td>
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<tr>
<td>DD</td>
<td>Decision Document</td>
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<tr>
<td>EEQ</td>
<td>environmental effects quotient</td>
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<td>ENPA</td>
<td>Enhanced Preliminary Assessment</td>
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<td>ERA</td>
<td>Ecological Risk Assessment</td>
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<td>ft</td>
<td>feet</td>
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<td>HHRA</td>
<td>Human Health Risk Assessment</td>
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<td>HI</td>
<td>Hazard Index</td>
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<td>HQ</td>
<td>Hazard Quotient</td>
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<tr>
<td>ICF KE</td>
<td>ICF Kaiser Engineers, Inc.</td>
</tr>
<tr>
<td>IEUBK</td>
<td>Integrated Exposure Uptake Biokinetic</td>
</tr>
<tr>
<td>MSL</td>
<td>mean sea level</td>
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<tr>
<td>NCP</td>
<td>National Oil and Hazardous Substances Pollution Contingency Plan</td>
</tr>
<tr>
<td>PAH</td>
<td>polynuclear aromatic hydrocarbon</td>
</tr>
<tr>
<td>ppm</td>
<td>parts per million</td>
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<tr>
<td>RBC</td>
<td>risk-based concentration</td>
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<td>RI</td>
<td>Remedial Investigation</td>
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<td>SAIC</td>
<td>Science Applications International Corporation</td>
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<td>SARA</td>
<td>Superfund Amendments and Reauthorization Act</td>
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<td>SI</td>
<td>Site Inspection</td>
</tr>
<tr>
<td>SRI</td>
<td>Supplemental Remedial Investigation</td>
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<tr>
<td>STP</td>
<td>Sewage Treatment Plant</td>
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<tr>
<td>TPH</td>
<td>total petroleum hydrocarbon</td>
</tr>
<tr>
<td>TRV</td>
<td>toxicity reference value</td>
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<tr>
<td>USACE</td>
<td>U.S. Army Corps of Engineers</td>
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<td>USAEC</td>
<td>U.S. Army Environmental Center</td>
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<tr>
<td>USEPA</td>
<td>U.S. Environmental Protection Agency</td>
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<tr>
<td>UST</td>
<td>underground storage tank</td>
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<tr>
<td>VDEQ</td>
<td>Virginia Department of Environmental Quality</td>
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<td>VHFS</td>
<td>Vint Hill Farms Station</td>
</tr>
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</table>
DECLARATION FOR THE DECISION DOCUMENT
REMEDIAL ALTERNATIVE SELECTION

Site Name and Location

Areas Requiring Environmental Evaluation (AREEs) 13, 14, 16-1, 27, and 29-4 Vint Hill Farms Station Warrenton, Virginia

Statement of Basis and Purpose

This Decision Document (DD) presents a determination that no action is necessary to protect human health and the environment for soil at AREEs 13, 14, 16-1, 27, and 29-4 at Vint Hill Farms Station (VHFS), Warrenton, Virginia. This determination was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendment and Reauthorization Act (SARA) of 1986 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This document was prepared as a joint effort between the U.S. Army, the Virginia Department of Environmental Quality (VOEQ), and the U.S. Environmental Protection Agency (USEPA). The no action decision is supported by documents contained in the Information Repository

Description of the Selected Remedy

No action is the selected remedy for AREEs 13, 14, 16-1, 27, and 29-4. The Baseline Risk Assessment (BRA), conducted as part of the investigation activities, supports the no action decision.

Declaration

The no action remedy selection is based upon the findings of the BRA which determined risks within USEPA's acceptable risk range for each of AREEs 13, 14, 16-1, 27, and 29-4. Therefore, the selected remedy is protective of human health and the environment. A five-year review will not be necessary for these AREEs.

Robert L. Nabors
Major General, USA
Commanding
U.S. Army Communications-Electronics Command

7/1/99

Date
DECISION SUMMARY

1.0 INTRODUCTION

The no action decision is based on the Phase I Reuse Area Remedial Investigation (RI) Report (USAEC 1998) and the Phase II Reuse Area RI Report (USACE, 1999) which include Baseline Risk Assessments (BRAs) documenting the risks from contamination in the soil at Areas Requiring Environmental Evaluation (AREEs) 13, 14, 16-1, 27, and 29-4. In the BRA, it was determined that the soils at AREEs 13, 14, 16-1, 27, and 29-4 do not pose unacceptable risks to human health and the environment. Therefore the soils at AREEs 13, 14, 16-1, 27, and 29-4 require no action to be protective of human health and the environment.

2.0 SITE BACKGROUND

Vint Hill Farms Station (VHFS) is part of the U.S. Army Communications - Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence. VHFS is located approximately 40 miles southwest of Washington, D.C., in Fauquier County, Virginia, as shown on Figure 1. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites.

VHFS was designated for closure in March, 1993, under the Base Realignment and Closure (BRAC) Act. Pursuant to the decision to close the installation, an Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May, 1994, respectively. The ENPA identified 42 AREEs from thereview of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation.

These 27 AREEs were investigated from September, 1994, to June, 1995, as part of the Site Inspection (SI) conducted by SAIC. The objective of the SI was to determine the presence or absence of contamination and the chemical nature of any detected contamination. The final SI Report (USAEC, 1996), which was completed in June, 1996, identified 24 AREEs which required further investigation. In addition, four new AREEs were identified during site reconnaissance to warrant further investigation subsequent to the SI. AREEs that were determined to warrant further investigation were investigated as part of the Phase I and Phase II reuse area RIs and the Supplemental Remedial Investigation (SRI) conducted by ICF Kaiser Engineers, Inc. (ICF KE). The purposes of these reports were to evaluate: 1) the nature and extent of contamination; and 2) the level of risk posed to human health and the environment. The final RI Reports for the Phase I and Phase II reuse areas (USAEC, 1998; USACE, 1999) were completed in April, 1998, and January, 1999, respectively. The final SRI Report (USAEC, 1998b) was completed in November, 1998.

Five AREEs were identified in the RIs and SRI as having soil contamination which poses no unacceptable human health risks and/or significant adverse ecological effects:

- AREE 13 - Sludge Disposal Area;
- AREE 14 - Skeet Range;
• AREE 16-1 – Possible Firefighter Training Pit:
• AREE 27 – Army, Air Force Exchange Service (AAFES) Service Station; and
• AREE29-4 – Disposal Area.

The locations of these AREEs are shown on Figure 2.

3.0 SITE CHARACTERISTICS

3.1 Site Topography

VHFS is located within the Piedmont Plateau physiographic province approximately 20 miles west of the Fall Line. The Fall Line is a physiographic boundary that separates the folded and faulted crystalline rocks of the Piedmont Plateau physiographic province from the unconsolidated sediments of the Atlantic Coastal Plain physiographic province. The topography of the Piedmont Plateau in the vicinity of VHFS consists of gently rolling hills with slopes generally less than 10%. Surface elevations on the installation vary from 335 to 430 feet (ft) above mean sea level (MSL).

3.2 Adjacent Land Use

Land use in the immediate vicinity of VHFS consists mainly of agriculture (mostly horse farms) and residential areas. With the exception of a few residences to the north the majority of residential development is located to the south of VHFS. A small county recreation park is located adjacent to VHFS along South Run.

3.3 Surface Water Hydrology

VHFS is located in the Occoquan watershed. Most of VHFS drains to South Run via intermittent tributaries and drainage ditches, as shown on Figure 2. South Run is a small Class III Virginia stream which discharges into Lake Manassas, a recreation and drinking water reservoir built on Broad Run for the City of Manassas Lake Manassas discharges to Broad Run, which drains to the Occoquan Reservoir. Drainage for the southern portion of the installation flows south and east to Kettle Run. Kettle Run converges with Broad Run approximately 10 miles downstream from Lake Manassas.

3.4 Geology/ Hydrogeology

The central portion of VHFS is underlain by folded sedimentary rocks of the Catharpin Creek Member which consists of sandstone, arkosic sandstone, siltstone, shale, and claystone. Intrusions of basalt, oriented northeast to southwest, cut the bedrock in the central and western portions of the VHFS installation. The northeastern flank of VHFS is underlain by intrusions of diabase. Quaternary alluvium is present along the major drainage channels within the installation.

The overburden is thickest (20-40 ft) in the southern region of the site and thins to 0-10 ft in the northern areas. The overburden consists primarily of saprolite (a chemical and physical weathering product of the underlying bedrock) which underlies lesser amounts of clayey and silty soils.

Groundwater at VHFS occurs in fractured bedrock and to a lesser extent in the overburden. The bedrock aquifer is semi-confined, with the unfractured bedrock and saprolite acting as confining units. Recharge to the fractured bedrock aquifer occurs at outcrop areas and from percolation from the overburden along fractures. In the overburden, the aquifer is unconfined.
4.0 SITE HISTORY AND INVESTIGATION FINDINGS

The RIs for these five AREEs were conducted to evaluate the nature and extent of contamination associated with past site activities. Environmental samples collected and analyzed during the RIs were used in conjunction with the results from the SI to assess the condition of each of the AREEs. The environmental media investigated included surface soil (0 to 2 ft below ground surface [bgs]), subsurface soil (2 ft to approximately 10 ft bgs), surface water, sediment, and groundwater. Analytical results were compared to background concentrations and regulatory screening levels to determine if environmental media had been adversely impacted by site activities. A brief description of each of the five AREEs and the significant findings of the RIs and SI are presented in the following paragraphs. A detailed presentation of the samples collected and the analytical results can be found in the Phase I Reuse Area RI Report (USAEC, 1998) and the Phase II Reuse Area RI Report (USACE, 1999), available in the Information Repository. Comments received from the U.S. Environmental Protection Agency (USEPA) on the final Phase I Reuse Area RI Report and on the AREE 14 Investigation Summary Report (USACE, 1998a) regarding these five AREEs along with the U S Army's responses are provided in Attachments 1 and 2, respectively.

4.1 AREE 13 – Sludge Disposal Area

The Sludge Disposal Area was used during the 1980s to dispose of sludges from the sewage treatment plant (STP) and the former STP, and sand filter sludge and sandblasting waste from the Electric Equipment Facility. In 1982, the sludges were analyzed for total metals and were determined by the U S Army to be at concentrations sufficiently low for land spreading. The sludge pile was 75 ft in diameter and 3 ft high. In 1992, the U.S. Army decided to close the sludge pile, and twenty thousand cubic feet of sludge were excavated, mixed with pressed sludge cake from the STP digester, and transported to the Fauquier County Landfill. The area has been backfilled and seeded.

Surface and subsurface soil samples were collected at locations within the disposal area during the SI and Phase I reuse area RI. Iron (75,200 to 230,000 parts per million (ppm)) was the only analyte detected above its residential soil risk-based concentration (RBC) (23,000 ppm) and maximum background concentration (70,800 ppm).

4.2 AREE 14 – Skeet Range

AREE 14 was used on weekends as a skeet range between 1961 and 1994. The spent ammunition, consisting of lead and steel shotgun pellets, was spread over the range and remains unrecovered. The skeet range firing fan is oriented eastward in an 800-foot radius and is separated into the Hit and Miss Zones.

Surface soil samples collected from two locations in the Miss Zone contained lead concentrations (940 ppm, and 414 - 650 ppm) that exceeded the USEPA screening level for lead in residential soil of 400 ppm. The lead concentrations in the Hit Zone did not exceed the USEPA screening level for lead in residential soil.

4.3 AREE 16-1 – Possible Firefighter Training Pit

Site history indicated that a Firefighter Training Pit was used at VHFS; however, the exact location of the pit is not known with certainty. AREE 16-1 represents one possible location of the Firefighter Training Pit. The Firefighter Training Pit was used monthly by the VHFS Fire Department for training in the mid-1970s. The unlined pit was approximately 50 ft in diameter and 3 ft deep. During training activities, the pit was partially filled with petroleum and natural gas odorant and then ignited. Solvents and other combustible materials may have also been used in the pit. In the mid-1980s, the pit was filled with ½ -inch gravel.
Total petroleum hydrocarbon (TPH) field screening of the soil at AREE 16-1 was conducted to delineate the area of contamination and to determine where soil samples should be collected for laboratory analysis. Surface soil samples were collected based on positive TPH results from the field screening. Arsenic (up to 21.6 ppm) exceeded its residential soil RBC (0.43 ppm) as well as its maximum background concentration (4.89 ppm) in the surface soil samples collected at AREE 16-1. A number of a exinsifurans indicative of combustion operations, were detected in the surface soil samples. 2,3,7,8-TCDD (2.4E-04 ppm) was the only dioxin/furan to exceed its residential soil RSC (4.3E-06 ppm).

4.4 AREE 27 — AAFES Service Station

The AAFES Service Station (Building 238) was constructed in 1969 to provide fuel and service for VHFS personnel vehicles. The service station had underground storage tanks (USTs) for three grades of gasoline a pump area, and a service station area with two lifts. Drains in the pump island area lead to a grit chamber, which discharges to a field north of the facility. In addition, a fenced storage area was located in the rear of the facility for tires, batteries, and drums. Several gasoline, oil, and other spills were reported in this area. In April, 1993, pressure testing of the regular unleaded gasoline pipeline confirmed a suspected leak. A 0.5-inch hole was found in the pipeline within the pump area. The corroded section of pipe was replaced, and the soils around the area where the leak occurred were excavated and then backfilled. The system was re-tested to ensure no other leaks existed, and the pump was re-opened. During the summer and fall of 1993, field investigations confirmed soil and groundwater contamination due to the release of gasoline from one or more leaking USTs and associated distribution piping. The USTs were closed in June 1994, and removed in November, 1994. Operations at the AAFES Service Station were discontinued in the fall of 1994. Contaminated soil removal and groundwater remediation activities at the AAFES Service Station have been initiated and are being handled separately from the rest of AREE 27.

Surface and subsurface soil samples were collected from areas of potential contamination downgradient from the discharge point of the grit chamber, at the service bay spill run-off area, and in the tire storage area. Arsenic (up to 12.2 ppm) was found to exceed its residential soil RBC (0.43 ppm) and maximum background concentrations (4.89 ppm surface soil and 5.4 ppm subsurface soil) in most of the surface and subsurface soil samples. Lead was detected in a surface soil sample at the discharge point of the grit chamber at a concentration of 1,200 ppm, which is three times the USEPA screening level of 400 ppm for lead in residential soils. The maximum TPH concentration detected was 2,310 ppm, which is significantly higher than the State's TPH soil action level of 100 ppm for UST sites, in the surface soil sample collected at the discharge point of the grit chamber. TPH (737 ppm) was also detected above the State's TPH soil action level for UST sites in the surface soil at the service bay spill run-off area immediately off the parking pad. However, TPHP did not exceed the State's TPH soil action level for UST sites downhill from the grit chamber, further along the spill run-off pathway, or in subsurface soils, indicating small localized areas of contamination. Other than arsenic, none of the analytes were found to exceed their associated screening levels in the subsurface soil samples.

4.5 AREE 29-4 — Disposal Area

The Disposal Area is located near the northeast corner of VHFS, northwest of the Skeet Range (AREE 14). Review of aerial photographs of this area provided evidence of disposal activities as early as 1958. These signs were visible to various extents as late as 1977. A total of five distinct areas were located within the Disposal Area, based on ground stains and debris visible in aerial photographs. Two areas were used for construction debris disposal and are now enclosed within groves of trees. Another area is an approximately 30-foot wide man-made depression in the ground where water collects after rain events. It is not known whether the area was used to obtain fill material or for liquid disposal. The last two sites appeared as orange-stained areas in historic aerial photographs. These are both currently level and covered with grass. It is not known what materials, if any, were disposed in these areas.
Surface soil samples were collected at the two construction debris piles and at the three other areas of potential contamination. Aluminum (85,000 ppm), beryllium (2.15 ppm), and iron (160,000 ppm) concentrations in surface soil in the area of the former orange mound exceeded residential soil RBCs (78,000 ppm, 0.15 ppm, and 23,000 ppm, respectively) and maximum background concentrations (20,900 ppm, 2.13 ppm, and 70,800 ppm, respectively). Benzo(a)pyrene (0.1 ppm), a polynuclear aromatic hydrocarbon (PAH), slightly exceeded its residential soil RBC (0.088 ppm) in one surface soil sample collected from the construction debris areas. Arsenic (up to 13.6 ppm) exceeded its residential soil RBC (0.43 ppm) and maximum background concentration (4.89 ppm) at the construction debris areas.

5.0 SUMMARY OF SITE RISKS

BRAs were conducted as part of the RIs to assess the human health and ecological problems that could result if the contamination at the AREEs was not remediated. The Human Health Risk Assessment (HHRA) was prepared to evaluate the magnitude of potential adverse effects on human health associated with current industrial/commercial and potential future residential exposures to site-related chemicals at the AREEs. The Ecological Risk Assessment (ERA) was conducted to characterize the potential threats to ecological receptors posed by contaminants at the AREEs.

The HHRA follows a four-step process:

- **Selection of Chemicals of Potential Concern** - identifies the contaminants of potential concern based on their toxicity, frequency of occurrence, and concentration by comparing the maximum concentrations of detected chemicals with RBCs which are health-protective chemical concentrations that are back-calculated using toxicity criteria, a $1 \times 10^{-6}$ target carcinogenic risk or a 0.1 hazard quotient (HQ, defined below), and conservative exposure parameters;

- **Exposure Assessment** - identifies the potential pathways of exposure, and estimates the concentrations of contaminants to which people may be exposed as well as the frequency and duration of these exposures;

- **Toxicity Assessment** - determines the toxic effects of the contaminants, and

- **Risk Characterization** - provides a quantitative assessment of the overall current and future risk to people from site contaminants based on the exposure and toxicity information.

The HHRA evaluated health effects which could result from exposure to soil, groundwater, surface water, and sediment contamination in the Phase I and Phase II reuse areas of VHFS. The HHRA evaluated potential risks to current workers who could be exposed to contaminants in surface soil, and to current trespassers who could be exposed to contamination in surface soil, surface water, and sediment. In addition, the HHRA evaluated potential risks to hypothetical future adult residents who could be exposed to contaminants in groundwater and surface soil and to hypothetical future child residents who could be exposed to contaminants in groundwater surface soil, surface water, and sediment. Potential risks to future excavation workers who could be exposed to contaminants in subsurface soil were also evaluated in the HHRA. Subsurface soil was only evaluated for excavation workers and not residents since residents would be unlikely to be exposed to subsurface soil. In addition, the concentrations of contaminants currently present in subsurface soil would not be representative of the concentrations that might be present if landscaping activities were to occur which would involve mixing of subsurface soils with surface soil, clean topsoil, and other soil amendments. Therefore, it would not be appropriate to evaluate risks to residents using available subsurface soil data.

Potential carcinogenic (cancer-related) effects and noncarcinogenic effects (including various impacts on different organ systems, such as lungs, liver, etc.) were evaluated in the HHRA. Carcinogenic effects are
expressed as the probability that an individual will develop cancer from exposure to the contaminants from each AREE. The evaluation of noncarcinogenic effects is based on the hazard index (HI), which is the summation of the HQs for individual chemicals. The HQ is a comparison of chemical-specific chronic exposure doses with the corresponding protective doses derived from health criteria. The USEPA recommends that remedial actions may be warranted at sites where the carcinogenic risk to any person is greater than 1x10^{-4} or the HI is greater than 1. A carcinogenic risk of 1x10^{-4} means that there is a potential of one additional person in a population of 10,000 developing cancer from exposure to contaminants at an AREE if the AREE is not remediated. A HI greater than 1 indicates a potential for noncancerous health effects if the AREE is not remediated.

The ERA also follows a four-step process:

- **Problem Formulation**: develops information that characterizes habitats and potentially exposed species and identifies contaminants of concern, exposure pathways, and receptors.
- **Exposure Assessment**: estimates exposure point concentrations for selected indicator species.
- **Ecotoxicologic Effects Assessment**: identifies concentrations or doses of contaminants that are protective of indicator species; and
- **Risk Characterization**: estimates potential adverse effects from exposure to contaminants based on exposure and toxicity information.

The ERA evaluated ecological effects which could result from exposure to surface soil, surface water, and sediment contamination in the Phase I and Phase II reuse areas of VHFS. The ERA evaluated potential adverse ecological effects to terrestrial plants and terrestrial invertebrates (represented by earthworms) exposed to contaminants in surface soil. In addition, potential adverse ecological effects to mammals (represented by shrews) and birds (represented by robins) through bioaccumulation in the food web and exposure to contaminants in surface soil were evaluated. Potential adverse ecological effects to aquatic life from exposure to contaminants in surface water and sediment were also evaluated in the ERA.

The evaluation of significant potential adverse ecological effects is based on the Environmental Effects Quotient (EEQ). The EEQ is the ratio of the estimated exposure concentrations/doses for the chemicals of potential concern and the toxicity reference values (TRVs) for the ecological receptors. If the EEQ is greater than 1, there is a potential for adverse ecological effects to occur. As the magnitude of the EEQ becomes greater than 1, the potential for adverse ecological effects becomes more significant.

The results of the BRAs for the five AREEs are presented in the following paragraphs. A detailed presentation of the BRAs can be found in the Phase I Reuse Area RI Report (USAEC, 1998) and the Phase II Reuse Area RI Report (USACE, 1999), available in the Information Repository.

### 5.1 AREE 13 - Sludge Disposal Area

The HHRA determined that site-related contamination at AREE 13 does not pose an unacceptable human health risk under either current industrial/commercial or potential future residential land-use conditions. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated excess lifetime cancer risk (8x10^{-6}) is for child residents exposed to contaminants in surface soil by incidental ingestion. The contaminant that drove the elevated HI at AREE 13 is iron. When site and background iron concentrations were statistically compared, iron was not determined to be within background concentrations and, therefore, was not discounted. However, iron was detected at comparable levels in similar subsurface soil types in background locations and is therefore, determined to be naturally-occurring and not site-related. An ERA was not conducted at AREE 13.
because all samples were collected at depths of greater than 6 inches. Based on these results, no action is recommended at AREE 13.

5.2 AREE 14 – Skeet Range

The HHRA concluded that, under both current industrial/commercial and potential future residential land-use conditions, site-related contamination at AREE 14 does not pose an unacceptable human health risk, except for lead in surface soil. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk \((4 \times 10^{-6})\) is for adult residents and child residents exposed to contaminants in surface soil by dermal absorption and incidental ingestion, respectively; and the highest noncarcinogenic risk \((HI = 0.8)\) is for adult residents exposed to contaminants in surface soil by dermal absorption.

The human health risks associated with exposure to lead contamination in surface soil at AREE 14 were evaluated using the Integrated Exposure Uptake Biokinetic (IEUBK) Model recommended by USEPA for evaluating lead exposures for young children in residential settings. The IEUBK Model calculates blood lead levels which result from exposures to lead which may then be compared to blood lead levels of toxicological significance for purposes of risk evaluation. The IEUBK Model run for AREE 14 predicted a geometric mean blood lead level of 5.2 g/dL, with 7.75 percent of the population exceeding the blood lead level of concern (10 g/dL). The USEPA currently finds 5 percent of the population exceeding the blood lead level of concern acceptable. Therefore, the IEUBK Model results indicate that if AREE 14 was developed for residential use in the future, the lead concentrations in the surface soil may be a potential problem for young children.

The potential adverse effects to child residents were driven by the presence of lead above the USEPA screening level for lead in residential soil of 400 ppm at two locations in the Miss Zone. The extent of lead contamination in the two locations that drove unacceptable human health risks was further investigated during the SRI. Soil in those two locations was excavated and disposed off site, and the sample results from the remaining soil show that lead concentrations do not exceed the USEPA screening level for lead in residential soil. Thus, no action is recommended at AREE 14 because the unacceptably high lead concentrations were removed during the SRI. A detailed presentation of the investigation of lead hot spots at AREE 14 can be found in the SRI Report, available in the Information Repository.

The ERA determined that surface soil at AREE 14 does not pose significant potential adverse ecological effects.

Based on these results, no action is recommended for AREE 14.

5.3 AREE 16-1 – Possible Firefighter Training Pit

Results of the HHRA indicate that, under both current industrial/commercial and potential future residential land-use conditions, the risks to workers, trespassers, and residents are acceptable for exposure to site-related contaminants (i.e., arsenic and 2,3,7,8-TCDD) in surface soil. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk \((9 \times 10^{-5})\) is for adult residents and child residents exposed to site-related contaminants in surface soil by dermal absorption and incidental ingestion, respectively; and the highest noncarcinogenic risk \((HI = 1)\) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion. Although the total HI equals 1, the HIs recalculated by target organ/critical effect are all less than 1. No significant potential for adverse ecological effects were found in the ERA. Based on these results, no action is recommended at AREE 16-1.
5.4 AREE 27 – AAFES Service Station

Results of the HHRA suggested that site-related contamination at AREE 27 does not pose an unacceptable human health risk under either current industrial/commercial or potential future residential land use conditions. Discounting naturally-occurring metals that were statistically determined to be with background levels the highest estimated upper-bound excess lifetime cancer risk (7x10^{-5}) is for child residents exposed to contaminants in surface soil by dermal absorption, and the highest noncarcinogenic risk (HI = 2) is for child residents exposed to site-related contaminants in surface soil by dermal absorption. When recalculated by target organ/critical effect, the HI equals 1.3 for the kidneys, primarily as a result of exposures to chromium in surface soil at AREE 27. Although not all chromium present at AREE 27 will be hexavalent chromium (i.e., the most toxic form of chromium), the conservative toxicity criterion for hexavalent chromium was used in the HHRA. Therefore, a HI of 1.3 calculated using conservative toxicity criteria is considered acceptable. Although arsenic exceeds its residential soil RBC, it was not a risk driver at AREE 27.

Lead contamination in surface soil at AREE 27 was evaluated using the IEBUK Model, as explained in the AREE 14 discussion, which predicted a geometric mean blood lead level of 3.2 µg/dL, with 0.77 percent of the population exceeding the blood lead level of concern (10 µg/dL). Again, the USEPA currently finds 5 percent of the population exceeding the blood lead level of concern acceptable. Therefore, the surface soil lead concentrations at AREE 27 are unlikely to have an adverse effect on the exposed child resident population.

The ERA determined that site-related contaminants at AREE 27 posed no significant potential for adverse ecological effects.

Based on these results, no action is recommended at AREE 27.

5.5 AREE 29-4 – Disposal Area

The HHRA determined that site-related contamination at AREE 29-4 does not pose an unacceptable human health risk under either current industrial/commercial or potential future residential land-use conditions. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (3x10^{-5}) is for child residents exposed to contaminants (i.e., benzo[a]pyrene and aluminum) in surface soil by incidental ingestion, and the highest noncarcinogenic risk (HI = 1) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion. The ERA concluded that significant potential adverse ecological effects are not posed by the site-related contaminants at AREE 29-4. Based on these results, no action is recommended at AREE 29-4.

6.0 SELECTED ALTERNATIVE

No action is selected by the U.S. Army for AREEs 13, 14, 16-1, 27, and 29-4 because these sites do not pose unacceptable human health or ecological risks. USEPA and the Virginia Department of Environmental Quality (VDEQ) concur with this decision. The estimated cost to implement this alternative is $0.

7.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Proposed Plan for AREEs 13, 14, 16-1, 27, and 29-4 was released to the public on or about March 31, 1999 (see Attachment 3). This document was made available for public review in the Information Repository at the following location:
The notice of availability of the Proposed Plan (see Attachment 4) was published in The Fauquier Citizen, the Fauquier Times-Democrat, and the Manassas Journal Messenger during the week of March 29, 1999. A public comment period was held from April 1, 1999, through April 30, 1999. In addition, a public meeting was held on April 15, 1999, to present the Proposed Plan for AREEs 13, 14, 16-1, 27, and 29-4 and to answer questions and receive public comments. The public meeting minutes have been transcribed, and a copy of the transcript is available to the public at the aforementioned location. A Responsiveness Summary, included as part of this Decision Document (DD), has been prepared to respond to the significant comments, criticisms, and new relevant information received during the comment period. Upon signing the DD, the U.S. Army will publish a notice of availability of this DD in The Fauquier Citizen, the Fauquier Times-Democrat, and the Manassas Journal Messenger and place the DD in the Information Repository.

8.0 RESPONSIVENESS SUMMARY

The purpose of this Responsiveness Summary is to provide the public with a summary of citizen comments, concerns, and questions about AREEs 13, 14, 16-1, 27, and 29-4. A public meeting was held on April 15, 1999, to present the Proposed Plan and to answer questions and receive comments. At the public meeting, one citizen had a question regarding the Proposed Plan. No written public comments were received during the April 1, 1999, through April 30, 1999, public comment period. Written comments, however, were received from USEPA.

The Responsiveness Summary is divided into the following sections:

- Selected newspaper notices announcing dates of the public comment period and location and time of the public meeting;
- Comments raised during the public meeting on April 15, 1999;
- Public meeting attendance roster;
- Restoration Advisory Board Members; and
- Written comments received during the public comment period.

All comments and concerns summarized in this document have been considered by the U.S. Army in making a decision regarding the selected alternative.

8.1 Selected Newspaper Notices

A public notice announcing the availability of the Proposed Plan and the public meeting was published in The Fauquier Citizen, the Fauquier Times-Democrat, and the Manassas Journal Messenger during the week of March 29, 1999. This public notice is provided in Attachment 4.
8.2 Comments Raised During the Public Meeting on April 15,1999

One citizen raised a comment during the public meeting. The citizen's question and the U. S Army's response are presented below:

**CONCERNED CITIZEN:** Is the chromium at AREE 27 going to present a hazard to the water source used in the pool?

**ARMY RESPONSE:** No, the chromium is present at very low levels that may actually be indicative of background chromium levels and thus would not impact the water source for the pool.

8.3 Public Meeting Attendance Roster

The public meeting was held on April 15, 1999, at the Former Headquarters Conference Room (Building 101) at VHFS. The members of the community that attended the public meeting included Pat White, Mary Noel McMullen, and William McMullen (see Attachment 5).

8.4 Active Restoration Advisory Board Members

1. Chris Kencik
2. Dean Eckelberry
3. John Mayhugh
4. Owen Bludau
5. Tim Tarr
6. Kevin Bell
7. Steve Mihalko
8. Robert Stroud
9. Joe Phelan

8.5 Written Comments Received During the Public Comment Period

No written comments were received from citizens during the public comment period. Written comments were received from USEPA during the public comment period and are provided in Attachment 6. The U. S. Army's responses to these comments are also provided in Attachment 6 and were distributed to the public during the public comment period. Most of USEPA's comments suggested wording changes or requested clarification regarding specific information. Wording changes and clarifications requested by USEPA (see Attachment 6 for details) have been incorporated into this DD.

The USEPA offered a comment regarding the appropriateness of decision-making based on the draft SRI Report. The SRI was conducted to fill data gaps identified in the RIs (e.g., the extent of contamination at AREE 14). The SRI Report does not include risk assessment. All risk conclusions were made based on the RIs. Therefore, this status of the SRI Report has no impact on the no action decision made for AREEs 13,14, 16-1, 27, and 29-4.

9.0 REFERENCES


ATTACHMENT 1

RESPONSE TO USEPA COMMENTS ON THE FINAL PHASE I REUSE AREA RI REPORT
Response to Comments on the
Final Phase I Reuse Area RI Report, Vint Hill Farms Station
from USEPA Region III

RESOLUTION OF PREVIOUS COMMENTS

Comment: Regarding data validation, please explain why no J, K, or L qualifiers appear on any of the data. Since there was a discrepancy between the IRDMIS database and the SI report for a few values, please indicate the method used when determining accurate results for AREE 11.

Response: Since the data qualifiers had to be hand entered, only the qualifiers that affect the risk assessment and, therefore, the conclusions of the Phase I Reuse Area RI Report were entered into the database and presented in the report.

Since the Site Inspection (SI) Report was supposedly prepared using the IRDMIS database, the IRDMIS database information was used when a discrepancy was found between the IRDMIS database and the SI Report.

IMPACT OF NEW TOXICITY FACTORS ON RISK AT PHASE I

NOTE: The complete text of USEPA's comments including point-by-point impacts of the toxicity factor changes are provided in Attachment 1 to these responses. USEPA's comments are summarized herein to focus attention on the overall conclusions made by USEPA regarding the impact of the toxicity factor changes on the Final Phase I Reuse Area RI Report recommendations.

Comment 1.

Comment: Toxicity factors for some chemicals have changed since April, when this report was submitted. In most cases, the changes would not alter the outcome of the risk assessment. However, in a few cases, the impacts on risk-management decisions could be significant. As we discussed during our conference call on December 2, 1998, in cases where toxicity factors could possibly change risk decisions a technical memo will be developed that rationalizes no further action decisions at selected AREES. This technical memo should include rationalizations for AREES 12, 13, 16-1, 27, 29-4 and groundwater wells that reveal high levels of bis(2-ethylhexyl)phthalate (BEHP).

a) For AREE 12 subsurface soil, future residential risks did exceed 1E-4 due to benzo[a]pyrene.

b) For AREE 13, aluminum, iron, and possibly vanadium also contributed.

c) For AREE 16-1 surface soil, risks did exceed NCP targets, due to arsenic, TCDD, and chromium. The concentrations of arsenic and TCDD at AREE 16-1 pose a total cancer risk of 2E-4 for the child/adult scenario. Chromium is a possible driver of an HI above 1.
d) For AREE 27, chromium and cadmium contribute to an HI above 1.

e) For AREE 29-4 surface soil, the aluminum HI of 1.4 was borderline.

f) For site-wide groundwater, the BEHP is a potential concern. Although phthalates are common laboratory contaminants, BEHP was detected in several wells at high levels that were not attributed to blank contamination. On the other hand, the presence of BEHP in background wells at similar levels implies that there may be a regional BEHP issue. As a base-closure issue, the groundwater BEHP could be important, since it exceeds both NCP target risks and the MCL.

Response:

The U.S. Army appreciates USEPA's assessment of risks for the Phase I reuse area based on the recent toxicity factor changes. However, for the record, the U.S. Army cannot agree with the details of USEPA's assessment and the risk numbers presented without conducting the assessment itself. Reassessment of risks is not productive since the report is final based on the toxicity factors valid at the time the report was finalized and requested by USEPA in its comments on the Draft Phase I Reuse Area RI Report. Therefore, rather than addressing the specific numbers presented in USEPA's comments, the goal of these responses is to address the major conclusions made by USEPA during its assessment of the toxicity factor changes.

It is important to note that the toxicity factors used in USEPA's assessment were not available at the time the Phase I Reuse Area RI Report was being finalized and the remediation decisions were being made. Rather, the Phase I Reuse Area RI Report was prepared, and the remediation decisions made, based on the toxicity factors that were valid at the time (i.e., toxicity factors published in October, 1997). However, in light of the recent toxicity factor changes, the U.S. Army still believes that the no further action conclusions made in the Final Phase I Reuse Area RI Report are protective for the five AREEs identified in USEPA's comments and site-wide groundwater as discussed in the following paragraphs.

a) For AREE 12 (Dump #2) subsurface soil, the no further action decision is protective for two reasons. First, USEPA has previously established a policy position that only industrial exposures (i.e., construction workers) be considered when evaluating soils below 2 ft below ground surface (bgs). Therefore, the observation made by the USEPA toxicologist that the recently published toxicity factor changes cause future residential risks from exposure to subsurface soil at AREE 12 to exceed 1E-4 due to benzolapyrene is not relevant. Construction worker exposures remain below the target risk levels even in light of the recent toxicity factor changes. Second, it is important to note that AREE 12 is a permitted construction debris landfill, and the U.S. Army intends to institute deed restrictions which will prevent exposure to subsurface soil.

b) For AREE 13 (Sludge Disposal Area), USEPA identified aluminum, iron, and possibly vanadium as compounds that contribute to elevated non-carcinogenic risk. As discussed in Section 8 of the Final Phase I Reuse Area RI Report, the soil samples from AREE 13 were collected from 1-3 ft bgs which straddles the surface/subsurface soil boundary (i.e., 2 ft bgs). To be conservative, these samples were evaluated as surface soil samples in the Human Health Risk Assessment (HHRA) and thus were statistically compared to surface soil background results which are based on samples collected from 0-0.5 ft bgs. However, a more appropriate comparison can be made using the background
subsurface soil sample results since surface soil was likely removed along with the sludge in 1992. Iron concentrations in background subsurface soil samples are highly variable, ranging from 9,360 µg/g to 180,000 µg/g. Aluminum concentrations in background subsurface soil samples range from 4,410 µg/g to 60,600 µg/g, and vanadium concentrations in background subsurface soil samples range from 44.3 µg/g to 531 µg/g. The variability of iron, aluminum, and vanadium concentrations in the background subsurface soil samples is most likely due to the variability of soils that were sampled. The composition of soil is primarily controlled by the composition of the bedrock from which it is formed. Figure 2-1 of the Final Phase I Reuse Area RI Report shows the geology of shallow bedrock across VHFS. For example, the background subsurface soils which have the highest iron concentrations (SB-BK-002 [91,000 µg/g at 3 ft bgs] and SB-BK-003 [180,000 µg/g at 5 ft bgs and 100,000 µg/g at 18.5 ft bgs]) are located in areas where intrusions of mafic material (i.e., basalt) have occurred. Mafic rocks are rich in iron and magnesium and will produce soils that are rich in iron and magnesium. Iron concentrations in soil at AREE 13 range from 75,200 µg/g to 230,000 µg/g. According to the Environmental Contamination Survey (USATHAMA, 1986), a mafic intrusion (Hickory Grove Basalt) bisects AREE 13, and the sludge disposal area lies over the geological contact area of the Catharpin Creek Member and the Hickory Grove Basalt. The high iron concentrations are most likely a product of the parent material from which the soil in this area is derived. In addition, it should be noted that the aluminum and vanadium concentrations at AREE 13 (53,300 µg/g to 73,100 µg/g for aluminum, and 221 µg/g to 317 µg/g for vanadium) are more comparable to the subsurface soil background ranges than they are to the surface soil background ranges. Furthermore and more importantly, aluminum, iron, and vanadium are not anticipated to be present in environmental media at AREE 13 based on site history. Other metals (e.g., silver, cadmium, lead, and mercury) which are more likely to be site-related contaminants based on site history were either not detected or were detected at concentrations below screening levels. Therefore, aluminum, iron, and vanadium are not site-related contaminants but rather are representative of background concentrations in soil derived from the type of bedrock present at AREE 13. No further action is a protective recommendation for AREE 1.3.

c) For AREE 16-1 (Possible Firefighter Training Pit) surface soil, USEPA found that the concentrations of arsenic and TCDD pose a total cancer risk of 2E-4 for the child/adult scenario. Even when ingestion and dermal absorption exposure routes are added as was done by USEPA, the cancer risk is borderline compared to the target risk of 1E-4. Based on the borderline cancer risk associated with arsenic and TCDD, the small size of the firefighter training pit (i.e., 50 ft diameter for one of the possible pits which was most likely AREE 16-2 based on terrain) for which typical exposure assumptions are exaggerated, and the uncertainty that AREE 16-1 truly represents a former firefighter training pit, no further action at AREE 16-1 is protective.

USEPA also found that chromium is a possible driver of a HI above 1 given the recently lowered (i.e., more stringent) toxicity factor for hexavalent chromium. It should be noted that there is a great deal of conservatism built into the calculation of the HI for chromium in surface soil at AREE 16-1 for the following reasons: 1) the HHRA is based on the conservative assumption that all chromium present at
AREE 16-1 is hexavalent chromium which is not supported by site history; and 2) the oral RfD for hexavalent chromium has an uncertainty factor of 900, which indicates high uncertainty associated with the RfD. Hexavalent chromium is typically found in the environment as a result of contamination from electroplating or conversion coating operations where hexavalent chromium is used in the process solutions. The residential soil risk-based concentration (RBC) for trivalent chromium, the form of chromium more commonly found in the environment when electroplating and conversion coating operations are not involved, is three orders of magnitude higher (i.e., less stringent) than the corresponding RBC for hexavalent chromium (i.e., 1.2E5 pg/g versus 2.3E2 µg/g). In the case of AREE 16-1, which was a possible firefighter training pit, operations that used hexavalent chromium were not conducted. In fact, operations using chromium in any form were not conducted.

In addition, although chromium at AREE 16-1 was not statistically within background, the data do not suggest widespread chromium contamination that would be present if the contamination was site-related. Four surface soil samples were collected at AREE 16-1 and yielded chromium at concentrations ranging from 27.2 µg/g to 59.9 µg/g, with an arithmetic mean concentration of 41.0 µg/g. Background concentrations in surface soil were detected at concentrations as high as 60 µg/g. A common sense review of the data in light of site history indicates that it is reasonable to find the chromium concentrations to be representative of background concentrations.

Based on the conservatism of the HI calculation for chromium, the lack of site history involving chromium, and the fact that the detected chromium levels are potential background levels, the no further action decision for AREE 16-1 is protective.

d) For AREE 27 (AAFES Service Station) surface soil, although cadmium and chromium both contribute to a HI above 1, chromium is the risk driver because of the recently lowered (i.e., more stringent) toxicity factor for hexavalent chromium. Therefore, this response focuses on chromium. As discussed in Section 8 of the Final Phase I Reuse Area RI Report, there is a great deal of conservatism built into the calculation of the HI for chromium in surface soil at AREE 27 for the following reasons: 1) the HHRA is based on the conservative assumption that all chromium present at AREE 27 is hexavalent chromium which is not supported by site history; and 2) the oral RfD for hexavalent chromium has an uncertainty factor of 900, which indicates high uncertainty associated with the RfD. Hexavalent chromium is typically found in the environment as a result of contamination from electroplating or conversion coating operations where hexavalent chromium is used in the process solutions. The residential soil RBC for trivalent chromium, the form of chromium more commonly found in the environment when electroplating and conversion coating operations are not involved, is three orders of magnitude higher (i.e., less stringent) than the corresponding RBC for hexavalent chromium (i.e., 1.2E5 µg/g versus 2.3E2 µg/g). In the case of AREE 27, which was a fuel and service station, operations that used hexavalent chromium were not conducted. In fact, operations using chromium in any form were not conducted.

In addition, although chromium at AREE 27 was not statistically within background, the data do not suggest widespread chromium contamination that
would be present if the contamination was site-related. Nine surface soil samples were collected at AREE 27 and yielded chromium at concentrations ranging from 24.8 µg/g to 75.5 µg/g, with an arithmetic mean concentration of 40.6 µg/g. Background concentrations in surface soil were detected at concentrations as high as 60 µg/g. A common sense review of the data in light of the site history indicates that it is reasonable to find the chromium concentrations to be representative of background concentrations.

Based on the conservatism of the HI calculation for chromium, the lack of site history involving chromium, and the fact that the detected chromium levels are potential background levels, the no further action decision for AREE 27 is protective.

e) For AREE 29-4 (Disposal Area) surface soil, USEPA calculated a HI for aluminum of 1.4 which they acknowledge is borderline. Based on the fact that the oral RfD for aluminum has an uncertainty factor of 100 and the HI is not significantly different from 1 even when ingestion and dermal absorption exposure routes are added, no further action at AREE 29-4 is protective.

f) For site-wide groundwater, the fact that BEHP is both a common laboratory contaminant and a common field contaminant is an important point. Although it is true that not all BEHP detections were blank qualified, the primary source of BEHP is the sampling equipment in combination with the sampling technique. BEHP is used as a plasticizer in the flexible tubing used to sample the wells. BEHP was detected in the equipment blanks prepared in the field at lower levels than was found in some of the groundwater samples primarily because of how the equipment blanks were prepared versus how the groundwater samples were collected. In the preparation of the equipment blanks, water was pumped through the sample tubing at a comparatively rapid rate which did not allow for significant leaching and accumulation of BEHP in the sample. Conversely, the low-flow groundwater monitoring well sampling method involved pumping of groundwater through the sample tubing at low flow rates. Many of the monitoring wells were slow producers and required pumping at very low flow rates. The low flow of water through the sample tubing during groundwater sampling increased the opportunity for BEHP to leach into the sample and concentrate. This finding is supported by the fact that elevated BEHP was found in site wells and background wells at similar levels. Neither site nor regional history support USEPA’s suggestion that the BEHP found in the groundwater samples may represent a regional issue. Groundwater samples were analyzed for a wide range of constituents, and BEHP was the only constituent that exceeded screening levels in most of the wells. If the BEHP were the result of site or regional groundwater contamination, it would have been found in combination with other contaminants rather than alone. Therefore, the conclusion that the BEHP is present as a result of field contamination is appropriate, and no further action is a protective recommendation for site-wide groundwater at VHFS.
OTHER RISK-RELATED ISSUES

Comment 1.

Comment: Cancer risks were presented separately for children and adults. In order to estimate the lifetime cancer risk when exposure includes both childhood and adulthood, the risks would be:

\[(\text{Adult cancer risk} \times \frac{24}{30}) + (\text{Child cancer risk})\].

Response: Remediation decisions have all been made based on separate adult and child exposures since this comment had not been made until well into the decision-making process (i.e., after the Final Phase I Reuse Area RI Report was submitted). Furthermore, this methodology is consistent with that used in other HHRAS performed for and accepted USEPA Region III.

Comment 2.

Comment: The soil-to-skin adherence factors are generally reported at lower levels in the new Exposure Factors Handbook than previously (Section 7.1.2.3; Tables 7-16, 7-17, 7-19, 724). Therefore, it is possible that dermal soil risks are overestimated in this respect.

Response: The uncertainty associated with the soil-to-skin adherence factors and their impact on risk estimates is already discussed in the Uncertainty Section of the Final Phase I Reuse Area RI Report.
ATTACHMENT 1

DETAILED COMMENTS FROM USEPA REGARDING NEW TOXICITY FACTORS
IMPACT OF NEW TOXICITY FACTORS ON RISK AT PHASE I

Toxicity factors for some chemicals have changed since April, when this report was submitted. In most cases, the changes would not alter the outcome of the risk assessment. However, in a few cases, the impacts on risk-management decisions could be significant. As we discussed during our conference call on December 2, 1998, in cases where toxicity factors could possibly change risk decisions a technical memo will be developed that rationalizes no further action decisions at selected AREEs. This technical memo should include rationalizations for AREEs 12, 13, 16-1, 27, 29-4 and groundwater wells that reveal high levels of BEHP. To assist in the facilitation of this memo, EPA has provided a table in this letter that indicates the impacts of the toxicity changes on the final estimates of risk. The toxicity-factor changes would also impact other tables and sections of the RI, on which the final risk estimates are built. For informational purposes, the changes to those “building-block,” non-summary sections are included in an attachment to this letter.

1. Table 7-155 (and pages 7-62 to 7-73):

The table should not be split by route; total risks are more informative. Also, given the changes noted in the attachment, the risks on this table would be as follows:

<table>
<thead>
<tr>
<th>MEDIUM/LOCATION</th>
<th>WORKER CA. RISK</th>
<th>WORKER HI</th>
<th>ADULT RES. CA. RISK</th>
<th>ADULT RES. HI</th>
<th>CHILD RES. CA. RISK</th>
<th>CHILD RES. HI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Soil:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AREE 9</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1.9 c</td>
<td>--</td>
<td>6.5 a</td>
</tr>
<tr>
<td>AREE 11</td>
<td>3E-5</td>
<td>1.6 c</td>
<td>7E-5</td>
<td>4 a</td>
<td>5E-5</td>
<td>11</td>
</tr>
<tr>
<td>AREE 13</td>
<td>--</td>
<td>1.7 c</td>
<td>-</td>
<td>4</td>
<td>--</td>
<td>14</td>
</tr>
<tr>
<td>AREE 16-1</td>
<td>--</td>
<td>1.3</td>
<td>1E-4</td>
<td>2.7 a</td>
<td>1E-4</td>
<td>8</td>
</tr>
<tr>
<td>AREE 16-2</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>-</td>
<td>--</td>
<td>3.6 a</td>
</tr>
<tr>
<td>AREE 17</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>2 c</td>
<td>--</td>
<td>3 a</td>
</tr>
<tr>
<td>AREE 18</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>2 c</td>
<td>--</td>
<td>6 a</td>
</tr>
<tr>
<td>AREE 19</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>2.4 c</td>
<td>--</td>
<td>7</td>
</tr>
<tr>
<td>AREE 21</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1.6 c</td>
<td>--</td>
<td>6 a</td>
</tr>
<tr>
<td>AREE 24</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>2.2 c</td>
<td>--</td>
<td>7 a</td>
</tr>
<tr>
<td>AREE 27</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>3</td>
<td>--</td>
<td>7.5</td>
</tr>
<tr>
<td>AREE 29-2</td>
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<td>--</td>
<td>1.4 c</td>
<td>--</td>
<td>4.3 a</td>
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<tr>
<td>AREE 29-3</td>
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<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>31. c</td>
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<td>AREE 29-4</td>
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<td>2.3 a</td>
<td>--</td>
<td>5 a</td>
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<td>Groundwater</td>
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<td>--</td>
<td>6E-4</td>
<td>8</td>
<td>3E-4</td>
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</table>
### SEDIMENT:

<table>
<thead>
<tr>
<th>MEDIUM/LOCATION</th>
<th>WORKER CA. RISK</th>
<th>WORKER HI</th>
<th>ADULT RES. CA. RISK</th>
<th>ADULT RES. HI</th>
<th>CHILD RES. CA. RISK</th>
<th>CHILD RES. HI</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASTERN</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>12 a</td>
</tr>
<tr>
<td>NORTHERN</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>10 a</td>
</tr>
<tr>
<td>WESTERN</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1E-4 22</td>
</tr>
</tbody>
</table>

### SUBSURFACE SOIL:

<table>
<thead>
<tr>
<th>AREE 12</th>
<th>--</th>
<th>1.8 c</th>
<th>1E-4</th>
<th>1.5 c</th>
<th>2E-4</th>
<th>5.1 a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central AREEs</td>
<td>--</td>
<td>1.6 c</td>
<td>--</td>
<td>2 c</td>
<td>--</td>
<td>7 a</td>
</tr>
<tr>
<td>AREE 27</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>2 a</td>
<td>--</td>
<td>6.7 a</td>
</tr>
</tbody>
</table>

(Footnotes have the same meaning as in the original table.)

2. The conclusions on page 7-63 should be altered slightly:

   a) Add AREE 12 subsurface soil, benzo[a]pyrene.
   b) Add AREE 29-4 surface soil, aluminum.
   c) Add AREE 16-1 surface soil, arsenic, TCDD, and chromium.
   d) To AREE 13, add aluminum and possibly vanadium.
   e) To AREE 27, add cadmium.

3. Table 8-1:

   a) For AREE 12, future residential risks did exceed 1E-4 due to benzo[a]pyrene.
   b) For AREE 13, aluminum and possibly vanadium also contributed; the reason that no remediation is recommended is not clear.
   c) For AREE 16-1, risks did exceed NCP targets, due to arsenic, TCDD, and chromium. The reason for no remediation is not clear.
   d) For AREE 27, cadmium was also a contributor. The reason for no remediation, given the "yes" in unacceptable health risks, is not clear.
   e) For AREE 29-4, the aluminum HI of 1.4 was borderline.
   f) For site-wide groundwater, the bis(2-ethylhexyl)phthalate (BEHP) is a potential concern. Reported levels were not all attributed to blank contamination.

1. Section 8.1 should also include a discussion of AREE 12 subsoil, AREE 16-1 surface soil, AREE 29-4 surface soil, AREE 13 iron, aluminum, and vanadium (as elevated metals in a sludge
disposal area), and AREE 27 (for which the increase in the chromium toxicity factor has increased the HI, although the point about valence state is well taken).

5. Section 8.2 should not dismiss the BEHP lightly. Although phthalates are common laboratory contaminants, BEHP was detected in several wells at high levels that were not attributed to blank contamination. On the other hand, the presence of BEHP in background wells at similar levels implies that there may be a regional BEHP issue. As a base-closure issue, the groundwater BEHP could be important, since it exceeds both NCP target risks and the MCL.

6. Page ES-2: For AREE 12, subsoil cancer risks exceed E-4 for potential residential exposure. For AREE 13, it is not clear that no action should be taken for metals exceeding background levels in a sludge disposal area.

7. Page ES-3:
   a) The concentrations of arsenic and TCDD at AREE 16-1 pose a total cancer risk of 2E-4 for the child/adult scenario. Chromium is a possible driver of an HI above 1. Therefore, is not clear that no action is appropriate.
   b) For AREE 27, chromium and cadmium contribute to an HI above 1.

8. Page ES-4:
   a) For AREE 29-4, the aluminum HQ is 1.4.
   b) For groundwater, further consideration should be given to the BEHP results.
   c) For the summary bullets, antimony and arsenic should be added to AREE 19. AREE 13 (aluminum, iron, and possibly vanadium) should be added. AREE 16-1 (arsenic, TCDD and chromium) should be added. AREE 29-4 (aluminum) and AREE 12 subsurface soil (benzo[a]pyrene) may warrant inclusion. Groundwater BEHP should receive further consideration. AREE 27 (cadmium and chromium) may warrant inclusion.

OTHER RISK-RELATED ISSUES

9. Cancer risks were presented separately for children and adults. In order to estimate the lifetime cancer risk when exposure includes both childhood and adulthood, the risks would be:

   (Adult cancer risk x 24/30) + (Child cancer risk).

10. Appendix F: This appendix generates residential risks, but uses industrial RBCs to screen. If residential RBCs were used, then additional COPCs (with their EPCs shown here) would be identified:

    AREE 12: aluminum (16100 mg/kg), chromium (24.7 mg/kg), iron (40400 mg/kg), manganese (605 mg/kg), vanadium (95 mg/kg)

    Central AREEs: aluminum (18900 mg/kg), antimony (0.27 mg/kg), cadmium (0.4 mg/kg), chromium (27 mg/kg), manganese (2390 mg/kg), silver (0.44 mg/kg), vanadium (110 mg/kg)

    AREE 27: aluminum (15000 mg/kg), arsenic (12.2 mg/kg), chromium (46 mg/kg), iron (48000 mg/kg), manganese (950 mg/kg), vanadium (116 mg/kg)
For AREE 12, the residential cancer risks exceed 1E-4 due to benzo[a]pyrene: For all other residential subsoil scenarios, the cancer risks are below 1E-4 and the His are at or below 1 after background attribution and target organ separation.

11. The soil-to-skin adherence factors are generally reported at lower levels in the new Exposure Factors Handbook than previously (Section 7.1.2.3; Tables 7-16, 7-17, 7-19, 24). Therefore, it is possible that dermal soil risks are overestimated in this respect.
ATTACHMENT: DETAILS ON RISK ASSESSMENT SECTIONS IMPACTED BY NEW TOXICITY FACTORS

1. Tables 4-2 and F-1: Screening RBCs for beryllium, chromium, vinyl acetate, 1,3-dichlorobenzene, 2-chloronaphthalenebis(2-chloroethyl)ether, dibenzofuran, 2-methylnaphthalene, naphthalene, the chlordanes, toxaphene, dinoseb, and Aroclor 1016 have been updated. As will be seen, only the differences for beryllium, chromium, and chlordane are generally significant for Vint Hill. The 1,2,3,7,8-PeCDF RBCs were incorrect on this table. However, since the correct numbers were used elsewhere in the report, this is not a major issue.

2. Beryllium’s RBC would be higher and it would no longer be a COPC, and chromium's RBC would be lower but its COPC status would not change, on Tables 4-3 through 4-6, Tables 5-2 through 5-9, Table 5-10 (chromium only), Table 5-11, Table 5-12, Tables 5-15 through 5-23, Tables 5-25 through 5-30, Tables 5-33 through 5-43, Table 5-45, Table 6-1, Table 7-2, and in Sections 4.2.1, 4.2.2, 4.2.3, 5.1.2, 5.1.4, 5.2.2, 5.2.4, 5.2.5, 5.3.2.1, 5.3.2.2, 5.3.4.1. 5.3.4.2, 5.4.4, 5.5.1, 5.7.4.2, 5.7.5.2, 5.8.4.1, 5.8.4.2, 5.9.2, 5.9.4, 5.10.4.1, 5.10.4.2, 5.10.5, 5.11.2, 5.11.3, 5.12.1, 5.14.2, 5.14.4, 5.15.4, 5.16.2, 5.17.4, 5.18.2, 5.18.4, 5.18.5, 5.19.2, 5.19.4, 5.19.5, 6.4.1.1, 6.4.2.1, and 7.1.1.4; also on page 7-6, 3rd paragraph.

2-Methylnaphthalene's RBC would be lower, but its COPC status would not change, on Tables 5-2, 5-9, 5-19, 5-35, 5-41, 5-45, and 7-2, and in Sections 5.1.2, 5.3.4.1, 5.3.4.2, 5.8.4.1, 5.14.4, 5.18.4, 5.18.5, 5.19.4, and 5.19.5.

Chlordane's RBC would be higher, but its COPC status would not change, on Tables 5-7, 5-11, 5-20, and 5-43, and in Sections 5.3.2.1, 5.3.2.2, 5.4.4, 5.8.4.2, 5.19.2, and 5.19.5. The COPC status of total chlordane would not change on Tables 5-8 and 5-9, and in Sections 5.3.4.1 and 5.3.4.2. Chlordane would no longer be a COPC on Table 5-19 and in Section 5.8.4.1.

Naphthalene's RBC would be lower, but its COPC status would not change, on Tables 5-8, 5-9, 5-11, 5-19, 5-41, 5-42, 5-45, and 7-2, and in Sections 5.3.4.1, 5.3.4.2, 5.4.4, 5.8.4.1, 5.18.4, 5.18.5, 5.19.4, and 5.19.5.

3. On Tables 7-4 and 7-11 (also pp. 7-7 through 7-10), the COPC selections would change as follows:

AREEs 9, 13, 19, 21, 24, 29-2, 29-3: beryllium no, chromium yes;

AREEs 11, 16-1, 16-2, 18, 27, 29-4: beryllium no;

AREE 17: chlordane no, beryllium no, chromium yes.

4. On Tables 7-6 and 7-11 (also on p. 7-12), the COPC selections for occupational use would change as follows: Central AREEs: beryllium no.

5. On Tables 7-8 and 7-11 (also on p. 7-12), the COPC selections would change as follows: chlordane no.

6. On Tables 7-10 and 7-11 (also on pp. 7-13 and 7-14), the COPC selections would change as follows:

Eastern: beryllium no;

Northern: beryllium no, chromium yes;

Western: alpha-chlordane no, gamma-chlordane no, beryllium no.
7. Table 7-14:

Beryllium does not need to be a COPC for groundwater, surface soil AREE 9, surface soil AREE 11, surface soil AREE 13, surface soil AREE 16-1, surface soil AREE 16-2, surface soil AREE 17, surface soil AREE 18, surface soil AREE 19, surface soil AREE 21, surface soil AREE 24, surface soil AREE 27, surface soil AREE 29-2, surface soil AREE 29-3, surface soil AREE 29-4 subsurface soil central AREEs, eastern tributary sediment, northern tributary sediment, and western tributary sediment.

Chlordane does not need to be a COPC in AREE 17 surface soil or western tributary surface water. Alpha- and gamma-chlordane do not need to be COPCs in western tributary sediment.

Surface soil, AREE 9: The manganese EPC should be 2980 mg/kg, but this transcription error is negligible in terms of risk. Chromium should be added, with an EPC of 32.5 mg/kg.

Surface soil, AREE 13: Chromium should be added, with an EPC of 28.9 mg/kg.

Surface soil, AREE 17: Chromium should be added, with an EPC of 35 mg/kg.

Surface soil, AREE 19: Chromium should be added, with an EPC of 23 mg/kg.

Surface soil, AREE 21: Chromium should be added, with an EPC of 20 mg/kg.

Surface soil, AREE 24: Chromium should be added, with an EPC of 33.6 mg/kg.

Surface soil, AREE 29-2: Chromium should be added, with an EPC of 36.6 mg/kg.

Surface soil, AREE 29-3: The iron EPC should be 26000 mg/kg, but this transcription error is negligible. Chromium should be added, with an EPC of 24 mg/kg.

Subsurface soil, AREE 12: The EPCs should be 13 mg/kg for benz[a]anthracene, 13 mg/kg for benzo[a]pyrene, 16 mg/kg for benzo[b]fluoranthene, 3.8 mg/kg for dibenz[a,h]anthracene, and 9.5 for indeno[1,2,3-c,d]pyrene. However, these changes are negligible in terms of risk.

8. Table 7-25:

The new oral slope factors for the chlordanes are all 0.35 per mg/kg/day; the new oral RfDs are 5E-4 mg/kg/day.

The 1,2-dichloroethane target organs include the stomach and thymus.

The barium target organs include the kidney.

The new beryllium oral RfD is 2E-3 mg/kg/day with the intestines as the target organ; the oral slope factor has been withdrawn.

The new chromium oral RfD is 3E-3 mg/kg/day.

The inorganic mercury target organ is the immune system.

9. Table 7-26:

The new unit risk for chlordane is 1E-4 per ug/m³; the new RfC is 7E-4 mg/m³.

The 1,2-dichloroethane target organs include possible kidney effects.

The provisional aluminum RfC is 3.5E-3 mg/m³.
The new beryllium RfC is 2E-5 mg/m$^3$.

The new chromium RfC is 1E-4 mg/m$^3$.

10. **Table 7-27**: As noted elsewhere in the report, adjusted slope factors are not calculated for the carcinogenic PAHs. The beryllium, chromium, and chlordane dermal numbers would change in accordance with their new oral numbers.

11. The risk drivers for AREE 9 surface soil would be iron, manganese, chromium, and vanadium, which are all similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 11 surface soil would be chromium, vanadium, mercury, iron, and chlordane, of which mercury and chlordane exceed background levels.

The risk drivers for AREE 13 surface soil would be aluminum, iron, chromium, and vanadium, of which only chromium is similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 16-1 surface soil would be arsenic, chromium, iron, manganese, vanadium, and TCDD, of which arsenic, TCDD, and chromium exceed background levels.

The risk drivers for AREE 16-2 surface soil would be iron and vanadium, both similar to background levels.

The risk drivers for AREE 17 surface soil would be iron, manganese, chromium, and vanadium, which are all similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 18 surface soil would be iron, manganese, and chromium, which are all similar to background levels.

The risk drivers for AREE 19 surface soil would be iron, antimony, chromium, arsenic, and vanadium, of which antimony and arsenic exceed background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 21 surface soil would be iron, manganese, chromium, and vanadium, all of which are similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 24 surface soil would be iron, manganese, chromium, and vanadium, all of which are similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 27 surface soil would be chromium, vanadium, cadmium, and iron, of which chromium and cadmium exceed background levels.

The risk drivers for AREE 29-2 surface soil would be iron and chromium, which are both similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 29-4 surface soil would be chromium, vanadium, beryllium, iron, aluminum, and manganese, of which only aluminum exceeds background levels.

The risk drivers for groundwater are manganese and bis(2-ethylhexyl)phthalate (BEHP), of which both are similar to background levels, although BEHP is not naturally occurring.

The risk drivers for western tributary sediment are arsenic, chromium, iron, manganese, and vanadium, of which arsenic exceeds background levels.

The risk drivers for eastern tributary sediment are iron, chromium, manganese, and vanadium, all of which are similar to background levels.
The risk drivers for northern tributary sediment are iron, manganese, chromium, and vanadium, all of which are similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 27 subsurface soil would be chromium, iron, and vanadium, all of which are similar to background, according to a Mann-Whitney test.

The risk drivers for AREE 12 subsurface soil would be iron, chromium, vanadium, and benzo[a]pyrene, of which only benzo[a]pyrene appears to exceed background levels (metals tested with Mann-Whitney).

The risk drivers for central subsurface soil would be chromium, iron, manganese, and vanadium, all of which are similar to background (chromium, vanadium, and manganese tested with Mann-Whitney).

12. For Tables 7-28 through 7-42 and Table 7-144, along with pages 7-38 through 7-40: Chromium would be added to some of these AREEs. Risks for chromium would increase, while risks for beryllium and chlordane would decrease. However, all cancer risks would remain below 1E-4 and all HIs would remain at or below 1.

13. For Tables 7-43 through 7-72 and Table 7-145, along with pages 7-40 through 7-43: Chromium would be added to some of these AREEs. Inhalation HQs could be calculated for aluminum. Risks for chromium would increase, while risks for beryllium and chlordane would decrease. However, all cancer risks would remain below 1E-4 and all HIs would remain at or below 1, when target organs are considered and background chemicals are excluded.

14. For Tables 7-73, 7-74, and 7-146, along with page 7-43: Chromium would be added to northern tributary sediment. Risks for chromium would increase, while risks for beryllium and chlordane would decrease. However, all cancer risks would remain below 1E-4 and all HIs would remain at or below 1, when target organs are considered and background chemicals are excluded.

15. For Tables 7-75 through 7-77 and 7-147, along with pages 7-44 and 7-45: Inhalation risks for the child would increase. Risks for chromium would increase, while risks for beryllium would decrease. The dermal risks for adults are likely to be overestimated, since the amount that volatilizes during showering was not subtracted from the EPC. The total cancer risk (ingestion, dermal, and inhalation) for adults, 24-year exposure, would be 6E-4; the total HI would be 8. The total cancer risk for children (ingestion and dermal) would be 3E-4; the total HI would be 18. The risk drivers are still manganese and BEHP, with manganese attributed to background.

16. For Tables 7-78 through 7-107 and 7-148, along with pages 7-45 through 7-53: Chromium would be added to some of these AREEs. Inhalation HQs could be calculated for aluminum. Risks for chromium would increase, while risks for beryllium and chlordane would decrease. However, all cancer risks would be less than 1E-4, and all HIs would be at or below 1 after consideration of target organs and background, except for the following:

At AREE 13, the iron HQ (ingestion + dermal) is 1.5; the vanadium HQ is 1.06, and these are potentially additive. Vanadium may not be attributable to background.

At AREE 16-1, the arsenic cancer risk is 5E-5; the TCDD cancer risk is 8E-5 (total 1E-4); the chromium HQ is 1.4. Chromium may not be attributable to background. The cancer risks on Table 7-148 should not be marked “b.”

At AREE 27, the cadmium HQ is 0.21; the chromium HQ is 1.22; these are potentially additive.

17. Tables 7-108 through 7-137 and Table 7-149, along with pages 7-45 through 7-53: Chromium would be added to some of these AREEs. Inhalation HQs could be calculated for aluminum. Inhalation risks would increase due to body-weight consideration. Risks for chromium would
Increase, while risks for beryllium and chlordane would decrease. However, all cancer risks would be less than 1E-4, and all HIs would be at or below 1 after consideration of target organs and background, except for the following:

At AREE 11, the mercury HQ is 1.8; the chlordane HQ is 2.7. The chlordane cancer risk is 4E-5. The cancer risk on Table 7-149 should not be attributed to background.

At AREE 13, the aluminum HQ is 1.2, the iron HQ is greater than 10; the vanadium HQ is 2.6. Vanadium may not be attributable to background.

At AREE 16-1, the arsenic cancer risk is 5E-5; the TCDD cancer risk is 7E-5 (total 1E-4); the chromium HQ is 2.5. Chromium may not be attributable to background. The cancer risks on Table 7-149 should not be marked "b."

At AREE 19, the antimony HQ is 1.5; the arsenic HQ is 1.4; these are potentially additive. The HIs on Table 7-149 should not be marked "e."

At AREE 27, the cadmium HQ is 0.4; the chromium HQ is 2.2; these are potentially additive. The HIs on Table 7-149 should not be marked "b."

At AREE 29-4, the aluminum HQ is 1.4; this was not attributed to background.

18. For Tables 7-138 through 7-141 and 7-150, along with pages 7-53 and 7-54: Beryllium risks would decrease, while risks for chromium would increase. However, all cancer risks would be less than 1E-4, and all HIs would be at or below 1 after consideration of target organs and background.

19. For Tables 7-142, 7-143, and 7-151, along with pages 7-54 and 7-55: Risks for chromium would increase, while risks for beryllium and chlordane would decrease. However, all cancer risks would be less than 1E-4, and all HIs would be at or below 1 after consideration of target organs and background, except for the following:

For western tributary sediment, the arsenic HQ is 2.5 and the arsenic cancer risk is 9E-5 (added to a chlordane risk of 1E-5). The cancer risk should not be marked "c' on Table 7-151.

20. Beryllium should not be a cancer driver on Tables 7-144 through 7-151.

21. Table 7-152, Section 7.1.4.3, Section 7.1.5.4: AREE 16-1 now has the highest cancer risk, and AREE 29-4 has the highest HI. The risks on this table would change as previously noted.
ATTACHMENT 2

RESPONSE TO USEPA COMMENTS ON THE
AREE 14 INVESTIGATION SUMMARY REPORT
Comment 1.

**Comment:** Section 4.1.4.4 includes a pre-excavation risk assessment. Hot spots were found and removed in the miss zone; the remaining lead in the excavated area has an average concentration of approximately 125 mg/kg. Because of the nature of the site activities, it is possible that other hot spots may be present. The contamination that was found at this site was not homogeneous, and the original source was scattered rather than issuing from an identifiable location (such as a tank, spill, transformer, etc.). Therefore, the residential risks from lead cannot be truly known unless the skeet range is systematically examined for lead, however, since the HUD guideline for lead in soil is 400 mg/kg a field screening technique may be used instead of re-sampling to ensure that all the hot spots have been removed from this AREE.

**Response:** It is important to note that the skeet range (AREE 14) at VHFS was only used on weekends and thus would be expected to have limited contamination as compared to a commercial skeet range. During the Site Inspection (SI), surface soil samples were collected from randomly selected grid points. During this sampling, only limited contamination was identified in the form of two hot spots. During the Supplemental Remedial Investigation (SRI), these hot spots were removed, and numerous confirmation samples were collected which yielded an average lead concentration remaining at the skeet range of 102 ppm (including all SI and SRI "left-in-place" samples). In addition, on December 10, 1998, USEPA, VDEQ, VHFS, USACE, and ICF KE personnel conducted a site walk-through of AREE 14. During this site walk-through, no lead pellets or clay pigeons were observed on the surface of the skeet range. In light of these observations, the U.S. Army stands by its conclusion that the hazard previously posed by AREE 14 has been removed and that no further sampling or action is required. It should be further noted that USEPA agreed with this no further action determination in a subsequent comment document (for the SRI) dated January 7, 1999, "... since the average concentration for lead is 125 ppm and the HUD residential guidelines is set at 400 ppm..."
The United States Army at Vint Hill Farms Station, Virginia invites public comment on recently proposed environmental actions for Vint Hill Farms Station, as a result of the base closure process.

* Please Come To Our *

* PUBLIC MEETING *

* Thursday, April 15, 1999 * 7:00 p.m.

* Building 101 (Old Headquarters Bldg.), Conference Room *

* Vint Hill Farms Station, VA 20187 *

PURPOSE

To discuss and present remedial alternatives and no further action proposals for the sites discussed below.

BACKGROUND

Vint Hill Farms Station is part of the U.S. Army Communications - Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence. VHS is located approximately 40 miles southwest of Washington, DC, Fauquier County, Virginia. The installation occupies approximately 701 acres of land in the town of Warren, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres on the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for the radio transmitting and receiving antenna operation areas. The facility was designed for closure in March 1992, under the Base Realignment and Closure (BRAC) Act.

SUMMARY

The U.S. Army, in consultation with the U.S. Environmental Protection Agency (USEPA) Region III and the Virginia Department of Environmental Quality (VDEQ), invites public comment on proposed plans for numerous sites at VHS. Before selecting final remedies and making final no further action decisions, VHS will consider all written and oral comments received during the public comment period of April 1 through April 30, 1999.

The U.S. Army is proposing remediation for the landfill at AREA 1 - Dump #1 and for the east and south side of the military training area 28 - incinerator building. No further action is proposed for groundwater underlying the installation, a portion of the South Run near AREA 1 and AREA 2 Sewage Treatment Plant, and the three gravel drainage ditches.

Additionally, the U.S. Army is proposing no further action at the following areas requiring environmental evaluation:

(AREAS)

AREA 1 - Warehouses
AREA 2 - Environmental Photograph Interpretation Center (EPIC) Building
AREA 7 - Electrical Equipment Facility
AREA 8 - Former Photograph Interpretation Center
AREA 10 - Former Photographic Wastewater Lagoon
AREA 12 - Shingle Disposal Area
AREA 14 - Skid Ramps
AREA 15 - Possible Firefighter Training Pit
AREA 16 - Possible Firefighter Training Pit
AREA 17 - Dump #3
AREA 18 - Grease Pit

The U.S. Army will be accepting comments during a 30-DAY PUBLIC COMMENT PERIOD, which begins Thursday, April 1, and ends Friday, April 30, 1999.

WRITTEN COMMENTS MAY BE SUBMITTED TO THE FOLLOWING ADDRESS:

Kevn Bell, Public Affairs Officer
Vint Hill Farms Station
Building 2500, Holmes Road
Warrenton, VA 20187

PROPOSAL

VHS evaluated four remedial alternatives to address soil contamination at AREA 1:

ALTERNATIVE 1: No action;
ALTERNATIVE 2: Excavation of Landfill;
ALTERNATIVE 3: Clay Cap;
ALTERNATIVE 4: Line Cap.

Based on available information, VHS prefers Alternative 4, which consists of constructing a liner cap over the AREA 1 landfill and implementing land use restrictions. This remedial alternative offers adequate protection of human health and the environment, providing both short- and long-term effectiveness by: 1) removing the potential for direct contact with the contaminated soil; and 2) reducing the mobilization of contaminants in air to other media. Due to the complexity of the system that would be required for a treatment system to effectively treat the wide variety of contaminants present, it was not practical to consider active treatment in terms of cost-effectiveness and the ability to implement. Capping of the landfill would be done in accordance with applicable Federal and Commonwealth of Virginia regulations.

VHS evaluated two remedial alternatives to address the incinerator building at AREA 20:

ALTERNATIVE 1: No action;
ALTERNATIVE 2: Ash and Oil Removal.

Based on available information, VHS prefers Alternative 2, which consists of the removal of ash and oil from the incinerator and de-oiling deposition at a permanent facility. This remedies remedial alternative is a permanent solution that offers long-term effectiveness. Furthermore, the contaminated materials are removed and transported off-site for proper disposal. The removal and disposal of ash and oil would be done in accordance with applicable Federal and Commonwealth of Virginia regulations.

In addition, VHS prefers no further action for AREAS 3, 5, 7, 13, 12, 14, 16-1, 16-2, 17, 18, 20, 24, 25, 26, 27, 28-1, 28-2, 29-1, 29-2, 20-4, 20-3, 20-2, 20-3, 20-4, 30, and 31; the groundwater underlying the installation, the South Run at AREAS 1 and 2; and three gravel drainage ditches because these areas pose no unacceptable human health or ecological risks.

FOR MORE INFORMATION

You can review the Proposel Plan and related technical documents at the Information Repository at the following location:

Fauquier County Library
Warrenton Branch - Reference Section
11 Caroline Street
Warrenton, VA 20186
Phone (540) 347-4750

Hours: M-Th 9am - 9pm, Fri 9am - 5pm, 1st Sat 9am - 5pm
ATTACHMENT 5

PUBLIC MEETING ROSTER
<table>
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<th>NAME</th>
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<th>Permit to Speak</th>
<th>Name on File</th>
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<tbody>
<tr>
<td>Nova Zirps</td>
<td>The IT Group, Greensboro, NC</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>W. Steven Huff</td>
<td>THE IT GROUP, EDGEMO, MD 20340</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Frank Speck</td>
<td>COUNTY COURT RESEARCHES</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Wayne Phillips</td>
<td>VHF, Dts Corp</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Joseph Philan</td>
<td>C&amp;E - BALTIMORE</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Lawrence Smith</td>
<td>HR, US Army Comm-Electronics Command</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Kevin Bell</td>
<td>Cold War Force - VHF</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Frank Graziano</td>
<td>HQ, US Army Materiel Command</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Pat White</td>
<td>VINT HILL EOD</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Steve Mihalik</td>
<td>DEQ</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Bob Stroud</td>
<td>EPA - Region III 1650 Arch St. Phila, PA 19103</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Continued on Back
Vint Hill Farms Station

Sign-In Sheet

Thursday, April 15, 1999
Public Meeting 7:00 P.M.

Recently Proposed Environmental Actions for Vint Hill Farms Station, as a Result of the Base Closure Process

If you wish to speak, please sign in on the lines below. Your name will be called in the order that it appears. Thank you.

<table>
<thead>
<tr>
<th>NAME (Please Print)</th>
<th>ADDRESS (Please Print)</th>
<th>[ ]</th>
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<tbody>
<tr>
<td>Mary [redacted]</td>
<td>3206 North Star Crest Dr, Washington</td>
<td></td>
<td></td>
</tr>
<tr>
<td>William [redacted]</td>
<td>7206-W星Crest Dr, Washington</td>
<td>V</td>
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</tr>
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</table>

Continued on Back
ATTACHMENT 6

WRITTEN COMMENTS FROM REGULATORS AND U.S. ARMY RESPONSES
After mailing recent Proposed Plans to the public, the U.S. Army received comments on the Proposed Plans from the U.S. Environmental Protection Agency (USEPA) and the Virginia Department of the Environment (VDEQ). In an ongoing effort to solicit the public’s input on the proposed environmental actions at Vint Hill Farms Station (VHFS), the U.S. Army is distributing our responses to comments from USEPA and VDEQ to the public. Please note that the comments that are agreed to by the U.S. Army will be incorporated into the Decision Documents for the affected sites.

Response to Comments on the Proposed Plans for Vint Hill Farms Station from USEPA Region III

AREEs 13, 14, 16-1, 27 and 29-4

Comment 1: Introduction, 1st sentence, "to address contaminated soil..."

Comment: Delete "contaminated soil" so the sentence reads "alternative to address selected Areas Requiring ..."

Response: The U.S. Army agrees with this suggested wording change.

Comment 2: Page 2, Site Background, 3rd paragraph, "Currently undergoing regulatory review and having soil contamination which poses an unacceptable risk..."

Comment: If the report is still being reviewed, how can we rely on a report conclusion about risk?

Response: The SRI was conducted to fill data gaps identified in the RIs (e.g., the extent of the AREE 1 landfill). The SRI does not include risk assessment. All risk conclusions were made based on the RIs.

Comment 3: Page 5, AREE 13 description, 1st paragraph, "In 1992, total metals were determined..." and "In 1992, the Army selected..."

Comment: (1982) By whom? Any regulator involvement? (1992) By regulator or Army decision to stop?

Response: Based on available knowledge, AREE 13 was not regulated; therefore, decisions to spread sludge and later to remove the sludge and close the disposal area were presumably made by the U.S. Army.

Comment 4: Page 6, AREE 13 description, 2nd paragraph

Comment: As part of RI?

Response: Samples at AREE 13 were collected during the SI and the RI.

Comment 5: Page 6, AREE 13 description, 4th paragraph

Comment: Nothing in the hit zone?

Response: The lead concentrations in the Hit Zone did not exceed the USEPA screening level for lead in residential soil of 400 ppm.

Comment 6: Page 6, AREE 13 description, 5th paragraph

Comment: Why "possible" in heading but not text?
Response: Site history indicated that a Firefighter Training Pit was used at VHFS; however, the exact location of the pit is not known with certainty. AREEs 16-1 and 16-2 represent two possible locations of the Firefighter Training Pit.

Comment: Mentions arsenic and lead but what about chromium (see page 9)?
Response: The contaminant assessment focused on contaminants that were a potential concern by themselves, while the baseline risk assessment (BRA) evaluated contaminants in combination to determine if they were a potential concern. Chromium in combination with cadmium was identified as a potential concern for impacts to the kidneys in the BRA.

Comment: Should stored be disposed?
Response: Yes.

Comment: Current or future potential land-use conditions ... What are these? Maybe say "current industrial/commercial use or potential future residential use conditions", or unrestricted future land use conditions.
Response: Current land use conditions are based on the current usage of the VHFS property; therefore, it would be appropriate to say "current industrial/commercial use conditions". Plans for future use of the VHFS property have not yet been finalized. It was conservatively assumed that residents would inhabit the VHFS property in the future; therefore, it would be appropriate to say "potential future residential use conditions".

Yes, iron is naturally occurring. However, when AREE 13 site iron concentrations and background iron concentrations are statistically compared, iron was not determined to be within background concentrations. This is why iron was not discounted initially. As discussed in the Proposed Plan, a closer look at the subsurface soil type present at AREE 13 supports the conclusion that the iron is naturally occurring.

Comment: Current and future land-use conditions ... What are these?
Response: See response to Comment 10.

Comment: "Soil in those ... was excavated." Removed and disposed off site?
Response: Yes, the excavated soil was removed and disposed off site.
Comment: Current and future land-use conditions ... What are these?
Response: See response to Comment 10.

Comment: "contaminants" ... Are you referring to arsenic, TCDD?
Response: Yes.

Comment: Current or future land-use conditions ... What are these? Chromium not mentioned on page 6. What about arsenic?
Response: See response to Comment 10.
See response to Comment 8 regarding chromium. Arsenic was not a risk driver at AREE 27.

Comment: "Therefore, the HI of 1.3 ..." instead of "therefore a HI of 1.3 ..."
Response: The U.S. Army agrees with this suggested wording change.

Comment: Start the sentence from "lead contamination" and insert "explained in the AREE 14 discussion" after IEUBK Model.
Response: The U.S. Army agrees with this suggested wording change.

Comment: Current or future land-use conditions ... What are these?
Response: See response to Comment 10.

Comment: Are you referring to aluminum, benzo(a)pyrene, beryllium, arsenic, and iron?
Response: The text is referring to any contaminant identified as a chemical of potential concern that was not determined to be naturally-occurring. Benzo(a)pyrene and aluminum are the only two contaminants that meet these criteria.

AREEs 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33, and Site-wide Groundwater, South Run at AREEs 1 & 2, and Other Site Drainages

Comment: Is this a No Further Action or No Action Proposal?
Response: No Action.
Comment 21. Introduction, 1st sentence, “to address contamination at”
Comment: Delete “contamination at” so the sentence reads “alternative to address selected Areas Requiring...”
Response: The U.S. Army agrees with this suggested wording change.

Comment 22. Page 2, Site Background, 3rd & 4th paragraphs, “currently undergoing regulatory review” and “having contamination which poses no unacceptable”.
Comment: If the report is still being reviewed, how can we rely on a report conclusion about risk?
Response: See response to Comment 2.

Comment 23. Page 2, Site, Background
Comment: I'm concerned because we can't necessarily say that property is okay for unrestricted future use. In which case, we'll need institutional controls, a remedy. See AREE-specific comments below.
Response: See responses to AREE-specific comments below. Based on these responses, unrestricted future use is okay.

Comment 24. Page 4, AREE 3 description, 3rd sentence
Comment: “The Warehouse also may have been...” instead of “The Warehouse may have been...”
Response: The U.S. Army agrees with this suggested wording change.

Comment 25. Page 4, AREE 3 description, 2nd paragraph
Comment: What about residential risk? Consider a scenario where the property is reused as residential and trees are planted, with the tree pits dug below 2 ft bgs. Subsurface soil could then sit at the surface and be consumed by a child.
Response: The U.S. Army's understanding of USEPA's position is that soil below 2 ft bgs only needs to satisfy target risk levels for excavation workers and not residents since residents would be unlikely to be exposed to subsurface soils. In addition, the concentrations of contaminants currently present in subsurface soil would not be representative of the concentrations that might be present if landscaping activities were to occur which would involve mixing of subsurface soils with surface soil, clean topsoil, and other soil amendments. Therefore, it would not be appropriate to evaluate risks to residents using available subsurface soil data.

Comment 26. Page 6, AREE description 1st paragraph last sentence
Comment: AREE 7 will need to be closed under RCRA by VDEQ before FOST/transfer.
Response: The U.S. Army understands the requirement for clean closure of AREE 7 by VDEQ before a final No Action decision can be made. A closure report has been submitted to VDEQ, and approval is pending.

Comment 27. Page 6, AREE 10 description, 1st paragraph, 4th sentence
Comment: How was the overflow from the lagoon discharged? Via earthen trench? Pipe?
Response: The lagoon and WSRT were connected naturally. Thelagoon overflowed directly into WSRT.
Comment: What about sampling of the surface soil around the lagoon?
Response: The lagoon was dredged and backfilled such that any residual contamination would be present at the base of the former lagoon (i.e., 4 – 4.5 ft bgs) and not at the soil surface.

Comment: Why is it the “Possible” Firefighter Training Pit?
Response: See response to Comment 6.

Comment: AREE 16-1 only discusses surface soils. Was the sampling different for the two AREEs?
Response: Soil samples at AREE 16-1 could not be collected at depths below 2 ft bgs because bedrock was encountered.

Comment: The AREE 16-1 text doesn't give this range.
Response: A range of maximum background arsenic concentrations is given for AREE 16-2 and not AREE 16-1 because both surface soil and subsurface soil samples were collected at AREE 16-2, while only surface soil samples were collected at AREE 16-1 (see response to Comment 30).

Comment: Explain how analytical results indicate that soils have not been adversely impacted? Is it because only arsenic was found and not dioxins/furans? Then where does the arsenic come from?
Response: Soils have not been impacted because arsenic was the only contaminant that exceeded screening levels at AREE 16-2, and the arsenic concentrations at AREE 16-2 were determined to be statistically within background levels.

Comment: How deep is the dump? Is it unlined?
Response: Based on observations made during test pit excavation, the dump extends to depths up to 7 ft in some areas. The dump is unlined.

Comment: Are there any elevated lead levels?
Response: No.

Comment: Is groundwater contamination a concern?
<table>
<thead>
<tr>
<th>Comment</th>
<th>Page, Description</th>
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<tbody>
<tr>
<td><strong>36.</strong></td>
<td>Page 9, AREE 29-1 description</td>
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<tr>
<td>Comment:</td>
<td>Were hazardous materials stored in the “Salvage Yard”?</td>
</tr>
<tr>
<td>Response:</td>
<td>To the U.S. Army's best knowledge, no.</td>
</tr>
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</table>

| **37.** | Page 9, AREE 29-2, description |
| Comment: | What about the sludge piles themselves? |
| Response: | Based on review of aerial photography, there was a possibility that AREE 29-2 may have been used as a sludge disposal area. However, during sampling, there was no sludge present. |

| **38.** | Page 9, AREE 29-3 description |
| Comment: | Were hazardous materials stored at the “Possible Disposal Area”? |
| Response: | To the U.S. Army's best knowledge, no. |

| **39.** | Page 9, AREE 30 description 1st paragraph |
| Comment: | “a petroleum odor was detected” instead of “a petroleum odor was observed”. |
| Response: | The U.S. Army agrees with this suggested wording change. |

| **40.** | Page 9, AREE 30 description, 2nd paragraph last sentence |
| Comment: | “No contamination above screening levels...” What were the screening levels? |
| Response: | USEPA Region III risk-based concentrations (RBCs), the USEPA screening level for lead in residential soil, Virginia’s TPH soil action level, and maximum background concentrations. |

| **41.** | Page 9, AREE 33, description, 2nd paragraph |
| Comment: | Industrial soil RBCs were used as the screening levels. Why not residential (subsurface) RBCs? |
| Response: | Industrial soil RBCs were used to screen soil results at AREE 33 because the soil sample was collected from greater than 2 ft bgs (i.e., excavation workers are the most likely human receptor). Also, see response to Comment 25. |

| **42.** | Page 9, Site-Wide Groundwater description, 1st sentence |
| Comment: | “...composition of the aquifer...” Is there only one aquifer? |
| Response: | The groundwater “aquifer” of concern at VHFS consists of groundwater in the overburden and in fractured bedrock which are interconnected (i.e., there is no defined confining unit). Therefore, if is evaluated as a single aquifer. |

| **43.** | Page11, Other/Site Drainages, 3rd paragraph, 2nd sentence |
| Comment: | “Metals, PAHs, and pesticides were detected at concentrations above screening levels.” What are the screening levels? |
Response: The more stringent of the Effects Range - Lows and the No Effects Levels or Lowest Effects Levels for sediment which are protective of benthic organisms, and maximum background concentrations.

Comment 44. Page 12, 1st paragraph, 1st full sentence

Comment: "In addition, the HHRA evaluated potential risks to hypothetical future adult residents who could be exposed contaminants in groundwater and surface soil and to hypothetical future child residents who could be exposed to contaminants in groundwater, surface soil, surface water, and sediment." What about subsurface soil?

Response: For subsurface soil, the HHRA evaluated risks to excavation workers, the human receptor most likely to be exposed to subsurface soil. Also, see response to Comment 25.

Comment 45. Page 12, AREE 3 description, 1st sentence

Comment: Current and future land-use conditions... What are these? Maybe say current industrial/commercial use or potential future residential use conditions", or unrestricted future land use conditions.

Response: See response to Comment 10.

Comment 46. Page 12, AREE 3 description

Comment: With regard to the, excavation workers, there is no mention of subsurface soil exceedance of industrial RBCs. What about residential RBCs?

Response: Although industrial soil RBCs were exceeded by contaminants in subsurface soil as indicated, on page 4, the concentrations of contaminants yielded risks lower than those for residents exposed to surface soil; therefore, only the risks for residents are presented. Also, see response to Comment 25.

Comment 47. Page 13, AREE 5 description

Comment: Is there any reason to collect surface soil samples?

Response: Only subsurface soil samples were collected because the industrial sewerline is buried at least 5 ft bgs.

Comment 48. Page 13, AREE 5 description

Comment: Risks to excavation workers are presented. What about residential exposure risks?

Response: See response to comment 25.

Comment 49. Page 13, AREE 7 description

Comment: Current and future land-use conditions... What are these?

Response: See response to Comment 10.

Comment 50. Page 13, AREE 10 description

Comment: Why were surface soil samples not collected?

Response: See response to Comment 28.
Comment 51. Page 13, AREE 10 description 1st sentence

Comment: "...so the HHRA only evaluated risks to future excavation workers." ... Then can we say that property is okay for unrestricted future use?

Response: See response to Comment 25.

Comment 52. Page 13, AREE 10 description

Comment: "No ERA was conducted at AREE 10 because all samples were collected at depths of greater than 6 inches." Depths from 0 inches to 2 feet are defined as "surface soil". Internal inconsistency created.

Response: The USEPA protocols for HHRAs and ERAs differ with respect to the definition of "surface soils" to which receptors are exposed. ERAs only use data for surface soil samples collected from the 0-6 inch depth interval, while HHRAs use data for surface soil samples collected from the 0-2 ft depth interval. The U.S. Army followed USEPA's protocols.

Comment 53. Page 13, AREE 16-2 description, Title

Comment: Why is it the "Possible" Firefighter Training Pit?

Response: See response to Comment 6.

Comment 54. Page 13, AREE 16-2 description

Comment: Current or potential future land-use conditions ... What are these?

Response: See response to Comment 10.

Comment 55. Page 13, AREE 16-2 description

Comment: What about residential risks to subsurface soil?

Response: See response to Comment 25.

Comment 56. Page 13, AREE 17 description

Comment: Current and future land-use conditions ... What are these?

Response: See response to Comment 10.

Comment 57. Page 13, AREE 17 description

Comment: What about residential risks to subsurface soil?

Response: See response to Comment 25.

Comment 58. Page 14, AREE 18 description

Comment: Current and potential future land-use conditions ... What are these?

Response: See response to Comment 10.

Comment 59. Page 14, AREE 18 description

Comment: Did the HHRA consider residential exposure to subsurface soil?

Response: See response to Comment 25.
Comment: Current and future land uses ... What are these?
Response: See response to Comment 10.

Comment: Current and future land-use conditions ... What are these?
"... risk to workers, trespassers, and ..." should be "... risks to workers, trespassers, and ..."
Response: See response to Comment 10.
The U.S. Army agrees with this suggested wording change.

Comment: "...for child residents exposed to contaminants in surface soil ..." What are these contaminants? PCBs? Metals?
Response: The text is referring to any contaminant identified as a chemical of potential concern that was not determined to be naturally-occurring. Aluminum is the only contaminant that meet these criteria. PCBs were not detected in surface soil at AREE 24.

Comment: Are toxicologists satisfied that this area is okay for residential use?
Response: Based on discussions with USEPA, it is the U.S. Army's understanding that this area is okay for residential use based on the BRA findings.

Comment: Current and future land uses ... What are these?
Response: See response to Comment 10.

Comment: Current and potential future land-use conditions ... What are these?
Response: See response to Comment 10.

Comment: "...for child residents exposed to contaminants in surface soil ..." What are these contaminants?
Response: The text is referring to any contaminant identified as a chemical of potential concern that was not determined to be naturally-occurring. Aluminum is the only contaminant that meet these criteria.

Comment: What about the materials which were piled there?
Response: See response to Comment 37.
Comment 68.  Page 15 AREE 29-3 description
Comment:  Current and future land-use ... What are these?
Response:  See response to Comment 10.

Comment 69.  Page 15, AREE 29-3 description, 2nd sentence
Comment:  ... For child residents exposed to contaminants in surface soil..." What are these contaminants? Page 9 doesn't mention surface soil, just subsurface soil.
Response:  The text is referring to any contaminant identified as a chemical of potential concern that was not determined to be naturally-occurring. For AREE 29-3 surface soil, no contaminants meet this criteria. The risks presented for child residents exposed to contaminants in surface soil by dermal absorption is actually the risk associated with exposure to background metals (i.e., aluminum, arsenic, beryllium, iron, and manganese) which were only discounted if risks were found to exceed USEPA's target risk criteria.
Page 9 does not mention contamination in surface soil because none of the detected compounds exceed screening levels (i.e., residential soil RBCs and maximum background concentrations).

Comment 70.  Page 15, AREE 29-3 description
Comment:  "An ERA was not conducted because all soil samples were collected at depths greater than 6 inches." Are depths greater than 6 inches defined as surface or subsurface soil?
Response:  See response to Comment 52.

Comment 71.  Page 15, AREE 30 description
Comment:  "...human health risks were only evaluated for future excavation workers." Why?
Response:  See response to Comment 25.

Comment 72.  Page 15, AREE 30 description
Comment:  "All analytes were detected below their screening levels ..." What are the screening levels?
Response:  USEPA Region III industrial soil RBCs, the USEPA screening level for lead in residential soil, and maximum background concentrations.

Comment 73.  Page 15, AREE 30 description
Comment:  Can't determine that AREE 30 is safe for unrestricted future use based only on human health risks for future excavation workers.
Response:  See response to Comment 25. Based on this response and the findings of the BRA, it is the U.S. Army's understanding that unrestricted use of AREE 30 is okay.

Comment 74.  Page 15, AREE 33 description
Comment:  Why were only subsurface soil samples collected at AREE 33?
Response:  The purpose of the RI at AREE 33 was to determine if the household debris present had impacted the native soils which were encountered at greater than 2 ft bgs.
Comment 75. Page 15, AREE 33 description

Comment: Why is there no information regarding residential reuse risks?
Response: See response to Comment 25.

Comment 76. Page 15, Site-Wide Groundwater description 3rd sentence

Comment: “naturally- occurring” should be “naturally-occurring”
Response: The U.S. Army agrees with this suggested wording change.

Comment 77. Page 15, Site-Wide Groundwater description

Comment: Excluding bis(2-ethylhexyl)phthalate, what are the risk and HI? What is the contaminant with the next highest risk?
Response: Excluding bis(2-ethylhexyl)phthalate along with naturally-occurring metals that were statistically determined to be within background levels, the highest estimated upper-bound excess lifetime cancer risk ($9 \times 10^{-6}$) is for adult residents exposed to contaminants in site wide groundwater by ingestion, and the highest noncarcinogenic risk (HI=0.5) is for child residents exposed to contaminants in site-wide groundwater by ingestion. The site-related contaminants with the greatest impact on cancer risks and noncarcinogenic hazards are beryllium and barium, respectively.

Comment 78. Page 15, South Run at AREEs 1 and 2 description

Comment: Current or future land-use conditions ... What are these?
Response: See response to Comment 10.

Comment 79. Page 16, South Run at AREEs 1 and 2 description 1st paragraph

Comment: "Although the HI associated with incidental ingestion exposures to sediment in South Run at AREEs 1 and 2 by child residents exceeded 1, the exceedance was driven by metals believed to be naturally occurring." ... Why weren't the metals discounted before running the calculations?
Response: Statistical background comparisons could not be conducted for sediment sample results because of the limited number of available background samples. Therefore, all metal results were included in the calculations.

Comment 80. Page 16, South Run at AREEs 1 and 2 description, 2nd paragraph

Comment: Based on the potential for adverse effects to benthic organisms in the tributaries to South Run at AREEs 1 and 2 identified in the ERA, shouldn't an action alternative be evaluated?
Response: The ERA estimated the potential for adverse effects to benthic organisms based on the assumption that a viable habitat for benthic organisms existed. However, the habitat for benthic organisms in the tributaries to South Run at AREEs 1 and 2 is limited and, therefore, the adverse effects are over-estimated by the ERA and are actually limited. No action is warranted based on the existing conditions.

Comment 81. Page 16, Other Site-Drainages description

Comment: Current or potential future land-use conditions ... What are these?
Response: See response to Comment 10.
Comment: Delete "contaminated materials at".
Response: The U.S. Army agrees with this suggested wording change.

Comment: "major characteristic" should be replaced with "major component".
Response: The U.S. Army agrees with this suggested wording change.

Comment: Should read "... the structure, and the Army shut down the incinerator permanently ..."
Response: The U.S. Army agrees with this suggested wording change.

Comment: Replace "... (i.e., boxes ...)" with "... (e.g., boxes ...)"
Response: The U.S. Army agrees with this suggested wording change.

Comment: What if it isn't?
Response: The text in the Decision Document will be revised to say "is sufficiently low" instead of "should be sufficiently low".

Comment: Delete "further" in "no further action".
Response: The U.S. Army agrees with this suggested wording change.

Comment: How big is the incinerator?
Response: Approximately 45 ft long.

Comment: Under which regulatory program?
Response: Stabilization to eliminate free liquids from waste materials is required by Department of Transportation (DOT) regulations and disposal facility permits.

Comment: Under which regulatory program?
Response: Solid waste landfills in Virginia are not permitted to accept elevated dioxin/furan concentrations. Although the waste will still be managed under the Solid Waste Management Regulations, it will require special management because it will have to be disposed in a landfill that is permitted to accept elevated dioxin/furan concentrations.

Comment: Replace "e.g." with "i.e."
Response: The U.S. Army agrees with this suggested wording change.

Comment: There doesn't appear to be a risk driver; no CERCLA trigger for an action. Write this as a No Action Proposed Plan for this AREE.
Response: Per USEPA's comment, a No Action Decision Document will be written for AREE 20. The U.S. Army will remove and dispose of the ash and oil as a BRAC action rather than a CERCLA-driven action.

Comment: This doesn't appear to be warranted under CERCLA. As a CERCLA ROD, no action would seem to be appropriate. The ash and oil removal seems like a separate BRAC issue.
Response: See response to Comment 92.

AREE 1

Comment: Delete "contaminated soil".
Response: The U.S. Army agrees with this suggested wording change.

Comment: Replace "characteristics" with "components".
Response: The U.S. Army agrees with this suggested wording change.

Comment: Delete "... and is currently undergoing regulatory review."
Response: The U.S. Army agrees with this suggested wording change.

Comment: Under all scenarios?
Response: Yes, under all scenarios evaluated.

Comment: Spell out RI.
Response: This is not necessary since RI was spelled out on page 2.
Comment: What are the risk numbers for workers, trespassers, and excavation workers?
Response: The risk numbers for workers, trespassers, and excavation workers are too numerous to present individually in the Proposed Plan. However, discounting naturally-occurring metals that were statistically determined to be within background levels, the cancer risks and noncancerous hazards for workers, trespassers, and excavation workers by incidental ingestion, dermal absorption, and inhalation are below USEPA's target risks of $1 \times 10^{-4}$ and $H_i=1$, respectively.

Comment: "2,3,7,8-TCDF" ... spell out TCDF.
Response: Tetrachlorodibenzofuran.

Comment: Delete "draft".
Response: The U.S. Army agrees with this suggested wording change.

Comment: Insert "of" after construction.
Response: The U.S. Army agrees with this suggested wording change.

Comment: Have the type/costs and O&M been considered for land use restrictions?
Response: The type of land use restrictions considered are deed restrictions. These deed restrictions would be imposed after the cap is constructed and would limit uses of the property to activities that would not impact the integrity of the cap. For example, activities requiring excavation of the property would be prohibited. Further definition of the land use restrictions will be made once a final remedial alternative is selected, and will be included in the Decision Document for AREE 1.

The capital costs for implementing land use restrictions have been included as a line item in the FS cost estimate. The O&M cost contingency included in the FS cost estimate would cover any long-term O&M requirements for the land use restrictions.

Comment: Have these been thought out? Will the county accept zoning ordinances and permitting restrictions? What about monitoring of institutional controls? What are the permitting restrictions? What will happen during the window of the landfill cap installation and the time of transfer?
Response: Further definition of the land use restrictions will be made once a final remedial alternative is selected, and will be included in the Decision Document for AREE 1. The Decision Document text will address the issues raised by USEPA (i.e., county acceptance of zoning ordinances, permitting restrictions, and monitoring of institutional controls), as appropriate.

The landfill will not be transferred until cap construction is complete. Since the U.S. Army will maintain control over the use of the landfill property until such time as the property is transferred, land use restrictions will not be required during this time period. Since the risks associated with current industrial/commercial use were found to be acceptable,
access restrictions will not be required prior to cap construction. Access restrictions (e.g., safety fencing), however, will be maintained during cap construction to protect the public from construction hazards.

Comment: Have these been thought out? Will the county accept zoning ordinances and permitting restrictions? What about monitoring of institutional controls? What are the permitting restrictions? What will happen during the window of the landfill cap installation and the time of transfer?
Response: See response to Comment 104.

Comment: Replace "because it removes" with "because it would remove".
Response: The U.S. Army agrees with this suggested wording change.

Comment: Replace "will be implemented" with "would be implemented".
Response: The U.S. Army agrees with this suggested wording change.

Comment: DOT and OSHA regulations are not ARARs.
Response: The U.S. Army acknowledges this comment.

Comment: Hasn't this been evaluated/determined? What about landfill design standards in the waste regulations?
Response: Based on available data, the landfill contains non-hazardous waste and, therefore, would be governed by the Solid Waste Management Regulations. The landfill capping alternatives considered were identified based on this conclusion. However, if Alternative 2 were to be selected, waste characterization samples would be required by the disposal facility. Although not anticipated, if any portion of the excavated waste was found to be hazardous, Hazardous Waste Management Regulations would apply to the affected waste.

Comment: Change "form" to "from".
Response: The U.S. Army agrees with this suggested wording change.

Comment: No basis given for this since no details regarding the institutional controls have been provided. What are the reuse plans in and around this area?
Response: See response to Comment 104. The reuse plans in and around this area have not yet been finalized.
Comment 102. Page 12. Implementability

Comment: No basis to evaluate implementability of institutional controls.
Response: See response to Comment 104.

Comment 103. Page 12. Cost

Comment: What about the cost of institutional control implementation and future monitoring?
Response: See response to Comment 103.


Comment: What about institutional controls?
Response: The preferred alternative will include land use restrictions (a.k.a., institutional controls).

Response to Comments on the Proposed Plans for Vint Hill Farms Station from VDEQ

AREEs 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33, and Site-wide Groundwater, South Run at AREEs 1 & 2, and Other Site Drainages

Comment 105. AREEs 7, 16-1, 16-2, 29-1, 29-2, 29-3, 30, and 33

Comment: Since AREE 7 is to be closed under RCRA, clean closure must be approved by the Department's Office of Waste Permitting before a no further action alternative can be selected for this AREE.
ATTACHMENT 3

PROPOSED PLAN
INTRODUCTION

The U.S. Army has identified a preferred alternative to address contaminated soil at selected Areas Requiring Environmental Evaluation (AREEs) located on Vint Hill Farms Station (VHFS). The U.S. Army’s preferred alternative is no further action at these AREEs.

This Proposed Plan is based on site-related documents contained in the VHFS Information Repository. The Information Repository can provide you with important information about the site and the five AREEs. The Information Repository is located at:

Fauquier County Library
Warrenton Branch - Reference Section
11 Winchester Street, Warrenton, VA
(540) 347-8750
Monday - Wednesday: 10:00 a.m. to 9:00 p.m.
Thursday - Saturday: 9:00 a.m. to 5:00 p.m.
Sunday: 1:00 p.m. to 5:00 p.m.

The U.S. Army needs your comments and suggestions. The U.S. Army, the U.S. Environmental Protection Agency (USEPA) Region III, and the Virginia Department of Environmental Quality (VDEQ) encourage the public to review and comment on the action presented in the Proposed Plan. The public comment period begins on April 1, 1999, and closes on April 30, 1999. Please send your comments, postmarked no later than April 30, 1999, to:

Kevin Bell, Public Affairs Officer
Building 2500, Helms Road
Vint Hills Farm Stabon
Warrenton, VA 22187

In addition, you are invited to a public meeting regarding the investigation of the selected AREEs at VHFS. Representatives from the U.S. Army will report on the status of these AREEs and the U.S. Army’s preferred alternative. The meeting is scheduled for:

Thursday, April 15, 1999 at 7:00 pm
Building 101 - Former Headquarters Conference Room
Vint Hill Farms Station, Warrenton, VA

Special provisions will be made for the handicapped and hearing impaired.

The remedy described in this Proposed Plan is the U.S. Army’s preferred alternative for the selected AREEs. The U.S. Army may modify the preferred alternative or select another remedial alternative if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The U.S. Army, in consultation with USEPA and VDEQ, will make a remedy selection for the AREEs in a Decision Document after the public comment period has ended and the comments and information submitted during that time have been reviewed and considered.
The U.S. Army is issuing this Proposed Plan as part of its public participation responsibilities under Sections 113(k) and 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, commonly known as the “Superfund Program”, and the National Environmental Policy Act of 1969 (NEPA). This Proposed Plan focuses on AREEs 13, 14, 16-1, 27 and 29-4. Other areas of VHFS that the U.S. Army plans to remediate are addressed by separate Proposed Plans.

SITE BACKGROUND

VHFS is part of the U.S. Army Communications - Electronics Command (CECOM) and while active, primarily functioned as an Army installation engaged in communications intelligence. VHFS is located approximately 40 miles southwest of Washington, D.C., in Fauquier County, Virginia, as shown on Figure 1. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites.

The facility was designated for closure in March, 1993, under the Base Realignment and Closure (BRAC) Act. Pursuant to the decision to close the installation, an Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May, 1994, respectively. The ENPA identified 42 AREEs from the review of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation.

These 27 AREEs were investigated from September, 1994, to June, 1995, as part of the Site Inspection (SI) conducted by SAIC. The objective of the SI was to determine the presence or absence of contamination and the chemical nature of any detected contamination. The final SI Report which was completed in June, 1996, identified 24 AREEs which required further investigation. In addition, four new AREEs were identified during site reconnaissance to warrant further investigation subsequent to the SI AREEs that were determined to warrant further investigation were investigated as part of the Phase I and Phase II reuse area Remedial Investigations (RIs), and the Supplemental Remedial Investigation (SRI) conducted by ICF Kaiser Engineers, Inc. (ICF KE). The purposes of these reports were to evaluate: 1) the nature and extent of contamination; and 2) the level of risk posed to human health and the environment. The final RI Reports for the Phase I and Phase II reuse areas were completed in April, 1998, and January, 1999, respectively. The draft SRI Report was completed in November, 1998, and is currently undergoing regulatory review.

Five AREEs were identified in the RIs and SRI as having soil contamination which poses no unacceptable human health risks and/or significant adverse ecological effects:

- AREE 13 – Sludge Disposal Area;
- AREE 14 – Skeet Range;
- AREE 16-1 – Possible Firefighter Training Pit;
- AREE 27 – AAFES Service Station; and
- AREE 29-4 – Disposal Area.

The locations of these AREEs are shown on Figure 2.
RESULTS OF THE REMEDIAL INVESTIGATION

The RIs for these five AREEs were conducted to evaluate the nature and extent of contamination associated with past site activities. Environmental samples collected and analyzed during the RIs were used in conjunction with the results from the SI to assess the condition of each of the AREEs. The environmental media investigated included surface soil (0 to 2 feet below ground surface [bgs]), subsurface soil (greater than 2 feet bgs), surface water, sediment, and groundwater. Analytical results were compared to background concentrations and regulatory screening levels to determine if environmental media had been adversely impacted by site activities. A brief description of each of the five AREEs and the significant findings of the RIs and SI are presented in the following paragraphs. A detailed presentation of the samples collected and the analytical results can be found in the final Phase I Reuse Area RI Report and the final Phase II Reuse Area RI Report now available in the Information Repository at the Fauquier County Library.

AREE 13 – Sludge Disposal Area

The Sludge Disposal Area was used during the 1980s to dispose of sludges from the sewage treatment plant (STP) and the former STP, and sand filter sludge and sandblasting waste from the Electric Equipment Facility. In 1982, the sludges were analyzed for total metals and were determined to be at concentrations sufficiently low for land spreading. The sludge pile was 75 feet in diameter and 3 feet high. In 1992, the area was closed, with twenty thousand cubic feet of sludge being excavated, mixed with pressed sludge cake from the STP digester, and transported to the Fauquier County Landfill. The area has been backfilled and seeded.

Surface and subsurface soil samples were collected at locations within the disposal area. Iron (75,200 to 230,000 parts per million [ppm]) was the only analyte detected above its residential soil RBC (23,000 ppm) and maximum background concentration (70,800 ppm).

AREE 14 – Skeet Range

AREE 14 was used on weekends as a skeet range between 1961 and 1994. The spent ammunition, consisting of lead and steel shotgun pellets, was spread over the range and remains unrecovered. The skeet range firing fan is oriented eastward in an 800-foot radius and is separated into the Hit and Miss Zones.

Surface soil samples collected from two locations in the Miss Zone contained lead concentrations (940 ppm, and 414 - 650 ppm) that exceeded the USEPA screening level for lead in residential soil of 400 ppm.

AREE 16-1– Possible Firefighter Training Pit

The Firefighter Training Pit was used monthly by the VHFS Fire Department for training in the mid-1970s. The unlined pit was approximately 50 feet in diameter and 3 feet deep. During training activities, the pit was partially filled with petroleum and natural gas odorant and then ignited. Solvents and other combustible materials may have also been used in the pit. In the mid-1980s, the pit was filled with ½-inch gravel.

Total petroleum hydrocarbon (TPH) field screening of the soil at AREE 16-1 was conducted to delineate the area of contamination and to determine where soil samples should be collected for laboratory analysis. Surface soil samples were collected based on positive TPH results from the field screening. Arsenic (up to 21.6 ppm) exceeded its residential soil RBC (0.43 ppm) as well as its maximum background concentration (4.89 ppm) in the surface soil samples collected at AREE 16-1. A number of dioxins/furans, indicative of combustion operations, were detected in the surface soil samples. 2,3,7,8-TCDD (2.74E-04 ppm) was the only dioxin/furan to exceed its residential soil RBC (4.3E-06 ppm).

AREE 27 – AAFES Service Station

The AAFES Service Station (Building 238) was constructed in 1969 to provide fuel and service for VHFS personnel vehicles. The service station had underground storage tanks (USTs) for three grades of
gasoline, a pump area, and a service station area with two lifts. Drains in the pump island area lead to a grit chamber, which discharges to a field north of the facility. In addition, a fenced storage area was located in the rear of the facility for tires, batteries, and drums. Several gasoline, oil, and other spills were reported in this area. In April, 1993, pressure testing of the regular unleaded gasoline pipeline confirmed a suspected leak. A 0.5-inch hole was found in the pipeline within the pump area. The corroded section of pipe was replaced, and the soils around the area where the leak occurred were excavated and then backfilled. The system was re-tested to ensure no other leaks existed, and the pump was re-opened. During the summer and fall of 1993, field investigations confirmed soil and groundwater contamination due to the release of gasoline from one or more leaking USTs and associated distribution piping. The USTs were closed in June, 1994, and removed in November, 1994. Operations at the AAFES Service Station were discontinued in the fall of 1994. Contaminated soil removal and groundwater remediation activities at the AAFES Service Station have been initiated and are being handled separately from the rest of AREE 27.

Surface and subsurface soil samples were collected from areas of potential contamination: downgradient from the discharge point of the grit chamber, at the service bay spill run-off area; and in the tire storage area. Arsenic (up to 12.2 ppm) was found to exceed its residential soil RBC (0.43 ppm) and maximum background concentrations (4.89 ppm surface soil and 5.4 ppm subsurface soil) in most of the surface and subsurface soil samples. Lead was detected in a surface soil sample at the discharge point of the grit chamber at a concentration of 1,200 ppm, which is three times the USEPA screening level of 400 ppm for lead in residential soils. The maximum TPH concentration detected was 2,310 ppm, which is significantly higher than the State’s TPH soil action level of 100 ppm for UST sites, in the surface soil sample collected at the discharge point of the grit chamber. TPH (737 ppm) was also detected above the State’s TPH soil action level for UST sites in the surface soil at the service bay spill run-off area immediately off the parking pad. However, TPH did not exceed the State’s TPH soil action level for UST sites downhill from the grit chamber, further along the spill run-off pathway, or in subsurface soils, indicating small localized areas of contamination. Other than arsenic, none of the analytes were found to exceed their associated screening levels in the subsurface soil samples.

**AREE 29-4 – Disposal Area**

The Disposal Area is located near the northeast corner of VHFS, northwest of the Skee Range (AREE 14). Review of aerial photographs of this area provided evidence of disposal activities as early as 1958. These signs were visible to various extents as late as 1977. A total of five distinct areas were located within the Disposal Area, based on ground stains and debris visible in aerial photographs. Two areas were used for construction debris disposal and are now enclosed within groves of trees. Another area is an approximately 30-foot wide man-made depression in the ground where water collects after rain events. It is not known whether the area was used to obtain fill material or for liquid disposal. The last two sites appeared as orange-stained areas in historic aerial photographs. These are both currently level and covered with grass. It is not known what materials, if any, were stored in these areas.

Surface soil samples were collected at the two construction debris piles and at the three other areas of potential contamination. Aluminum (85,000 ppm), beryllium (2.15 ppm), and iron (160,000 ppm) concentrations in surface soil in the area of the former orange mound exceeded residential soil RBCs (78,000 ppm, 0.15 ppm, and 23,000 ppm, respectively) and maximum background concentrations (20,900 ppm, 2.13 ppm, and 70,800 ppm, respectively). Benzo(a)pyrene (0.1 ppm) slightly exceeded its residential soil RBC (0.088 ppm) in one surface soil sample collected from the construction debris areas. Arsenic (up to 13.6 ppm) exceeded its residential soil RBC (0.43 ppm) and maximum background concentration (4.89 ppm) at the construction debris areas.

**HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT**

A Baseline Risk Assessment (BRA) was conducted as part of the RIs to assess the human health and ecological problems that could result if the contamination at the AREEs was not remediated. The Human Health Risk Assessment (HHRA) was prepared to evaluate the magnitude of potential adverse effects on
human health associated with current and potential future (assuming residential development of the property) exposures to site-related chemicals at the AREEs. The Ecological Risk Assessment (ERA) was conducted to characterize the potential threats to ecological receptors posed by contaminants at the AREEs.

The HHRA follows a four-step process:

- **Selection of Chemicals of Potential Concern** - identifies the contaminants of potential concern based on their toxicity, frequency of occurrence, and concentration by comparing the maximum concentrations of detected chemicals with RBCs which are health-protective chemical concentrations that are back-calculated using toxicity criteria, a $1 \times 10^{-6}$ target carcinogenic risk or a 0.1 hazard quotient (defined below), and conservative exposure parameters;

- **Exposure Assessment** - identifies the potential pathways of exposure, and estimates the concentrations of contaminants to which people may be exposed as well as the frequency and duration of these exposures;

- **Toxicity Assessment** - determines the toxic effects of the contaminants; and

- **Risk Characterization** - provides a quantitative assessment of the overall current and future risk to people from site contaminants based on the exposure and toxicity information.

The ERA also follows a four-step process:

- **Problem Formulation** - develops information that characterizes habitats and potentially exposed species and identifies contaminants of concern, exposure pathways, and receptors;

- **Exposure Assessment** - estimates exposure point concentrations for selected indicator species;

- **Ecotoxicologic Effects Assessment** - identifies concentrations or doses of contaminants that are protective of indicator species; and

- **Risk Characterization** - estimates potential adverse effects from exposure to contaminants based on exposure and toxicity information.

The ERA evaluated ecological effects which could result from exposure to surface soil, surface water, and sediment contamination in the Phase I and II reuse areas of VHFS. The ERA evaluated potential adverse ecological effects to terrestrial plants and terrestrial invertebrates (represented by earthworms) exposed to contaminants in surface soil. In addition, potential adverse ecological effects to mammals (represented by
shrews) and birds (represented by robins) through bioaccumulation in the food web and exposure to contaminants in surface soil were evaluated. Potential adverse ecological effects to aquatic life from exposure to contaminants in surface water and sediment were also evaluated in the ERA.

The evaluation of significant potential adverse ecological effects is based on the Environmental Effects Quotient (EEQ). The EEQ is the ratio of the estimated exposure concentration/doses for the chemicals of potential concern and the toxicity reference values (TRVs) for the ecological receptors. If the EEQ is greater than 1, there is a potential for adverse ecological effects to occur. As the magnitude of the EEQ becomes greater than 1, the potential for adverse ecological effects becomes more significant.

The results of the BRA for the five AREEs are presented in the following paragraphs. A detailed presentation of the BRA can be found in the final Phase I Reuse Area RI Report and the final Phase II Reuse Area RI Report now available in the Information Repository at the Fauquier County Library.

**AREE 13 - Sludge Disposal Area**

The HHRA determined that site-related contamination at AREE 13 does not pose an unacceptable human health risk under either current or potential future land-use conditions. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated excess lifetime cancer risk \(8 \times 10^{-6}\) is for child residents exposed to contaminants in surface soil by incidental ingestion, and the highest noncarcinogenic risk (HI = 10) is for child residents exposed to contaminants in surface soil by incidental ingestion. The contaminant that drove the elevated HI at AREE 13 is iron which was detected at comparable levels in similar subsurface soil types in background locations and is, therefore, not site-related. An ERA was not conducted at AREE 13 because all samples were collected at depths of greater than 6 inches. Based on these results, no further action is recommended at AREE 13.

**AREE 14 - Skeet Range**

The HHRA concluded that, under both current and future land-use conditions, site-related contamination at AREE 14 does not pose an unacceptable human health risk, except for lead in surface soil. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk \(4 \times 10^{-6}\) is for adult residents and child residents exposed to contaminants in surface soil by dermal absorption and incidental ingestion respectively; and the highest noncarcinogenic risk (HI = 0.8) is for adult residents exposed to contaminants in surface soil by dermal absorption.

The human health risks associated with exposure to lead contamination in surface soil at AREE 14 were evaluated using the Integrated Exposure Uptake Biokinetic (IEUBK) Model recommended by USEPA for evaluating lead exposures for young children in residential settings. The IEUBK Model calculates blood lead levels which result from exposures to lead which may then be compared to blood lead levels of toxicological significance for purposes of risk evaluation. The IEUBK Model run for AREE 14 predicted a geometric mean blood lead level of 5.2 µg/dL, with 7.75 percent of the population exceeding the blood lead level of concern (10 µg/dL). The USEPA currently finds 5 percent of the population exceeding the blood lead level of concern acceptable. Therefore, the IEUBK Model results indicate that if AREE 14 was developed for residential use in the future, the lead concentrations in the surface soil may be a potential problem for young children.

The ERA determined that surface soil at AREE 14 does not pose significant potential adverse ecological effects.

The potential adverse effects to child residents were driven by the presence of lead above the USEPA screening level for lead in residential soil of 400 ppm at two locations in the Miss Zone. The extent of lead contamination in the two locations that drove unacceptable human health risks was further investigated during the SRI. Soil in those two locations was excavated, and the sample results from the remaining soil show that lead concentrations do not exceed the USEPA screening level for lead in residential soil. Thus, no further action is recommended at AREE 14 because the unacceptably high lead concentrations were
removed during the SRI. A detailed presentation of the investigation of lead hot spots at AREE 14 can be found in the draft SRI Report now available in the Information Repository at the Fauquier County Library.

**AREE 16-1 - Possible Firefighter Training Pit**

Results of the HHRA indicate that, under both current and future land-use conditions, the risks to workers, trespassers, and residents are acceptable for exposure to site-related contaminants in surface soil. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk \( (9 \times 10^{-5}) \) is for adult residents and child residents exposed to site-related contaminants in surface soil by dermal absorption and incidental ingestion, respectively; and the highest noncarcinogenic risk \( (\text{HI} = 1) \) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion. Although the total HI equals 1, the HIs recalculated by target organ/critical effect are all less than 1. No significant potential for adverse ecological effects were found in the ERA. Based on these results, no further action is recommended at AREE 16-1.

**AREE 27 - AAFES Service Station**

Results of the HHRA suggested that site-related contamination at AREE 27 does not pose an unacceptable human health risk under either current or future land-use conditions. Discounting naturally-occurring metals that were statistically determined to be within background levels, the highest estimated upper-bound excess lifetime cancer risk \( (7 \times 10^{-5}) \) is for child residents exposed to contaminants in surface soil by dermal absorption, and the highest noncarcinogenic risk \( (\text{HI} = 2) \) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion. When recalculated by target organ/critical effect, the HI equals 1.3 for the kidneys, primarily as a result of exposures to chromium in surface soil at AREE 27. Although not all chromium present at AREE 27 will be hexavalent chromium (i.e., the most toxic form of chromium), the conservative toxicity criterion for hexavalent chromium was used in the HHRA. Therefore, a HI of 1.3 calculated using conservative toxicity criteria is considered acceptable.

As explained in the AREE 14 discussion, lead contamination in surface soil at AREE 27 was evaluated using the IEUBK Model which predicted a geometric mean blood lead level of 3.2 µg/dL, with 0.77 percent of the population exceeding the blood lead level of concern (10 µg/dL). Again, the USEPA currently finds 5 percent of the population exceeding the blood lead level of concern acceptable. Therefore, the surface soil lead concentrations at AREE 27 are unlikely to have an adverse effect on the exposed child resident population.

The ERA determined that site-related contaminants at AREE 27 posed no significant potential for adverse ecological effects.

Based on these results, no further action is recommended at AREE 27.

**AREE 29-4 - Disposal Area**

The HHRA determined that site-related contamination at AREE 29-4 does not pose an unacceptable human health risk under either current or future land-use conditions. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk \( (3 \times 10^{-5}) \) is for child residents exposed to contaminants in surface soil by incidental ingestion, and the highest noncarcinogenic risk \( (\text{HI} = 1) \) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion. The ERA concluded that significant potential adverse ecological effects are not posed by the site-related contaminants at AREE 29-4. Based on these results, no further action is recommended at AREE 29-4.

**PREFERRED ALTERNATIVE**

No further action is recommended by the U.S. Army as the preferred alternative for AREEs 13, 14, 16-1, 27, and 29-4 because these sites do not pose unacceptable human health or ecological risks. The estimated cost to implement this alternative is $0.
USA VINT HILL FARMS STATION

Site Information:

Site Name: USA VINT HILL FARMS STATION
Address: WARRENTON, VA

EPA ID: VA8210020931
EPA Region: 03

Site Alias Name(s):

VINT HILL FARMS STATION

Record of Decision (ROD):

ROD Date: 07/01/1999
Operable Unit: 05
ROD ID: EPA/ROD/R03-99/015

Media: Groundwater, Sediment, Soil, Surface Water

Contaminant: Base Neutral Acids, Metals, PAH, Pesticides, Petroleum Hydrocarbon, VOC

Abstract: The Vint Hill Farms Station (VHFS) is located approximately 40 miles southwest of Washington, DC, in Fauquier County, Virginia. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites. Land use in the immediate vicinity of VHFS consists mainly of agriculture (mostly horse farms) and residential areas. With the exception of a few residences to the north, the majority of residential development is located to the south of VHFS. A small county recreational park is located adjacent to VHFS along South Run.

VHFS is part of the U.S. Army Communications-Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence. VHFS
was designated for closure in March 1993, under the Base Realignment and Closure (BRAC) Act. Pursuant to decision to close the installation, and Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May 1994, respectively. The ENPA identified 42 areas requiring environmental evaluation (AREEs) from the review of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation. These 27 AREEs were investigated from September 1994, to June 1995, as part of the Site Inspection (SI) conducted by SAIC. The final SI Report, which was completed in June 1996, identified 24 AREEs which required further investigation. In addition, four new AREEs were determined to warrant further investigation subsequent to the SI. AREEs that were determined to warrant further investigation were investigated as part of the Phase I and Phase II reuse areas Remedial Investigation (RI) and the supplemental RI conducted by ICF Kaiser Engineers, Inc. The final RI reports for the Phase I and Phase II reuse areas were completed in April 1998, and January 1999, respectively.

Remedy: No action is the selected remedy for Areas Requiring Environmental Evaluation (AREEs) 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30 and 33; site-wide groundwater; South Run at AREEs 1 and 2; and other site drainages because these sites do not pose unacceptable human health or ecological risks.

Estimated Capital Cost: $0
Estimated Annual O&M Costs: NA
Estimated Present Worth Costs: NA
"Other" Costs: $0 (Estimated cost to implement this alternative)

Text: Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

USA VINT HILL FARMS STATION
EPA ID: VA8210020931
OU 05
WARRENTON, VA
07/01/1999
FINAL
DECISION DOCUMENT
AREEs 3, 5, 7, 10, 16-2, 17, 18, 20, 24,
25, 26, 29-1, 29-2, 29-3, 30, AND 33;
SITE-WIDE GROUNDWATER;
SOUTH RUN AT AREEs 1 AND 2;
AND OTHER SITE DRAINAGES
VINT HILL FARMS STATION
WARRENTON, VIRGINIA

Prepared for:
U.S. Army Communications-Electronics Command

Prepared by:
IT Corporation
Edgewood, Maryland

June 1999
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.0 INTRODUCTION</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>2.0 SITE BACKGROUND</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>3.0 SITE CHARACTERISTICS</strong></td>
<td>3</td>
</tr>
<tr>
<td>3.1 Site Topography</td>
<td>3</td>
</tr>
<tr>
<td>3.2 Adjacent Land Use</td>
<td>3</td>
</tr>
<tr>
<td>3.3 Surface Water Hydrology</td>
<td>3</td>
</tr>
<tr>
<td>3.4 Geology/Hydrogeology</td>
<td>5</td>
</tr>
<tr>
<td><strong>4.0 SITE HISTORY AND INVESTIGATION FINDINGS</strong></td>
<td>5</td>
</tr>
<tr>
<td>4.1 AREE 3 – Warehouse</td>
<td>5</td>
</tr>
<tr>
<td>4.2 AREE 5 – EPIC Building</td>
<td>6</td>
</tr>
<tr>
<td>4.3 AREE 7 – Electrical Equipment Facility Pretreatment Tank</td>
<td>6</td>
</tr>
<tr>
<td>4.4 AREE 10 – Former Photographic Wastewater Lagoon</td>
<td>6</td>
</tr>
<tr>
<td>4.5 AREE 16-2 – Possible Firefighter Training Pit</td>
<td>7</td>
</tr>
<tr>
<td>4.6 AREE 17 – Dump #3</td>
<td>7</td>
</tr>
<tr>
<td>4.7 AREE 18 – Grease Pit</td>
<td>8</td>
</tr>
<tr>
<td>4.8 AREE 20 – Incinerator Septic Tank and Leach Field</td>
<td>8</td>
</tr>
<tr>
<td>4.9 AREE 24 – Transformer Storage Area</td>
<td>8</td>
</tr>
<tr>
<td>4.10 AREE 25 – Sugar Tree</td>
<td>8</td>
</tr>
<tr>
<td>4.11 AREE 26 – Outdoor Wash Racks</td>
<td>9</td>
</tr>
<tr>
<td>4.12 AREE 29-1 – Salvage Yard</td>
<td>9</td>
</tr>
<tr>
<td>4.13 AREE 29-2 – Possible Sludge Disposal Area</td>
<td>9</td>
</tr>
<tr>
<td>4.14 AREE 29-3 – Possible Disposal Area</td>
<td>9</td>
</tr>
<tr>
<td>4.15 AREE 30 – Motor Pool</td>
<td>10</td>
</tr>
<tr>
<td>4.16 AREE 33 – Household Debris Pile</td>
<td>10</td>
</tr>
<tr>
<td>4.17 Site-Wide Groundwater</td>
<td>10</td>
</tr>
<tr>
<td>4.18 South Run at AREEs 1 and 2</td>
<td>11</td>
</tr>
<tr>
<td>4.19 Other Site Drainages</td>
<td>11</td>
</tr>
<tr>
<td><strong>5.0 SUMMARY OF SITE RISKS</strong></td>
<td>12</td>
</tr>
<tr>
<td>5.1 AREE 3 - Warehouse</td>
<td>13</td>
</tr>
<tr>
<td>5.2 AREE 5 - EPIC Building</td>
<td>14</td>
</tr>
<tr>
<td>5.3 AREE 7 – Electrical Equipment Facility Pretreatment Tank</td>
<td>14</td>
</tr>
<tr>
<td>5.4 AREE 10 – Former Photographic Wastewater Lagoon</td>
<td>14</td>
</tr>
<tr>
<td>5.5 AREE 16-2 – Possible Firefighter Training Pit</td>
<td>14</td>
</tr>
<tr>
<td>5.6 AREE 17 – Dump #3</td>
<td>15</td>
</tr>
<tr>
<td>5.7 AREE 18 – Grease Pit</td>
<td>15</td>
</tr>
<tr>
<td>5.8 AREE 20 – Incinerator Septic Tank and Leach Field</td>
<td>15</td>
</tr>
<tr>
<td>5.9 AREE 24 – Transformer Storage Area</td>
<td>15</td>
</tr>
<tr>
<td>5.10 AREE 25 – Sugar Tree</td>
<td>15</td>
</tr>
<tr>
<td>5.11 AREE 26 – Outdoor Wash Racks</td>
<td>15</td>
</tr>
<tr>
<td>5.12 AREE 29-1 – Salvage Yard</td>
<td>16</td>
</tr>
<tr>
<td>5.13 AREE 29-2 – Possible Sludge Disposal Area</td>
<td>16</td>
</tr>
<tr>
<td>5.14 AREE 29-3 – Possible Disposal Area</td>
<td>16</td>
</tr>
<tr>
<td>5.15 AREE 30 – Motor Pool</td>
<td>16</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
</tr>
<tr>
<td>5.16 AREE 33 Household Debris Pile</td>
<td>16</td>
</tr>
<tr>
<td>5.17 Site-Wide Groundwater</td>
<td>17</td>
</tr>
<tr>
<td>5.18 South Run at AREEs 1 and 2</td>
<td>17</td>
</tr>
<tr>
<td>5.19 Other Site Drainages</td>
<td>17</td>
</tr>
<tr>
<td>6.0 SELECTED ALTERNATIVE</td>
<td>18</td>
</tr>
<tr>
<td>7.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION</td>
<td>18</td>
</tr>
<tr>
<td>8.0 RESPONSIVENESS SUMMARY</td>
<td>18</td>
</tr>
<tr>
<td>8.1 Selected Newspaper Notices</td>
<td>19</td>
</tr>
<tr>
<td>8.2 Comments Raised During the Public Meeting on April 15, 1999</td>
<td>19</td>
</tr>
<tr>
<td>8.3 Public Meeting Attendance Roster</td>
<td>20</td>
</tr>
<tr>
<td>8.4 Active Restoration Advisory Board Members</td>
<td>20</td>
</tr>
<tr>
<td>8.5 Written Comments Received During the Public Comment Period</td>
<td>20</td>
</tr>
<tr>
<td>9.0 REFERENCES</td>
<td>21</td>
</tr>
</tbody>
</table>
### LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Location of VHFS</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>General Locations of AREEs at</td>
<td>4</td>
</tr>
</tbody>
</table>

### LIST OF ATTACHMENTS

<table>
<thead>
<tr>
<th>Attachment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Response to USEPA Comments on the Final Phase I Reuse Area RI Report</td>
</tr>
<tr>
<td>2</td>
<td>Response to USEPA Comments on the Final Phase II Reuse Area RI Report</td>
</tr>
<tr>
<td>3</td>
<td>Proposed Plan</td>
</tr>
<tr>
<td>4</td>
<td>Public Notice</td>
</tr>
<tr>
<td>5</td>
<td>Public Meeting Roster</td>
</tr>
<tr>
<td>6</td>
<td>Written Comments From Regulators and U.S. Army Responses</td>
</tr>
</tbody>
</table>
### ABBREVIATIONS AND ACRONYMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAFES</td>
<td>Army, Air Force Exchange Service</td>
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<td>AREE</td>
<td>Area Requiring Environmental Evaluation</td>
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<td>Ambient Water Quality Criteria</td>
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<td>below ground surface</td>
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<td>Baseline Risk Assessment</td>
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<td>CERCLA</td>
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<td>Community Environmental Response Facilitation Act</td>
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<td>DD</td>
<td>Decision Document</td>
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<tr>
<td>EEQ</td>
<td>environmental effects quotient</td>
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<td>ENPA</td>
<td>Enhanced Preliminary Assessment</td>
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<td>Environmental Photographic Interpretation Center</td>
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<td>ERA</td>
<td>Ecological Risk Assessment</td>
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<td>ER-L</td>
<td>effects range-low</td>
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<td>ft</td>
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<td>HHRA</td>
<td>Human Health Risk Assessment</td>
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<td>Hazard Quotient</td>
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<td>ICF KE</td>
<td>ICF Kaiser Engineers, Inc.</td>
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<td>IMMC</td>
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<tr>
<td>MCL</td>
<td>maximum contaminant level</td>
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<td>MSL</td>
<td>mean sea level</td>
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<td>NCP</td>
<td>National Oil and Hazardous Substances Pollution Contingency Plan</td>
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<tr>
<td>PAH</td>
<td>polynuclear aromatic hydrocarbon</td>
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<tr>
<td>PCB</td>
<td>polychlorinated biphenyl</td>
</tr>
<tr>
<td>ppb</td>
<td>parts per billion</td>
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<tr>
<td>ppm</td>
<td>parts per million</td>
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<tr>
<td>RBC</td>
<td>risk-based concentration</td>
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<td>RI</td>
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</tr>
<tr>
<td>SAIC</td>
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</tr>
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<td>SARA</td>
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</tr>
<tr>
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</tr>
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</tr>
<tr>
<td>SOV</td>
<td>soil organic vapor</td>
</tr>
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<td>SRI</td>
<td>Supplemental Remedial Investigation</td>
</tr>
<tr>
<td>STP</td>
<td>Sewage Treatment Plant</td>
</tr>
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<td>TPH</td>
<td>total petroleum hydrocarbon</td>
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<td>TRV</td>
<td>toxicity reference value</td>
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<td>USACE</td>
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<td>USAEC</td>
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<td>USEPA</td>
<td>U.S. Environmental Protection Agency</td>
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<td>UST</td>
<td>underground storage tank</td>
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<td>VDEQ</td>
<td>Virginia Department of Environmental Quality</td>
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<td>VHFS</td>
<td>Vint Hill Farms Station</td>
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<tr>
<td>VOC</td>
<td>volatile organic compound</td>
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<td>WSRT</td>
<td>western South Run tributary</td>
</tr>
</tbody>
</table>
DECLARATION FOR THE DECISION DOCUMENT
REMEDIAL ALTERNATIVE SELECTION

Site Name and Location

Areas Requiring Environmental Evaluation (AREEs) 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33; Site-wide Groundwater, South Run at AREEs 1 and 2; and Other Site Drainages
Vint Hill Farms Station
Warrenton, Virginia

Statement of Basis and Purpose

This Decision Document (DD) presents a determination that no action is necessary to protect human health and the environment for soil at AREEs 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33; site-wide groundwater; South Run at AREEs 1 and 2; and other site drainages at Vint Hill Farms Station (VHFS), Warrenton, Virginia. This determination was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This document was prepared as a joint effort between the U.S. Army, the Virginia Department of Environmental Quality (VDEQ), and the U.S. Environmental Protection Agency (USEPA). The no action decision is supported by documents contained in the Information Repository.

Description of the Selected Remedy

No action is the selected remedy for AREEs 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33; site-wide groundwater; South Run at AREEs 1 and 2; and other site drainages. The Baseline Risk Assessment (BRA), conducted as part of the investigation activities, supports the no action decision.

Declaration

The no action remedy selection is based upon the findings of the BRA which determined risks within USEPA’s acceptable risk range for each of AREEs 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33; site-wide groundwater; South Run at AREEs 1 and 2; and other site drainages. Therefore, the selected remedy is protective of human health and the environment. A five-year review will not be necessary for these AREEs, site-wide groundwater, South Run at AREEs 1 and 2, or the other site drainages.

ROBERT L. NABORS
Major General, USA
Commanding
U.S. Army Communications-Electronics Command

7/1/99
Date
DECISION SUMMARY

1.0 INTRODUCTION

The no action decision is based on the Phase I Reuse Area Remedial Investigation (RI) Report (USAEC, 1998) and the Phase II Reuse Area RI Report (USACE, 1999) which include Baseline Risk Assessments (BRAs) documenting the risks from contamination in the soil at Areas Requiring Environmental Evaluation (AREEs) 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33; site-wide groundwater; South Run at AREEs 1 and 2; and other site drainages. In the BRAs, it was determined that the soils at AREEs 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33 do not pose unacceptable risks to human health and the environment. Therefore, the soils at these AREEs require no action to be protective of human health and the environment. Also in the BRAs, it was determined that the site-wide groundwater, surface water and sediment in South Run at AREEs 1 and 2, and surface water and sediment in the other site drainages do not pose unacceptable risks to human health and the environment. Therefore, site-wide groundwater, South Run at AREEs 1 and 2, and other site drainages require no action to be protective of human health and the environment.

2.0 SITE BACKGROUND

Vint Hill Farms Station (VHFS) is part of the U.S. Army Communications - Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence, VHFS is located approximately 40 miles southwest of Washington, D.C., in Fauquier County, Virginia, as shown on Figure 1. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites.

VHFS was designated for closure in March, 1993, under the Base Realignment and Closure (BRAC) Act. Pursuant to the decision to close the installation, an Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May, 1994, respectively. The ENPA identified 42 AREEs from the review of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation.

These 27 AREEs were investigated from September, 1994, to June, 1995, as part of the Site Inspection (SI) conducted by SAIC. The objective of the SI was to determine the presence or absence of contamination and the chemical nature of any detected contamination. The final SI Report (USAEC, 1996), which was completed in June, 1996, identified 24 AREEs which required further investigation. In addition, four new AREEs were identified during site reconnaissance to warrant further investigation subsequent to the SI. AREEs that were determined to warrant further investigation were investigated as part of the Phase I and Phase II reuse area RIs, and the Supplemental Remedial Investigation (SRI) conducted by ICF Kaiser Engineers, Inc. (ICF KE). The purposes of these reports were to evaluate: 1) the nature and extent of contamination; and 2) the level of risk posed to human health and the environment. The final RI Reports for the Phase I and Phase II reuse areas (USAEC, 1998; USACE, 1999) were completed in April, 1998, and January, 1999, respectively. The draft SRI Report (USACE, 1998) was completed in November, 1998.

Sixteen AREEs and three other sites were identified in the SI and RIs as having contamination which poses no unacceptable human health risks and/or significant adverse ecological effects:
• AREE 3 - Warehouse;
• AREE 5 - Environmental Photographic Interpretation Center (EPIC) Building;
• AREE 7 - Electrical Equipment Facility Pretreatment Tank;
• AREE 10 - Former Photographic Wastewater Lagoon;
• AREE 16-2 - Possible Firefighter Training Pit;
• AREE 17 - Dump # 3;
• AREE 18 - Grease Pit;
• AREE 20 - Incinerator Septic Tank and Leach Field;
• AREE 24 - Transformer Storage Area;
• AREE 25 - Sugar Tree;
• AREE 26 - Outdoor Wash Racks;
• AREE 29-1 - Salvage Yard;
• AREE 29-2 - Possible Sludge Disposal Area;
• AREE 29-3 - Possible Disposal Area;
• AREE 30 - Motor Pool;
• AREE 33 - Household Debris Pile;
• Site-Wide Groundwater;
• South Run at AREE I (Dump #1) and AREE 2 (Sewage Treatment Plant [STP]) and
• Other Site Drainages.

The locations of these AREEs are shown on Figure 2.

3.0 SITE CHARACTERISTICS

3.1 Site Topography

VHFS is located within the Piedmont Plateau physiographic province, approximately 20 miles west of the Fall Line. The Fall Line is a physiographic boundary that separates the folded and faulted crystalline rocks of the Piedmont Plateau physiographic province from the unconsolidated sediments of the Atlantic Coastal Plain physiographic province. The topography of the Piedmont Plateau in the vicinity of VHFS consists of gently rolling hills with slopes generally less than 10%. Surface elevations on the installation vary from 335 to 430 feet (ft) above mean sea level (MSL).

3.2 Adjacent Land Use

Land use in the immediate vicinity of VHFS consists mainly of agriculture (mostly horse farms) and residential areas. With the exception of a few residences to the north, the majority of residential development is located to the south of VHFS. A small county recreation park is located adjacent to VHFS along South Run.

3.3 Surface Water Hydrology

VHFS is located in the Occoquan watershed. Most of VHFS drains to South Run via intermittent tributaries and drainage ditches, as shown on Figure 2. South Run is a small Class III Virginia stream which discharges into Lake Manassas, a recreation and drinking water reservoir built on Broad Run for the City of
Manassas. Lake Manassas discharges to Broad Run, which drains to the Occoquan Reservoir. Drainage for the southern portion of the installation flows south and east to Kettle Run. Kettle Run converges with Broad Run approximately 10 miles downstream from Lake Manassas.

3.4 Geology/Hydrogeology

The central portion of VHFS is underlain by folded sedimentary rocks of the Catharpin Creek Member which consists of sandstone, arkosic sandstone, siltstone, shale, and claystone. Intrusions of basalt, oriented northeast to southwest, cut the bedrock in the central and western portions of the VHFS installation. The northeastern flank of VHFS is underlain by intrusions of diabase. Quaternary alluvium is present along the major drainage channels within the installation.

The overburden is thickest (20-40 ft) in the southern regions of the site and thins to 0-10 ft in the northern areas. The overburden consists primarily of saprolite (a chemical and physical weathering product of the underlying bedrock) which underlies lesser amounts of clayey and silty soils.

Groundwater at VHFS occurs in fractured bedrock and to a lesser extent in the overburden. The bedrock aquifer is semi-confined, with the unfractured bedrock and saprolite acting as confining units. Recharge to the fractured bedrock aquifer occurs at outcrop areas and from percolation from the overburden along fractures. In the overburden, the aquifer is unconfined.

4.0 SITE HISTORY AND INVESTIGATION FINDINGS

The RIs for these sites were conducted to evaluate the nature and extent of contamination associated with past site activities. Environmental samples collected and analyzed during the RIs were used in conjunction with the results from the SI and the SRI to assess the condition of each of the areas. The environmental media investigated included surface soil (0 to 2 ft below ground surface [bgs]), subsurface soil (greater than 2 ft bgs), surface water, sediment, and groundwater. Analytical results were compared to background concentrations and regulatory screening levels to determine if environmental media had been adversely impacted by site activities. A brief description of each of the areas and the significant findings of the RIs, SI, and SRI are presented in the following paragraphs. A detailed presentation of the samples collected and the analytical results can be found in the SI Report (USAEC, 1996), the Phase I Reuse Area RI Report (USAEC, 1998), the Phase II Reuse Area RI Report (USACE, 1999), and the SRI Report (USACE, 1998) available in the Information Repository. Comments received from the U.S. Environmental Protection Agency (USEPA) on the final Phase I Reuse Area RI Report and on the final Phase II Reuse Area RI Report regarding these sites along with the U.S. Army’s responses are provided in Attachments 1 and 2, respectively.

4.1 AREE 3 - Warehouse

The Warehouse (Building 309) was used as a vehicle maintenance area from 1943 to 1967. Two sets of pits, which formerly were used for the hydraulic lift and grease pit, were filled with concrete in 1967. The Warehouse also may have been used for the temporary offloading of drums of oil, grease, solvent, paint, acid, and industrial organic chemicals. Three areas of possible contamination have been identified at the Warehouse: the hydraulic lift pit; the grease pit; and the outlet of a floor drain located at the south end of the building, in a former lavatory. Drain pipes from a sink and water fountain run underneath the floor into the floor drain. The overflow from the floor drain discharges to the field south of the Warehouse.

Surface soil samples were collected at the drain outlet; and subsurface soil samples were collected beneath the drain outlet, grease pit, and hydraulic lifts. Benzo(a)pyrene, a polynuclear aromatic hydrocarbon (PAH), was detected in samples taken at the drain outlet at levels above the risk-based concentrations (RBC) established by the USEPA Region III for screening analytical results. Benzo(a)pyrene was detected above the residential soil RBC (0.087 parts per million [ppm]) in a surface soil sample at a concentration of 0.155 ppm. Total petroleum hydrocarbon (TPH) was detected (25.9 to 40.5 ppm) below the State’s TPH soil action level for
underground storage tanks (USTs) of 100 ppm in soil samples collected underneath the hydraulic lifts. No contamination was observed in subsurface soil samples collected along the perimeter of the hydraulic lift and the grease pit.

### 4.2 AREE 5 - EPIC Building

The EPIC Building was used for photographic operations from 1958 to 1995. From 1958 to 1968, wastewater generated during the photographic process was discharged from the building via a 6-inch industrial sewerline constructed of vitrified clay to the Former Photographic Wastewater Lagoon (AREE 10). In 1966, the first silver recovery units were installed for wastewater pretreatment. In 1968, the lagoon at AREE 10 was dredged to recover silver in the sediment and then filled. Wastewater was then diverted through the industrial sewerline directly into the western South Run tributary (WSRT). In 1973, an ion-exchange system was installed to remove cyanide, ammonia, phenols and silver from the photographic wastewater before being discharged through the industrial sewerline to WSRT. This practice continued until 1983 when the photographic wastewater was diverted to the VHFS STP. Leakage was suspected in the sewerline that carried the EPIC wastewater to AREE 10 and WSRT due to its age and the nature of the acidic wastewater.

The interior of the 2,700-foot sewerline at AREE 5 was inspected by closed-circuit television to reveal locations of cracks and other points where leakage would most likely occur. These locations were then selected for soil boring placement. Results from the subsurface soil samples collected near the sewerline did not show contamination from photographic wastewater. In order to characterize potential contamination from the sewerline, an effluent sample was collected at the outfall of the sewerline into WSRT. Effluent results indicated that silver exceeded the Ambient Water Quality Criteria (AWQC); however, the silver concentration was qualified with a B, indicating blank contamination. Based on the results of subsurface soil and sewerline effluent sampling and analysis, it does not appear that the EPIC sewerline has impacted subsurface soil or is an ongoing source of contamination to WSRT.

### 4.3 AREE 7 - Electrical Equipment Facility Pretreatment Tank

The Electrical Equipment Facility (Building 2400) was used for classified military activities associated with the Intelligence Materiel Management Center (IMMC) including black and white photo developing, metal etching, and graphics work from 1965 to 1995. In 1978, a concrete pretreatment tank containing a layer of rock and a layer of sand was installed to filter wastewaters generated in Building 2400 before discharging to the sanitary sewer. Wastes discharged to the pretreatment tank included chromic acid from metal etching, painting wastewater, and photographic wastewater (that was first neutralized in the neutralization pit). The floor drainage system also discharged spills of process chemicals and floor wash water from Building 2400 into the pretreatment tank between 1978 and 1990. Prior to 1978, the floor drains discharged directly to WSRT. The sand sludge removed from the pretreatment tank was disposed of in the Sludge Disposal Area (AREE 13) prior to 1981, and was managed as hazardous waste (based on chromium, silver, and lead content) off site starting in 1981. The pretreatment tank was closed in 1995, and no cracks in the concrete walls or stained soils were found when it was removed in 1997. The neutralization pit closed in May, 1990, and is being remediated according to the requirements of the Resource Conservation and Recovery Act (RCRA) under the purview of the Virginia Department of Environmental Quality (VDEQ).

Subsurface soil samples were collected around the perimeter of the pretreatment tank which indicated that operation of the pretreatment tank had not impacted the subsurface soil.

### 4.4 AREE 10 - Former Photographic Wastewater Lagoon

The Former Photographic Wastewater Lagoon was an earthen holding pond approximately 90 ft in diameter and 4-4.5 ft deep. Photographic wastewater; from the EPIC Building were discharged to the lagoon from 1958 to 1968. The photographic wastewater was acidic and contained significant amounts of silver and cyanide. The lagoon and WSRT were connected naturally such that overflow from the lagoon discharged
directly into WSRT. In 1968, flow problems developed in the lagoon, and it was dredged to recover silver from the sediments. The lagoon was then filled, and effluent was diverted directly to WSRT.

Subsurface soil samples were collected from within the area of the lagoon. The primary inorganics of concern, silver and cyanide, were not detected in the subsurface soil samples with the exception of one sample that contained silver well below the residential soil RBC. These results support the conclusion that most of the contaminated sediments from the former lagoon were removed during the 1968 dredging.

Surface soil samples were not collected at AREE 10 because the lagoon had been dredged and backfilled such that any residual contamination would be present at the base of the former lagoon (i.e., 4—4.5 ft bgs) and not at the soil surface.

4.5 AREE 16-2 - Possible Firefighter Training Pit

Site history indicated that a Firefighter Training Pit was used at VHFS; however, the exact location of the pit is not known with certainty. AREE 16-2 represents one possible location of the Firefighter Training Pit. The Firefighter Training Pit was used monthly by the VHFS Fire Department for training in the mid-1970s. The unlined pit was approximately 50 ft in diameter and 3 ft deep. During training activities, the pit was partially filled with petroleum and natural gas odorant and then ignited. Solvents and other combustible materials may have also been used in the pit. In the mid-1980s the pit was filled with ½-inch gravel.

TPH field screening of the soil at AREE 16-2 was conducted to delineate the area of contamination and to determine where soil samples should be collected for laboratory analysis. Surface and subsurface soil samples were collected based on positive TPH results from the field screening. Surface and subsurface soil samples collected at AREE 16-2 contained arsenic at concentrations (up to 33.8 ppm) that exceeded its residential soil RBC (0.43 ppm) as well as its maximum background concentration (4.89 ppm to 5.4 ppm). Analytical results indicate that soils have not been adversely impacted by firefighter training activities because arsenic was the only contaminant that exceeded screening levels at AREE 16-2, and the arsenic concentrations were determined to be statistically within background levels.

4.6 AREE 17 - Dump #3

Dump #3 is a 318-foot by 390-foot area that has been in use since 1958 to dispose of compost materials and construction debris. Sludge from the STP and Former STP and small amounts of sandblasting waste containing lead paint from the Electrical Equipment Facility (AREE 7) also may have been disposed of in Dump #3.

Surface soil samples were collected at AREE 17. Minimal contamination due to pesticides and PAH was observed in the surface soil samples. The PAH benzo(a)pyrene (0.098 ppm - 0.632 ppm) was detected above its residential soil RBC (0.088 ppm) in the northern portion of AREE 17. The pesticide chlordane (1.36 ppm) was also found to exceed its residential soil RBC (0.49 ppm) at one sampling location. Arsenic (up to 19.5 ppm) exceeded its residential soil RBC (0.43 ppm) and maximum background concentration (4.89 ppm) at all surface soil locations sampled.

Test pits were excavated to locate buried debris, and subsurface soil samples were collected from the test pits to determine if the debris was contaminating the soil. Based on observations made during test pit excavation, the dump extends to depths up to 7 ft in some areas and is unlined. Based on the results of the test pit sampling, the subsurface soils at AREE 17 have not been impacted by previous disposal activities at the site.

Although site history indicates that small amounts of sandblasting waste containing lead paint may have been disposed at AREE 17, there were no elevated lead levels in the soil samples collected at AREE 17. In addition, groundwater samples collected in the vicinity of AREE 17 indicate that groundwater has not been impacted by the disposal activities,
4.7 AREE 18 - Grease Pit

The grease pit was a 50-foot long by 2-foot wide by 4-foot deep trench used to dispose of kitchen grease, oily rags and possibly motor oil. The pit was covered with fill material in 1981 and has not been used since that time.

Surface and subsurface soil samples were collected at AREE 18. Manganese (3,100 ppm) and arsenic (10.1 ppm maximum) were the only analytes, that exceeded both residential soil RBCs (1,800 ppm and 0.43 ppm, respectively) and maximum background concentrations (2,970 ppm and 4.89 ppm, respectively) in surface soil samples. In subsurface soil arsenic (up to 14.7 ppm) was the only analyte to exceed both its residential soil RBC (0.43 ppm) and its maximum background concentration (5.4 ppm).

4.8 AREE 20 - Incinerator Septic Tank and Leach Field

The Incinerator (Building 282) was used from 1973 to 1985 to burn household and office garbage, and medical waste. Some hazardous wastes (e.g., solvents, pesticides, and waste oil) were also burned in the Incinerator. The Incinerator was temporarily closed from 1985 to 1987 for renovations. The Incinerator was operated for 4 months in 1987 until it was shut down permanently in July, 1987 when a series of explosions in the furnace damaged the structure. The Incinerator has its own septic system, which consists of a 500-gallon septic tank and a 135-foot leach field. The septic system is connected to the sinks and toilets in the Incinerator building. All floor washings were discharged to the septic system. Although there is no record of hazardous wastes having been disposed of in the septic system, any spills of liquid hazardous wastes inside the Incinerator building could have also discharged via the floor drains to the septic system.

Subsurface soil samples collected from the septic system leach field indicated that subsurface soils had not been impacted by the operation of the Incinerator septic system.

4.9 AREE 24 - Transformer Storage Area

AREE 24, the Transformer Storage Area, is located west of Building 272 in the engineering compound. It is an unbermed asphalt area that was used to store polychlorinated biphenyl (PCB) transformers (PCBs in oil greater than 500 ppm) and PCB-contaminated transformers (PCBs in oil between 50 and 500 ppm) before their removal by Aptus Environmental Services in 1990. The area is currently used for general storage of materials on pallets, including new “non-PCB” transformers. The area has also been used to store drums containing oil and fuel filters. No spills of transformer cooling oil were observed or recorded in this area.

Surface soil samples were collected for PCB field screening and laboratory analysis. PCBs were not detected during the field screening or subsequent laboratory analysis. TPH was detected below the State's TPH soil action level of 100 ppm in the laboratory samples. Evaluation of the field screening and laboratory analysis results indicate that surface soil has not been impacted from PCB transformer storage activities at AREE 24.

4.10 AREE 25 - Sugar Tree

AREE 25, Sugar Tree, is located in the northeastern portion of VHFS, just south of Route 215. AREE 25 is an area where small amounts of paint and solvents may have been disposed; however, no stressed vegetation or other evidence of contamination has been observed in the area. At one point a 200-gallon diesel aboveground, storage tank (AST) was located in this area for approximately six months for vehicle fueling during construction of a sewage lift station.

Soil organic vapor (SOV) surveys and surface and subsurface soil sampling were conducted at AREE 25. These studies indicated minimal impact from possible disposal of paint and solvents. At the former location of the diesel AST, however, TPH-diesel (930 ppm) was detected in excess of the State's TPH soil action level for USTs (100 ppm) in the duplicate surface soil sample sent to the laboratory. However, the primary surface soil sample and the duplicate surface soil sample were collected from different locations within a few inches.
of one another, and TPH was not detected in the primary sample. The large disparity in results of samples taken so closely to one another indicates that contamination is probably in the form of drops from the diesel tank rather than a diesel spill.

4.11 AREE 26 - Outdoor Wash Racks

The Outdoor Wash Racks area includes two automobile wash areas: one southeast of Building 161 (former wash racks); and one southwest of Building 161 (current wash racks). The current wash racks were constructed in April, 1982, to replace the former wash racks. Each current wash rack has 10-inch concrete berms to prevent run-off and a ramped entrance to prevent run-on. Drains from the current wash racks led to a grit chamber, which discharged effluent to the sanitary sewer. Drains from the former wash racks discharged to the surrounding soils. In February, 1992, the grit chamber and adjacent sewage lift station were steam cleaned and all fluids and sediments were disposed. These fluids and sediments contained motor oil, gasoline, antifreeze, and cleaning solution residues. The concrete sides of the grit chamber were in good condition with no cracks or leaks evident.

Surface soil samples were collected from around both the current and former wash racks. Samples at the current wash racks were collected in close proximity to the grit chamber and in areas where overflows from the wash racks would discharge if the drains to the grit chamber were clogged. Metals were detected at both locations at levels below background concentrations. TPH was detected in surface soil samples from the locations where run-off from the parking area and current wash racks could overflow at concentrations of 23.4 ppm and 111 ppm (slightly above the State's TPH soil action level for USTs of 100 ppm).

4.12 AREE 29-1 - Salvage Yard

The Salvage Yard is located in the northwestern section of VHFS, near Route 652. It was active in the mid-1970s as a small fenced storage yard containing drums and debris. The ground in the enclosure was scarred and two mounds of material were identified in a 1977 aerial photograph. Aerial photographs from 1982 indicated that the facility had been removed. There has been no evidence, either by aerial photographs or from installation personnel, indicating that hazardous materials were released or stored in this area.

Geophysical surveys and shallow test pit excavations conducted at AREE 29-1 identified assorted debris at the north-central edge of AREE 29-1. A subsurface soil sample was collected at the site of the buried debris which indicated that past storage practices and burial of inert debris at the salvage yard have not impacted subsurface soil.

4.13 AREE 29-2 - Possible Sludge Disposal Area

The Possible Sludge Disposal Area is located near the northernmost boundary of VHFS, near Route 215. Scarred ground and a pile of gray material, possibly sludge, were identified in the area in 1977 and 1978 EPIC aerial photographs. The ground in the area is very uneven, indicating that material may have previously been piled on the ground.

Surface soil samples were collected from the area which indicated that the piles identified in the area have not impacted surface soil. No sludge was present at the time of sampling.

4.14 AREE 29-3 - Possible Disposal Area

The Possible Disposal Area is located southeast of the fixed ammunition magazine. WSRT flows just to the east of the area. Review of 1950 aerial photographs indicated possible disposal activities based on ground scarring and the presence of mounds of material and possible equipment. Review of 1958 photographs indicated that the area was revegetating and an ammunition storage building had been constructed nearby. Neither aerial photographs, site visits, nor discussions with installation personnel provided evidence that hazardous materials had been released or stored in this area.
A geophysical survey was conducted to evaluate the potential for buried debris within the area. Test pits were excavated perpendicular to the magnetic anomalies. Subsurface soil samples collected from the test pits indicated that no soil contamination had occurred. Ground scarring observed in aerial photographs may be attributable to bedrock outcrops.

4.15 AREE 30 - Motor Pool

AREE 30 (Building 305) served as a motor pool for approximately 20 years. The building is now surrounded by asphalt; however, the asphalt parking lot was once gravel. According to VHFS personnel, vehicles were brought to the motor pool for maintenance and repair. Vehicle maintenance activities occurred on the gravel parking lot. A drainage grate is located at the eastern end of Building 305. In 1995, during repair of a gas line located adjacent to the drainage grate, a petroleum odor was detected in the soil surrounding the gas line.

Subsurface soil samples were collected in the area of the drainage grate. No contamination above screening levels was observed in the subsurface soil samples. The screening levels used included USEPA Region III RBCs, the USEPA screening level for lead in residential soil, Virginia’s TPH soil action level for USTs, and maximum background concentrations.

4.16 AREE 33 - Household Debris Pile

The Household Debris Pile is located southeast of the STP in a predominantly wooded and vegetated area. The debris pile contains items including, but not limited to, aluminum and tin cans, glass bottles, pots and pans, and bricks. A house known to exist in this approximate location in 1938 may have been the source of the debris. The pile consists of two small mounds approximately 2 ft high. The larger mound has a 15-foot diameter, and the smaller mound has a 14-foot diameter.

A test pit was excavated in the larger debris mound, and one subsurface soil sample was collected from the test pit. The PAH benzo(a)pyrene (1.86 ppm in the duplicate sample) was the only compound that exceeded its industrial soil RBC (0.78 ppm). The benzo(a)pyrene concentration (0.0001 ppm) in the primary sample did not exceed the industrial soil RBC. Industrial soil RBCs were used to screen soil results at AREE 33 because the soil sample was collected from greater than 2 ft bgs (i.e., excavation workers are the most likely human receptor as discussed in Section 5).

4.17 Site-wide Groundwater

Site-wide groundwater was investigated to determine the character and composition of the aquifer, and to evaluate potential contamination at the various AREEs. The groundwater aquifer of concern at VHFS consists of groundwater in the overburden and in fractured bedrock which are interconnected (i.e., there is no defined confining unit). Groundwater in the western and central portions of VHFS generally flows to the north-northwest, while groundwater flows toward the east in the eastern portion of the facility. Groundwater at VHFS was sampled from a total of 43 monitoring wells at 14 different AREEs and 5 other site locations during the Phase I reuse area RI, Phase II reuse area RI, and SRI sampling events.

During the Phase I and II reuse area RIs, the following significant findings resulted:

- AREE I (Dump #1): the pesticide aldrin (0.006 ppb) exceeded its tap water RBC (0.003 parts per billion [ppb]), but a TPH plume identified during the SI was not confirmed;
- AREE 2 (STP): the chlorinated volatile organic compounds (VOCs) bromodichloromethane (0.553 ppb) and chloroform (1.65 ppb) exceeded their tap water RBCs (0.17 ppb and 0.15 ppb, respectively) but were well below their Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs) (80 ppb and 80 ppb, respectively);
• AREE 5 (EPIC Building Industrial Sewerline): hexachlorobutadiene (0.265 ppb) and hexachlorobenzene (2.08 ppb) exceeded their tap water RBCs (0.14 ppb and 0.0066 ppb, respectively);
• AREE 9 (Vehicle Maintenance Area): benzene (9.43 ppb) exceeded its tap water RBC (0.36 ppb);
• AREE 10 (Former Photographic Wastewater Lagoon): chlorinated VOCs exceeded tap water RBCs but not MCLs; and
• AREE 28-5 (Former Service Station Abandoned USTs): benzene (1.2 ppb) exceeded its tap water RBC (0.36 ppb) but not its MCL (5 ppb).

It should be noted that the aldrin contamination at AREE 1, the chlorinated VOC contamination at AREE 2, the hexachloro-compound contamination at AREE 5, and the benzene contamination at AREE 9 were not confirmed during the SRI.

Bis(2-ethylhexyl)phthalate, a common field and laboratory contaminant, was detected in site and background samples above the tap water RBC. Bis(2-ethylhexyl)phthalate is believed to be an artifact of the low-flow sampling procedure and the sampling equipment used rather than a site-related contaminant. Known areas of groundwater contamination at AREE 4 (Auto Craft Shop) and AREE 27 (Army, Air Force Exchange Service [AAFES] Service Station) are currently undergoing corrective actions and, thus, have been segregated from site-wide groundwater.

4.18 South Run at AREEs 1 and 2

South Run is a small, Class III Virginia stream that begins in Fauquier County and flows northeast into Prince William County. South Run discharges into Lake Manassas, a recreational and drinking water reservoir built on Broad Run for the City of Manassas. AREE 1 (Dump #1) and AREE 2 (STP) are both located adjacent to South Run and are flanked by small tributaries that feed South Run. Seepage and run-off from AREE 1 and treated effluent discharged from the STP into South Run are possible sources of contamination.

Surface water and sediment samples were collected from South Run and its tributaries adjacent to AREEs 1 and 2 to determine the nature and extent of possible contamination. Dissolved copper and total iron were the only analytes detected above screening levels in the surface water samples, indicating that surface water has not been impacted by activities at AREEs 1 and 2. Metals, PAHs and pesticides exceeded their screening levels in the sediment samples. For example, the PAH anthracene and the pesticide chlordane (0.186 ppm and 0.213 ppm, respectively) exceeded their effects range-lows (ER-Ls) (0.085 ppm and 0.0005 ppm, respectively) in the sediment samples from South Run and its tributaries at AREEs 1 and 2. In addition, dioxins/furans, which do not have screening levels, were also detected in sediment samples.

4.19 Other Site Drainages

The other site drainages include the drainages in the northern portion of VHFS that remain dry throughout most of the year and only contain water immediately following storm events. Accordingly, these drainages are not expected to contain aquatic life except for a limited number of opportunistic species capable of withstanding periods of dryness. The surface water drainages at VHFS discharge to either South Run or Broad Run. Both South Run and Broad Run are likely to support aquatic invertebrates, amphibians, and several warm-water fish species.

Surface water samples were collected from the other site drainages during storm events to account for the possible movement of contaminants to downstream water bodies during storm events. During storm event sampling, total iron and aluminum exceeded AWQC and maximum background concentrations in most of the sample locations in the other site drainages. Aluminum (dissolved), zinc (total and dissolved), and
Cadmium (dissolved) were also found to exceed AWQC and maximum background concentrations at isolated spots within the other site drainages.

Sediment samples were also collected from the other site drainages. Metals, PAHS, and pesticides were detected at concentrations above screening levels. The screening levels used were the more stringent of the ER-L and the No Effects Levels or Lowest Effects Levels for sediment which are protective of benthic organisms, and maximum background concentrations. Arsenic exceeded its ER-L and maximum background concentration at nearly all of the sample locations. Zinc, chromium, iron, lead, and manganese were found in isolated samples above their ER-Ls and maximum background concentrations. 2-Methylnaphthalene (0.621 ppm),acenaphthene (0.911 ppm), anthracene (0.657 ppm), and pyrene (1.81 ppm) are a few of the PAHs that exceeded their ER-Ls (0.065 ppm, 0.15 ppm, 0.085 ppm, and 0.35 ppm, respectively). Pesticides exceeded their ER-Ls in samples collected near the headwaters of a drainage area in the southern portion of VHFS. Alpha-chlordane (0.034 ppm maximum), gamma-chlordane (0.025 ppm maximum), and chlordane (0.16 ppm maximum) exceeded their ER-Ls (0.005 ppm for each). Aldrin (0.0025 ppm), DDE (0.0051 ppm), and endrin (0.0072 ppm) also exceeded their ER-Ls (0.002 ppm, 0.002 ppm, and 0.00002 ppm, respectively).

5.0 SUMMARY OF SITE RISKS

BRAs were conducted as part of the RIs to assess the human health and ecological problems that could result if the contamination at the AREEs and in site-wide groundwater, South Run at AREEs 1 and 2, and the other site drainages was not remediated. The Human Health Risk Assessment (HHRA) was prepared to evaluate the magnitude of potential adverse effects on human health associated with current industrial/commercial and potential future residential exposures to site-related chemicals at the sites. The Ecological Risk Assessment (ERA) was conducted to characterize the potential threats to ecological receptors posed by contaminants at the sites.

The HHRA follows a four-step process:

- Selection of Chemicals of Potential Concern - identifies the contaminants of potential concern based on their toxicity, frequency of occurrence, and concentration by comparing the maximum concentrations of detected chemicals with RBCs which are health-protective chemical concentrations that are back-calculated using toxicity criteria, a $1 \times 10^{-6}$ target carcinogenic risk or a 0.1 hazard quotient (HQ, defined below), and conservative exposure parameters;

- Exposure Assessment - identifies the potential pathways of exposure, and estimates the concentrations of contaminants to which people may be exposed as well as the frequency and duration of these exposures;

- Toxicity Assessment - determines the toxic effects of the contaminants, and

- Risk Characterization - provides a quantitative assessment of the overall current and future risk to people from site contaminants based on the exposure and toxicity information.

The HHRA evaluated health effects which could result from exposure to soil, groundwater, surface water, and sediment contamination in the Phase I and Phase II reuse areas of VHFS. The HHRA evaluated potential risks to current workers who could be exposed to contaminants in surface soil, and to current trespassers who could be exposed to contamination in surface soil, surface water, and sediment. In addition, the HHRA evaluated potential risks to hypothetical future adult residents who could be exposed to contaminants in groundwater and surface soil and to hypothetical future child residents who could be exposed to contaminants in groundwater, surface soil, surface water, and sediment. Potential risks to future excavation workers who could be exposed to contaminants in subsurface soil were also evaluated in the HHRA. Subsurface soil was only evaluated for excavation workers and not residents since residents would be unlikely to be exposed to subsurface soil. In addition, the concentrations of contaminants currently present in subsurface soil would not be representative of the concentrations that might be present if landscaping activities were to
Potential carcinogenic (cancer-related) effects and noncarcinogenic effects (including various impacts on different organ systems, such as lungs, liver, etc.) were evaluated in the HHRA. Carcinogenic effects are expressed as the probability that an individual will develop cancer from exposure to the contaminants from each site. The evaluation of noncarcinogenic effects is based on the hazard index (HI), which is the summation of the HQs for individual chemicals. The HQ is a comparison of chemical-specific chronic exposure doses with the corresponding protective doses derived from health criteria. The USEPA recommends that remedial actions may be warranted at sites where the carcinogenic risk to any person is greater than $1 \times 10^{-4}$ or the HI is greater than 1. A carcinogenic risk of $1 \times 10^{-4}$ means that there is a potential of one additional person in a population of 10,000 developing cancer from exposure to contaminants at a site if the site is not remediated. A HI greater than 1 indicates a potential for noncarcinogenic health effects if the site is not remediated.

The ERA also follows a four-step process:

- **Problem Formulation** - develops information that characterizes habitats and potentially exposed species and identifies contaminants of concern, exposure pathways, and receptors;
- **Exposure Assessment** - estimates exposure point concentrations for selected indicator species;
- **Ecotoxicologic Effects Assessment** - identifies concentrations or doses of contaminants that are protective of indicator species; and
- **Risk Characterization** - estimates potential adverse effects from exposure to contaminants based on exposure and toxicity information.

The ERA evaluated ecological effects which could result from exposure to surface soil, surface water, and sediment contamination in the Phase I and II reuse areas of VHFS. The ERA evaluated potential adverse ecological effects to terrestrial plants and terrestrial invertebrates (represented by earthworms) exposed to contaminants in surface soil. In addition, potential adverse ecological effects to mammals (represented by shrews) and birds (represented by robins) through bioaccumulation in the food web and exposure to contaminants in surface soil were evaluated. Potential adverse ecological effects to aquatic life from exposure to contaminants in surface water and sediment were also evaluated in the ERA. Further, the potential adverse ecological effects to mammals (represented by minks) and birds (represented by herons) through bioaccumulation in the food web and exposure to contaminants in sediment were evaluated for South Run at AREEs 1 and 2.

The evaluation of significant potential adverse ecological effects is based on the Environmental Effects Quotient (EEQ). The EEQ is the ratio of the estimated exposure concentrations/doses for the chemicals of potential concern and the toxicity reference values (TRVs) for the ecological receptors. If the EEQ is greater than 1, there is a potential for adverse ecological effects to occur. As the magnitude of the EEQ becomes greater than 1, the potential for adverse ecological effects becomes more significant.

The results of the BRAs for the subject sites are presented in the following paragraphs. A detailed presentation of the BRAs can be found in the final Phase I Reuse Area RI Report (USAEC, 1998) and the final Phase II Reuse Area RI Report (USACE, 1999), available in the Information Repository.

### 5.1 AREE 3 - Warehouse

The HHRA concluded that, under both current industrial/commercial and potential future residential land-use conditions, the risks to workers, trespassers, residents, and excavation workers are acceptable for exposure to site-related contaminants at AREE 3. The highest estimated upper-bound excess lifetime cancer risk ($6 \times 10^{-6}$) is for child residents exposed to contaminants in surface soil by incidental ingestion, and the
highest noncarcinogenic risk (HI=2) is for child residents exposed to contaminants in surface soil by incidental ingestion. Although the HI associated with incidental ingestion exposures by child residents exceeded 1, inorganic compounds that were statistically determined to be within background levels accounted for the exceedance. Although industrial soil RSCs were exceeded by contaminants in subsurface soil as indicated in Section 4.1, the concentrations of contaminants yielded risks lower than those for residents exposed to surface soil; therefore, only the risks for residents are presented. The ERA determined that contaminants in surface soil at AREE 3 did not pose significant potential adverse ecological effects. Based on these results, no action is recommended at AREE 3.

5.2 AREE 5 - EPIC Building

No surface soil samples were collected at AREE 5 because the industrial sewer line is buried at least 5 ft bgs, so the HHRA only evaluated risks to future excavation workers. The highest estimated upper-bound excess lifetime cancer risk (2x10^-6) and the highest noncarcinogenic risk (HI=2) are for incidental ingestion of contaminated subsurface soils by excavation workers. Although the HI associated with incidental ingestion exposures by excavation workers exceeded 1, inorganic compounds that were statistically determined to be within background levels accounted for the exceedance. An ERA was not conducted for soil because surface soil data were not available. No chemicals of potential concern were selected from the results of the sewerline effluent sampling so neither a HHRA or an ERA was completed. Based on these results, no action is recommended at AREE 5.

5.3 AREE 7 - Electrical Equipment Facility Pretreatment Tank

A streamlined risk assessment was conducted for current industrial/commercial and potential future residential land uses at AREE 7. Human health risks were calculated only for the incidental ingestion pathway. The highest estimated upper-bound excess lifetime cancer risk (5x10^-6) is for child residents exposed to contaminants in soil through incidental ingestion, and the highest noncarcinogenic risk (HI=2) is for child resident exposures to contaminants in soil via incidental Ingestion. Although the HI associated with incidental ingestion exposures by child residents exceeded 1, inorganic compounds that were statistically determined to be within background levels accounted for the exceedance. An ERA was not conducted as part of the streamlined risk assessment. Based on these results, no action is recommended at AREE 7 pending clean closure of AREE 7 under RCRA by VDEQ.

5.4 AREE 10 - Former Photographic Wastewater Lagoon

No surface soil samples were collected at AREE 10 because the lagoon was dredged and backfilled such that any residual contamination would be at the base of the former lagoon and not at the soil surface, so the HHRA only evaluated risks to future excavation workers. The highest estimated upper-bound excess lifetime cancer risk (6x10^-6) is for excavation workers exposed to contaminants in subsurface soil by dermal absorption, and the highest noncarcinogenic risk (HI=0.9) is for excavation workers exposed to contaminants in subsurface soil by incidental ingestion. No ERA was conducted at AREE 10 because all samples were collected at depths of greater than 6 inches. Based on the results of the HHRA, no action is recommended at AREE 10.

5.5 AREE 16-2 - Possible Firefighter Training Pit

The HHRA determined that site-related contamination at AREE 16-2 does not pose an unacceptable human health risk under either current industrial/commercial or potential future residential land-use conditions. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (6x10^-6) is for child residents exposed to contaminants in surface soil by dermal absorption, and the highest noncarcinogenic risk (HI=0.9) is for excavation workers exposed to contaminants in subsurface soil by incidental ingestion. The ERA determined that surface soil at AREE 16-2 does not pose significant potential adverse ecological effects. Based on these results, no action is recommended at AREE 16-2.
5.6 AREE 17 - Dump #3

The HHRA concluded that under both current industrial/commercial and potential future residential land-use conditions, the risks to workers, trespassers, residents, and excavation workers are acceptable for exposure to contaminants. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (9x10^{-5}) is for child residents exposed to contaminants in surface soil by dermal absorption, and the highest noncarcinogenic risk (HI=0.9) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion and for excavation workers exposed to contaminants in subsurface soil by incidental ingestion. The ERA determined that surface soil at AREE 17 does not pose significant potential for adverse ecological effects. Based on these results, no action is recommended at AREE 17.

5.7 AREE 18 - Grease Pit

The HHRA determined that, under both current industrial/commercial and potential future residential land-use conditions, site-related contamination at AREE 18 does not pose an unacceptable human health risk. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (2x10^{-5}) is for child residents exposed to contaminants in surface soil by incidental ingestion, and the highest noncarcinogenic risk (HI=0.9) is for excavation workers exposed to contaminants in subsurface soil by incidental ingestion. The ERA determined that exposure to site-related contaminants at AREE 18 does not pose significant potential for adverse ecological effects. Based on these results, no action is recommended at AREE 18.

5.8 AREE 20 - Incinerator Septic Tank and Leach Field

A streamlined risk assessment was conducted for current industrial/commercial and potential future residential land uses at AREE 20. Risks were calculated only for the incidental ingestion pathway. The highest estimated upper-bound excess lifetime cancer risk (7x10^{-6}) and noncarcinogenic risk (HI = 0.7) were calculated for child residents exposed to contaminants in soil through incidental ingestion. The streamlined risk assessment did not include an ERA. Based on these results, no action is recommended for the AREE 20 septic tank and leach field.

5.9 AREE 24 - Transformer Storage Area

The HHRA concluded that, under both current industrial/commercial and potential future residential land-use conditions, the risks to workers, trespassers, and residents are acceptable for exposure to site-related contaminants in surface soil. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (1x10^{-5}) is for child residents exposed to contaminants (i.e., aluminum) in surface soil by incidental ingestion, and the highest noncarcinogenic risk (HI=0.9) is for adult residents exposed to contaminants in surface soil by dermal absorption. The ERA determined that surface soil at AREE 24 poses no significant potential for adverse ecological effects. Based on these results, no action is recommended at AREE 24.

5.10 AREE 25 - Sugar Tree

Since TPH is not evaluated in either the HHRA or the ERA, and no other chemicals of potential concern were identified, no unacceptable risk was determined due to contaminants at AREE 25. Based on the BRA and the fact that only one sample of a duplicate pair was found to contain TPH above the State’s TPH soil action level for USTs, no action is recommended at AREE 25.

5.11 AREE 26 - Outdoor Wash Racks

Streamlined risk assessments were conducted for current industrial/commercial and potential future residential land uses at both the current and former wash racks at AREE 26. Risks were calculated only for
the incidemal ingestion pathway. The highest upper-bound excess lifetime cancer risk (\(1 \times 10^{-6}\)) and noncarcinogenic risk (HI=1) were calculated for child residents exposed to contaminants in surface soil at the current wash racks. The streamlined risk assessment did not include an ERA. Based on these results, no action is recommended at AREE 26.

5.12 AREE 29-1 - Salvage Yard

No chemicals of potential concern were identified in the subsurface soil sample at AREE 29-1: therefore, the HHRA determined no unacceptable human health risk from exposure to contaminants in subsurface soil. An ERA was not completed because the AREE 29-1 sample was collected at a depth greater than 6 inches, thus eliminating the potential for exposure to ecological receptors. Based on these results, no action is recommended at AREE 29-1.

5.13 AREE 29-2 - Possible Sludge Disposal Area

The HHRA determined that site-related contamination in surface soil at AREE 29-2 does not pose unacceptable human health risks under either current industrial/commercial or potential future residential land-use conditions. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (6 \(10^{-6}\)) is for child residents exposed to contaminants (i.e., aluminum) in surface soil by incidental ingestion, and the highest noncarcinogenic risks (HI=0.3) are for child residents exposed to site-related contaminants in surface soil by incidental ingestion and dermal absorption. The ERA found no significant potential for adverse ecological effects from surface soil at AREE 29-2. Based on these results, no action is recommended at AREE 29-2.

5.14 AREE 29-3 - Possible Disposal Area

The results of the HHRA indicated that, under both current industrial/commercial and potential future residential land-use conditions, the risk to workers, trespassers, residents, and excavation workers are acceptable for exposure to site-related contaminants. Discounting naturally-occurring metals that were statistically determined to be within background levels, the highest estimated upper-bound excess lifetime cancer risk (8 \(10^{-5}\)) is for child residents exposed to contaminants in surface soil by dermal absorption, and the highest noncarcinogenic risk (HI=0.9) is for excavation workers exposed to contaminants in subsurface soil by incidental ingestion. An ERA was not conducted because all soil samples were collected at depths greater than 6 inches. Based on these results, no action is recommended at AREE 29-3.

5.5 AREE 30 - Motor Pool

Only subsurface soil samples were collected at AREE 30; therefore, an ERA was not conducted, and human health risks were only evaluated for future excavation workers. All analytes were detected below their screening levels (i.e., USEPA Region III industrial soil RBCs and the USEPA screening level for lead in residential soil) and were eliminated as chemicals of potential concern such that risks to excavation workers were determined to be acceptable. Based on these results, no action is recommended at AREE 30.

5.16 AREE 33 - Household Debris Pile

Only subsurface soil was sampled at AREE 33 because the purpose of the sampling was to determine if the household debris had impacted the native soils which were encountered at greater than 2 ft bgs; therefore, an ERA was not conducted, and human health risks were only evaluated for future excavation workers. The highest estimated upper-bound excess lifetime cancer risk (9 \(10^{-6}\)) is for excavation workers exposed to contaminants through incidental ingestion of subsurface soil. No noncarcinogenic risks were estimated because no noncarcinogenic chemicals of potential concern were identified. Based on these results, no action is recommended at AREE 33.
5.17 Site-Wide Groundwater

Risks associated with exposure to site-related contaminants in site-wide groundwater were only evaluated for future residents. An ERA was not conducted for groundwater. Discounting naturally-occurring metals that were statistically determined to be within background levels, the highest estimated upper-bound excess lifetime cancer risk \(7 \times 10^{-4}\) is for adult residents exposed to contaminants in site-wide groundwater by dermal absorption, and the highest noncarcinogenic risk (HI=10) is for children exposed to contaminants in site-wide groundwater by dermal absorption. The contaminant that drove these unacceptable human health risks is bis(2-ethylhexyl)phthalate. Bis(2-ethylhexyl)phthalate is a common laboratory and field contaminant that was detected in the majority of the on-site and background groundwater samples (i.e., is not site-related). Excluding bis(2-ethylhexyl)phthalate along with naturally-occurring metals that were statistically determined to be within background levels, the highest estimated upper-bound excess lifetime cancer risk \(9 \times 10^{-6}\) is for adult residents exposed to contaminants in site-wide groundwater by ingestion, and the highest noncarcinogenic risk (HI=0.5) is for children exposed to contaminants in site-wide groundwater by ingestion. The site-related contaminants with the greatest impact on cancer risks and noncarcinogenic hazards are beryllium and barium, respectively. Remediation of the site-wide groundwater is not recommended based on the results of the HHRA.

5.18 South Run at AREEs 1 and 2

The HHRA determined that site-related contamination in the sediment and surface water of South Run at AREEs 1 and 2 does not pose unacceptable human health risks under either current industrial/commercial or potential future residential land-use conditions. Cancer risks were not estimated for exposure to surface water in South Run at AREEs 1 and 2 because no carcinogenic chemicals of potential concern were identified. The highest noncarcinogenic risks (HI = 0.004) associated with surface water in South Run at AREEs 1 and 2 were for child resident exposures by dermal absorption. For sediment in South Run at AREEs 1 and 2, the highest estimated upper-bound excess lifetime cancer risk \(1 \times 10^{-6}\) is for child residents exposed to contaminants in sediment by incidental ingestion, and the highest noncarcinogenic risk (HI=9) is for child residents exposed to contaminants in sediment by incidental ingestion. Although the HI associated with incidental ingestion exposures to sediment in South Run at AREEs 1 and 2 by child residents exceeded 1, the exceedance was driven by metals believed to be naturally occurring. It should be noted that background metals were not discounted prior to calculating risks because statistical comparisons could not be conducted for sediment sample results because of the limited number of available background samples.

Results of the ERA for surface water in South Run at AREEs 1 and 2 indicate very little potential for adverse effects to aquatic life from the presence of chemicals in surface water. The ERA determined that there is potential for adverse effects to heron (EEQ = 19) and mink (EEQ = 54) from selenium in sediment from South Run at AREEs 1 and 2; however, the adverse effects are limited because selenium was only detected in one sediment sample. The greatest potential for adverse effects to benthic organisms is in the tributaries to South Run at AREEs 1 and 2 due to dioxin/furan congeners (primarily OCDD [EEQ=57]) and pesticides (primarily chlordane [EEQ=30] and DDT [EEQ=15]). The ERA estimated the potential for adverse effects to benthic organisms based on the assumption that a viable habitat for benthic organisms existed. However, the habitat for benthic organisms in the tributaries to South Run at AREEs 1 and 2 is limited and, therefore, the adverse effects are over-estimated by the ERA and are actually limited.

Based on these results, no action is recommended for South Run at AREEs 1 and 2.

5.19 Other Site Drainages

The HHRA determined that contamination in the sediment of the other site drainages does not pose an unacceptable human health risk under either current industrial/commercial or potential future residential land-use conditions. Human health risks associated with surface water in the other site drainages were not evaluated because these water bodies only contain flowing water during storm events thus limiting the potential for exposure. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk \(4 \times 10^{-5}\) is for child residents through incidental ingestion of site-related contaminants in sediment in the other site drainages. The highest
noncarcinogenic risk (H = 1) is for child residents exposed to site-related contaminants in sediment in the other site drainages through incidental ingestion.

The ERA determined that the contaminants in the surface water and sediments of the other site drainages do not pose significant potential for adverse ecological effects to aquatic life.

Based on these results, no action is recommended for the other site drainages.

6.0 SELECTED ALTERNATIVE

No action is selected by the U.S. Army for AREEs 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33; site-wide groundwater, South Run at AREEs 1 and 2; and other site drainages because these sites do not pose unacceptable human health or ecological risks. USEPA and VDEQ concur with this decision. The estimated cost to implement this alternative is $0.

7.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Proposed Plan for AREEs 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33; site-wide groundwater, South Run at AREEs 1 and 2; and other site drainages was released to the public on or about March 31, 1999 (see Attachment 3). This document was made available for public review in the Information Repository at the following location:

Fauquier County Library
Warrenton Branch - Reference Section
11 Winchester Street, Warrenton, VA
(540) 347-8750
Monday - Wednesday: 10:00 a.m. to 9:00 p.m.
Thursday - Saturday: 9:00 a.m. to 5:00 p.m.
Sunday: 1:00 p.m. to 5:00 p.m.

The notice of availability of the Proposed Plan (see Attachment 4) was published in The Fauquier Citizen, the Fauquier Times-Democrat, and the Manassas Journal Messenger during the week of March 29, 1999. A public comment period was held from April 1, 1999, through April 30, 1999. In addition, a public meeting was held on April 15, 1999, to present the Proposed Plan for AREEs 3, 5, 7, 10, 16-2, 17, 18, 26, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33; site-wide groundwater; South Run at AREEs 1 and 2; and other site drainages was released to the public on or about March 31, 1999 (see Attachment 3). This document was made available for public review in the Information Repository at the following location:

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8.0 RESPONSIVENESS SUMMARY

The purpose of this Responsiveness Summary is to provide the public with a summary of citizen comments, concerns, and questions about AREEs 3, 5, 7, 10, 16-2, 17, 18, 26, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33; site-wide groundwater; South Run at AREEs 1 and 2; and other site drainages. A public meeting was held on April 15, 1999, to present the Proposed Plan and to answer questions and receive comments. At the public meeting, USEPA had a question regarding the Proposed Plan; the citizens present did not have any comments on the Proposed Plan. However, one citizen had a question regarding the use of radioactive materials at VHFS. No written public comments were received during the April 1, 1999, through April 30, 1999, public comment period. Written comments, however, were received from USEPA and VDEQ.
The Responsiveness Summary is divided into the following sections:

• Selected newspaper notices announcing dates of the public comment period and location and time of the public meeting;
• Comments raised during the public meeting on April 15,1999;
• Public meeting attendance roster;
• Restoration Advisory Board Members; and
• Written comments received during the public comment period.

All comments and concerns summarized in this document have been considered by the U.S. Army in making a decision regarding the selected alternative.

8.1 Selected Newspaper Notices

A public notice announcing the availability of the Proposed Plan and the public meeting was published in The Fauquier Citizen, the Fauquier Times-Democrat, and the Manassas Journal Messenger during the week of March 29, 1999. This public notice is provided in Attachment 4.

8.2 Comments Raised During the Public Meeting on April 15, 1999

USEPA raised a comment during the public meeting. USEPA's question and the U.S. Army's response are presented below:

USEPA QUESTION: Is the explanation for bis(2-ethylhexyl)phthalate being found in background groundwater because it is a common laboratory contaminant used to make plastics pliable?

ARMY RESPONSE: Bis(2-ethylhexyl)phthalate is both a laboratory and a field contaminant. Bis(2-ethylhexyl)phthalate is used in plastic gloves and tubing to make them pliable. Plastic tubing is used to collect groundwater samples, and the bis(2-ethylhexyl)phthalate is picked up in the groundwater as it is pumped through the tubing. That is why it is found in the background groundwater samples as well as site groundwater samples.

During the public meeting, one citizen raised a question regarding the use of radioactive materials at VHFS. The citizen's question and the U.S. Army's response are presented below:

CONCERNED CITIZEN: Has the U.S. Army investigated the use of radioactive materials at VHFS? The citizen recollected that radioactive materials were used in the basement of a building located adjacent to the educational offices and catty-cornered to the mess hall.

ARMY RESPONSE: In 1996, the U.S. Army conducted a historical site assessment to establish the history of the handling of radioactive sources/commodities at VHFS including the location of these materials; the types of operations that used them; and any accidents, incidents, or leaks that may have occurred. During this assessment, it was determined that there was a high probability that a Radioactive Source Set had been stored in the basement of Building 160; this item was removed from VHFS in 1967. Subsequent to the assessment, a radiation survey was conducted in the buildings, rooms, and areas known to or which could have had radioactive materials on the premises (including the basement of Building 160) to determine if there was any residual radioactive contamination at VHFS. The findings of the assessment and the radiation survey were documented in "Industrial Radiation Historical Site Assessment and Final Status Radiation Survey" published
in August 1996 (U.S. Army CECOM, 1996). No radioactive contamination was detected during the radiation survey.

8.3 Public Meeting Attendance Roster

The public meeting was held on April 15, 1999, at the Former Headquarters Conference Room (Building 101) at VHFS. The members of the community that attended the public meeting included Pat White, Mary Noel McMullen, and William McMullen (see Attachment 5).

8.4 Active Restoration Advisory Board Members

1. Chris Kencik
2. Dean Eckelberry
3. John Mayhugh
4. Owen Bludau
5. Tim Tarr
6. Kevin Bell
7. Steve Mihalko
8. Robert Stroud
9. Joe Phelan

8.5 Written Comments Received During the Public Comment Period

No written comments were received from citizens during the public comment period. Written comments were received from USEPA and VDEQ during the public comment period and are provided in Attachment 6. The U.S. Army’s responses to these comments are also provided in Attachment 6 and were distributed to the public during the public comment period. Most of the USEPA’s comments suggested wording changes or requested clarification regarding specific information. Wording changes and clarifications requested by USEPA (see Attachment 6 for details) have been incorporated into this DD. Substantive comments and the U.S. Army’s responses are presented below:

USEPA COMMENT: Is it appropriate to base decision-making on the draft SRI Report.

ARMY RESPONSE: The SRI Report does not include risk assessment. All risk conclusions were made based on the RIs. Therefore, the status of the SRI Report has no impact on the no action decision made for the subject sites.

USEPA COMMENT: Can we say that the property is okay for unrestricted future use if residential risk has not been evaluated for subsurface soil? If not, we’ll need institutional controls, a remedy. Consider a scenario where the property is reused as residential and trees are planted, with the tree pits dug below 2 ft bgs. Subsurface soil could then sit at the surface and be consumed by a child.

ARMY RESPONSE: The U.S. Army's understanding of USEP's position is that soil below 2 ft bgs only needs to satisfy target risk levels for excavation workers and not residents since residents would be unlikely to be exposed to subsurface soils. In addition, the concentrations of contaminants currently present in subsurface soil would not be representative of the concentrations that might be present if landscaping activities were to occur which would involve mixing of subsurface soils with surface soil, clean topsoil, and other soil amendments. Therefore, it would not be appropriate to evaluate risks to residents using available subsurface soil data.

USEPA/VDEQ COMMENT: Since AREE 7 is to be closed under RCRA, clean closure must be approved by the VDEQ's Office of Waste Permitting before a no action alternative can be selected for this AREE.
ARMY RESPONSE: The U.S. Army understands the requirement for clean closure of AREE 7 by VDEQ before a final no action decision can be made. A closure report has been submitted to VDEQ, and approval is pending. AREE 7 will not be transferred until clean closure approval is received from VDEQ.

USEPA COMMENT: Depths from 0-2 ft are defined as "surface soil" for the HHRA, and depths from 0-6 inches are defined as "surface soil" for the ERA. Internal inconsistency created.

ARMY RESPONSE: The USEPA protocols for HHRAs and ERAs differ with respect to the definition of "surface soils" to which receptors are exposed. ERAs only use data for surface soil samples collected from the 0-6 inch depth interval, while HHRAs use data for surface soil samples collected from the 0-2 ft depth interval. The U.S. Army followed USEPA’s protocols.

USEPA COMMENT: Based on the potential for adverse effects to benthic organisms in the tributaries to South Run at AREEs 1 and 2 identified in the ERA, shouldn't an action alternative be evaluated?

ARMY RESPONSE: The ERA estimated the potential for adverse effects to benthic organisms based on the assumption that a viable habitat for benthic organisms existed. However, the habitat for benthic organisms in the tributaries to South Run at AREEs 1 and 2 is limited and, therefore, the adverse effects are overestimated by the ERA and are actually limited. No action is warranted based on the existing conditions.

9.0 REFERENCES


ATTACHMENT 1

RESPONSE TO USEPA COMMENTS ON THE FINAL PHASE I REUSE AREA RI REPORT
RESOLUTION OF PREVIOUS COMMENTS

Comment 1.

Comment: Regarding data validation, please explain why no J, K, or L qualifiers appear on any of the data. Since there was a discrepancy between the IRDMIS database and the SI report for a few values, please indicate the method used when determining accurate results for AREE 11.

Response: Since the data qualifiers had to be hand entered, only the qualifiers that affect the risk assessment and, therefore, the conclusions of the Phase I Reuse Area RI Report were entered into the database and presented in the report.

Since the Site Inspection (SI) Report was supposedly prepared using the IRDMIS database, the IRDMIS database information was used when a discrepancy was found between the IRDMIS database and the SI Report.

IMPACT OF NEW TOXICITY FACTORS ON RISK AT PHASE I

NOTE: The complete text of USEPA’s comments including point-by-point impacts of the toxicity factor changes are provided in Attachment 1 to these responses. USEPA’s comments are summarized herein to focus attention on the overall conclusions made by USEPA regarding the impact of the toxicity factor changes on the Final Phase I Reuse Area RI Report recommendations.

Comment 1.

Comment: Toxicity factors for some chemicals have changed since April, when this report was submitted. In most cases, the changes would not alter the outcome of the risk assessment. However, in a few cases, the impacts on risk-management decisions could be significant. As we discussed during our conference call on December 2, 1998, in cases where toxicity factors could possibly change risk decisions a technical memo will be developed that rationalizes no further action decisions at selected AREEs. This technical memo should include rationalizations for AREEs 12, 13, 16-1, 27, 29-4 and groundwater wells that reveal high levels of bis(2-ethylhexyl)phthalate (BEHP).

a) For AREE 12 subsurface soil, future residential risks did exceed 1E-4 due to benzo[a]pyrene.

b) For AREE 13, aluminum, iron, and possibly vanadium also contributed.

c) For AREE 16-1 surface soil, risks did exceed NCP targets, due to arsenic, TCDD, and chromium. The concentrations of arsenic and TCDD at AREE 16-1 pose a total cancer risk of 2E-4 for the child/adult scenario. Chromium is a possible driver of an HI above 1.
d) For AREE 27, chromium and cadmium contribute to an HI above 1.
e) For AREE 29-4 surface soil, the aluminum HI of 1.4 was borderline.
f) For site-wide groundwater, the BEHP is a potential concern. Although phthalates are common laboratory contaminants, BEHP was detected in several wells at high levels that were not attributed to blank contamination. On the other hand, the presence of BEHP in background wells at similar levels implies that there may be a regional BEHP issue. As a base-closure issue, the groundwater BEHP could be important, since it exceeds both NCP target risks and the MCL.

Response: The U.S. Army appreciates USEPA's assessment of risks for the Phase I reuse area based on the recent toxicity factor changes. However, for the record, the U.S. Army cannot agree with the details of USEPA's assessment and the risk numbers presented without conducting the assessment itself. Reassessment of risks is not productive since the report is final based on the toxicity factors valid at the time the report was finalized and requested by USEPA in its comments on the Draft Phase I Reuse Area RI Report. Therefore, rather than addressing the specific numbers presented in USEPA's comments, the goal of these responses is to address the major conclusions made by USEPA during its assessment of the toxicity factor changes.

It is important to note that the toxicity factors used in USEPA's assessment were not available at the time the Phase I Reuse Area RI Report was being finalized and the remediation decisions were being made. Rather, the Phase I Reuse Area RI Report was prepared, and the remediation decisions made, based on the toxicity factors that were valid at the time (i.e., toxicity factors published in October, 1997). However, in light of the recent toxicity factor changes, the U.S. Army still believes that the no further action conclusions made in the Final Phase I Reuse Area RI Report are protective for the five AREEs identified in USEPA's comments and site-wide groundwater as discussed in the following paragraphs.

a) For AREE 12 (Dump #2) subsurface soil, the no further action decision is protective for two reasons. First, USEPA has previously established a policy position that only industrial exposures (i.e., construction workers) be considered when evaluating soils below 2 ft below ground surface (bgs). Therefore, the observation made by the USEPA toxicologist that the recently published toxicity factor changes cause future residential risks from exposure to subsurface soil at AREE 12 to exceed 1E-4 due to benzo[a]pyrene is not relevant. Construction worker exposures remain below the target risk levels even in light of the recent toxicity factor changes. Second, it is important to note that AREE 12 is a permitted construction debris landfill, and the U.S. Army intends to institute deed restrictions which will prevent exposure to subsurface soil.

b) For AREE 13 (Sludge Disposal Area), USEPA identified aluminum, iron, and possibly vanadium as compounds that contribute to elevated non-carcinogenic risk. As discussed in Section 8 of the Final Phase I Reuse Area RI Report, the soil samples from AREE 13 were collected from 1-3 ft bgs which straddles the surface/subsurface soil boundary (i.e., 2 ft bgs). To be conservative, these samples were evaluated as surface soil samples in the Human Health Risk Assessment (HHRA) and thus were statistically compared to surface soil background results which are based on samples collected from 0-0.5 ft bgs. However, a more appropriate comparison can be made using the background...
subsurface soil sample results since surface soil was likely removed along with the sludge in 1992. Iron concentrations background subsurface soil samples are highly variable, ranging from 9,360 Fg/g to 180,000 Fg/g. Aluminum concentrations in background subsurface soil samples range from 4,410 Fg/g to 60,600 Fg/g, and vanadium concentrations in background subsurface soil samples range from 44.3 Fg/g to 531 Fg/g. The variability of iron, aluminum, and vanadium concentrations in the background subsurface soil samples is most likely due to the variability of soils that were sampled. The composition of soil is primarily controlled by the composition of the bedrock from which it is formed. Figure 2-1 of the Final Phase I Reuse Area RI Report shows the geology of shallow bedrock across VHFS. For example, the background subsurface soils which have the highest iron concentrations (SB-BK-002 [91,000 Fg/g at 3 ft bgs] and SB-BK-003 [180,000 Fg/g at 5 ft bgs and 100,000 Fg/g at 18.5 ft bgs]) are located in areas where intrusions of mafic material (i.e., basalt) have occurred. Mafic rocks are rich in iron and magnesium and will produce soils that are rich in iron and magnesium. Iron concentrations in soil at AREE 13 range from 75,200 Fg/g to 230,000 Fg/g. According to the Environmental Contamination Survey (USATHAMA, 1986), a mafic intrusion (Hickory Grove Basalt) bisects AREE 13, and the sludge disposal area lies over the geological contact area of the Catharpin Creek Member and the Hickory Grove Basalt. The high iron concentrations are most likely a product of the parent material from which the soil in this area is derived. In addition, it should be noted that the aluminum and vanadium concentrations at AREE 13 (53,300 Fg/g to 73,100 Fg/g for aluminum, and 221 Fg/g to 317 Fg/g for vanadium) are more comparable to the subsurface soil background ranges than they are to the surface soil background ranges. Furthermore and more importantly, aluminum, iron, and vanadium are not anticipated to be present in environmental media at AREE 13 based on site history. Other metals (e.g., silver, cadmium, lead, and mercury) which are more likely to be site-related contaminants based on site history were either not detected or were detected at concentrations below screening levels. Therefore, aluminum, iron, and vanadium are not site-related contaminants but rather are representative of background concentrations in soil derived from the type of bedrock present at AREE 13. No further action is a protective recommendation for AREE 13.

c) For AREE 16-1 (Possible Firefighter Training Pit) surface soil, USEPA found that the concentrations of arsenic and TCDD pose a total cancer risk of 2E-4 for the child/adult scenario. Even when ingestion and dermal absorption exposure routes are added as was done by USEPA, the cancer risk is borderline compared to the target risk of 1E-4. Based on the borderline cancer risk associated with arsenic and TCDD, the small size of the firefighter training pit (i.e., 50 ft diameter for one of the possible pits which was most likely AREE 16-2 based on terrain) for which typical exposure assumptions are exaggerated, and the uncertainty that AREE 16-1 truly represents a former firefighter training pit, no further action at AREE 16-1 is protective.

USEPA also found that chromium is a possible driver of a HI above 1 given the recently lowered (i.e., more stringent) toxicity factor for hexavalent chromium. It should be noted that there is a great deal of conservatism built into the calculation of the HI for chromium in surface soil at AREE 16-1 for the following reasons: 1) the HHRA is based on the conservative assumption that all chromium present at
AREE 16-1 is hexavalent chromium which is not supported by site history: and 2) the oral RfD for hexavalent chromium has an uncertainty factor of 900, which indicates high uncertainty associated with the RfD. Hexavalent chromium is typically found in the environment as a result of contamination from electroplating or conversion coating operations where hexavalent chromium is used in the process solutions. The residential soil risk-based concentration (RBC) for trivalent chromium, the form of chromium more commonly found in the environment when electroplating and conversion coating operations are not involved, is three orders of magnitude higher (i.e., less stringent) than the corresponding RBC for hexavalent chromium (i.e., 1.2E5 Fg/g versus 2.3E2 Fg/g). In the case of AREE 16-1, which was a possible firefighter training pit, operations that used hexavalent chromium were not conducted. In fact, operations using chromium in any form were not conducted.

In addition, although chromium at AREE 16-1 was not statistically within background, the data do not suggest widespread chromium contamination that would be present if the contamination was site-related. Four surface soil samples were collected at AREE 16-1 and yielded chromium at concentrations ranging from 27.2 Fg/g to 59.9 Fg/g, with an arithmetic mean concentration of 41.0 Fg/g. Background concentrations in surface soil were detected at concentrations as high as 60 Fg/g. A common sense review of the data in light of site history indicates that it is reasonable to find the chromium concentrations to be representative of background concentrations.

Based on the conservatism of the HI calculation for chromium, the lack of site history involving chromium, and the fact that the detected chromium levels are potential background levels, the no further action decision for AREE 16-1 is protective.

d) For AREE 27 (AAFES Service Station) surface soil, although cadmium and chromium both contribute to a HI above 1, chromium is the risk driver because of the recently lowered (i.e., more stringent) toxicity factor for hexavalent chromium. Therefore, this response focuses on chromium. As discussed in Section 8 of the Final Phase I Reuse Area RI Report there is a great deal of conservatism built into the calculation of the HI for chromium in surface soil at AREE 27 for the following reasons: 1) the HHRA is based on the conservative assumption that all chromium present at AREE 27 is hexavalent chromium which is not supported by site history; and 2) the oral RfD for hexavalent chromium has an uncertainty factor of 900, which indicates high uncertainty associated with the RfD. Hexavalent chromium is typically found in the environment as a result of contamination from electroplating or conversion coating operations where hexavalent chromium is used in the process solutions. The residential soil RBC for trivalent chromium, the form of chromium more commonly found in the environment when electroplating and conversion coating operations are not involved, is three orders of magnitude higher (i.e., less stringent) than the corresponding RBC for hexavalent chromium (i.e., 1.2E5 Fg/g versus 2.3E2 Fg/g). In the case of AREE 27, which was a fuel and service station, operations that used hexavalent chromium were not conducted. In fact, operations using chromium in any form were not conducted.

In addition, although chromium at AREE 21 was not statistically within background, the data do not suggest widespread chromium contamination that
would be present if the contamination was site-related. Nine surface soil samples were collected at AREE 27 and yielded chromium at concentrations ranging from 24.8 mg/g to 75.5 mg/g, with an arithmetic mean concentration of 40.6 mg/g. Background concentrations in surface soil were detected at concentrations as high as 60 mg/g. A common sense review of the data in light of the site history indicates that it is reasonable to find the chromium concentrations to be representative of background concentrations.

Based on the conservatism of the HI calculation for chromium, the lack of site history involving chromium, and the fact that the detected chromium levels are potential background levels, the no further action decision for AREE 27 is protective.

e) For AREE 29-4 (Disposal Area) surface soil, USEPA calculated a HI for aluminum of 1.4 which they acknowledge is borderline. Based on the fact that the oral RfD for aluminum has an uncertainty factor of 100 and the HI is not significantly different from 1 even when ingestion and dermal absorption exposure routes are added, no further action at AREE 29-4 is protective.

f) For site-wide groundwater, the fact that BEHP is both a common laboratory contaminant and a common field contaminant is an important point. Although it is true that not all BEHP detections were blank qualified, the primary source of BEHP is the sampling equipment in combination with the sampling technique. BEHP is used as a plasticizer in the flexible tubing used to sample the wells. BEHP was detected in the equipment blanks prepared in the field at lower levels that was found in some of the groundwater samples primarily because of how the equipment blanks were prepared versus how the groundwater samples were collected. In the preparation of the equipment blanks, water was pumped through the sample tubing at a comparatively rapid rate which did not allow for significant leaching and accumulation of BEHP in the sample, Conversely, the low-flow groundwater monitoring well sampling method involved pumping of groundwater through the sample tubing at low flow rates. Many of the monitoring wells were low producers and required pumping at very low flow rates. The low flow of water through the sample tubing during groundwater sampling increased the opportunity for BEHP to leach into the sample and concentrate. This finding is supported by the fact that elevated BEHP was found in site wells and background wells at similar levels. Neither site nor regional history support USEPA's suggestion that the BEHP found in the groundwater samples may represent a regional issue. Groundwater samples were analyzed for a wide range of constituents, and BEHP was the only constituent that exceeded screening levels in most of the wells. If the BEHP were the result of site or regional groundwater contamination, it would have been found in combination with other contaminants rather than alone. Therefore, the conclusion that the BEHP is present as a result of field contamination is appropriate, and no further action is a protective recommendation for site-wide groundwater at VHFS.
OTHER RISK-RELATED ISSUES

Comment 1.

Comment: Cancer risks were presented separately for children and adults. In order to estimate the lifetime cancer risk when exposure includes both childhood and adulthood, the risks would be:

\[(\text{Adult cancer risk} \times 24/30) + (\text{Child cancer risk}).\]

Response: Remediation decisions have all been made based on separate adult and child exposures since this comment had not been made until well into the decision-making process (i.e., after the Final Phase I Reuse Area RI Report was submitted). Furthermore, this methodology is consistent with that used in other HHRAs performed for and accepted by USEPA Region III.

Comment 2.

Comment: The soil-to-skin adherence factors are generally reported at lower levels in the new Exposure Factors Handbook than previously (Section 7.1.2.3; Tables 7-16, 7-17, 7-19, 7-24). Therefore, it is possible that dermal soil risks are overestimated in this respect.

Response: The uncertainty associated with the soil-to-skin adherence factors and their impact on risk estimates is already discussed in the Uncertainty Section of the Final Phase I Reuse Area RI Report.
ATTACHMENT 1

DETAILED COMMENTS FROM USEPA REGARDING NEW TOXICITY FACTORS
IMPACT OF NEW TOXICITY FACTORS ON RISK AT PHASE I

Toxicity factors for some chemicals have changed since April, when this report was submitted. In most cases, the changes would not alter the outcome of the risk assessment. However, in a few cases, the impacts on risk-management decisions could be significant. As we discussed during our conference call on December 2, 1998, in cases where toxicity factors could possibly change risk decisions a technical memo will be developed that rationalizes no further action decisions at selected AREEs. This technical memo should include rationalizations for AREEs 12, 13, 16-1, 27, 29-4 and groundwater wells that reveal high levels of BEHP. To assist in the facilitation of this memo, EPA has provided a table in this letter that indicates the impacts of the toxicity changes on the final estimates of risk. The toxicity-factor changes would also impact other tables and sections of the RI, on which the final risk estimates are built. For informational purposes, the changes to those "building-block," non-summary sections are included in an attachment to this letter.

1. Table 7-155 (and pages 7-62 to 7-73):

The table should not be split by route; total risks are more informative. Also, given the changes noted in the attachment, the risks on this table would be as follows:

<table>
<thead>
<tr>
<th>MEDIUM/LOCATION</th>
<th>WORKER C.A. RISK</th>
<th>WORKER HI.</th>
<th>ADULT RES. C.A. RISK</th>
<th>ADULT RES. HI.</th>
<th>CHILD RES. C.A. RISK</th>
<th>CHILD RES. HI.</th>
</tr>
</thead>
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<tr>
<td>SURFACE SOIL:</td>
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<td></td>
</tr>
<tr>
<td>AREE 9</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>1.9 c</td>
<td>G</td>
<td>6.5 a</td>
</tr>
<tr>
<td>AREE 11</td>
<td>3E-5</td>
<td>1.6c</td>
<td>7E-5</td>
<td>4 a</td>
<td>5E-5</td>
<td>11</td>
</tr>
<tr>
<td>AREE 13</td>
<td>G</td>
<td>1.7 c</td>
<td>G</td>
<td>4</td>
<td>G</td>
<td>14</td>
</tr>
<tr>
<td>AREE 16-1</td>
<td>G</td>
<td>1.3</td>
<td>1E-4</td>
<td>2.7 a</td>
<td>1E-4</td>
<td>8</td>
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<tr>
<td>AREE 16-2</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>3.6 a</td>
</tr>
<tr>
<td>AREE 17</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>2 c</td>
<td>G</td>
<td>3 a</td>
</tr>
<tr>
<td>AREE 18</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>2 c</td>
<td>G</td>
<td>6 a</td>
</tr>
<tr>
<td>AREE 19</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>2.4 c</td>
<td>G</td>
<td>7</td>
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<td>AREE 21</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>1.6 c</td>
<td>G</td>
<td>6 a</td>
</tr>
<tr>
<td>AREE 24</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>2.2 c</td>
<td>G</td>
<td>7 a</td>
</tr>
<tr>
<td>AREE 27</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>3</td>
<td>G</td>
<td>7.5</td>
</tr>
<tr>
<td>AREE 29-2</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>1.4 c</td>
<td>G</td>
<td>4.3 a</td>
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<tr>
<td>AREE 29-3</td>
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<td>G</td>
<td>G</td>
<td>G</td>
<td>3.1 c</td>
</tr>
<tr>
<td>AREE 29-4</td>
<td>G</td>
<td>2.3 a</td>
<td>G</td>
<td>5 a</td>
<td>G</td>
<td>16</td>
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<td>6E-4</td>
<td>8</td>
<td>3E-4</td>
<td>18</td>
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</tbody>
</table>
(Footnotes have the same meaning as in the original table.)

2. The conclusions on page 7-63 should be altered slightly:
   a) Add AREE 12 subsurface soil, benzo[a]pyrene.
   b) Add AREE 29-4 surface soil, aluminum.
   c) Add AREE 16-1 surface soil, arsenic, TCDD, and chromium.
   d) To AREE 13, add aluminum and possibly vanadium.
   e) To AREE 27, add cadmium.

3. Table 8-1:
   a) For AREE 12, future residential risks did exceed 1E-4 due to benzo[a]pyrene.
   b) For AREE 13, aluminum and possibly vanadium also contributed; the reason that no remediation is recommended is not clear.
   c) For AREE 16-1, risks did exceed NCP targets, due to arsenic, TCDD, and chromium. The reason for no remediation is not clear.
   d) For AREE 27, cadmium was also a contributor. The reason for no remediation, given the "yes" in unacceptable health risks, is not clear.
   e) For AREE 29-4, the aluminum HI of 1.4 was borderline.
   f) For site-wide groundwater, the bis(2-ethylhexyl)phthalate (BEHP) is a potential concern. Reported levels were not all attributed to blank contamination.

4. Section 8.1 should also include a discussion of AREE 12 subsoil, AREE 16-1 surface soil, AREE 29-4 surface soil, AREE 13 iron, aluminum, and vanadium (as elevated metals in a sludge
disposal area), and AREE 27 (for which the increase in the chromium toxicity factor has increased the HI, although the point about valence state is well taken).

5. Section 8.2 - should not dismiss the BEHP lightly. Although phthalates are common laboratory contaminants, BEHP was detected in several wells at high levels that were not attributed to blank contamination. On the other hand, the presence of BEHP in background wells at similar levels implies that there may be a regional BEHP issue. As a base-closure issue, the groundwater BEHP could be important, since it exceeds both NCP target risks and the MCL.

6. Page ES-2: For AREE 12, subsoil cancer risks exceed 1E-4 for potential residential exposure. For AREE 13, it is not clear that no action should be taken for metals exceeding background levels in a sludge disposal area.

7. Page ES-3:
   a) The concentrations of arsenic and TCDD at AREE 16-1 pose a total cancer risk of 2E-4 for the child/adult scenario. Chromium is a possible driver of an HI above 1. Therefore, it is not clear that no action is appropriate.
   b) For AREE 27, chromium and cadmium contribute to an HI above 1.

8. Page ES-4:
   a) For AREE 29-4, the aluminum HQ is 1.4.
   b) For groundwater, further consideration should be given to the BEHP results.
   c) For the summary bullets, antimony and arsenic should be added to AREE 19. AREE 13 (aluminum, iron, and possibly vanadium) should be added. AREE 16-1 (arsenic, TCDD, and chromium) should be added. AREE 29-4 (aluminum) and AREE 12 subsurface soil (benzo[a]pyrene) may warrant inclusion. Groundwater BEHP should receive further consideration. AREE 27 (cadmium and chromium) may warrant inclusion.

OTHER RISK-RELATED ISSUES

9. Cancer risks were presented separately for children and adults. In order to estimate the lifetime cancer risk when exposure includes both childhood and adulthood, the risks would be:

   (Adult cancer risk x 24/30) + (Child cancer risk).

10. Appendix F: This appendix generates residential risks, but uses industrial RBCs to screen. If residential RBCs were used, then additional COPCs (with their EPCs shown here) would be identified:

    AREE 12: aluminum (16100 mg/kg), chromium (24.7 mg/kg), iron (40400 mg/kg), manganese (605 mg/kg), vanadium (95 mg/kg)

    Central AREEs: aluminum (18900 mg/kg), antimony (0.27 mg/kg), cadmium (0.4 mg/kg), chromium (27 mg/kg), manganese (2390 mg/kg), silver (0.44 mg/kg), vanadium (110 mg/kg)

    AREE 27: aluminum (15000 mg/kg), arsenic (12.2 mg/kg), chromium (46 mg/kg), iron (48000 mg/kg), manganese (950 mg/kg), vanadium (116 mg/kg)
For AREE 12, the residential cancer risks exceed 1E-4 due to benzo[a]pyrene. For all other residential subsoil scenarios, the cancer risks are below 1E-4 and the HIs are at or below 1 after background attribution and target organ separation.

11. The soil-to-skin adherence factors, are generally reported at lower levels in the new Exposure Factors Handbook than previously (Section 7.1.2.3; Tables 7-16, 7-17, 7-19, 7-24). Therefore, it is possible that dermal soil risks are overestimated in this respect.
ATTACHMENT: DETAILS ON RISK ASSESSMENT SECTIONS IMPACTED BY NEW TOXICITY FACTORS

1. Tables 4-2 and F-1: Screening RBCs for beryllium, chromium, vinyl acetate, 1,3-dichlorobenzene, 2-chloronaphthalene, bis(2-chloroethyl)ether, dibenzofuran, 2-methylnaphthalene, naphthalene, the chlordanes, toxaphene, dinoseb, and Aroclor 1016 have been updated. As will be seen, only the differences for beryllium, chromium, and chlordane are generally significant for Vint Hill. The 1,2,3,7,8-PeCDF RBCs were incorrect on this table. However, since the correct numbers were used elsewhere in the report, this is not a major issue.

2. Beryllium's RBC would be higher and it would no longer be a COPC, and chromium's RBC would be lower but its COPC status would not change, on Tables 4-3 through 4-6, Tables 5-2 through 5-9, Table 5-10 (chromium only), Table 5-11, Table 5-12, Tables 5-15 through 5-23, Tables 5-25 through 5-30, Tables 5-33 through 5-43, Table 5-45, Table 6-1, Table 7-2, and Sections 4.2.1, 4.2.2, 4.2.3, 5.1.2, 5.1.4, 5.2.2, 5.2.4, 5.2.5, 5.3.2.1, 5.3.2.2, 5.3.4.1, 5.3.4.2, 5.4.4, 5.5.1, 5.7.4.2, 5.7.5.2, 5.8.4.1, 5.8.4.2, 5.9.2, 5.9.4, 5.10.4.1, 5.10.4.2, 5.10.5, 5.11.2, 5.11.3, 5.12.1, 5.14.2, 5.14.4, 5.15.4, 5.16.2, 5.17.4, 5.18.2, 5.18.4, 5.18.5, 5.19.2, 5.19.4, 5.19.5, 6.4.1.1, 6.4.2.1, and 7.1.1.4; also on page 7-6, 3rd paragraph.

2-Methylnaphthalene's RBC would be lower, but its COPC status would not change, on Tables 5-2, 5-9, 5-19, 5-35, 5-41, 5-45, and 7-2, and in Sections 5.1.2, 5.3.4.2, 5.8.4.1, 5.14.4, 5.18.4, 5.18.5, 5.19.4, and 5.19.5.

Chlordane's RBC would be higher, but its COPC status would not change, on Tables 5-7, 5-11, 5-20, and 5-43, and in Sections 5.3.2.1, 5.3.2.2, 5.4.4, 5.8.4.2, 5.19.2, and 5.19.5. The COPC status of total chlordane would not change on Tables 5-8 and 5-9, and in Sections 5.3.4.1 and 5.3.4.2. Chlordane would no longer be a COPC on Table 5-19 and in Section 5.8.4.1.

Naphthalene's RBC would be lower but its COPC status would not change, on Tables 5-8, 5-9, 5-11, 5-19, 5-41; 5-42, 5-45, and 7-2, and in Sections 5.3.4.1, 5.3.4.2, 5.4.4, 5.8.4.1, 5.18.4, 5.18.5, 5.19.4, and 5.19.5.

3. On Tables 7-4 and 7-11 (also pp. 7-7 through 7-10), the COPC selections would change as follows:

AREEs 9, 13, 19, 21, 24, 29-2, 29-3: beryllium no, chromium yes;

AREEs 11, 16-1, 16-2, 18, 27, 29-4: beryllium no;

AREE 17: chlordane no, beryllium no, chromium yes.

4. On Tables 7-6 and 7-11 (also on p. 7-12), the COPC selections for occupational use would change as follows: Central AREEs: beryllium no.

5. On Tables 7-8 and 7-11 (also on p. 7-12), the COPC selections would change as follows: chlordane no.

6. Or. Tables 7-10 and 7-11 (also on pp. 7-13 and 7-14), the COPC selections would change as follows:

Eastern: beryllium no;

Northern: beryllium no, chromium yes;

Western: alpha-chlordane no, gamma-chlordane no, beryllium no.
7. Table 7-14:

Beryllium does not need to be a COPC for groundwater, surface soil AREE 9, surface soil AREE 11, surface soil AREE 13, surface soil AREE 16-1, surface soil AREE 16-2, surface soil AREE 17, surface soil AREE 18, surface soil AREE 19, surface soil AREE 21, surface soil AREE 24, surface soil AREE 27, surface soil AREE 29-2, surface soil AREE 29-3, surface soil AREE 29-4, subsurface soil central AAREEs, eastern tributary sediment, northern tributary sediment, and western tributary sediment.

Chlordane does not need to be a COPC in AREE 17 surface soil or western tributary surface water. Alpha- and gamma-chlordane do not need to be COPCs in western tributary sediment.

Surface soil, AREE 9: The manganese EPC should be 2980 mg/kg, but this transcription error is negligible in terms of risk. Chromium should be added, with an EPC of 32.5 mg/kg.

Surface soil, AREE 13: Chromium should be added, with an EPC of 28.9 mg/kg.

Surface soil, AREE 17: Chromium should be added, with an EPC of 35 mg/kg.

Surface soil, AREE 19: Chromium should be added, with an EPC of 23 mg/kg.

Surface soil, AREE 21: Chromium should be added, with an EPC of 20 mg/kg.

Surface soil, AREE 24: Chromium should be added, with an EPC of 33.6 mg/kg.

Surface soil, AREE 29-2: Chromium should be added, with an EPC of 36.6 mg/kg.

Surface soil, AREE 29-3: The iron EPC should be 26000 mg/kg, but this transcription error is negligible. Chromium should be added, with an EPC of 24 mg/kg.

Subsurface soil, AREE 12: The EPCs should be 13 mg/kg for benz[a]anthracene, 13 mg/kg for benzo[a]pyrene, 16 mg/kg for benzo[b]fluoranthene, 3.8 mg/kg for dibenz[a,h]anthracene, and 9.5 for indeno[1,2,3-c,d]pyrene. However, these changes are negligible in terms of risk.

8. Table 7-25:

The new oral slope factors for the chlordanes are all 0.35 per mg/kg/day; the new oral RfDs are 5E-4 mg/kg/day.

The 1,2-dichloroethane target organs include the stomach and thymus.

The barium target organs include the kidney.

The new beryllium oral RFD is 2E-3 mg/kg/day with the intestines as the target organ; the oral slope factor has been withdrawn.

The new chromium oral RFD is 3E-3 mg/kg/day.

The inorganic mercury target organ is the immune system.

9. Table 7-26:

The new unit risk for chlordane is 1E-4 per ug/m³ the new RfC is 7E-4 mg/m³.

The 1,2-dichloroethane target organs include possible kidney effects.

The provisional aluminum RfC is 3.5E-3 mg/m³.
The new beryllium RfC is 2E-5 mg/m³.

The new chromium RfC is 1 E-4 mg/m³.

10. Table 7-27: As noted elsewhere in the report adjusted slope factors are not calculated for the carcinogenic PAHs. The beryllium, chromium, and chlordane dermal numbers would change in accordance with their new oral numbers.

11. The risk drivers for AREE 9 surface soil would be iron, manganese, chromium, and vanadium, which are all similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 11 surface soil would be chromium, vanadium, mercury, iron, and chlordane, of which mercury and chlordane exceed background levels.

The risk drivers for AREE 13 surface soil would be aluminum, iron, chromium, and vanadium, of which only chromium is similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 16-1 surface soil would be arsenic, chromium, iron, manganese, vanadium, and TCDD, of which arsenic, TCDD, and chromium exceed background levels.

The risk drivers for AREE 16-2 surface soil would be iron and vanadium, both similar to background levels.

The risk drivers for AREE 17 surface soil would be iron, manganese, chromium, and vanadium, which are all similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 18 surface soil would be iron, manganese, and chromium, which are all similar to background levels.

The risk drivers for AREE 19 surface soil would be iron, antimony, chromium, arsenic, and vanadium, of which antimony and arsenic exceed background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 21 surface soil would be iron, manganese, chromium, and vanadium, all of which are similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 24 surface soil would be iron, manganese, chromium, and vanadium, all of which are similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 27 surface soil would be chromium, vanadium, cadmium, and iron, of which chromium and cadmium exceed background levels.

The risk drivers for AREE 29-2 surface soil would be iron and chromium, which are both similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 29-4 surface soil would be chromium, vanadium, beryllium, iron, aluminum, and manganese, of which only aluminum exceeds background levels.

The risk drivers for groundwater are manganese and bis(2-ethylhexyl)phthalate (BEHP), of which both are similar to background levels, although BEHP is not naturally occurring.

The risk drivers for western tributary sediment are arsenic, chromium, iron, manganese, and vanadium, of which arsenic exceeds background levels.

The risk drivers for eastern tributary sediment are iron, chromium, manganese, and vanadium, all of which are similar to background levels.
The risk drivers for northern tributary sediment are iron, manganese, chromium, and vanadium, all of which are similar to background levels (chromium tested with Mann-Whitney).

The risk drivers for AREE 27 subsurface soil would be chromium, iron, and vanadium, all of which are similar to background, according to a Mann-Whitney test.

The risk drivers for AREE 12 subsurface soil would be iron, chromium, vanadium, and benzo[a]pyrene, of which only benzo[a]pyrene appears to exceed background levels (metals tested with Mann-Whitney).

The risk drivers for central subsurface soil would be chromium, iron, manganese, and vanadium, all of which are similar to background (chromium, vanadium, and manganese tested with Mann-Whitney).

12. For Tables 7-28 through 7-42 and Table 7-144, along with pages 7-38 through 7-40: Chromium would be added to some of these AREEs. Risks for chromium would increase, while risks for beryllium and chlordane would decrease. However, all cancer risks would remain below 1E-4 and all HIs would remain at or below 1.

13. For Tables 7-43 through 7-72 and Table 7-145, along with pages 7-40 through 7-43: Chromium would be added to some of these AREEs. Inhalation HQs could be calculated for aluminum. Risks for chromium would increase, while risks for beryllium and chlordane would decrease. However, all cancer risks would remain below 1E-4 and all HIs would remain at or below 1 when target organs are considered and background chemicals are excluded.

14. For Tables 7-73, 7-74, and 7-146, along with page 7-43: Chromium would be added to northern tributary sediment. Risks for chromium would increase, while risks for beryllium would decrease. However, all cancer risks would remain below 1E-4 and all HIs would remain at or below 1 when target organs are considered and background chemicals are excluded.

15. For Tables 7-75 through 7-77 and 7-147, along with pages 7-44 and 7-45: Inhalation risks for the child would increase. Risks for chromium would increase, while risks for beryllium would decrease. The dermal risks for adults are likely to be overestimated, since the amount that volatilizes during showering was not subtracted from the EPC. The total cancer risk (ingestion, dermal, and inhalation) for adults, 24-year exposure, would be 6E-4; the total HI would be 8. The total cancer risk for children (ingestion and dermal) would be 3E-4; the total IHI would be 18. The risk drivers are still manganese and BEHP, with manganese attributed to background.

16. For Tables 7-78 through 7-107 and 7-148, along with pages 7-45 through 7-53: Chromium would be added to some of these AREEs, Inhalation HQs could be calculated for aluminum. Risks for chromium would increase, while risks for beryllium and chlordane would decrease. However, all cancer risks would be less than 1E-4, and all HIs would be at or below 1 after consideration of target organs and background, except for the following:

At AREE 13, the iron HQ (ingestion + dermal) is 1.5; the vanadium HQ is 1.06, and these are, potentially additive. Vanadium may not be attributable to background.

At AREE 16-1, the arsenic cancer risk is 5E-5; the TCDD cancer risk is 8E-5 (total 1E-4); the chromium HQ is 1.4. Chromium may not be attributable to background. The cancer risks on Table 7-148 should not be marked "b."

At AREE 27, the cadmium HQ is 0.21; the chromium HQ is 1.22; these are potentially additive.

17. For Tables 7-108 through 7-137 and Table 7-149, along with pages 7-45 through 7-53: Chromium would be added to some of these AREEs. Inhalation HQs could be calculated for aluminum. Inhalation risks would increase due to body-weight consideration. Risks for chromium would
increase, while risks for beryllium and chlordane would decrease. However, all cancer risks would be less than 1E-4, and all HIs would be at or below 1 after consideration of target organs and background, except for the following:

At AREE 11, the mercury HQ is 1.8; the chlordane HQ is 2.7. The chlordane cancer risk is 4E-5. The cancer risk on Table 7-149 should not be attributed to background.

At AREE 13, the aluminum HQ is 1.2; the iron HQ is greater than 10; the vanadium HQ is 2.6. Vanadium may not be attributable to background.

At AREE 16-1, the arsenic cancer risk is 5E-5; the TCDD cancer risk is 7E-5 (total 1E-4); the chromium HQ is 2.5. Chromium may not be attributable to background. The cancer risks on Table 7-149 should not be marked "b."

At AREE 19, the antimony HQ is 1.5; the arsenic HQ is 1.4; these are potentially additive. The HIs on Table 7-149 should not be marked "e."

At AREE 27, the cadmium HQ is 0.4; the chromium HQ is 2.2; these are potentially additive. The HIs on Table 7-149 should not be marked “b.”

At AREE 29-4, the aluminum HQ is 1.4; this was not attributed to background.

18. For Tables 7-138 through 7-141 and 7-150, along with pages 7-53 and 7-54: Beryllium risks would decrease, while risks for chromium would increase. However, all cancer risks would be less than 1E-4, and all HIs would be at or below 1 after consideration of target organs and background.

19. For Tables 7-142, 7-143, and 7-151, along with pages 7-54 and 7-55: Risks for chromium would increase, while risks for beryllium and chlordane would decrease. However, all cancer risks would be less than 1E-4, and all HIs would be at or below 1 after consideration of target organs and background, except for the following:

For western tributary sediment, the arsenic HQ is 2.5 and the arsenic cancer risk is 9E-5 (added to a chlordane risk of 1E-5). The cancer risk should not be marked “c” on Table 7-151.

20. Beryllium should not be a cancer driver on Tables 7-144 through 7-151.

21. Table 7-152, Section 7.1.4.3, Section 7.1.5.4: AREE 16-1 now has the highest cancer risk, and AREE 29-4 has the highest HI. The risks on this table would change as previously noted.
ATTACHMENT 2

RESPONSE TO USEPA COMMENTS ON THE FINAL PHASE II REUSE AREA RI REPORT
Response to Comments on the
Final Phase II Reuse Area RI Report, Vint Hill Farms Station
from USEPA Region III

RESOLUTION OF PREVIOUS COMMENTS

Comment: The change was made to Table 5-12 but not Section 5.2.4.1. This is a minor error (a text note concerning the chloroform RBC) and is not expected to affect the conclusions of the risk assessment.

Response: The text error is acknowledged. No further response is required since the conclusions of the risk assessment are not affected.

Comment: The third sentence of Section 5.10.5, which refers to screening levels rather than background, is contradicted by the findings of the RI in previous sections and should have been corrected. However, this is a minor issue which is not expected to affect the conclusions of the risk assessment.

Response: If a metal concentration exceeds the relevant RBC but does not exceed the maximum background concentration, the discussion text states that screening levels were not exceeded. Therefore, the text is not contradictory. No further response is required since the conclusions of the risk assessment are not affected.

Comment: Table 5-42: The original comment requested the addition of certain human health COPCs to this table. These chemicals were important because of their status as COPCs or (in the case of 24e) because of their potential to serve as a contaminant source for migration. Therefore, the requested changes should have been made to this table. However, there are tables that appear later in the report which indicate the site-related chemicals and risk drivers. Because the latter (i.e., Section 7 and 8) tables are more useful, Table 5-42 is not expected to greatly impact the usefulness of the risk assessment.

Response: Table 5-42 is not meant to be an exhaustive list of COPCs. Rather, Table 5-42 presents only the most significant investigation findings. COPCs are presented in the Section 7 tables.

Comment: Aluminum and iron could easily be site-related, particularly when the sites in question involve general dumping or sewage treatment. However, the metals are addressed statistically later in the report, so that Section 6 is balanced by other parts of the RI.

Response: Section 6 is based on the general findings of the statistical background comparisons for metals presented in Section 7.

Comment: The findings of pesticides in groundwater were worthy of mention in the text and should have been added. However, the chemicals appear in data tables and this wording issue is not expected to affect the conclusions of the risk assessment.
Response: The pesticides in question (chlordane and heptachlor) were not mentioned in Sections 6.4.2 and 6.4.2.4 because they are not considered to be significant contaminants in groundwater at VHFS.

Comment 6. Comment 29

Comment: The finding of thallium in sediment was worthy of mention in the text, particularly since this chemical was a risk driver, and it should have been added. However, discussion of sediment thallium appears elsewhere in the RI, and this wording issue is not expected to affect the conclusions of the risk assessment.

Response: Thallium was not discussed in Section 6.4.3.1 because it is not considered to be a significant contaminant in sediment at VHS. No further response is required since the conclusions of the risk assessment are not affected.

Comment 7. Comment 33

Comment: The PEF equation was added to the report, but the SSL equation (SSL = ?) does not appear. The site-specific SSL equation, which combined PEF and VF and therefore cannot be determined by consulting the general guidance, should be provided.

Response: Residential SSLs were based on residential child exposure parameters for noncarcinogenic compounds and integrated child and adult exposure parameters for carcinogenic compounds. Industrial SSLs were based on industrial worker exposures for both noncarcinogenic and carcinogenic compounds. The following equations were used to develop the SSLs.

\[
\begin{align*}
SSL_{\text{cart}} &= \frac{\text{THQ} \times \text{BW} \times \text{AT} \times \text{Days} \times \text{RfD}}{\text{EF} \times \text{IR} \times \text{ED} \times (1/\text{VF} + 1/\text{PEF})} \\
SSL_{\text{ind}} &= \frac{\text{TR} \times \text{AT} \times \text{Days}}{\text{EF} \times \text{IKA} \times (1/\text{VF} + 1/\text{PEF}) \times \text{CSF}}
\end{align*}
\]

where:

- \(SSL_{\text{cart}}\) = (Non)cancer soil screening level (mg/kg);
- ThQ = Target hazard quotient (dimensionless);
- TR = Target cancer risk (dimensionless);
- BW = Body weight (kg);
- AT = Averaging Time (yr);
- Days = Conversion factor (d/yr);
- RfD = Inhalation reference dose (mg/kg-d);
- CSF = Inhalation cancer slope factor (mg/kg-d)^{-1};
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF</td>
<td>Exposure frequency (d/yr);</td>
</tr>
<tr>
<td>ED</td>
<td>Exposure duration (yr);</td>
</tr>
<tr>
<td>IR</td>
<td>Inhalation rate (m³/d);</td>
</tr>
<tr>
<td>IFA&lt;sub&gt;adj&lt;/sub&gt;</td>
<td>Age-adjusted inhalation factor (m³-yr/d-kg);</td>
</tr>
<tr>
<td>PEF</td>
<td>Particulate Emission Factor (1.15 x10⁶ m³/kg); and</td>
</tr>
<tr>
<td>VF</td>
<td>Volatilization Factor (m³/kg).</td>
</tr>
</tbody>
</table>

**Comment:** The 1997 aluminum paper gives the same RfC (5E-3 mg/m²) as the 1994 paper, however, the paper has been provided as requested. EPA's value of 1E-3 mg/kg/day is rounded from 1.4E-3 mg/kg/day.

**Response:** The U.S. Army is in receipt of the requested paper. The values identified in the comment were used in the Final Phase II Reuse Area RI Report.

**Comment:** The response to #36 was satisfactory, but it is not clear whether this explanation appears in the RI text.

**Response:** The explanation can be found on Page 7-7.

**Comment:** The adjusted cancer risk (24 years of adulthood and 6 years of childhood) is commonly used in EPA risk assessments. This can be derived from the existing report using the following equation: ((Adult 30-year risk / 30) x 24] + (Child 6-year risk).

**Response:** As stated in the U.S. Army's original response, the methodology used in the Phase II Reuse Area HHRA to evaluate an adult for an exposure duration of 30 years and a child for the exposure duration of 6 years is consistent with the Phase I Reuse Area HHRA as well as other HHRAs performed for and accepted by USEPA Region III.

**Comment:** The ingestion and dermal risks should have been added as requested. This is standard risk assessment practice, particularly since the dermal risks are derived based on adjusted oral criteria. This issue is partly redeemed by the cumulative risks shown on Table 7-96. Fortunately, the total risks can easily be found by adding the route-specific risks displayed in the RI. Risk managers should be aware of this issue when quoting or addressing the risks.

**Response:** To be consistent with the Phase I Reuse Area HHRA, the incidental ingestion and dermal absorption risks and HIs were not totaled. As stated in the comment, risks managers can easily add incidental ingestion and dermal absorption risks by referring to the tables in Section 7. Discounting metals determined to be statistically within background levels, summing incidental ingestion and dermal absorption risks and HIs does not affect the conclusions of the risk assessment with respect to areas exceeding USEPA's target risk range for health protectiveness at Superfund sites.

**Comment:** The groundwater risks are slightly overestimated because volatilization was not subtracted from the amount available for dermal exposure during showering. However,
the results are very close to EPA estimates (e.g., adult dermal HI of 4 vs. 5), and the bottom-line conclusions remain the same.

Response: Since the bottom-line conclusions of the risk assessment remain the same, no response is required.

Comment 13  Comment 106b

Comment: It should be noted that chromium and manganese are also risk drivers, although attributed to background. This information is not expected to greatly impact the conclusions of the risk assessment.

Response: The U.S. Army does not agree with listing background metals as risk drivers.

Comment 14  Comments 106c,106d,106e,106g

Comment: It should be noted that vanadium and manganese are also risk drivers, although attributed to background. This information is not expected to greatly impact the conclusions of the risk assessment.

Response: The U.S. Army does not agree with listing background metals as risk drivers.

Comment 15  Comment 112a.

Comment: The adult resident for AREE 1 has a total cancer risk of 1E-4.

Response: The U.S. Army agrees with this comment.

Comment 16  Comment 112e.

Comment: The child resident dermal HI for AREE 14 is 1 (c), which is notable because the ingestion HI is greater than 1 (possible additive effects).

Response: Since all the COPCs for surface soil at AREE 14 are metals statistically determined to be within background levels, additive effects are not a concern.

Comment 17  Comment 121d.

Comment: For AREE 31, the child resident ingestion HI is 1.3 (d) and the dermal HI is 0.6 (d); the total HI exceeds 1.

Response: Although the U.S. Army does not agree with values quoted in the comment, the Phase II Reuse Area RI Report did conclude that the risks associated with surface soil at AREE 31 exceeded USEPA’s target risk range for health protectiveness at Superfund sites. Surface soil at AREE 31 has since been remediated.

Comment 18  Comment 112g.

Comment: The child resident dermal HI for AREE 32 is 1.3 (c), which is notable because the ingestion H1 is greater than 1 (possible additive effects).

Response: The only COPC which was not statistically determined to be within background levels in AREE 32 surface soil was aluminum. The total HI for aluminum (i.e., incidental ingestion plus dermal absorption) is 0.3. Therefore, additive effects are not a concern.
Comment: The following involve wording in the risk characterization section (now pp. 7-39 through 7-51):

a) Page 7-41, AREE 1 worker: the HI is actually less than 1 when separated by target organ;
b) Page 7-41, AREE 2 worker: the total HI is 1, but is less than 1 when separated by target organ;
c) Page 7-43 of the report was missing and should be provided;
d) Page 7-45, last paragraph; and page 7-46, 4th paragraph: no effects are assumed when the HI is equal to 1, contrary to the text statements that effects could be expected at HI = 1;
e) Page 7-46, AREE 1 adult resident: the total HI is 1;
f) Page 7-47, AREE 31 child resident: the total HI is approximately 1, but is 1 or less when separated by target organ;
g) Page 7-47, AREE 32 adult resident: the total HI is 1, but is less than 1 when separated by target organ;
h) Page 7-51, 1st paragraph, last sentence: it is more accurate to state that exposed children may have adverse effects, rather than that this is likely, given the levels found at most of these AREEs.

Response:

a) The U.S. Army agrees with this comment.
b) The U.S. Army agrees with this comment.
c) Page 7-43 is attached.
d) The U.S. Army acknowledges and agrees with this comment.
e) The U.S. Army believes this comment was meant to be on either AREE 4 or AREE 14. If this is the case, the U.S. Army agrees with this comment.
f) The U.S. Army agrees with this comment.
g) The U.S. Army agrees with this comment.
h) The U.S. Army acknowledges and agrees with this comment.

Comment: The page in question is now 7-56; it should be noted that chromium and dioxins and furans are also contributors to risk.

Response: The U.S. Army agrees that chromium and dioxins/furans also contribute to risk for AREE 1 surface soil although to a lesser extent than the contaminants listed.

Comment: It is difficult to determine whether the sediment metals are site-related, because the two nearest AREEs (1 and 2) are a dump and a sewage treatment plant, both of which could
be associated with a wide variety of contaminants, including metals. However, the similarity of the non-thallium metals to background and the low frequency of the thallium (one detection) are the strongest arguments for the facility’s interpretation of the sediment metals pattern.

Response: Based on this comment, USEPA appears to agree with the arguments presented in the Phase II Reuse Area RI Report regarding metals in South Run sediment at AREEs 1 and 2 not being site-related.

Comment 22. Comment 22a.

Comment: Table 8-1: For groundwater issues at AREE 1 and AREE 28-5, please refer to my review of the SRI. No further amendment of the Phase 2 RI is expected with respect to this issue.

Response: Comments regarding the SRI Report will be addressed separately. Since the comment indicates that no further amendment to the Phase II Reuse Area RI Report is required, no response is necessary.

Comment 23. Comment 124a, 127b.

Comment: It is difficult to support the claim that iron is not site-related at AREE 2, because the on site levels were statistically greater than background and because the nature of the site (sewage treatment plant) could be associated with a variety of metals. As noted in the report, there are also arguments to made against site attribution of iron, but in my view they are not conclusive. The facility should explain how and if the planned mercury remedy will address iron (whether incidentally or intentionally).

Response: Although the U.S. Army maintains that iron in AREE 2 surface soil is attributable to background, the planned remediation of surface soil at AREE 2 as a result of mercury contamination (i.e., excavation and off-site disposal) will also address iron in the surface soil.
ATTACHMENT 3

PROPOSED PLAN
INTRODUCTION

The U.S. Army has identified a preferred alternative to address contamination at selected Areas Requiring Environmental Evaluation (AREEs) and three other sites located on Vint Hill Farms Station (VHFS). The U.S. Army’s preferred alternative at these areas is no further action.

This Proposed Plan is based on site-related documents contained in the VHFS Information Repository. The Information Repository can provide you with important information about VHFS and the affected areas. The Information Repository is located at

Fauquier County Library
Warrenton Branch - Reference Section
11 Winchester Street, Warrenton, VA
(540) 347-8750
Monday - Wednesday: 10:00 a.m. to 9:00 p.m.
Thursday - Saturday: 9:00 a.m. to 5:00 p.m.
Sunday: 1:00 p.m. to 5:00 p.m.

The U.S. Army needs your comments and suggestions. The U.S. Army, the U.S. Environmental Protection Agency (USEPA) Region III, and the Virginia Department of Environmental Quality (VDEQ) encourage the public to review and comment on the action presented in the Proposed Plan. The public comment period begins on April 1, 1999, and closes on April 30, 1999. Please send your comments, postmarked no later than April 30, 1999 to:

Kevin Bell, Public Affairs Officer
Building 2500, Helms Road
Vint Hills Farm Station
Warrenton, VA 22187

in addition, you are invited to a public meeting regarding the investigation of the selected areas at VHFS. Representatives from the U.S. Army will report on the status of these areas and the U.S. Army’s preferred alternative. The meeting is scheduled for:

Thursday, April 15, 1999 at 7:00 p.m.
Building 100 - Former Headquarters Conference Room
Vint Hill Farms Station, Warrenton, VA

Special provisions will be made for the handicapped and hearing impaired.

The remedy described in this Proposed Plan is the U.S. Army’s preferred alternative for the selected areas. The U.S. Army may modify the preferred alternative or select another remedial alternative if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The U.S. Army, in consultation with USEPA and VDEQ, will make a remedy selection for the areas in a Decision Document after the public comment period has ended and the comments and information submitted during that time have been reviewed and considered.
The U.S. Army is issuing this Proposed Plan as part of its public participation responsibilities under Sections 113(k) and 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, commonly known as the “Superfund Program”, and the National Environmental Policy Act of 1969 (NEPA). This Proposed Plan focuses on: AREEs 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33; Site-wide Groundwater, South Run at AREEs 1 and 2; and Other Site Drainages. Other areas of VHFS that the U.S. Army plans to remediate are addressed by separate Proposed Plans.

SITE BACKGROUND

VHFS is part of the U.S. Army Communications - Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence. VHFS is located approximately 40 miles southwest of Washington, D.C., in Fauquier County, Virginia, as shown on Figure 1. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites.

The facility was designated for closure in March, 1993, under the Base Realignment and Closure (BRAC) Act. Pursuant to the decision to close the installation, and Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May, 1994, respectively. The ENPA identified 42 AREEs from the review of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation.

These 27 AREEs were investigated from September, 1994, to June, 1995, as part of the Site Inspection (SI) conducted by SAIC. The objective of the SI was to determine the presence or absence of contamination and the chemical nature of any detected contamination. The final SI Report, which was completed in June, 1996, identified 24 AREEs which required further investigation. In addition, four new AREEs were identified during site reconnaissance to warrant further investigation subsequent to the SI. AREEs that were determined to warrant further investigation were investigated as part of the Phase I or Phase II reuse area Remedial Investigation (RIs) and the Supplemental Remedial Investigation (SRI) conducted by ICF Kaiser Engineers, Inc. (ICF KE). The purposes of these reports were to evaluate: 1) the nature and extent of contamination; and 2) the level of risk posed to human health and the environment. The final RI Reports for the Phase I and II reuse areas were completed in April, 1998, and January, 1999, respectively. The draft SRI report was completed in November, 1998, and is currently undergoing regulatory review.

Sixteen AREEs and three other sites were identified in the SI, RIs, and SRI as having contamination which poses no unacceptable human health risks and/or significant adverse ecological effects:

- AREE 3 - Warehouse;
- AREE 5 - Environmental Photographic Interpretation Center (EPIC) Building;
- AREE 7 - Electrical Equipment Facility Pretreatment Tank;
- AREE 10 - Former Photographic Wastewater Lagoon;
- AREE 16-2 - Possible Firefighter Training Pit;
- AREE 17 - Dump # 3;
- AREE 18 - Grease Pit;
- AREE 20 - Incinerator Septic Tank and Leach Field;
• AREE 24 - Transformer Storage Area;
• AREE 25 - Sugar Tree;
• AREE 26 - Outdoor Wash Racks;
• AREE 29-1 - Salvage Yard;
• AREE 29-2 - Possible Sludge Disposal Area;
• AREE 29-3 - Possible Disposal Area;
• AREE 30 - Motor Pool;
• AREE 33 - Household Debris Pile;
• Site-Wide Groundwater;
• South Run at AREE 1 (Dump #1) and AREE 2 (Sewage Treatment Plant [STP]); and
• Other Site Drainages.

The locations of these AREEs are shown on Figure 2.

RESULTS OF THE REMEDIAL INVESTIGATION

The RIs for these sites were conducted to evaluate the nature and extent of contamination associated with past site activities. Environmental samples collected and analyzed during the RIs were used in conjunction with the results from the SI and the SRI to assess the condition of each of the areas. The environmental media investigated included surface soil (0 to 2 feet below ground surface [bgs]), subsurface soil (greater than 2 feet bgs), surface water, sediment, and groundwater. Analytical results were compared to background concentrations and regulatory screening levels to determine if environmental media had been adversely impacted by site activities. A brief description of each of the areas and the significant findings of the RIs, SRI, and SI are presented in the following paragraphs. A detailed presentation of the samples collected and the analytical results can be found in the final SI Report, final Phase I Reuse Area RI Report, final Phase II Reuse Area RI Report, and draft SRI Report now available in the information Repository at the Fauquier County Library.

AREE 3 - Warehouse

The Warehouse (Building 309) was used as a vehicle maintenance area from 1943 to 1967. Two sets of pits, which formerly were used for the hydraulic lifts and grease pit, were filled with concrete in 1967. The Warehouse may have been used for the temporary offloading of drums of oil, grease, solvent, paint, acid, and industrial organic chemicals. Three areas of possible contamination have been identified at the Warehouse: the hydraulic lift pit; the grease pit; and the outlet of a floor drain located at the south end of the building, in a former lavatory. Drain pipes from a sink and water fountain run underneath the floor into the floor drain. The overflow from the floor drain discharges to the field south of the Warehouse.

Surface soil sample were collected at the drain outlet; and subsurface soil samples were collected beneath the drain outlet, grease pit and hydraulic lifts. Benzo(a)pyrene, a polynuclear aromatic hydrocarbon (PAH), was detected in samples taken at the drain outlet at levels above the risk-based concentrations (RBC) established by the USEPA Region III for screening analytical results. Benzo(a)pyrene was detected above the residential soil RBC (0.087 parts per million [ppm]) in a surface soil sample at a concentration of 0.155 ppm, and above the industrial soil RBC (0.78 ppm) in a subsurface soil sample at a concentration of 2.9 ppm. Total petroleum hydrocarbon (TPH) was detected (25.9 to 40.5 ppm) below the State's TPH soil action level for underground storage tanks (USTs) of 100 ppm in soil samples collected underneath the hydraulic lifts. No contamination was observed in subsurface soil samples collected along the perimeter of the hydraulic lifts and the grease pit.
**AREE 5 — EPIC Building**

The EPIC Building was used for photographic operations from 1958 to 1995. From 1958 to 1968, wastewater generated during the photographic process was discharged from the building via a 6-inch industrial sewerline constructed of vitrified clay to the Former Photographic Wastewater Lagoon (AREE 10). In 1966, the first silver recovery units were installed for wastewater pretreatment. In 1968, the lagoon at AREE 10 was dredged to recover silver in the sediment and the filled. Wastewater was then diverted through the industrial sewerline directly into the western South Run tributary (WSRT). In 1973, an ion-exchange system was installed to remove cyanide, ammonia, phenols and silver from the photographic wastewater before being discharged through the industrial sewerline to WSRT. This practice continued until 1983 when the photographic wastewater was diverted to the VHFS STP. Leakage was suspected in the sewerline that carried the EPIC wastewater to AREE 10 and WSRT due to its age and the nature of the acidic wastewater.

The interior of the 2,700-foot sewerline at AREE 5 was inspected by closed-circuit television to reveal locations of cracks and other points where leakage would most likely occur. These locations were then selected for soil boring placement. Results from the subsurface soil samples collected near the sewerline did not show contamination from photographic wastewater. In order to characterize potential contamination from the sewerline, and effluent sample was collected at the outfall of the sewerline into WSRT. Effluent results indicated that silver exceeded the Ambient Water Quality Criteria (AWQC); however, the silver concentration was qualified with a B, indicating blank contamination. Based on the results of subsurface soil and sewerline effluent sampling and analysis, it does not appear that the EPIC sewerline has impacted subsurface soil or is an ongoing source of contamination to WSRT.

**AREE 7 — Electrical Equipment Facility Pretreatment Tank**

The Electrical Equipment Facility (Building 2400) was used for classified military activities associated with the Intelligence Materiel Management Center (IMMC) including black and white photo developing, metal etching, and graphics work from 1965 to 1995. In 1978, a concrete pretreatment tank containing a layer of rock and a layer of sand was installed to filter wastewaters generated in Building 2400 before discharging to the sanitary sewer. Wastes discharged to the pretreatment tank included chromic acid from metal etching, painting wastewater, and photographic wastewater (that was first neutralized in the neutralization pit). The floor drainage system also discharged spills of process chemicals and floor wash water from Building 2400 into the pretreatment tank between 1978 to 1990. Prior to 1978, the floor drains discharged directly to WSRT. The sand sludge removed from the pretreatment tank was disposed of in the Sludge Disposal Area (AREE 13) prior to 1981, and was managed as hazardous waste (based on chromium, silver, and lead content) off site starting in 1981. The pretreatment tank was closed in 1995, and no cracks in the concrete walls or stained soils were found when it was removed in 1997. The neutralization pit closed in May, 1990, and is being remediated according to the requirements of the Resource Conservation and Recovery Act (RCRA) under the purview of VDEQ.

Subsurface soil samples were collected around the perimeter of the pretreatment tank which indicated that operation of the pretreatment tank had not impacted the subsurface soil.

**AREE 10 — Former Photographic Wastewater Lagoon**

The Former Photographic Wastewater Lagoon was an earthen holding pond approximately 90 feet in diameter and 4-4.5 feet deep. Photographic wastewaters from the EPIC Building were discharged to the lagoon from 1958 to 1968. The photographic wastewater was acidic and contained significant amounts of silver and cyanide. The overflow from the lagoon discharged to WSRT. In 1968, flow problems developed in the lagoon, and it was dredged to recover silver from the sediments. The lagoon was then filled, and effluent was diverted directly to WSRT.

Subsurface soil samples were collected from within the area of the lagoon. The primary inorganics of concern, silver and cyanide, were not detected in the subsurface soil samples with the exception of one sample that contained silver well below the residential soil RBC. These results support the conclusion that most of the contaminated sediments from the former lagoon were removed during the 1968 dredging.
**AREE 16-2 — Possible Firefighter Training Pit**

The Firefighter Training Pit was used monthly by the VHFS Fire Department for training in the mid-1970s. The unlined pit was approximately 50 feet in diameter and 3 feet deep. During training activities, the pit was partially filled with petroleum and natural gas odorant and then ignited. Solvents and other combustible materials may have also been used in the pit. In the mid-1980s the pit was filled with ½-inch gravel.

TPH field screening of the soil at AREE 16-2 was conducted to delineate the area of contamination and to determine where soil samples should be collected for laboratory analysis. Surface and subsurface soil samples were collected based on positive TPH result from the field screening. Surface and subsurface soil samples collected AREE 16-2 contained arsenic at concentrations (up to 33.8 ppm) that exceeded its residential soil RBC (0.43 ppm) as well as its maximum background concentration (4.89 ppm to 5.4 ppm). Analytical results indicate that soils have not been adversely impacted by firefighter training activities.

**AREE 17 - Dump #3**

Dump #3 is a 318-foot by 390-foot area that has been in use since 1958 to dispose of compost materials and construction debris. Sludge from the STP and Former STP and small amounts of sandblasting waste containing lead paint from the Electrical Equipment Facility (AREE 7) also may have been disposed of in Dump #3.

Surface soil samples were collected at AREE 17. Minimal contamination due to pesticides and PAH was observed in the surface soil samples. The PAH benzo(a)pyrene (0.098 ppm - 0.632 ppm) was detected above its residential soil RBC (0.088 ppm) in the northern portion of AREE 17. The pesticide chlordane (1.36 ppm) was also found to exceed its residential soil RBC (0.49 ppm) at one sampling location. Arsenic (up to 19.5 ppm) exceeded its residential soil RBC (0.43 ppm) and maximum background concentration (4.89 ppm) at all surface soil locations sampled.

Test pits were excavated to locate buried debris, and subsurface soil samples were collected from the test pits to determine if the debris was contaminating the soil. Based on the results of the test pit sampling, the subsurface soils at AREE 17 have not been impacted by previous disposal activities at the site.

**AREE 18 - Grease Pit**

The grease pit was a 50-foot long by 2-foot wide by 4-foot deep trench used to dispose of kitchen grease, oily rags and possibly motor oil. The pit was covered with fill material in 1981 and has not been used since that time.

Surface and subsurface soil samples were collected at AREE 18. Manganese (3,100 ppm) and arsenic (10.1 ppm maximum) were the only analytes that exceeded both residential soil RBCs (1,800 ppm and 0.43 ppm, respectively) and maximum background concentrations (2,970 ppm and 4.89 ppm, respectively) in surface soil samples. In subsurface soil, arsenic (up to 14.7 ppm) was the only analyte to exceed both its residential soil RBC (0.43 ppm) and its maximum background concentration (5.4 ppm).

**AREE 20 - Incinerator Septic Tank and Leach Field**

The Incinerator (Building 282) was used from 1973 to 1985 to bum household and office garbage, and medical waste. Some hazardous wastes (e.g., solvents, pesticides, and waste oil) were also burned in the Incinerator. The Incinerator was temporarily closed from 1985 to 1987 for renovations. The Incinerator was operated for 4 months in 1987 until it was shut down permanently in July, 1987, when a series of explosions in the furnace damaged the structure. The Incinerator has its own septic system, which consists of a 500-gallon septic tank and a 135-foot leach field. The septic system is connected to the sinks and toilets in the Incinerator building. All floor washings were discharged to the septic system. Although there is no record of hazardous wastes having been disposed of in the septic system, any spills of liquid hazardous wastes inside the Incinerator building could have also discharged via the floor drains to the septic system.

Subsurface soil samples collected from the septic system leach field indicated that subsurface soils had not been impacted by the operation of the Incinerator septic system.
**AREE 24 - Transformer Storage Area**

AREE 24, the Transformer Storage Area, is located west of Building 272 in the engineering compound. It is an unbermed asphalt area that was used to store polychlorinated biphenyl (PCB) transformers (PCBs in oil greater than 500 ppm) and PCB-contaminated transformers (PCBs in oil between 50 and 500 ppm) before their removal by Aptus Environmental Services in 1990. The area is currently used for general storage of materials on pallets, including new "non-PCB" transformers. The area has also been used to store drums containing oil and fuel filters. No spills of transformer cooling oil were observed or recorded in this area.

Surface soil samples were collected for PCB field screening and laboratory analysis. PCBs were not detected during the field screening or subsequent laboratory analysis. TPH was detected below the State's TPH soil action level of 100 ppm in the laboratory samples. Evaluation of the field screening and laboratory analysis results indicate that surface soil has not been impacted from PCB transformer storage activities at AREE 24.

**AREE 25 - Sugar Tree**

AREE 25, Sugar Tree, is located in the northeastern portion of VHFS, just south of Route 215. AREE 25 is an area where small amounts of paint and solvents may have been disposed; however, no stressed vegetation or other evidence of contamination has been observed in the area. At one point a 200-gallon diesel aboveground storage tank (AST) was located in this area for approximately six months for vehicle fueling during construction of a sewage lift station.

Soil organic vapor (SOV) surveys and surface and subsurface soil sampling were conducted at AREE 25. These studies indicated minimal impact from possible disposal of paint and solvents. At the former location of the diesel AST, however, TPH-diesel (930 ppm) was detected in excess of the State's TPH soil action level for underground storage tanks (USTs) (100 ppm) in the duplicate surface soil sample sent to the laboratory. However, the primary surface soil sample and the duplicate surface soil sample were collected from different locations within a few inches of one another, and TPH was not detected in the primary sample. The large disparity in results of samples taken so closely to one another indicates that contamination is probably in the form of drops from the diesel tank rather than a diesel spill.

**AREE 26 - Outdoor Wash Racks**

The Outdoor Wash Racks area includes two automobile wash areas: one southeast of Building 161 (former wash racks); and one southwest of Building 161 (current wash racks). The current wash racks were constructed in April, 1982, to replace the former wash racks. Each current wash rack has 10-inch concrete berms to prevent run-off and a ramped entrance to prevent run-on. Drains from the current wash racks led to a grit chamber, which discharged effluent to the sanitary sewer. Drains from the former wash racks discharged to the surrounding soils. In February, 1992, the grit chamber and adjacent sewage lift station were steam cleaned and all fluids and sediments were disposed. These fluids and sediments contained motor oil, gasoline, antifreeze, and cleaning solution residues. The concrete sides of the grit chamber were in good condition with no cracks or leaks evident.

Surface soil samples were collected from around both the current and former wash racks. Samples at the current wash racks were collected in close proximity to the grit chamber and in areas where overflows from the wash racks would discharge if the drains to the grit chamber were clogged. Metals were detected at both locations at levels below background concentrations. TPH was detected in surface soil samples from the locations where run-off from the parking area and current wash racks could overflow at concentrations of 23.4 ppm and 11 ppm (slightly above the State’s TPH soil action level for USTs of 100 ppm).

**AREE 29-1 - Salvage Yard**

The Salvage Yard is located in the northwestern section of VHFS, near Route 652. It was active in the mid-1970s as a small fenced storage yard containing drums and debris. The ground in the enclosure was scarred and two mounds of material were identified in a 1977 aerial photograph. Aerial photographs from
1982 indicated that the facility had been removed. There has been no evidence, either by aerial photographs or from installation personnel, indicating that hazardous materials were released in this area.

Geophysical surveys and shallow test pit excavations conducted at AREE 29-1 identified assorted debris at the north-central edge of AREE 29-1. A subsurface soil sample was collected at the site of the buried debris which indicated that past storage practices and burial of Inert debris at the salvage yard have not impacted subsurface soil.

**AREE 29-2 - Possible Sludge Disposal Area**

The Possible Sludge Disposal Area is located near the northernmost boundary of VHFS, near Route 215. Scarred ground and a pile of gray material, possibly sludge, were identified in the area in 1977 and 1978 EPIC aerial photographs. The ground in the area is very uneven, indicating that material may have previously been piled on the ground.

Surface soil samples were collected from the area which indicated that the piles identified in the area have not impacted surface soil.

**AREE 29-3 - Possible Disposal Area**

The Possible Disposal Area is located southeast of the fixed ammunition magazine. WSRT flows just to the east of the area. Review of 1950 aerial photographs indicated possible disposal activities based on ground scarring and the presence of mounds of material and possible equipment. Review of 1958 photographs indicated that the area was revegetating and an ammunition storage building had been constructed nearby. Neither aerial photographs, site visits, nor discussions with installation personnel provided evidence that hazardous materials had been released in this area.

A geophysical survey was conducted to evaluate the potential for buried debris within the area. Test pits were excavated perpendicular to the magnetic anomalies. Subsurface soil samples collected from the test pits indicated that no soil contamination had occurred. Ground scarring observed in aerial photographs may be attributable to bedrock outcrops.

**AREE 30 - Motor Pool**

AREE 30 (Building 305) served as a motor pool for approximately 20 years. The building is now surrounded by asphalt; however, the asphalt parking lot was once gravel. According to VHFS personnel, vehicles were brought to the motor pool for maintenance and repair. Vehicle maintenance activities occurred on the gravel parking lot. A drainage grate is located at the eastern end of Building 305. In 1995, during repair of a gas line located adjacent to the drainage grate, a petroleum odor was observed in the soil surrounding the gas line.

Subsurface soil samples were collected in the area of the drainage grate. No contamination above screening levels was observed in the subsurface soil samples.

**AREE 33 - Household Debris Pile**

The Household Debris Pile is located southeast of the STP in a predominantly wooded and vegetated area. The debris pile contains items including, but not limited to, aluminum and tin cans, glass bottles, pots and pans, and bricks. A house known to exist in this approximate location in 1938 may have been the source of the debris. The pile consists of two small mounds approximately 2 feet high. The larger mound has a 15-foot diameter, and the smaller mound has a 14-foot diameter.

A test pit was excavated in the larger debris mound, and one subsurface soil sample was collected from the test pit. The PAH benzo(a)pyrene (1.86 ppm in the duplicate sample) was the only compound that exceeded its industrial soil RBC (0.78 ppm). The benzo(a)pyrene concentration (0.0001 ppm) in the primary sample did not exceed the industrial soil RBC.

**Site-wide Groundwater**

Site-wide groundwater was investigated to determine the character and composition of the aquifer, and to evaluate potential contamination at the various AREEs. Groundwater in the western and central portions of
VHFS generally flows to the north-northwest while groundwater flows toward the east. In the eastern portion of the facility, groundwater at VHFS was sampled from a total of 43 monitoring wells at 14 different AREEs and 5 other site locations during the Phase I reuse area RI, Phase II reuse area RI, and SRI sampling events.

During the Phase I and II reuse area RIs, the following significant findings resulted:

- **AREE 1 (Dump - #1)**: the pesticide aldrin (0.006 ppb) exceeded its tap water RBC (0.0039 parts per billion [ppb]), but a TPH plume identified during the SI was not confirmed;
- **AREE 2 (STP)**: the chlorinated volatile organic compounds (VOCs) bromodichloromethane (0.553 ppb) and chloroform (1.65 ppb) exceeded their tap water RBCs (0.17 ppb and 0.15 ppb, respectively) but were well below their Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs) (80 ppb and 80 ppb, respectively);
- **AREE 5 (EPIC Building Industrial Sewerline)**: hexachlorobutadiene (0.265 ppb) and hexachlorobenzene (2.08 ppb) exceeded their tap water RBCs (0.14 ppb and 0.0066 ppb, respectively);
- **AREE 9 (Vehicle Maintenance Area)**: benzene (9.43 ppb) exceeded its tap water RBC (0.36 ppb);
- **AREE 10 (Former Photographic Wastewater Lagoon)**: chlorinated VOCs exceeded tap water RBCs but not MCLs; and
- **AREE 28-5 (Former Service Station Abandoned USTs)**: benzene (1.2 ppb) exceeded its tap water RBC (0.36 ppb) but not its MCL (5 ppb).

It should be noted that the aldrin contamination at AREE 1, the chlorinated VOC contamination at AREE 2, the hexachloro-compound contamination at AREE 5, and the benzene contamination at AREE 9 were not confirmed during the SRI.

Bis(2-ethylhexyl)phthalate, a common field and laboratory contaminant, was detected in site and background samples above the tap water RBC. Bis(2-ethylhexyl)phthalate is believed to be an artifact of the low-flow sampling procedure and the sampling equipment used rather than a site-related contaminant.

Known areas of groundwater contamination at AREE 4 (Auto Craft Shop) and AREE 27 (AAFES Service Station) are currently undergoing corrective actions and, thus, have been segregated from site-wide groundwater.

**South Run at AREEs I and 2**

South Run is a small, Class III Virginia stream that begins in Fauquier County and flows northeast into Prince William County. South Run discharges into Lake Manassas, a recreational and drinking water reservoir built on Broad Run for the City of Manassas. AREE 1 (Dump #1) and AREE 2 (STP) are both located adjacent to South Run and are flanked by small tributaries that feed South Run. Seepage and run-off from AREE 1 and treated effluent discharged from the STP into South Run are possible sources of contamination.

Surface water and sediment samples were collected from South Run and its tributaries adjacent to AREEs 1 and 2 to determine the nature and extent of possible contamination. Dissolved copper and total iron were the only analytes detected above screening levels in the surface water samples, indicating that surface water has not been impacted by activities at AREEs 1 and 2. Metals, PAHs and pesticides exceeded their screening levels in the sediment samples. For example, the PAH anthracene and the pesticide chloradane (0.186 ppm and 0.213 ppm, respectively) exceeded their effects range-lows (ER-Ls) (0.085 ppm and 0.0005 ppm, respectively) in the sediment samples from South Run and its tributaries at AREEs 1 and 2. In addition, dioxins/furans, which do not have screening levels, were also detected in sediment samples.
Other Site Drainages

The other site drainages include the drainages in the northern portion of VHFS that remain dry throughout most of the year and only contain water immediately following storm events. Accordingly, these drainages are not expected to contain aquatic life except for a limited number of opportunistic species capable of withstanding periods of dryness. The surface water drainages at VHFS discharge to either South Run or Broad Run. Both South Run and Broad Run are likely to support aquatic invertebrates, amphibians, and several warm-water fish species.

Surface water samples were collected from the other site drainages during storm events to account for the possible movement of contaminants to downstream water bodies during storm events. During storm event sampling, total iron and aluminum exceeded AWQC and maximum background concentrations in most of the sample locations in the other site drainages. Aluminum (dissolved), zinc (total and dissolved), and cadmium (dissolved) were also found to exceed AWQC and maximum background concentrations at isolated spots within the other site drainages.

Sediment samples were also collected from the other site drainages. Metals, PAHs, and pesticides were detected at concentrations above screening levels. Arsenic exceeded its ER-L and maximum background concentration at nearly all of the sample locations. Zinc, chromium, iron, lead, and manganese were found in isolated samples above their ER-Ls and maximum background concentration. 2-methylnaphthalene (0.621 ppm), acenaphthene (0.911 ppm), anthracene (0.657 ppm), and pyrene (181 ppm) are a few of the PAHs that exceeded their ER-Ls (0.065 ppm, 0.15 ppm, 0.085 ppm, and 0.35 ppm, respectively). Pesticides exceeded their ER-Ls in samples collected near the headwaters of a drainage area in the southern portion of VHFS. Alpha-chlordane (0.034 ppm maximum), gamma-chlordane (0.025 ppm maximum), and chlordane (0.16 ppm maximum) exceeded their ER-Ls (0.005 ppm for each). Aldrin (0.0025 ppm), DDE (0.0051 ppm), and endrin (0.0072 ppm) also exceeded their ER-Ls (0.002 ppm, 0.002 ppm, and 0.00002 ppm, respectively).

HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

A Baseline Risk Assessment (BRA) was conducted as part of the RI to assess the human health and ecological problems that could result if the contamination at the AREEs and site-wide groundwater, South Run at AREEs 1 and 2, and other site drainages was not remediated. The Human Health Risk Assessment (HHRA) was prepared to evaluate the magnitude of potential adverse effects on human health associated with current and potential future (assuming residential development of the property) exposures to site-related chemicals at the sites addressed by this Proposed Plan. The Ecological Risk Assessment (ERA) was conducted to characterize the potential threats to ecological receptors posed by contaminants at the sites addressed by this Proposed Plan.

The HHRA follows a four-step process:

- **Selection of Chemicals of Potential Concern** - identifies the contaminants of potential concern based on their toxicity, frequency of occurrence, and concentration by comparing the maximum concentrations of detected chemicals with RBCs which are health-protective chemical concentrations that are back-calculated using toxicity criteria, a $1 \times 10^6$ target carcinogenic risk or a 0.1 hazard quotient (defined below), and conservative exposure parameters;

- **Exposure Assessment** - identifies the potential pathways of exposure, and estimates the concentrations of contaminants to which people may be exposed as well as the frequency and duration of these exposures;

- **Toxicity Assessment** - determines the toxic effects of the contaminants; and

- **Risk Characterization** - provides a quantitative assessment of the overall current and future risk to people from site contaminants based on the exposure and toxicity information.

The HHRA evaluated health effects which could result from exposure to soil, groundwater, surface water, and sediment contamination at sites addressed by this Proposed Plan. The HHRA evaluated potential risks
to current workers who could be exposed to contaminants in surface soil, and to current trespassers who could be exposed to contamination in surface soil, surface water, and sediment. In addition, the HHRA evaluated potential risks to hypothetical future adult residents who could be exposed to contaminants in groundwater and surface soil and to hypothetical future child residents who could be exposed to contaminants in groundwater, surface soil, surface water, and sediment. Potential risks to future excavation workers who could be exposed to contaminants in subsurface soil were also evaluated in the HHRA.

Potential carcinogenic (cancer-related) effects and noncarcinogenic effects (including various impacts on different organ systems, such as lungs, liver, etc.) were evaluated in the HHRA. Carcinogenic effects are expressed as the probability that an individual will develop cancer from exposure to the contaminants from each site. The evaluation of noncarcinogenic effects is based on the hazard index (HI), which is the summation of the hazard quotients for individual chemicals. The hazard quotient is a comparison of chemical-specific chronic exposure doses with the corresponding protective doses derived from health criteria. The USEPA recommends that remedial actions may be warranted at site where the carcinogenic risk to any person is greater than \(1 \times 10^{-4}\) or the HI is greater than 1. A carcinogenic risk of \(1 \times 10^{-4}\) means that there is a potential of one additional person in a population of 10,000 developing cancer from exposure to contaminants at a site if the site is not remediated. A HI greater than 1 indicates a potential for noncarcinogenic health effects if the site is not remediated.

The ERA also follows a four-step process:

- **Problem Formulation** - develops information that characterizes habitats and potentially exposed species and identifies contaminants of concern, exposure pathways, and receptors;
- **Exposure Assessment** - estimates exposure point concentrations for selected indicator species;
- **Ecotoxicologic Effects Assessment** - identifies concentrations or doses of contaminants that are protective of indicator species; and
- **Risk Characterization** - estimates potential adverse effects from exposure to contaminants based on exposure and toxicity information.

The ERA evaluated ecological effects which could result from exposure to surface soil, surface water, and sediment contamination at the sites addressed by this Proposed Plan. The ERA evaluated potential adverse ecological effects to terrestrial plants and terrestrial invertebrates (represented by earthworms) exposed to contaminants in surface soil. In addition, potential adverse ecological effects to mammals (represented by shrews) and birds (represented by robins) through bioaccumulation in the food web and exposure to contaminants in surface soil were evaluated. Potential adverse ecological effects to aquatic life from exposure to contaminants in surface water and sediment were also evaluated in the ERA. Further, the potential adverse ecological effects to mammals (represented by minks) and birds (represented by herons) through bioaccumulation in the food web and exposure to contaminants in sediment were evaluated for South Run at AREEs 1 and 2.

The evaluation of significant potential adverse ecological effects is based on the Environmental Effects Quotient (EEQ). The EEQ is the ratio of the estimated exposure concentrations/doses for the chemicals of potential concern and the toxicity reference values (TRVs) for the ecological receptors. If the EEQ is greater than 1, there is a potential for adverse ecological effects to occur. As the magnitude of the EEQ becomes greater than 1, the potential for adverse ecological effects becomes more significant.

The results of the BRA for the sites addressed by this Proposed Plan are presented in the following paragraphs. A detailed presentation of the BRA can be found in the final SI Report, final Phase I Reuse Area RI Report, and final Phase II Reuse Area RI Report now available in the Information Repository at the Fauquier County Library.

**AREE 3 - Warehouse**

The HHRA concluded that, under both current and future land-use conditions, the risks to workers, trespassers, residents, and excavation workers are acceptable for exposure to site-related contaminants at AREE 3. The highest estimated upper-bound excess lifetime cancer risk \((6 \times 10^{-6})\) is for child residents.
exposed to contaminants in surface soil by incidental ingestion, and the highest noncarcinogenic risk (HI=2) is for child residents exposed to contaminants in surface soil by incidental ingestion. Although the HI associated with incidental ingestion exposures by child residents exceeded 1, inorganic compounds that were statistically determined to be within background levels accounted for the exceedance. The ERA determined that contaminants in surface soil at AREE 3 did not pose significant potential adverse ecological effects. Based on these results, no further action is recommended at AREE 3.

**AREE 5 - EPIC Building**

No surface soil samples were collected at AREE 5, so the HHRA only evaluated risks to future excavation workers. The highest estimated upper-bound excess lifetime cancer risk (2X10^{-6}) and the highest noncarcinogenic risk (HI=2) are for incidental ingestion of contaminated subsurface soils by excavation workers. Although the HI associated with incidental ingestion exposures by excavation workers exceeded 1, inorganic compounds that were statistically determined to be within background levels accounted for the exceedance. An ERA was not conducted for soil because surface soil data were not available. No chemicals of potential concern were selected from the results of the sewerline effluent sampling so neither a HHRA or an ERA was completed. Based on these results, no further action is recommended at AREE 5.

**AREE 7 - Electrical Equipment Facility Pretreatment Tank**

A streamlined risk assessment was conducted for current and future land uses at AREE 7. Human health risks were calculated only for the incidental ingestion pathway. The highest estimated upper-bound excess lifetime cancer risk (5X10^{-6}) is for child residents exposed to contaminants in soil through incidental ingestion, and the highest noncarcinogenic risk (HI=2) is for child resident exposures to contaminants in soil via incidental ingestion. Although the HI associated with incidental ingestion exposures by child residents exceeded 1, inorganic compounds that were statistically determined to be within background levels accounted for the exceedance. An ERA was not conducted as part of the streamlined risk assessment. Based on these results, no further action is recommended at AREE 7.

**AREE 10 - Former Photographic Wastewater Lagoon**

No surface soil samples were collected at AREE 10, so the HHRA only evaluated risks to future excavation workers. The highest estimated upper-bound excess lifetime cancer risk (6X10^{-6}) is for excavation workers exposed to contaminants in subsurface soil by dermal absorption, and the highest noncarcinogenic risk (HI=0.9) is for excavation workers exposed to contaminants in subsurface soil by incidental ingestion. No ERA was conducted at AREE 10 because all samples were collected at depths of greater than 6 inches. Based on the results of the HHRA, no further action is recommended at AREE 10.

**AREE 16-2 - Possible Firefighter Training Pit**

The HHRA determined that site-related contamination at AREE 16-2 does pose an unacceptable human health risk under either current or potential future land-use conditions. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (6X10^{-5}) is for child residents exposed to contaminants in surface soil by dermal absorption, and the highest noncarcinogenic risk (HI=0.9) is for excavation workers exposed to contaminants in subsurface soil by incidental ingestion. The ERA determined that surface soil at AREE 16-2 does not pose significant potential adverse ecological effects. Based on these results, no further action is recommended at AREE 16-2.

**AREE 17 - Dump #3**

The HHRA concluded that under both current and future land-use conditions, the risks to workers, trespassers, residents, and excavation workers are acceptable for exposure to contaminants. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (9X10^{-5}) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion and for excavation workers exposed to contaminants in subsurface soil by incidental ingestion. The ERA
determined that surface soil at AREE 17 does not pose significant potential for adverse ecological effects. Based on these results, no further action is recommended at AREE 17.

**AREE 18 - Grease Pit**

The HHRA determined that, under both current and potential future land-use conditions, site-related contamination at AREE 18 does not pose an unacceptable human health risk. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (2X10^{-5}) is for child residents exposed to contaminants in surface soil by incidental ingestion, and the highest noncarcinogenic risk (HI=0.9) is for excavation workers exposed to contaminants in subsurface soil by incidental ingestion. The ERA determined that exposure to site-related contaminants at AREE 18 does not pose significant potential for adverse ecological effects. Based on these results, no further action is recommended at AREE 18.

**AREE 20 - Incinerator Septic Tank and Leach Field**

A streamlined risk assessment was conducted for current and future land uses AREE 20. Risks were calculated only for the incidental ingestion pathway. The highest estimated upper-bound excess lifetime cancer risk (7X10^{-6}) and noncarcinogenic risk (HI=0.7) were calculated for child residents exposed to contaminants in soil through incidental ingestion. The streamlined risk assessment did not include an ERA. Based on these results, no further action is recommended for the AREE 20 septic tank and leach field.

**AREE 24 - Transformer Storage Area**

The HHRA concluded that, under both current and future land-use conditions, the risk to workers, trespassers, and residents are acceptable for exposure to site-related contaminants in surface soil. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest upper-bound excess lifetime cancer risk (1X10^{-5}) is for child residents exposed to contaminants in surface soil by incidental ingestion, and the highest noncarcinogenic risk (HI=0.9) is for adult residents exposed to contaminants in surface soil by dermal absorption. The ERA determined the surface soil at AREE 24 poses no significant potential for adverse ecological effects. Based on these results, no further action is recommended at AREE 24.

**AREE 25 - Sugar Tree**

Since TPH is not evaluated in either the HHRA or the ERA, and no other chemicals of potential concern were identified, no unacceptable risk was determined due to contaminants at AREE 25. Based on the BRA and the fact that only one sample of a duplicate pair was found to contain TPH above the State's TPH soil action for USTs, no further action is recommended at AREE 25.

**AREE 26 - Outdoor Wash Racks**

Streamlined risk assessments were conducted for current and future land uses at both the current and former wash racks at AREE 26. Risks were calculated only for the incidental ingestion pathway. The highest upper-bound excess lifetime cancer risk (1X10^{-5}) and noncarcinogenic risk (HI=1) were calculated for child residents exposed to contaminants in surface soil at the current wash racks. The streamlined risk assessment did not include an ERA. Based on these results, no further action is recommended at AREE 26.

**AREE 29-1 Salvage Yard**

No chemicals of potential concern were identified in the subsurface soil sample at AREE 29-1; therefore, the HHRA determined no unacceptable human health risk from exposure to contaminants in subsurface soil. An ERA was not completed because the AREE 29-1 sample was collected at a depth greater than 6 inches, thus eliminating the potential for exposure to ecological receptors. Based on these results, no further action is recommended at AREE 29-1.
**AREE 29-2 - Possible Sludge Disposal Area**

The HHRA determined that site-related contamination in surface soil at AREE 29-2 does not pose unacceptable human health risks under either current or potential future land-use conditions. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (6X10⁻⁶) is for child residents exposed to contaminants in surface soil by incidental ingestion, and the highest noncarcinogenic risk (HI=0.3) are for child residents exposed to site-related contaminants in surface soil by incidental ingestion and dermal absorption. The ERA found no significant potential for adverse ecological effects from surface soil at AREE 29-2. Based on these results, no further action is recommended at AREE 29-2.

**AREE 29-3 - Possible Disposal Area**

The results of the HHRA indicated that, under both current and future land-use conditions, the risk to workers, trespassers, residents, and excavation workers are acceptable for exposure to site-related contaminants. Discounting naturally-occurring metals that were statistically determined to be within background levels, the highest estimated upper-bound excess lifetime cancer risk (8X10⁻⁵) is for child residents exposed to contaminants in surface soil by dermal absorption, and the highest noncarcinogenic risk (HI=0.9) is for excavation workers exposed to contaminants in subsurface soil by incidental ingestion. An ERA was not conducted because all soil samples were collected at depths greater than 6 inches. Based on these results, no further action is recommended at AREE 29-3.

**AREE 30 - Motor Pool**

Only subsurface samples were collected at AREE 30; therefore, an ERA was not conducted, and human health risks were only evaluated for future excavation workers. All analytes were detected below their screening levels and were eliminated as chemicals of potential concern such that risks to excavation workers were determined to be acceptable. Based on these results, no further action is recommended at AREE 30.

**AREE 33 - Household Debris Pile**

Only subsurface soil was sampled at AREE 33; therefore, an ERA was not conducted, and human health risks were only evaluated for future excavation workers. The highest estimated upper-bound excess lifetime cancer risk (9X10⁻⁷) is for excavation workers exposed to contaminants through incidental ingestion of subsurface soil. No noncarcinogenic risks were estimated because no noncarcinogenic chemicals of potential concern were identified. Based on these results, no further action is recommended at AREE 33.

**Site-Wide Groundwater**

Risk associated with exposure to site-related contaminants in site-wide groundwater were only evaluated for future residents. An ERA was not conducted for groundwater. Discounting naturally-occurring metals that were statistically determined to be within background levels, the highest estimated upper-bound excess lifetime cancer risk (7X10⁻⁴) is for adult residents exposed to contaminants in site-wide groundwater by dermal absorption, and the highest noncarcinogenic risk (HI=10) is for child residents exposed to contaminants in site-wide groundwater by dermal absorption. The contaminant that drove these unacceptable human health risks is bis(2-ethylhexyl)phthalate. Bis(2-ethylhexyl)phthalate is a common laboratory and field contaminant that was detected in the majority of the on-site and background groundwater samples (i.e., is not site-related); therefore, remediation of the site-wide groundwater is not recommended based on the results of the HHRA.

**South Run at AREEs 1 and 2**

The HHRA determined that site-related contamination in the sediment and surface water of South Run at AREEs 1 and 2 does not pose unacceptable human health risks under either current or future land-use conditions. Cancer risks were not estimated for exposure to surface water in South Run at AREEs 1 and 2 because no carcinogenic chemicals of potential concern were identified. The highest noncarcinogenic risk (HI = 0.004) associated with surface water in South Run at AREEs 1 and 2 were for child resident
exposure by dermal absorption. For sediment in South Run at AREES 1 and 2, the highest estimated upper-bound excess lifetime cancer risk (1x10^-6) is for child residents exposed to contaminants in sediment by incidental ingestion, and the highest noncarcinogenic risk (HI=9) is for child residents exposed to contaminants in sediment by incidental ingestion. Although the HI associated with incidental ingestion exposures to sediment in South Run at AREES 1 and 2 by child residents exceeded 1, the exceedance was driven by metals believed to be naturally occurring.

Results of the ERA for surface water in South Run at AREES 1 and 2 indicate very little potential for adverse effects to aquatic life from the presence of chemicals in surface water. The ERA determined that there is potential for adverse effects to heron (EEQ = 19) and mink (EEQ = 54) from selenium in sediment from South Run at AREES 1 and 2; however, the adverse effects are limited because selenium was only detected in one sediment sample. The greatest potential for adverse effects to benthic organisms is in the tributaries to South Run at AREES 1 and 2 due to dioxin/furan congeners (primarily OCDD [EEQ = 57]) and pesticides (primarily chlordane [EEQ = 30] and DDT [EEQ = 15]); however, adverse effects would be limited by the limited aquatic habitat provided by these small tributaries.

Based on these results, no further action is recommended for South Run at AREES 1 and 2.

Other Site Drainages

The HHRA determined that contamination in the sediment of the other site drainages does not pose an unacceptable human health risk under either current or potential future land-use conditions. Human health risks associated with surface water in the other site drainages were not evaluated because these water bodies only contain flowing water during storm events thus limiting the potential for exposure. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (4x10^-5) is for child residents through incidental ingestion of site-related contaminants in sediment in the other site drainages. The highest noncarcinogenic risk (HI = 1) is for child residents exposed to site-related contaminants in sediment in the other site drainages through incidental ingestion.

The ERA determined that the contaminants in the surface water and sediments of the other site drainages do not pose significant potential for adverse ecological effects to aquatic life.

Based on these results, no further action is recommended for the other site drainages.

PREFERRED ALTERNATIVE

No further action is recommended by the U.S. Army as the preferred alternative for AREES 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-3, 30, and 33; site-wide groundwater; South Run at AREES 1 & 2; and other site drainages because these sites do not pose unacceptable human health or ecological risks. The estimated cost to implement this alternative is $0.
ATTACHMENT 4

PUBLIC NOTICE
The United States Army
at Vint Hill Farms Station, Virginia
Invites Public Comment ON RECENTLY PROPOSED ENVIRONMENTAL ACTIONS FOR VINT HILL FARMS STATION, AS A RESULT OF THE BASE CLOSING PROGRESS.

PURPOSE

TO DISCUSS AND PROVIDE FEEDBACK ON SEVERAL PROPOSED ALTERNATIVES AND NO ACTION Options INDICATED FOR THE Sites DISCUSSED BELOW

BACKGROUND

Vint Hill Farms Station is one of the Department of Defense's largest Intelligence Community (IC) facilities in Virginia. The site contains numerous buildings and facilities dedicated to the storage, processing, and dissemination of classified information. The site is located on a rolling landscape of approximately 320 acres, with a significant portion of the property used for research and development activities.

The buildings and facilities at VHS include high-security bunkers, communication towers, and other structures that have been designated as sensitive compartmented information systems (SCIs) for the storage and dissemination of classified information. The site is also home to a number of classified communication systems and networks that are integral to the nation's defense and intelligence operations.

SUMMARY

The U.S. Army, in coordination with the U.S. Environmental Protection Agency (EPA), is proposing remediation actions at VHS, which includes the demolition, removal, and disposal of certain facilities and structures. The proposed actions are being considered as a result of the closure of the station and the transfer of its assets to other entities. The proposed actions are intended to address environmental concerns and ensure that the site is ready for reuse.

The U.S. Army is proposing remediation actions at the following locations:

- **AARES 3** - Warehouse Building
- **AARES 6** - Environmental Action Page
- **AARES 7** - Electrical Equipment Facility
- **AARES 10** - Former Photographic Material Lagoon
- **AARES 11** - Sludge Disposal Area
- **AARES 13** - Gravel Pile
- **AARES 14-1** - Possible Firefighter Training Pit
- **AARES 14-2** - Possible Firefighter Training Area
- **AARES 15** - Dump 2
- **AARES 18** - Grease Pit
- **AARES 20** - Incinerator Building
- **AARES 25** - Transformer伯特

Additionally, the U.S. Army is proposing no further action at the following areas:

- **AARES 9** - Incinerator Building
- **AARES 26** - Transformer伯特

The U.S. Army will be accepting comments during a 30-DAY PUBLIC COMMENT PERIOD, which begins Thursday, April 11, and ends Friday, April 25, 1992.

WRITTEN COMMENTS MAY BE SUBMITTED TO THE FOLLOWING ADDRESS:

Kevan Bell, Public Affairs Officer
Vint Hill Farms Station
Building 746, River Road
Warrenton, VA 20187

PROPOSAL

VHS has evaluated four remedial alternatives to address soil contamination at AARES 1:

ALTERNATIVE A: No Action
ALTERNATIVE B: Excavation of Lagoon
ALTERNATIVE C: Clay Cap
ALTERNATIVE D: Liner Cap

Based on available information, VHS prefers Alternative B, which consists of excavating the lagoon and disposing of the excavated material off-site. This alternative is preferred because it removes the contaminated soil from the site and prevents any future contamination of the site. The alternative also minimizes the potential for long-term contamination and ensures that the site is ready for reuse.

ALTERNATIVE E: No Action

Based on available information, VHS prefers Alternative E, which consists of the demolition and disposal of the facilities at AARES 20. This alternative is preferred because it removes the contaminated material from the site and prevents any future contamination of the site. The alternative also minimizes the potential for long-term contamination and ensures that the site is ready for reuse.

IN ADDITION, VHS prefers no further action for AARES 2, 6, 7, 10, 13, 14, 16-1, 16-2, 17, 18, 20, 24, 25, 28, 29-1, 29-2, 29-3, 29-4, 29-5, 29-6, 30-1, 30-2, and the groundwater underlying the lagoons. The action is expected to occur in 1992, and the property will be made available for development at that time.

FOR MORE INFORMATION

You can review the Proposed Plan and related technical documents at the Information Repository at the following location:

Warrenton County Library
Warrenton Branch - Reference Section
11 W. Main Street
Warrenton, VA 20187
Phone: (540) 414-7776

Open: M-Th 9:30 a.m. - 9 p.m., Fri-Sat 9 a.m. - 5 p.m., and Sun 1 p.m. - 5 p.m.
ATTACHMENT 6

WRITTEN COMMENTS FROM REGULATORS AND U.S. ARMY RESPONSES
After mailing recent Proposed Plans to the public, the U.S. Army received comments on the Proposed Plans from the U.S. Environmental Protection Agency (USEPA) and the Virginia Department of the Environment (VDEQ). In an ongoing effort to solicit the public's input on the proposed environmental actions at Vint Hill Farms Station (VHFS), the U.S. Army is distributing our responses to comments from USEPA and VDEQ to the public. Please note that the comments that are agreed to by the U.S. Army will be incorporated into the Decision Documents for the affected sites.

**Response to Comments on the Proposed Plans for Vint Hill Farms Station from USEPA Region III**

**AREEs 13, 14, 16-1, 27 AND 29-4**

**Comment 1.** Introduction 1st sentence, “to address contaminated soil”

**Comment:** Delete “contaminated soil” so the sentence reads “alternative to address selected Areas Requiring …

**Response:** The U.S. Army agrees with this suggested wording change.

**Comment 2.** Page 2, Site Background 3rd & 4th paragraphs “currently undergoing regulatory review” and “having soil contamination which poses no unacceptable”.

**Comment:** If the report is still being reviewed, how can we rely on a report conclusion about risk?

**Response:** The SRI was conducted to fill data gaps identified in the RIs (e.g., the extent of the AREE 1 landfill). The SRI does not include risk assessment. All risk conclusions were made based on the RIs.

**Comment 3.** Page 5, AREE 13 description, 1st paragraph, “In 1982 total metals were determined “and” In 1992 the area was closed …”

**Comment:** (1982) By whom? Any regulator involvement? (1992) By regulator or Army decision to stop?

**Response:** Based on available knowledge. AREE 13 was not regulated; therefore, decisions to spread sludge and later to remove the sludge and close the disposal area were presumably made by the U.S. Army.

**Comment 4.** Page 5, AREE is description, 2nd paragraph.

**Comment:** As part of RI?

**Response:** Samples at AREE 13 were collected during the SI and the RI.

**Comment 5.** Page 5, AREE 14 description, 2nd paragraph

**Comment:** Nothing in the hit zone?

**Response:** The lead concentrations in the Hit Zone did not exceed the USEPA screening level for lead in residential soil of 400 ppm.

**Comment 6.** Page 5, AREE 16, description title

**Comment:** Why “possible” in heading but not text?
Response: Site history indicated that a Firefighter Training Pit was used at VHFS; however, the exact location of the pit is not known with certainty. AREEs 16-1 and 16-2 represent two possible locations of the Firefighter Training Pit.

Comment 7. Page 5, AREE 27 description, 1st paragraph, 4th line
Comment: Discharges or discharged?
Response: Discharges.

Comment 8. Page 6, 1st full paragraph
Comment: Mentions arsenic and lead but what about chromium (see page 9)?
Response: The contaminant assessment focused on contaminants that were a potential concern by themselves, while the baseline risk assessment (BRA) evaluated contaminants in combination to determine if they were potential concern. Chromium in combination with cadmium was identified as a potential concern for impacts to the kidneys in the BRA.

Comments 9. Page 6, AREE 29-4 description 1st paragraph last sentence
Comment: Should stored be disposed?
Response: Yes.

Comments 10. Page 8, AREE 13 description
Comment: Current or future potential land-use conditions ... What are these? Maybe say “current industrial/commercial use or potential future residential use conditions”, or unrestricted future land use conditions.
Isn't iron naturally occurring? If so, why wasn't it discounted?
Response: Current land use conditions are based on the current usage of the VHFS property, therefore, it would be appropriate to say “current industrial/commercial use conditions”. Plans for future use of the VHFS property have not yet been finalized. It was conservatively assumed that residents would inhabit the VHFS property in the future, therefore, it would be appropriate to say “potential future residential use conditions”.

Yes, iron is naturally occurring. However, when AREE 13 site Iron concentrations and background Iron concentrations were statistically compared, iron was not determined to be within background concentrations. This is why iron was not discounted initially. As discussed in the Proposed Plan, a closer look at the subsurface soil type present at AREE 13 supports the conclusion that the iron is naturally occurring.

Comment 11. Page AREE 14 description
Comment: Current and future land-use conditions ... What are these?
Response: See response to Comment 10.

Comment 12. Page 8 AREE 14 description 4th paragraph
Comment: “Soil in those ... was excavated. “Removed and disposed off site?
Response: Yes, the excavated soil was removed and disposed off site.
ATTACHMENT 5

PUBLIC MEETING ROSTER
Recently Proposed Environmental Actions
for Vint Hill Farms Station, as a Result of
the Base Closure Process

If you wish to speak, please sign in on the lines below. Your name will be called in the order that it appears. Thank you.

<table>
<thead>
<tr>
<th>NAME</th>
<th>ADDRESS</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>Nora Zimps</td>
<td>The IT Group, Greensboro, NC</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>W Steven Huff</td>
<td>THE IT GROUP, EDGEMOD, MD 20480</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Frank Spacie</td>
<td>COUNTY COURT REMATERS</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Wayne Phillips</td>
<td>VHFS - DynCorp</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Joseph Phelan</td>
<td>COE - BALTIMORE</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Lawrence Smith</td>
<td>HR, US Army Comm-Electronics Command</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Kevin Bell</td>
<td>CENTRONIC Force - VHFS</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Frank Graziano</td>
<td>HQ US Army Materiel Command</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Pat Wolfe</td>
<td>VINT HILL EOD</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Steve Mihalco</td>
<td>DEQ</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Bob Stroud</td>
<td>EPA - Region III 1650 Arch St. Philadelphia, PA 19103</td>
<td>Yes</td>
<td>Yes</td>
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Recently Proposed Environmental Actions for Vint Hill Farms Station, as a Result of the Base Closure Process

If you wish to speak, please sign in on the lines below. Your name will be called in the order that it appears. Thank you.

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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Mary Noel McMillan</td>
<td>7206 North Star Crest Drive 30501</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>William McMillan</td>
<td>7206 N Star Crest Drive, Warrenton</td>
<td></td>
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<tr>
<th>Comment 13. Page 9 AREE 16-1 description</th>
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<tr>
<td><strong>Comment:</strong> Current and future land-use conditions ... What are these?</td>
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<tr>
<td><strong>Response:</strong> See response to Comment 10.</td>
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<tr>
<th>Comment 14. Page 9 AREE 16-1 description 1st sentence</th>
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<tr>
<td><strong>Comment:</strong> “contaminants” ... Are you referring to arsenic, TCDD?</td>
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<tr>
<td><strong>Response:</strong> Yes.</td>
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<tr>
<th>Comment 15. Page 9 AREE 27 description</th>
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<tbody>
<tr>
<td><strong>Comment:</strong> Current and future land-use conditions ... What are these? Chromium not mentioned on page 6. What about arsenic?</td>
</tr>
<tr>
<td><strong>Response:</strong> See response to Comment 10. See response to Comment 8 regarding chromium. Arsenic was not a risk driver at AREE 27.</td>
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<thead>
<tr>
<th>Comment 16. Page 9 AREE 27 description 1st paragraph last sentence</th>
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<tbody>
<tr>
<td><strong>Comment:</strong> “Therefore, the HI of 1.3 ... “ instead of “therefore a HI of 1.3 ... “</td>
</tr>
<tr>
<td><strong>Response:</strong> The U.S. Army agrees with this suggested wording change.</td>
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<tr>
<th>Comment 17. Page 9, AREE 27 description 2nd paragraph</th>
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<tbody>
<tr>
<td><strong>Comment:</strong> Start the sentence form “lead contamination” and insert “explained in the AREE 14 discussion” after IEUBK Model.</td>
</tr>
<tr>
<td><strong>Response:</strong> The U.S. Army agrees with this suggested wording change.</td>
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<tr>
<th>Comment 18. Page 9 AREE 29-4 description</th>
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<tbody>
<tr>
<td><strong>Comment:</strong> Current of future land-use conditions ... What are these?</td>
</tr>
<tr>
<td><strong>Response:</strong> See response to Comment 10.</td>
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<tr>
<th>Comment 19. Page 9, AREE 29-4 description4th line exposed to contaminants”</th>
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</thead>
<tbody>
<tr>
<td><strong>Comment:</strong> Are you referring to aluminum, benzo(a)pyrene, beryllium, arsenic, and iron?</td>
</tr>
<tr>
<td><strong>Response:</strong> The text is referring to any contaminant identified as a chemical of potential concern that was not determined to be naturally-occurring. Benzo(a)pyrene and aluminum are the only two contaminants that meet these criteria.</td>
</tr>
</tbody>
</table>

**AREEs 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33, and Site-wide Groundwater, South Run at AREEs 1&2, and Other Site Drainages**

<table>
<thead>
<tr>
<th>Comments 20. General</th>
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<tbody>
<tr>
<td><strong>Comment:</strong> Is this a No further Action or No Action Proposal?</td>
</tr>
<tr>
<td><strong>Response:</strong> No Action.</td>
</tr>
</tbody>
</table>
Comment 21. Introduction 1st sentence, “to address contamination at”

Comment: Delete “contamination at” so the sentence reads “alternative to address selected Areas Requiring ... “

Response: The U.S. Army agrees with this suggested wording change.

Comment 22. Page 2, Site Background 3rd & 4th paragraphs currently undergoing regulatory review” and having contamination which poses no unacceptable”.

Comment: If the report is still being reviewed, how can we relay on a report conclusion about risk?

Response: See response to Comment 2.

Comment 23. Page 2, Site Background

Comment: I’m concerned because we can’t necessarily say that property is okay for unrestricted future use. In which case, we’ll need institutional controls, a remedy. See AREE-specific comments below.

Response: See response to AREE-specific comments below. Based on these responses, unrestricted future use is okay.

Comment 24. Page 4 AREE 3 description 3rd sentence

Comment: “The Warehouse also may have been ... “instead of “The Warehouse may have been ...”

Response: The U.S. Army agrees with this suggested wording change.

Comment 25. Page 4 AREE description 2nd paragraph

Comment: What about residential risk? Consider a scenario where the property is reused as residential and trees are planted, with the tree pits dug below 2 ft bgs. Subsurface soil could then sit at the surface and be consumed by a child.

Response: The U.S. Army’s understanding of USEPA’s position is that soil below 2 ft bgs only needs to satisfy target risk levels for excavation workers and not residents since residents would be unlikely to be exposed to subsurface soils. In addition, the concentrations of contaminants currently present in subsurface soil would not be representative of the concentrations that might be present if landscaping activities were to occur which could involve mixing of subsurface soils with surface soil, clean topsoil, and other soil amendments. Therefore, it would not be appropriate to evaluate risk to residents using available subsurface soil data.

Comments 26 page 6 AREE 7 description 1st paragraph last sentence

Comment: Aree 7 will need to be closed under RCRA by VDEQ before FOST/transfer.

Response: The U.S. Army understands the requirement for clean closure of AREE 7 by VDEQ before a final No Action decision can be made. A closure report has been submitted to VDEQ, and approval is pending.

Comment 27 page 6 AREE 10 description is paragraph 4th sentence

Comment: How was the overflow form the lagoon discharged? Via earthen trench? Pipe?

Response: The lagoon and WSRT were connected naturally. The lagoon overflowed directly into WSRT.
Comment 28. Page 6 AREE 10 description 2nd paragraph

Comment: What about sampling of the surface soil around the lagoon?
Response: The lagoon was dredged and backfilled such that any residual contamination would be present at the base of the former lagoon (i.e., 4-4.5 ft bgs) and not at the soil surface.

Comment 29. Page 7 AREE 16-2 description title

Comment: Why is it the “Possible” Firefighter Training Pit?
Response: See response to Comment 6.

Comment 30. Page 7, AREE 16-2 description, 2nd paragraph, 2nd sentence “Surface and subsurface soil ... “

Comment: AREE 16-1 only discusses surface soils. Was the sampling different for the two AREEs?
Response: Soil samples at AREE 16-1 could not be collected at depths below 2 ft bgs because bedrock was encountered.

Comment 31. Page 7 AREE 16-2 description, 2nd paragraph, “maximum background concentration (4.89 ppm to 5.4ppm)”

Comment: The AREE 16-1 text doesn't give this range.
Response: A range of maximum background arsenic concentrations is given for AREE 16-2 and not AREE 16-1 because both surface soil and subsurface soil samples were collected at AREE 16-2, while only surface soil samples were collected at AREE 16-1 (see response to Comment 30.)

Comment 32. Page 7 AREE 16-2 description 2nd paragraph last sentence

Comment: Explain how analytical results indicate that soils have not been adversely impacted? Is it because only arsenic was found and not dioxins/furans? Then where does the arsenic come from?
Response: Soils have not been impacted because arsenic was the only contaminant that exceeded screening levels at AREE 16-2, and the arsenic concentrations at AREE 16-2 were determined to be statistically within background levels.

Comment 33. Page 7, AREE 17 description 1st paragraph

Comment: How deep is the dump? Is it unlined?
Response: Based on observations made during test pot excavation, the dump extends to depths up to 7ft in some areas. The dump is unlined.

Comment 34. Page 7, AREE 17 description 1st paragraph ... and small amounts sandblasting waste containing lead paint.

Comments: Are there any elevated lead levels?
Response: No.

Comment 35. Page 7 AREE 17 description 3rd paragraph

Comment: Is groundwater contamination a concern?
Response: No.

Comment 36. Page 9, AREE 29-1 description

Comment: were hazardous materials stored in the “Salvage Yard”?

Respond: To the U.S. Army’s best knowledge, no.

Comment 37. Page 9, AREE 29-2 description

Comment: What about the sludge piles themselves?

Response: Based on review of aerial photography, there was a possibility that AREE 29-2 may have been used as a sludge disposal area. However, during sampling, there was no sludge present.

Comment 38. Page 9, AREE 29-3 description

Comment: Were hazardous materials stored at the “Possible Disposal Area”?

Response: To the U.S. Army’s best knowledge, no.

Comment 39. Page 9, AREE 30 description, 1st paragraph

Comment: “a petroleum odor was detected” instead of “a petroleum odor was observed”.

Response: The U.S. Army agrees with this suggested wording change.

Comment 40. Page 9, AREE 30 description, 2nd paragraph last sentence

Comment: “No containment above screening levels...” What were the screening levels?

Response: USEPA Region III risk-based concentrations (RBCs), the USEPA screening level for lead in residential soil, Virginia’s TPH soil action level, and maximum background concentrations.

Comment 41. Page 9, AREE 33 description 2nd paragraph

Comment: Industrial soil RBCs were used as the screening levels. Why not residential (subsurface) RBCs?

Response: Industrial soil RBCs were used to screen soil results at AREE 33 because the soil sample was collected from greater than 2 ft bgs (i.e., excavation workers are the most likely human receptor). Also, see response to Comment 25.

Comment 42. Page 9, Site-wide Groundwater description 1st sentence

Comment: “...composition of the aquifer...” Is there only one aquifer?

Response: The groundwater “aquifer” of concern at VHFS consist if groundwater in the overburden and in fractured bedrock which are interconnected (i.e., there is no defined confining unit). Therefore, it is evaluated as a single aquifer.

Comment 43. Page 14, Other Site Drainages 3rd paragraph, 2nd sentence

Comment: “Metals, PAHs, and pesticides were detected at concentrations above screening levels.” What are the screening levels?
Response: The more stringent of the Effects Range - Lows and the No Effects Levels of Lowest Effects Levels for sediment which are protective of benthic organisms, and maximum background concentrations.

Comments 44. Page 12 1st paragraph 1st full sentence

Comments: “In additional, the HHRA evaluated potential risks to hypothetical future adult residents who could be exposed contaminants in groundwater and surface soil and to hypothetical future child residents who could be exposed to contaminants in groundwater, surface soil, surface water, and sediment.” What about surface soil?

Response: For subsurface soil, the HHRA evaluated risks to excavation workers, the human receptor most likely to be exposed to subsurface soil. Also, see response to Comment 25.

Comment 45. page 12, AREE 3 description 1sr sentence

Comment: Current and future land-use conditions ... What are these? Maybe say “current industrial/commercial use or potential future use conditions”, or unrestricted future land use conditions

Response: See response to Comment 10.

Comment 46. page 12, AREE 3 description

Comment: With regard to the excavation workers, there is no mention of subsurface soil exceedance of industrial RBCs. What about residential RBCs?

Response: Although industrial soil RBCs were exceeded by contaminants in subsurface soil as indicated on page 4 the concentrations of contaminants yielded risks lower than those for residents exposed to surface soil; therefore, only the risk for residents are presented. Also, see response to Comment 25.

Comment 47. Page 13, AREE 5 description

Comment: Is there any reason to collect surface soil samples?

Response: Only subsurface soil samples were collected because the industrial sewerline is buried at least 5 ft bgs.

Comment 48. Page 13, AREE 5 description

Comment: Risk to excavation workers are presented. What about residential exposure risks?

Response: See response to Comment 25.

Comment 49. Page 13, AREE 7 description

Comment: Current and future land-use conditions ... What are these?

Response: See response to Comment 10.

Comment 50. Page 13, AREE 10 description

Comment: Why were surface soil samples not collected?

Response: See response to Comment 28.
Comment 51. Page 13 AREE 10 description is sentence

Comments: "...so the HHRA only evaluated risks to future excavation workers."...Then can we say that property is okay for unrestricted future use?

Response: See response to Comment 25.

Comment 52. Page 13, AREE 10 description

Comment: No ERA was conducted at AREE 10 because all samples were collected at depths of greater than 6 inches. Depths from 0 inches to 2 feet are defined as "surface soil". Internal inconsistency created.

Response: The USEPA protocols for HHRAs and ERAs differ with respect to the definition of "surface soils" to which receptors are exposed. ERAs only use data for surface soil samples collected from the 0-6 inch depth interval, while HHRAs use data for surface soil samples collected from the 0-2 ft depth interval. The U.S. Army followed USEPA's protocols.

Comment 53. Page 13, AREE 16-2 description Title

Comment: Why is it the “Possible” Firefighter Training Pit?

Response: See response to Comment 6.

Comment 54. Page 13, AREE 16-2 description

Comment: Current or potential future land-use conditions ... What are these?

Response: See response to Comment 10.

Comment 55. Page 13, AREE 16-2 description

Comment: What about residential risk to subsurface soil?

Response: See response to Comment 25.

Comment 56. Page 13, AREE 17 description

Comment: Current and future land-use conditions ... What are these?

Response: See response to Comment 10.

Comment 57. Page 13, AREE 17 description

Comment: What about residential risk to subsurface soil?

Response: See response to Comment 25.

Comment 58. Page 14, AREE 18 description

Comment: Current and potential future land-use conditions ... What are these?

Response: See response to Comment 10.

Comment 59. Page 14, AREE 18 description

Comment: Did the HHRA consider residential exposure to subsurface soil?

Response: See response to Comment 25.
Comment 60. Page 14, AREE 20 description

Comment: Current and future land uses ... What are these?
Response: See response to Comment 10.

Comment 61. Page 14 AREE 24 description 1st sentence

Comment: Current and future lean-use conditions ... What are these?
“... risk to workers, trespassers, and ... “should be” ... risk to workers, trespassers, and ...

Response: See response to Comment 10.
The U.S. Army agrees with this suggested wording change.

Comment 62. Page 14, AREE 24 description 2nd sentence

Comment: “…for child residents exposed to contaminants in surface soil…” What are these contaminants? PCBs? Metals?
Response: The text is referring to any contaminant identified as a chemical of potential concern that was not determined to be naturally-occurring. Aluminum is the only contaminant that meet these criteria. PCBs were not detected in surface soil at AREE 24.

Comment 63. Page 14 AREE 25 description

Comment: Are toxicologist satisfied that this area is okay for residential use?
Response: Based on discussions with USEPA, it is the U.S. Army's understanding that this area is okay for residential use based on the BRA findings.

Comments 64. Page 14 AREE 26 description

Comment: Current and future land uses ... What are these?
Response: See response to Comment 10.

Comment 65. Page 15, AREE 9-2 description

Comment: Current and potential future land-use conditions ... What are these?
Response: See response to Comment 10.

Comment 66. Page 15 AREE 29-2 description 2nd sentence

Comment: “...for residents child exposure to contaminants in surface soil...” What are these contaminants?
Response: The text is referring to any contaminant identified as a chemical of potential concern that was not determined to be naturally-occurring. Aluminum is the only contaminant that meet these criteria.

Comment 67. Page 15 AREE 29-2 description

Comment: What about the material which were piled there?
Response: See response to Comment 37.
Comment 68. Page 5 AREE 29 description

Comment: Current and future land-use conditions ... What are these?
Response: See response to Comment 10.

Comment 69. Page 5 AREE 29-3 description 2nd sentence

Comment: “...for child residents exposed to contaminants in surface soil ...” What are these contaminants? Page 9 doesn't mention surface soil, just subsurface soil.
Response: The text is referring to any contaminant identified as a chemical of potential concern that was not determined to be naturally-occurring. For AREE 29-3 surface soil, no contaminants meet these criteria. The risk presented for child residents exposed to contaminants on surface soil by dermal absorption is actually the risk associated with exposure to background metals (i.e., aluminum, arsenic, beryllium, iron, and manganese) which were only discounted if risk were found to exceed USEPA's target risk criteria.

Page 9 does not mention contamination in surface soil because none of the detected compounds exceeded screening levels (i.e., residential soil RBCs and maximum background concentrations).

Comment 70. Page 15 AREE 29-3 description

Comment: “An ERA was not conducted because all soil sample were collected at depths greater than 6 inches.” Are depths greater than 6 inches as surface or subsurface soil?
Response: See response to Comment 52.

Comment 71. Page 15, AREE 30 description

Comment: “…human health risk were only evaluated for future excavation workers. “Why?
Response: See response to Comment 25.

Comment 72. Page 15, AREE 30 description

Comments: “All analytes were detected below their screening levels ...”What are the screening levels?
Response: USEPA Region III industrial soil RBCs, the USEPA screening level for lead in residential soil, and maximum background concentrations.

Comment 73. Page 15, AREE 30 description

Comment: Can't determine that AREE 30 is safe for unrestricted future use based only on human health risks for future excavation workers.
Response: See response to Comment 25. Based on this response and the findings of the BRA, it is the U.S. Army’s understanding that unrestricted use of AREE 30 is okay.

Comment 74. Page 15, AREE 33 description

Comment: Why were only subsurface soil samples collected at AREE 33?
Response: The purpose of the RI at AREE 33 was to determine of the household debris present had impacted the native soils which were encountered at greater than 2 ft bgs.
Comment 75. Page 15, AREE 33 description

Comment: Why is there no information regarding residential reuse risk?
Response: See response to Comment 25.

Comment 76. Page 15, Site-wide Groundwater description 3rd sentence

Comment: “naturally-occurring” should be “naturally-occurring”
Response: The U.S. Army agrees with this suggested wording change.

Comment 77. Page 15, Site-wide Groundwater description

Comment: Excluding bis(2-ethylhexyl)phthalate, what are the risk and HI? What is the contaminant with the next highest risk?
Response: Excluding bis(2-ethylhexyl)phthalate along with naturally-occurring metals that were statistically determined to be within background levels, the highest estimated upper-bond excess lifetime cancer risk \((9 \times 10^{-6})\) is for adult residents exposed to contaminants in site-wide groundwater by ingestion, and the highest noncarcinogenic risk (HI=0.5) is for child residents exposed to contaminants in site-wide groundwater by ingestion. The site-related contaminants with the greatest impact on cancer risks and noncarcinogenic hazards are beryllium and barium, respectively.

Comment 78. Page 15, South Run at AREEs 1 and 2 description

Comment: Current or future land-use conditions .. What are these?
Response: See response to Comment 10.

Comment 79. Page 16, South Run at AREEs 1 and 2 description, 1st paragraph

Comment: “Although the HI associated with incidental exposure to sediment in South Run at AREEs 1 and 2 by child residents exceeded 1, the exceedance was driven by metals believed to be naturally occurring.” ... Why weren't the metals discounted before running the calculations?
Response: Statistical background comparison could not be conducted for sediments sample results because of the limited number of available background samples. Therefore, all metal results were included in the calculations.

Comment 80. Page 16 South Run at AREEs 1 and 2 description, 2nd paragraph

Comment: Based on the potential for adverse effects to benthic organisms in the tributaries to South Run at AREEs 1 and 2 identified in the ERA, shouldn't an action alternative be evaluated?
Response: The ERA estimated the potential for adverse effects to benthic organisms based on the assumption that a viable habitat for benthic organisms existed. However, the habitat for benthic organisms in the tributaries to South Run at AREEs 1 and 2 is limited and, therefore, the adverse effects are over-estimated by the ERA and are actually limited. No action is warranted based on the existing conditions.

Comment 81. Page 16, Other Site Drainages description

Comment: Current or potential future land-use conditions ... What are these?
Response: See response to Comment 10.
| Comment 82. | Page 4, Introduction |
| Comment: | Delete “contaminated materials at” |
| Response: | The U.S. Army agrees with this suggested wording change. |

| Comment 83. | Page 1, Introduction 2nd sentence |
| Comment: | “major characteristic” should be replaced with “major component”. |
| Response: | The U.S. Army agrees with this suggested wording change. |

| Comment 84. | Page 5, AREE 20 description, 2nd paragraph, 2nd sentence |
| Comment: | Should read “... the structure, and the Army shut down the incinerator permanently ..” |
| Response: | The U.S. Army agrees with suggested wording change. |

| Comment 85. | Page 5, AREE 20 description 2nd paragraph, 3rd sentence |
| Comment: | Replace “… (i.e., boxes ... “with”...(e.g., boxes...” |
| Response: | The U.S. Army agrees with this suggested wording change. |

| Comment 86. | Page 5, AREE 20 description, 4th paragraph, 3rd sentence “should be sufficiently low” |
| Comment: | What if it isn’t? |
| Response: | The text in the Decision Document will be revised to say “is sufficiently low” instead of “should be sufficiently low”. |

| Comment 87. | Page AREE 20 description, 4th paragraph 4th sentence |
| Comment: | Delete “further” in “no further action”. |
| Response: | The U.S. Army agrees with this suggested wording change. |

| Comment 88. | Page 5, AREE 20 description 5th paragraph 1st sentence the length of the incinerator |
| Comment: | How big is the incinerator? |
| Response: | Approximately 45 ft long. |

| Comment 89. | Page 5, AREE 20 description 5th paragraph, end of second sentence “… will require stabilization prior to disposal…” |
| Comment: | Under which regulatory program? |
| Response: | Stabilization to eliminate free liquids from waste materials is required by Department of Transportation (DOT) regulations and disposal facility permits. |

| Comment 90. | Page 5, AREE 20 description 5th paragraph last sentence, “...since the cash requires special management…” |
| Comment: | Under which regulatory program? |
Response: Solid waste landfill in Virginia are not permitted to accept elevated dioxin/furan concentrations. Although the waste will still be managed under the Solid Waste Management Regulations, it will required special management because it will have to be disposed in a landfill that is permitted to accept elevated dioxin/furan concentrations.

Comment 91. Page 5, AREE 20 description 6th paragraph last sentence
Comment: Replace “e.g.” With “i.e.”
Response: The U.S. Army agrees with this suggested wording change.

Comment 92. Page 7, Remedial Action Objective
Comment: There doesn't appear to be a risk driver, no CERCLA trigger for an action. Write this as a No Action Proposed Plan for this AREE.
Response: Per USEPA’s comment, a No Action Decision Document will be written for AREE 20. The U.S. Army will remove and dispose of the ash and oil as a BRAC action rather than a CERCLA-driven action.

Comment 93. Page 7, Summary of Remedial Alternatives, Alternative 2-Ash and Oil Removal
Comment: This doesn't appear to be warranted under CERCLA. As a CERCLA ROD, no action would seem to be appropriate. The ash and oil removal seems like a separate BRAC issue.
Response: See response to Comment 92.

AREE 1
Comment 94. Page 1, introduction 1st sentence
Comment: Delete “contaminated soil”
Response: The U.S. Army agrees with this suggestion wording change.

Comment 95. Page 1, Introduction, 2nd sentence
Comment: Replace “characteristics” with “components”.
Response: The U.S. Army agrees with this suggested wording change.

Comment 96. Page 2, Site Background 3rd paragraph, last sentence
Comment: Delete “...and is currently undergoing regulatory review.”
Response: The U.S. Army agrees with this suggested wording change.

Comment 97. Page 5, partial sentence at top of page, “contaminants in these media were not found to pose unacceptable risk”
Comment: Under all scenarios?
Response: Yes, under all scenarios evaluated.

Comments 98. Page 5, Human Health and Ecological Risk Assessment 1st paragraph 1st sentence
Comment: Spell out RI.
Response: This is not necessary since RI was spelled out on page 2.
Comment 99. Page 7, AREE 1 description 1st two sentences

Comment: What are the risk numbers for workers, trespassers, and excavations workers?

Response: The risk numbers for workers, trespassers, and excavation workers are too numerous to present individually in the Proposed Plan. However, discounting naturally-occurring metals that were statistically determined to be within background levels, the cancer risks and noncancerous hazards for workers, trespassers, and excavation workers by incidental ingestion, dermal absorption, and inhalation are below USEPA's target risk of 1x10^-4 and HI=1, respectively.

Comment 100. Page 8, 2nd full paragraph

Comment: “2,3,7,8-TCDF”...spell out TCDF

Response: Tetrachlorodibenzofuran.

Comment 101. Page 9, 1st paragraph 2nd sentence

Comment: Delete “draft”

Response: The U.S. Army agrees with this suggested wording change.

Comment 102. Page 9, Alternative 3 - Clay Cap, 1st sentence

Comment: Insert “of” after construction.

Response: The U.S. Army agrees with this suggested wording change.

Comment 103. Page 9, alternative 3-Clay Cap, 1st sentence, “and use restrictions”

Comment: Have the type/costs and O&M been considered for land use restrictions?

Response: The type of land use restrictions considered are deed restrictions. These deed restrictions would be imposed after the cap is constructed and would limit uses of the property to activities that would not impact the integrity of the cap. For example, activities requiring excavation of the property would be prohibited. Further definition of the land use restrictions will be made once a final remedial alternative is selected, and will be included in the Decision Document for AREE 1.

The capital costs for implementing land use restrictions have been included as a line item in the FS cost estimate. The O&M cost contingency included in the FS cost estimate would cover any long-term O&M requirements for the land use restrictions.

Comment 104 Page 9, Alternative 3-Clay Cap, 2nd paragraph concerning and use restrictions

Comment: Have these been thought out? Will the county accept zoning ordinances and permitting restrictions? What about monitoring of institutional controls? What are the permitting restrictions? What will happen during the window of the landfill cap installation and the time of transfer?

Response: Further definition of the land use restrictions will be made once a final remedial alternative is selected, and will be included in the Decision Document for AREE 1. The Decision Document text will address the issues raised by USEPA (i.e., county acceptance of zoning ordinances, permitting restrictions, and monitoring of institutional controls), as appropriate.

The landfill will not be transferred until cap construction is complete. Since the U.S. Army will maintain control over the use of the landfill property until such time as the property is transferred, land use restrictions will not be required during this time period. Since the risks associated with current industrial commercial use were found to be acceptable,
access restriction will not be required to cap construction. Access restrictions (e.g., safety fencing), however, will be maintained during cap construction to protect the public from construction hazards.

Comment 105. Page 10, Alternative 4-Liner Cap, 2nd paragraph concerning and use restrictions

Comment: Have these been thought out? Will the county accept zoning ordinances and permitting restrictions? What about monitoring of institutional controls? What are the permitting restrictions? What will happen during the window of the landfill cap installation and the time of transfer?

Response: See response to Comment 104.

Comment 106. Page 11, Overall Protection of Human Health in the Environment

Comment: Replace “because it removes” with “because it would remove”.

Response: The U.S. Army agrees with this suggested wording change.

Comment 107. Page 11, Complete with ARARs

Comment: Replace “will be implemented” with “would be implemented”.

Response: The U.S. Army agrees with this suggested wording change.

Comment 108. Page 11, Compliance with ARARs

Comment: DOT and OSHA regulations are not ARARs.

Response: The U.S. Army acknowledges this comment.

Comment 109. Page 11, Compliance with ARARs, ARARs, such as solid and hazardous, if applicable waste regulations

Comment: Hasn't this been evaluated/determined? What about landfill design standards in the waste regulations?

Response: Based on available data, the landfill contains non-hazardous waste and, therefore, would be governed by the Solid Waste Management Regulations. The landfill capping alternatives considered were identified based on this conclusion. However, if Alternative 2 were to be selected, waste characterization samples would be required by the disposal facility. Although not anticipated, if any portion of the excavated waste was found to be hazardous, Hazardous Waste Management Regulations would apply to the affected waste.

Comment 110. Page 12, 1st partial sentence

Comment: Change “form” to “from”.

Response: The U.S. Army agrees with this suggested wording change.

Comment 111. Page 12, 1st partial sentence, “and appropriate land use restrictions”

Comment: No basis given for this since no details regarding the institutional controls have been provided. What are the reuse plans in and around this area?

Response: See response to Comment 104. The reuse plans in and around this area have not yet been finalized.
<table>
<thead>
<tr>
<th>Comment 112.</th>
<th>Page 12, Implementability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comment:</strong></td>
<td>No basis to evaluate implementability of institutional controls.</td>
</tr>
<tr>
<td><strong>Response:</strong></td>
<td>See response to Comment 104.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comment 113.</th>
<th>Page 12, Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comment:</strong></td>
<td>What about the cost of institutional control implementation and future monitoring?</td>
</tr>
<tr>
<td><strong>Response:</strong></td>
<td>See response to Comment 103.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comment 114.</th>
<th>Page 12, Preferred Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comment:</strong></td>
<td>What about institutional controls?</td>
</tr>
<tr>
<td><strong>Response:</strong></td>
<td>The preferred alternative will include land use restrictions (a.k.a., institutional controls).</td>
</tr>
</tbody>
</table>

Response to Comments on the Proposed Plans for Vint Hill Farms Station from VDEQ

AREEs 3, 5, 7, 10, 16-2, 17, 18, 20, 24, 25, 26, 29-1, 29-2, 29-3, 30, and 33, and Site-wide Groundwater, South Run at AREEs 1 & 2, and Other Site Drainages

<table>
<thead>
<tr>
<th>Comment 115.</th>
<th>AREE 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comment:</strong></td>
<td>Since AREE 7 is to be closed under RCRA, clean closure must be approved by the Department's Office of Waste Permitting before a no further action alternative can be selected for this AREE.</td>
</tr>
<tr>
<td><strong>Response:</strong></td>
<td>See response to Comment 26.</td>
</tr>
</tbody>
</table>
USA VINT HILL FARMS STATION

Site Information:

Site Name: USA VINT HILL FARMS STATION
Address: WARRENTON, VA

EPA ID: VA8210020931
EPA Region: 03

Site Alias Name(s):

VINT HILL FARMS STATION

Record of Decision (ROD):

ROD Date: 07/01/1999
Operable Unit: 07
ROD ID: EPA/ROD/R03-99/014

Media: Soil

Contaminant: Metals, PAH, Petroleum Hydrocarbon

Abstract: The Vint Hill Farms Station (VHFS) is located approximately 40 miles southwest of Washington, DC, in Fauquier County, Virginia. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites. Land use in the immediate vicinity of VHFS consists mainly of agriculture (mostly horse farms) and residential areas. With the exception of a few residences to the north, the majority of residential development is located to the south of VHFS. A small county recreational park is located adjacent to VHFS along South Run.

VHFS is part of the U.S. Army Communications-Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence. VHFS was designated for closure in March 1993, under the Base
Realignment and Closure (BRAC) Act. Pursuant to decision to close the installation, and Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May 1994, respectively. The ENPA identified 42 areas requiring environmental evaluation (AREEs) from the review of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation. These 27 AREEs were investigated from September 1994, to June 1995, as part of the Site Inspection (SI) conducted by SAIC. The final SI Report, which was completed in June 1996, identified 24 AREEs which required further investigation. In addition, four new AREEs were determined to warrant further investigation subsequent to the SI. AREEs that were determined to warrant further investigation were investigated as part of the Phase I and Phase II reuse areas Remedial Investigation (RI) and the supplemental RI conducted by ICF Kaiser Engineers, Inc. The final RI reports for the Phase I and Phase II reuse areas were completed in April 1998, and January 1999, respectively.

Remedy: Under this remedy, all contaminated soil exceeding the established cleanup levels would be excavated, transported off site by truck, and disposed using a combination of permitted off-site hazardous waste, construction debris, and/or municipal landfills, as appropriate based on analytical results. Approximately 400 cubic yards of impacted soil would be excavated as part of this remedy, followed by confirmation sampling to assure adequate removal of all soil exceeding the cleanup levels. Upon completion of the soil excavation, disturbed areas would be backfilled, regraded, and either vegetatively stabilized or paved (AREE 28-5). The 5 year review does not apply to this alternative because hazardous substances above risk-based cleanup levels would not remain on-site.

Estimated Capital Cost: $260,000
Estimated Annual O&M Costs: Not Provided
Estimated Present Worth Costs: Not Provided

The National Oil and Hazardous Substances Contingency Plan and CERCLA require that a No Action alternative be considered as a baseline for comparison to other alts. No action would be taken to address site contamination under this alternative. Each AREE would be reviewed at least once every 5 years to re-evaluate site conditions and to
determine the need for remedial action to protect human health and the environment.

Text: Full-text ROD document follows on next page.
EPA Superfund
Record of Decision:

USA VINT HILL FARMS STATION
EPA ID: VA8210020931
OU 07
WARRENTON, VA
07/01/1999
FINAL DECISION DOCUMENT AREEs 2, 4, 28-5, AND 31 VINT HILL FARMS STATION WARRENTON, VIRGINIA

Prepared for: U.S. Army Communications-Electronics Command

Prepared by: IT Corporation Edgewood, Maryland

June 1999
TABLE OF CONTENTS

Section                                Page
1.0 INTRODUCTION                         1

2.0 SITE BACKGROUND                      1

3.0 SITE CHARACTERISTICS                  4
   3.1 Site Topography                    4
   3.2 Adjacent Land Use                  4
   3.3 Surface Water Hydrology            4
   3.4 Geology/Hydrogeology               4

4.0 SITE HISTORY AND INVESTIGATION FINDINGS 5
   4.1 AREE 2 - Sewage Treatment Plant    5
   4.2 AREE 4 - Auto Craft Shop           5
   4.3 AREE 28-5 - Former Service Station Abandoned USTs    8
   4.4 AREE 31 - Construction Debris Pile #1     8

5.0 SUMMARY OF SITE RISKS                 8
   5.1 AREE 2 - Sewage Treatment Plant     12
   5.2 AREE 4 - Auto Craft Shop            12
   5.3 AREE 28-5 - Former Service Station Abandoned USTs    13
   5.4 AREE 31 - Construction Debris Pile #1     13

6.0 REMEDIAL ACTION OBJECTIVES           14

7.0 CLEANUP LEVELS ESTABLISHED FOR THE SELECTED ALTERNATIVE 14

8.0 SUMMARY OF REMEDIAL ALTERNATIVES     14
   8.1 Alternative 1 - No Action          16
   8.2 Alternative 2 - Soil Removal        16

9.0 EVALUATION OF ALTERNATIVES           16
   9.1 Overall Protection of Human Health and the Environment 17
   9.2 Compliance with ARARs               17
   9.3 Long-term Effectiveness and Permanence 17
   9.4 Reduction of Toxicity, Mobility, or Volume Through Treatment 17
   9.5 Short-term Effectiveness             17
   9.6 Implementability                    18
   9.7 Cost                                18
   9.8 Regulator Acceptance                18
   9.9 Community Acceptance                18

10.0 SELECTED REMEDY AND STATUTORY DETERMINATIONS          18
   10.1 Selected Remedy                    18
   10.2 Statutory Determinations           18
       10.2.1 Protection of Human Health and the Environment 19
       10.2.2 Compliance with ARARs            19
       10.2.3 Cost-Effectiveness               19
       10.2.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable 19
       10.2.5 Preference for Treatment as a Principal Element 20
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION</td>
<td>20</td>
</tr>
<tr>
<td>12.0 RESPONSIVENESS SUMMARY</td>
<td>20</td>
</tr>
<tr>
<td>12.1 Selected Newspaper Notices</td>
<td>21</td>
</tr>
<tr>
<td>12.2 Comments Raised During the Public Meeting on April 9, 1998</td>
<td>21</td>
</tr>
<tr>
<td>12.3 Public Meeting Attendance Roster</td>
<td>21</td>
</tr>
<tr>
<td>12.4 Restoration Advisory Board Members</td>
<td>21</td>
</tr>
<tr>
<td>13.0 REFERENCES</td>
<td>22</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

Figure | Page
-------|------
1      | General Location of VHFS | 2
2      | General Locations of AREEs at VHFS | 3
3      | SI and RI Sample Locations for AREE 2 - Sewage Treatment Plant | 6
4      | SI and RI Sample Locations for AREE 4 - Auto Craft Shop | 7
5      | SI and RI Sample Locations for AREE 28-5 - Former Service Station USTs | 9
6      | RI Sample Locations for AREE 31 - Construction Debris Pile #1 | 10

LIST OF TABLES

Table | Page
------|------
1     | Cleanup Levels Established for Soil at the Four AREEs | 15

LIST OF ATTACHMENTS

Attachment 1 | Proposed Plan
Attachment 2 | Cleanup Level Development Documents
Attachment 3 | Public Notice
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARAR</td>
<td>Applicable or relevant and appropriate requirement</td>
</tr>
<tr>
<td>AREE</td>
<td>Area Requiring Environmental Evaluation</td>
</tr>
<tr>
<td>bgs</td>
<td>Below ground surface</td>
</tr>
<tr>
<td>BRA</td>
<td>Baseline Risk Assessment</td>
</tr>
<tr>
<td>BRAC</td>
<td>Base Realignment and Closure</td>
</tr>
<tr>
<td>CECOM</td>
<td>Communications-Electronics Command</td>
</tr>
<tr>
<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation, and Liability Act</td>
</tr>
<tr>
<td>CERFA</td>
<td>Community Environmental, Response Facilitation Act</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>DD</td>
<td>Decision Document</td>
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<tr>
<td>EEQ</td>
<td>Environmental effects quotient</td>
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<tr>
<td>ENPA</td>
<td>Enhanced Preliminary Assessment</td>
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<tr>
<td>ERA</td>
<td>Ecological Risk Assessment</td>
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<tr>
<td>ERC</td>
<td>Environmental Restoration Company</td>
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<td>FS</td>
<td>Feasibility Study</td>
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<td>HHRA</td>
<td>Human Health Risk Assessment</td>
</tr>
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<td>HI</td>
<td>Hazard Index</td>
</tr>
<tr>
<td>HQ</td>
<td>Hazard Quotient</td>
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<tr>
<td>ICF KE</td>
<td>ICF Kaiser Engineers, Inc.</td>
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<td>IEUBK</td>
<td>Integrated Exposure Uptake Biokinetic</td>
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<td>MSL</td>
<td>Mean sea level</td>
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<tr>
<td>NCP</td>
<td>National Oil and Hazardous Substances Pollution Contingency Plan</td>
</tr>
<tr>
<td>PAH</td>
<td>Polynuclear aromatic hydrocarbon</td>
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<tr>
<td>ppm</td>
<td>Parts per million</td>
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<tr>
<td>RBC</td>
<td>Risk-based concentration</td>
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<tr>
<td>RI</td>
<td>Remedial Investigation</td>
</tr>
<tr>
<td>SAIC</td>
<td>Science Applications International Corporation</td>
</tr>
<tr>
<td>SARA</td>
<td>Superfund Amendments and Reauthorization Act</td>
</tr>
<tr>
<td>SI</td>
<td>Site Inspection</td>
</tr>
<tr>
<td>STP</td>
<td>Sewage treatment plant</td>
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<tr>
<td>TPH</td>
<td>Total petroleum hydrocarbon</td>
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<tr>
<td>TRV</td>
<td>Toxicity reference value</td>
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<tr>
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<td>U.S. Army Corps of Engineers</td>
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<td>U.S. Army Environmental Center</td>
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<td>U.S. Environmental Protection Agency</td>
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<tr>
<td>UST</td>
<td>Underground storage tank</td>
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<tr>
<td>VAC</td>
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<tr>
<td>VDEQ</td>
<td>Virginia Department of Environmental Quality</td>
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<td>VHFS</td>
<td>Vint Hill Farms Station</td>
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<tr>
<td>VPDES</td>
<td>Virginia Pollutant Discharge Elimination System</td>
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DECLARATION FOR THE DECISION DOCUMENT
REMEDIAL ALTERNATIVE SELECTION

Site Name and Location

Areas Requiring Environmental Evaluation (AREEs) 2, 4, 28-5, and 31
Vint Hill Farms Station
Warrenton, Virginia

Statement of Basis and Purpose

This Decision Document (DD) presents the selected remedial action for soil at AREEs 2, 4, 28-5, and 31 at Vint Hill Farms Station (VHFS), Warrenton, Virginia, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This document was prepared as a joint effort between the U.S. Army, the Virginia Department of Environmental Quality (VDEQ), and the U.S. Environmental Protection Agency (USEPA). The remedial action decision is based on documents contained in the Information Repository.

Assessment of the AREEs

Actual or threatened releases of hazardous substances from AREEs 2, 4, 28-5, and 31, if not addressed by implementing the remedial action selected in this DD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

This action addresses the principal threat at AREEs 2, 4, 28-5, and 31 by the excavation of contaminated soil and off-site disposal at a permitted facility.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for AREEs 2, 4, 28-5, and 31. However, because treatment of the principal threat at AREEs 2, 4, 28-5, and 31 was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. A five-year review will not be necessary for AREEs 2, 4, 28-5, and 31 since the selected remedy involves the removal of contaminated soil to risk-based cleanup levels.

ROBERT L. NABORS
Major General, USA
Commanding
U.S. Army Communications-Electronics Command

7/1/99
Date
DECISION SUMMARY

1.0 INTRODUCTION

The remedial action decision is based on the Phase II Reuse Area Remedial Investigation (RI) Report (USACE, 1999) which includes a Baseline Risk Assessment (BRA) documenting the risks from contamination in the soils at Areas Requiring Environmental Evaluation (AREEs) 2, 4, 28-5, and 31. In the BRA, it was determined that the soils at AREEs 2, 4, and 31 pose unacceptable risks to human health and the environment. In addition, total petroleum hydrocarbon (TPH) concentrations in soil at AREE 28-5 exceed the Virginia TPH soil action level for underground storage tanks (USTs). Therefore, the soils at AREEs 2, 4, 28-5, and 31 require remedial action to be protective of human health and the environment.

A feasibility study (FS), which develops and examines remedial action alternatives for a site, was performed for AREEs 2, 4, 28-5, and 31 and presented in the Proposed Plan (see Attachment 1).

2.0 SITE BACKGROUND

Vint Hill Farms Station (VHFS) is part of the U.S. Army Communications - Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence. VHFS is located approximately 40 miles southwest of Washington, D.C., in Fauquier County, Virginia, as shown on Figure 1. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites.

VHFS was designated for closure in March, 1993, under the Base Realignment and Closure (BRAC) Act. Pursuant to the decision to close the installation, an Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May, 1994, respectively. The ENPA identified 42 AREEs from the review of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation.

These 27 AREEs were investigated from September, 1994, to June, 1995, as part of the Site Inspection (SI) conducted by SAIC. The objective of the SI was to determine the presence or absence of contamination and the chemical nature of any detected contamination. The final SI Report (USAEC, 1996), which was completed in June, 1996, identified 24 AREEs which required further investigation. In addition, four new AREEs were identified during site reconnaissance to warrant further investigation subsequent to the SI. AREEs that were determined to warrant further investigation and are located in the Phase II reuse area (shown on Figure 2) were investigated between February and April, 1997, as part of the Phase II reuse area RI conducted by ICF Kaiser Engineers, Inc. (ICF KE). The purposes of the RI were to evaluate: 1) the nature and extent of contamination; and 2) the level of risk posed to human health and the environment. The final RI Report for the Phase II reuse area (USACE, 1999) was completed in January, 1999.

Four AREEs were identified in the RI as having soil contamination which poses unacceptable human health risks and/or significant adverse ecological effects:

- AREE 2 - Sewage Treatment Plant;
• AREE 4 - Auto Craft Shop;
• AREE 28-5 - Former Service Station Abandoned USTs; and
• AREE 31 - Construction Debris Pile #1.

The locations of these AREEs are shown on Figure 2.

3.0 SITE CHARACTERISTICS

3.1 Site Topography

VHFS is located within the Piedmont Plateau physiographic province, approximately 20 miles west of the
Fall Line. The Fall Line is a physiographic boundary that separates the folded and faulted crystalline rocks of the
Piedmont Plateau physiographic province from the unconsolidated sediments of the Atlantic Coastal Plain
physiographic province. The topography of the Piedmont Plateau in the vicinity of VHFS consists of gently rolling
hills with slopes generally less than 10%. Surface elevations on the installation vary from 335 to 430 feet (ft) above
mean sea level (MSL).

3.2 Adjacent Land Use

Land use in the immediate vicinity of VHFS consists mainly of agriculture (mostly horse farms) and
residential areas. With the exception of a few residences to the north, the majority of residential development is
located to the south of VHFS. A small county recreation park is located adjacent to VHFS along South Run.

3.3 Surface Water Hydrology

VHFS is located in the Occoquan watershed. Most of VHFS drains to South Run via intermittent tributaries
and drainage ditches, as shown on Figure 2. South Run is a small Class III Virginia stream which discharges into
Lake Manassas, a recreation and drinking water reservoir built on Broad Run for the City of Manassas. Lake
Manassas discharges to Broad Run, which drains to the Occoquan Reservoir. Drainage for the southern portion
of the installation flows south and east to Kettle Run. Kettle Run converges with Broad Run approximately 10 miles
downstream from Lake Manassas.

3.4 Geology/Hydrogeology

The central portion of VHFS is underlain by folded sedimentary rocks of the Catharpin Creek Member which
consists of sandstone, arkosic sandstone, siltstone, shale, and claystone. Intrusions of basalt, oriented northeast to
southwest, cut the bedrock in the central and western portions of the VHFS installation. The northeastern flank of
VHFS is underlain by intrusions of diabase. Quaternary alluvium is present along the major drainage channels within
the installation.

The overburden is thickest (20-40 ft) in the southern regions of the site and thins to 0-10 ft in the northern
areas. The overburden consists primarily of saprolite (a chemical and physical weathering product of the underlying
bedrock) which underlies lesser amounts of clayey and silty soils.

Groundwater at VHFS occurs in fractured bedrock and to a lesser extent in the overburden. The bedrock
aquifer is semi-confined, with the unfractured bedrock and saprolite acting as confining units. Recharge to the
fractured bedrock aquifer occurs at outcrop areas and from percolation from the overburden along fractures. In the
overburden, the aquifer is unconfined.
4.0 SITE HISTORY AND INVESTIGATION FINDINGS

The RI for these four AREEs was conducted to evaluate the nature and extent of contamination associated with past site activities. Environmental samples collected and analyzed during the RI were used in conjunction with the results from the SI to assess the condition of each of the AREEs. The environmental media investigated included surface soil (0 to 2 ft below ground surface [bgs]), subsurface soil (2 ft to approximately 10 ft bgs), surface water, sediment, and groundwater. Analytical results were compared to background concentrations and regulatory screening levels to determine if environmental media had been adversely impacted by site activities. A brief description of each of the four AREEs and the significant findings of the RI and SI are presented in the following paragraphs. A detailed presentation of the samples collected and the analytical results can be found in the Phase II Reuse Area RI Report (USACE, 1999), available in the Information Repository.

4.1 AREE 2 - Sewage Treatment Plant

AREE 2 is the sewage treatment plant (STP) which serves permanent residents and daily employees at VHFS and has been in service since 1952. The plant has treated sanitary wastewater, industrial wastewater from VHFS operations (photographic, painting, laboratory, vehicle washing, and metal etching), and surface water runoff. The facility discharges treated effluent to South Run under a Virginia Pollutant Discharge Elimination System (VPDES) permit. Before 1980, sludge was stored in piles on the ground near South Run.

Surface soil, subsurface soil, sediment, surface water, and groundwater samples were collected at AREE 2 as shown on Figure 3. Metals were detected in surface soil above residential soil risk-based concentrations (RBCs) established by U.S. Environmental Protection Agency (USEPA) Region III for screening analytical results. Mercury (maximum concentration of 4.3 parts per million [ppm]) was detected above the residential soil RBC of 0.78 ppm in surface soil samples SS-02-001 and SS-02-002. Benzo(a)pyrene, a polynuclear aromatic hydrocarbon (PAH), was present above residential soil RBCs in one surface soil sample downgradient of the former sludge pile. Based on the results of the subsurface soil samples, subsurface soil has not been impacted by AREE 2 activities.

4.2 AREE 4 - Auto Craft Shop

The Auto Craft Shop (Buildings 306 and 308) was used as the motor pool from 1943 to 1967, and as a vehicle maintenance area where military personnel performed maintenance on their private vehicles from 1968 to 1994. The buildings were used to store oil, solvents, and lubricants for vehicle maintenance activities as well as spent solvent and waste oil filters. The buildings have concrete floors with no curbs or floor drains. Gasoline and oil spills have been recorded in this area and were cleaned up using absorbents. A 1,000-gallon UST was used to store waste oil prior to its removal in July, 1990. A plume of petroleum contamination currently lies under the shop as a result of leaks from the UST. A corrective action for this plume has been implemented. Three areas where surface runoff/discharge from AREE 4 occurs have been identified (see Figure 4). An outdoor vehicle wash rack near Building 308 drained into a grit chamber, which has been removed. The grit chamber was used to settle the solids prior to discharge of water from the vehicle wash rack via a ceramic pipe into the wooded area south of Building 308. The floor of the grit chamber and the associated contaminated soil were removed during the Phase II reuse area RI field investigation. A storm sewer drain located west of Buildings 306 and 308 discharged surface runoff to the field south of the Auto Craft Shop. Surface runoff also drains south of the Auto Craft Shop near the former hydraulic lift.

Surface soil, subsurface soil, and groundwater samples were collected at AREE 4 as shown on Figure 4. Surface and subsurface soil results are presented herein; groundwater results are presented in a separate Decision Document (DD) which addresses site-wide groundwater. TPH contamination, exceeding the Virginia TPH soil action level for USTs of 100 ppm, was present in surface soil samples collected near the storm sewer discharge area, former hydraulic lift surface runoff area, and wash rack discharge area. The maximum TPH concentration (1,860 ppm) was detected in surface soil sample SS-04-002 collected at the former hydraulic lift.
LEGEND:

- Impacted Surface Soil Area (approximate)
- Building
- WWS Boundary
- Paved Road
- Fence
- Stream
- Tributary
- Topographic Contour (ft NGVD)
- SI Surface Soil Sample Location
- Existing Monitoring Well
- Phase II RI Monitoring Well
- Phase II RI Soil Boring Location
- Phase II RI Surface Water/Sediment Sample Location

NOTES:
1. Surface soil locations (SSB-1 and SSB-2) are co-located with the soil boring locations (SSB-1 and SSB-2).
2. Monitoring well numbers 2MW-1 through 2MW-3 have been modified from the numbers reported in the original field investigations in order to provide unique well numbers for this report.

FIGURE 3
SI and RI Sample Locations for Area 2 - Sewage Treatment Plant
NOTES:
1. SURFACE SOIL SAMPLE LOCATIONS (RBS4-3 THROUGH RBS4-11) ARE CO-LOCATED WITH THE SOIL BORING LOCATIONS (RBS4-3 THROUGH RBS4-11).
2. MONITORING WELL NUMBERS 4WX-1 THROUGH 4WX-3 HAVE BEEN MODIFIED FROM THE NUMBERS REPORTED IN THE ORIGINAL FIELD INVESTIGATIONS IN ORDER TO PROVIDE UNIQUE WELL NUMBERS FOR THIS REPORT.

LEGEND:
- IMPACTED SURFACE SOIL AREA (APPROXIMATE)
- FENCE
- BUILDING
- ROAD
- STORM DRAIN
- TOPOGRAPHIC CONTOUR (FT. WELL)
- SI SOIL BORING LOCATION
- SI SURFACE SOIL SAMPLE LOCATION
- PHASE I RI SOIL BORING LOCATION
- EXISTING MONITORING WELL
- PHASE II RI MONITORING WELL

FIGURE 4
SI AND RI SAMPLE LOCATIONS FOR AREA 4 - AUTO CRAFT SHOP
lift surface runoff area. Metals were detected in surface soil above residential soil RBCs at all three surface runoff/discharge areas. Lead contamination exceeding the USEPA screening level for lead in residential soil of 400 ppm was detected in surface soil at all three surface runoff/discharge areas. The maximum lead concentration (1,700 ppm) was detected in a surface soil sample collected from the storm sewer discharge area. Four PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, and indeno[1,2,3-cd]pyrene) exceeding the residential soil RBCs are present in surface soil at the wash rack discharge area. Only benzo(a)pyrene is present in surface soil above the residential soil RBC (0.087 ppm) in all three surface runoff/discharge areas. The maximum benzo(a)pyrene concentration of 1.52 ppm was detected in surface soil sample RISS4-5 located in the wash rack discharge area. Based on the results of the subsurface soil samples from the three surface runoff/discharge areas, contaminant concentrations in subsurface soil were all below screening levels.

4.3 AREE 28-5 - Former Service Station Abandoned USTs

AREE 28-5 consists of the Former Service Station Abandoned USTs located under the asphalt parking lot approximately 60 ft northwest of the former service station (Building 220). Three 5,000-gallon steel USTs were used for the storage of gasoline and diesel fuel products. The USTs were approximately 30 years old and were in service until 1983. Environmental Restoration Company (ERC) removed the USTs and associated pipelines in December, 1994.

Subsurface soil and groundwater samples were collected at AREE 28-5 as shown on Figure 5. TPH contamination, exceeding the Virginia TPH soil action level for USTs of 100 ppm, was detected in subsurface soil in the vicinity of the former pump island at depths ranging from 2 ft bgs to at least 10 ft bgs. The maximum TPH concentration (5,273 ppm) was detected at a depth of 8-10 ft bgs in soil boring RISB28-5-1.

4.4 AREE 31 - Construction Debris Pile #1

AREE 31 is a construction debris pile located approximately 200 to 300 ft northwest of the southernmost tip of the VHFS property boundary in a predominantly wooded and vegetated area. The pile consists of construction debris including, but not limited to, concrete pipe, corrugated steel pipe, steel footers, antennae pillars, roofing paper, bricks, cinder blocks, cement slabs, and insulation material. The debris pile has an area of approximately 15 ft by 150 ft.

Surface and subsurface (from a test pit) soil samples were collected at AREE 31 as shown on Figure 6. Metals (copper and lead) and PAH contamination is present in surface soil sample RISS31-2. The lead concentration of 3,610 ppm exceeded the USEPA screening level for lead in residential soil of 400 ppm. Copper at 1,880 ppm exceeded its residential soil RBC of 310 ppm. Five PAHs (benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, and indeno[1,2,3-cd]pyrene) exceeded the residential soil RBCs by one or more orders of magnitude in surface soil sample RISS31-2. For example, benzo(a)pyrene was detected at 34.6 ppm compared to its residential soil RBC of 0.087 ppm. Subsurface soil has not been impacted by the debris present at AREE 31.

5.0 SUMMARY OF SITE RISKS

A BRA was conducted as part of the RI to assess the human health and ecological problems that could result if the contamination at the AREEs was not remediated. The Human Health Risk Assessment (HHRA) was prepared to evaluate the magnitude of potential adverse effects on human health associated with current industrial/commercial and potential future residential exposures to site-related chemicals at the AREEs. The Ecological Risk Assessment (ERA) was conducted to characterize the potential threats to ecological receptors posed by contaminants at the AREEs.
FIGURE 5
SI AND RI SAMPLE LOCATIONS FOR AREE 28-5 - FORMER SERVICE STATION USTs
The HHRA follows a four-step process:

- **Selection of Chemicals of Potential Concern** - identifies the contaminants of potential concern based on their toxicity, frequency of occurrence, and concentration by comparing the maximum concentrations of detected chemicals with RBCs which are health-protective chemical concentrations that are back-calculated using toxicity criteria, a $1 \times 10^{-6}$ target carcinogenic risk or a 0.1 hazard quotient (HQ, defined below), and conservative exposure parameters;

- **Exposure Assessment** - identifies the potential pathways of exposure, and estimates the concentrations of contaminants to which people may be exposed as well as the frequency and duration of these exposures;

- **Toxicity Assessment** - determines the toxic effects of the contaminants; and

- **Risk Characterization** - provides a quantitative assessment of the overall current and future risk to people from site contaminants based on the exposure and toxicity information.

The HHRA evaluated health effects which could result from exposure to soil, groundwater, surface water, and sediment contamination in the Phase II reuse area of VHFS. The HHRA evaluated potential risks to current workers who could be exposed to contaminants in surface soil, and to current trespassers who could be exposed to contamination in surface soil, surface water, and sediment. In addition, the HHRA evaluated potential risks to hypothetical future adult residents who could be exposed to contaminants in groundwater and surface soil and to hypothetical future child residents who could be exposed to contaminants in groundwater, surface soil, surface water, and sediment. Potential risks to future excavation workers who could be exposed to contaminants in subsurface soil were also evaluated in the HHRA. Subsurface soil was only evaluated for excavation workers and not residents since residents would be unlikely to be exposed to subsurface soil. In addition, the concentrations of contaminants currently present in subsurface soil would not be representative of the concentrations that might be present if landscaping activities were to occur which would involve mixing of subsurface soils with surface soil, clean topsoil, and other soil amendments. Therefore, it would not be appropriate to evaluate risks to residents using available subsurface soil data.

Potential carcinogenic (cancer-related) effects and noncarcinogenic effects (including various impacts on different organ systems, such as lungs, liver, etc.) were evaluated in the HHRA. Carcinogenic effects are expressed as the probability that an individual will develop cancer from exposure to the contaminants from each AREE. The evaluation of noncarcinogenic effects is based on the hazard index (HI), which is the summation of the HQs for individual chemicals. The HQ is a comparison of chemical-specific chronic exposure doses with the corresponding protective doses derived from health criteria. The USEPA recommends that remedial actions may be warranted at sites where the carcinogenic risk to any person is greater than $1 \times 10^{-4}$ or the HI is greater than 1. A carcinogenic risk of $1 \times 10^{-4}$ means that there is a potential of one additional person in a population of 10,000 developing cancer from exposure to contaminants at an AREE if the AREE is not remediated. A HI greater than 1 indicates a potential for noncarcinogenic health effects if the AREE is not remediated.

The ERA also follows a four-step process:

- **Problem Formulation** - develops information that characterizes habitats and potentially exposed species and identifies contaminants of concern, exposure pathways, and receptors;

- **Exposure Assessment** - estimates exposure point concentrations for selected indicator species;

- **Ecotoxicologic Effects Assessment** - identifies concentrations or doses of contaminants that are protective of indicator species; and
The ERA evaluated ecological effects which could result from exposure to surface soil, surface water, and sediment contamination in the Phase II reuse area of VHFS. The ERA evaluated potential adverse ecological effects to terrestrial plants and terrestrial invertebrates (represented by earthworms) exposed to contaminants in surface soil. In addition, potential adverse ecological effects to mammals (represented by shrews) and birds (represented by robins) through bioaccumulation in the food web and exposure to contaminants in surface soil were evaluated. Potential adverse ecological effects to aquatic life from exposure to contaminants in surface water and sediment were also evaluated in the ERA. Further, the potential adverse ecological effects to mammals (represented by minks) and birds (represented by herons) through bioaccumulation in the food web and exposure to contaminants in sediment were evaluated.

The evaluation of significant potential adverse ecological effects is based on the Environmental Effects Quotient (EEQ). The EEQ is the ratio of the estimated exposure concentrations/doses for the chemicals of potential concern and the toxicity reference values (TRVs) for the ecological receptors. If the EEO is greater than 1, there is a potential for adverse ecological effects to occur. As the magnitude of the EEQ becomes greater than 1, the potential for adverse ecological effects becomes more significant.

The results of the BRA for the four AREEs are presented in the following paragraphs. A detailed presentation of the BRA can be found in the Phase II Reuse Area RI Report (USACE, 1999), available in the Information Repository.

5.1 AREE 2 - Sewage Treatment Plant

The HHRA determined that, under both current industrial/commercial and potential future residential land-use conditions, the risks to workers, trespassers, residents, and excavation workers are acceptable for exposure to site-related contaminants at AREE 2. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (1X10^{-5}) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion, and the highest noncarcinogenic risk (HI=5) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion. The contaminant that drove the elevated HI at AREE 2 is iron which was detected at comparable levels in similar surface soil types in background locations and is, therefore, not site-related.

The ERA determined that contaminants in surface soil at AREE 2 pose significant potential adverse ecological effects. The significant potential adverse ecological effects result primarily from mercury. Mercury results in significant potential adverse ecological effects for terrestrial plants, earthworms, robins, and shrews, with the greatest potential adverse ecological effects occurring to robins (EEQ of 3,500).

The mercury contamination downgradient of the former sludge pile is recommended for remediation. The impacted area has approximate dimensions of 75 ft by 25 ft by 2 ft deep, as shown on Figure 3.

5.2 AREE 4 - Auto Craft Shop

The HHRA concluded that, under both current industrial/commercial and potential future residential land-use conditions, the risks to workers, trespassers, residents, and excavation workers are acceptable for exposure to site-related contaminants, except for lead, in soil at AREE 4. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (3X10^{-5}) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion, and the highest noncarcinogenic risk (HI=0.5) is for child residents exposed to site-related contaminants in surface soil by dermal absorption.
The human health risks associated with exposure to lead contamination in surface soil at AREE 4 were evaluated using the Integrated Exposure Uptake Biokinetic (IEUBK) Model recommended by USEPA for evaluating lead exposures for young children in residential settings. The IEUBK Model calculates blood lead levels which result from exposures to lead which may then be compared to blood lead levels of toxicological significance for purposes of risk evaluation. The IEUBK Model run for AREE 4 predicted a geometric mean blood lead level of 6.9 µg/dL, with 19.81 percent of the population exceeding the blood lead level of concern (10 µg/dL). The USEPA currently finds 5 percent of the population exceeding the blood lead level of concern acceptable. Therefore, the IEUBK model results indicate that if AREE 4 was developed for residential use in the future, the lead concentrations in the surface soil may be a potential problem for young children.

The ERA determined that metals in surface soil at AREE 4 pose significant potential adverse ecological effects. The significant potential adverse ecological effects result primarily from lead, selenium, mercury, and zinc. Lead, selenium, and zinc result in significant potential adverse ecological effects to terrestrial plants with EEQs of 34, 38, and 15, respectively. Mercury results in significant potential adverse ecological effects to robins (EEQ of 210) and shrews (EEQ of 13).

The metals contamination in the surface soil at the three surface runoff/discharge areas is recommended for remediation. The approximate dimensions of the impacted area at each of the three surface runoff/discharge areas are 15 ft x 15 ft x 2 ft deep, as shown on Figure 4.

5.3 AREE 28-5 - Former Service Station Abandoned USTs

The ERA did not evaluate AREE 28-5 because this area is covered with asphalt, thus eliminating the potential for exposure to ecological receptors.

The HHRA determined that contamination at AREE 28-5 does not pose an unacceptable human health risk under either current industrial/commercial or potential future residential land-use conditions. In fact, no chemicals of potential concern were identified in subsurface soil at AREE 28-5 in the HHRA. However, risks associated with exposures to TPH could not be assessed in the BRA because this analytical parameter represents a mixture of chemical constituents. Since TPH measurements give no indication of the chemical constituents present or their respective concentrations, they cannot be used to predict risks. Although risks associated with TPH cannot be estimated, TPH contamination in subsurface soil in the vicinity of the former pump island at AREE 28-5 exceeds the Virginia TPH soil action level for USTs and is, therefore, recommended for remediation. The impacted area is approximately 20 ft x 20 ft x 10 ft deep (minimum), as shown on Figure 5.

5.4 AREE 31 - Construction Debris Pile #1

The HHRA determined that, under current industrial/commercial land-use conditions, the risks to workers and trespassers are acceptable for exposure to contaminants in surface soil at AREE 31. Under potential future residential land-use conditions, assuming that AREE 31 is not remediated, the risks to potential adult and child residents are unacceptable for exposure to contaminants in surface soil at AREE 31. The highest estimated upper-bound excess lifetime cancer risk is for child residents exposed to contaminants in surface soil by incidental ingestion; this risk is 4x10^{-4} (i.e., 4 in 10,000 residents may develop cancer caused by exposure to contaminants in surface soil at AREE 31). Cancer risks were due primarily to exposure to benzo(a)pyrene and other PAHs. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest noncarcinogenic risk is for child residents exposed to contaminants in surface soil by incidental ingestion; the HI is estimated to be 0.7.

As explained in the AREE 4 discussion, lead contamination in surface soil at AREE 31 was evaluated using the IEUBK Model which predicted a geometric mean blood lead level of 15 µg/dL, with 78.4 percent of the population exceeding the blood lead level of concern (10 µg/dL). Again, the USEPA currently finds 5 percent of the population exceeding the blood lead level of concern acceptable. Therefore, the IEUBK Model
results indicate that if AREE 31 was developed for residential use in the future, the lead concentrations in the surface soil may be a potential problem for young children.

The ERA determined that contaminants in surface soil at AREE 31 pose significant potential adverse ecological effects. The significant potential adverse ecological effects result primarily from metals (copper, lead, mercury, and selenium) and one PAH (benzo[a]pyrene). Mercury results in significant potential adverse ecological effects for robins and shrews, with the greatest potential adverse ecological effects occurring to robins (EEQ of 250). Copper results in significant potential adverse ecological effects for terrestrial plants and earthworms, with the greatest potential adverse ecological effects occurring to earthworms (EEQ of 38). Selenium and lead result in significant potential adverse ecological effects for terrestrial plants with EEQs of 25 and 72, respectively. Benzo(a)pyrene results in significant potential adverse effects to earthworms with an EEQ of 13.

The most significant contamination at AREE 31 is in surface soil in the vicinity of surface soil sample RISS31-2 located in the northeastern portion of the debris pile, which is recommended for remediation. The impacted area has approximate dimensions of 50 ft x 15 ft x 2 ft, as shown on Figure 6.

6.0 REMEDIAL ACTION OBJECTIVES

Remedial action objectives are specific goals to protect human health and the environment. The remedial action objective for the four AREEs is to minimize the potential for contaminated soil to pose unacceptable risks to human or ecological receptors.

7.0 CLEANUP LEVELS ESTABLISHED FOR THE SELECTED ALTERNATIVE

USEPA has established soil cleanup levels for the contaminants that contribute to the unacceptable risk determination at each of the four AREEs. The soil cleanup levels are presented in Table 1. The soil cleanup level for AREE 2 is based on concentrations which are protective of ecological receptors (EEQ=10). The soil cleanup level for lead in surface soil at AREEs 4 and 31 is based on the USEPA screening level for lead in residential soil of 400 ppm. The soil cleanup levels for other metals at AREE 4 are based on concentrations which are protective of ecological receptors. The soil cleanup level for AREE 28-5 is based on the Virginia TPH soil action level for USTs of 100 ppm. USEPA established the soil cleanup levels for PAHs at AREE 31 based on a 1X10^-6 (one in 1,000,000 people) upper-bound excess lifetime cancer risk for the potential future residential use scenario. The soil cleanup levels for metals, other than lead, at AREE 31 are based on concentrations which are protective of ecological receptors.

8.0 SUMMARY OF REMEDIAL ALTERNATIVES

Two remedial alternatives were evaluated to address soil contamination at AREEs 2, 4, 28-5, and 31. The range of remedial alternatives considered was limited by the nature and extent of the contamination. Since the amount of soil requiring remediation is relatively small (approximately 400 cubic yards), it was not practical to consider active treatment or containment options in terms of cost-effectiveness and implementability. The following remedial alternatives were evaluated:

- Alternative 1 - No Action; and
- Alternative 2 - Soil Removal.
Table 1
Cleanup Levels Established for Soil at the Four AREEs

<table>
<thead>
<tr>
<th>Constituents</th>
<th>Cleanup Levels (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AREE 2 - SEWAGE TREATMENT PLANT</strong></td>
<td></td>
</tr>
<tr>
<td>Mercury (Ecological risk)</td>
<td>0.192 (a)</td>
</tr>
<tr>
<td><strong>AREE 4 - AUTO CRAFT SHOP</strong></td>
<td></td>
</tr>
<tr>
<td>Lead (Human Health &amp; Ecological risk)</td>
<td>400 (d)</td>
</tr>
<tr>
<td>Mercury (Ecological risk)</td>
<td>0.534 (a)</td>
</tr>
<tr>
<td>Selenium (Ecological risk)</td>
<td>10 (a)</td>
</tr>
<tr>
<td>Zinc (Ecological risk) (c)</td>
<td>500 (a)</td>
</tr>
<tr>
<td><strong>AREE 28-5 - FORMER SERVICE STATION ABANDONED USTs</strong></td>
<td></td>
</tr>
<tr>
<td>TPH</td>
<td>100 (e)</td>
</tr>
<tr>
<td><strong>AREE 31 - CONSTRUCTION DEBRIS PILE #1</strong></td>
<td></td>
</tr>
<tr>
<td>Benzo(a)anthracene (Human Health risk)</td>
<td>0.87 (b)</td>
</tr>
<tr>
<td>Benzo(a)pyrene (Human Health &amp; Ecological risk)</td>
<td>0.087 (b)</td>
</tr>
<tr>
<td>Benzo(b)fluoranthene (Human Health risk)</td>
<td>0.87 (b)</td>
</tr>
<tr>
<td>Benzo(k)fluoranthene (Human Health risk) (c)</td>
<td>8.7 (b)</td>
</tr>
<tr>
<td>Copper (Ecological risk)</td>
<td>500 (a)</td>
</tr>
<tr>
<td>Indeno(1,2,3-cd)pyrene (Human Health risk)</td>
<td>0.87 (b)</td>
</tr>
<tr>
<td>Lead (Human Health &amp; Ecological risk)</td>
<td>400 (d)</td>
</tr>
<tr>
<td>Mercury (Ecological risk)</td>
<td>0.48 (a)</td>
</tr>
<tr>
<td>Selenium (Ecological risk)</td>
<td>10 (a)</td>
</tr>
</tbody>
</table>

TPH - total petroleum hydrocarbons
USTs - underground storage tanks
(a) Based on a concentration which is protective of ecological receptors (EEQ=10).
(b) Human health cleanup levels are based on a $1 \times 10^6$ upper-bound excess lifetime cancer risk for the potential future residential land-use scenario.
(c) These compounds contribute to but do not drive unacceptable risk.
(d) USEPA screening level for lead in residential soil.
(e) Virginia TPH soil action level for USTs.
8.1 Alternative 1 - No Action

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), require that a No Action alternative be considered as a baseline for comparison to other alternatives. No action would be taken to address site contamination under this alternative. In accordance with Section 121 of CERCLA, each AREE would be reviewed at least once every five years to re-evaluate site conditions and to determine the need for remedial action to protect human health and the environment.

8.2 Alternative 2 - Soil Removal

Under this alternative, all contaminated soil exceeding the established cleanup levels would be excavated, transported off site by truck, and disposed using a combination of permitted off-site, hazardous waste, construction debris, and/or municipal landfills, as appropriate based on analytical results. Approximately 400 cubic yards of impacted soil would be excavated as part of this alternative, followed by confirmation sampling to assure adequate removal of all soil exceeding the cleanup levels. Upon completion of the soil excavation, disturbed areas would be backfilled, regraded, and either vegetatively stabilized or paved (AREE 28-5). The five-year review does not apply to this alternative because hazardous substances above risk-based cleanup levels would not remain on site.

9.0 EVALUATION OF ALTERNATIVES

CERCLA requires a comparison of the alternatives using nine evaluation criteria: overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements (ARARs); long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; cost; and regulator and community acceptance. The first two criteria are considered by USEPA to be threshold criteria which must be met by each alternative. The nine evaluation criteria are described below:

- **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with ARARs** addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and requirements or provides grounds for invoking a waiver.

- **Long-term effectiveness and permanence** refers to the ability of a remedy to maintain reliable protection of human health over time, once cleanup goals have been met.

- **Reduction of toxicity, mobility, or volume through treatment** is the anticipated performance of the treatment technologies a remedy may employ.

- **Short-term effectiveness** addressesthe period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

- **Implementability** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.
• **Cost** includes estimated capital and operation and maintenance costs, and net present worth costs.

• **Regulator acceptance** indicates whether, based on their review of the RI and Proposed Plan, the regulators (the Virginia Department of Environmental Quality [VDEQ] and USEPA) concur, oppose, or have no comment on the selected alternative.

• **Community acceptance** is assessed in the Responsiveness Summary which summarizes the public comments received on the RI and the Proposed Plan.

The comparative analysis of the alternatives was conducted based upon these evaluation criteria, and is described below.

9.1 Overall Protection of Human Health and the Environment

The no action alternative (Alternative 1) is not protective of human health or the environment because the risks to potential future residents and the potential adverse effects to ecological receptors remain unchanged, which is unacceptable. Therefore, the no action alternative was eliminated from further consideration and will not be discussed further.

Alternative 2 provides adequate protection of human health and the environment by removing contaminated soil, thereby eliminating the potential for exposure.

9.2 Compliance with ARARs

Alternative 2 has been designed to achieve or comply with ARARs. This alternative will satisfy the established cleanup levels since all soil that is contaminated above applicable cleanup levels will be removed. In addition, the removal and disposition of contaminated soil during implementation of Alternative 2 would be done in accordance with federal and Virginia solid and hazardous waste regulations. During soil excavation, the Regulations of the Virginia Air Pollution Control Board may apply. Ambient air conditions would be monitored during excavation activities to assure acceptable air quality. As necessary based on the ambient air monitoring, water sprays would be used to keep dust levels down.

9.3 Long-term Effectiveness and Permanence

Alternative 2 would provide for the permanent removal of contaminated soil to a permitted off-site location designed to prevent contaminant migration and exposures to human and ecological receptors.

9.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 2 provides reduction of contamination at the AREEs by removing contaminated soil. The toxicity and volume of the contaminated soil would not be affected by this alternative; however, the mobility of the contaminants would be reduced because the off-site disposal facilities used would be designed to prevent contaminant migration.

Because treatment of the contaminated soil at the AREEs was not found to be practicable due to the small volume of impacted soil, Alternative 2 does not satisfy the statutory preference for treatment as a principal element of the remedy.

9.5 Short-term Effectiveness

Alternative 2 is considered to be effective in the short term because the volume of soil to be excavated is relatively small and would result in limited negative impacts to human health or the environment. Dust
exposure to workers and adjacent residents would be controlled during excavation activities by water sprays as needed. Prior to excavation operations, temporary erosion control structures would be installed to prevent entry of storm water into the soil excavation areas and prevent erosion and movement of soil from contaminated areas. Although truck traffic would be increased during implementation of Alternative 2, the implementation period (approximately one month) is short and the number of trucks per day would be less than 20.

9.6 Implementability

Alternative 2 is considered readily implementable. Licensed transporters and permitted disposal facilities are currently available.

9.7 Cost

The cost to implement Alternative 2 is estimated at $260,000.

9.8 Regulator Acceptance

VDEQ and USEPA concur with the selected remedy.

9.9 Community Acceptance

A public meeting on the Proposed Plan was held on April 9, 1998, in Warrenton, Virginia. Comments received during the public meeting and the public comment period are referenced in the Responsiveness Summary (Section 12 of this DD).

10.0 SELECTED REMEDY AND STATUTORY DETERMINATIONS

10.1 Selected Remedy

Following review and consideration of the information in the Information Repository, requirements of CERCLA and the NCP, and the review of public comments on the Proposed Plan, the U.S. Army, in coordination with VDEQ and USEPA, has selected Alternative 2, Soil Removal, as the remedy for the contaminated soil at AREEs 2, 4, 28-5, and 31.

Under this remedy, all contaminated soil exceeding the established cleanup levels would be excavated, transported off site by truck, and disposed using a combination of permitted off-site hazardous waste, construction debris, and/or municipal landfills, as appropriate based on analytical results. Approximately 400 cubic yards of impacted soil would be excavated as part of this remedy, followed by confirmation sampling to assure adequate removal of all soil exceeding the cleanup levels (refer to Table 1). Upon completion of the soil excavation, disturbed areas would be backfilled, regraded, and either vegetatively stabilized or paved (AREE 28-5).

The estimated cost to implement this remedy is $260,000, and the on-site activities would require approximately one month to complete.

10.2 Statutory Determinations

Under CERCLA Section 121, selected remedies must be protective of human health and the environment, must comply with ARARs (unless a statutory waiver is justified), must be cost-effective, and must utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment
that permanently and significantly reduces the volume, toxicity, or mobility of hazardous waste as their principal element. The following sections discuss the remedy in light of these statutory requirements.

10.2.1 Protection of Human Health and the Environment

The selected remedy would protect human health and the environment. All contaminated soil exceeding the established cleanup levels will be removed and disposed of in permitted, off-site facilities. The cleanup levels listed in Table 1 were developed to be protective of human health and the environment.

Short-term risks would be present as a result of dust exposure to workers and adjacent residents, soil erosion and sedimentation during excavation activities, and transport of contaminated soil off site. These risks would be acceptable as a result of control measures which would be implemented during the remedial action. These control measures include use of water sprays during excavation operations to control dust, and use of silt fences and other erosion control techniques to control erosion and soil movement from contaminated areas. The increase in truck traffic would be minimal, with the addition of less than 20 trucks per day over the course of approximately one month.

10.2.2 Compliance with ARARs

The selected remedy will be in full compliance with ARARs:

• 9 Virginia Administrative Code (VAC) 20-80-10 et seq.: Virginia Solid Waste Management Regulations – the disposal of any soil, debris, sludge or any other solid waste must be done in compliance with the regulations;

• 9 VAC 20-60-10 et seq.: Virginia Hazardous Waste Management Regulations – the disposal of any hazardous waste must be done in compliance with the regulations;

• 4 VAC 50-30-10, et seq.: Virginia Erosion and Sedimentation Control Regulations – an erosion and sedimentation control plan that complies with the minimum design and implementation standards of the regulations will be prepared before engaging in any land disturbing activity;

• 9 VAC 5-10-10 through 9 VAC 5-80-350: Regulations of the Virginia Air Pollution Control Board – ambient air monitoring will be used to determine the need for water sprays to control dust generation in order to comply with ambient air quality standards for particulate matter.

10.2.3 Cost-Effectiveness

The selected remedy affords overall effectiveness proportional to its costs. All contaminated soil exceeding the established cleanup levels will be removed from AREEs 2, 4, 28-5, and 31. The entire remedy will be achieved for approximately $260,000.

10.2.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The selected remedy utilizes permanent solutions to the maximum extent practicable while providing the best balance among the other evaluation criteria. It achieves the best balance of tradeoffs with respect to the primary balancing criteria of long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; short-term effectiveness; implementability; and cost; while also considering regulator and community acceptance.

The selected remedy provides a high degree of long-term effectiveness and permanence as the removal and off-site disposal of the contaminated soil would be permanent and irreversible. The variety of contaminants present in the soil at AREEs 2, 4, 28-5, and 31 and the relatively small volume of contaminated soil cause on-site treatment technologies to be impracticable and not cost-effective. The selected remedy is
easily implementable, with a relatively short time frame needed for design development. There is minimal risk to the community during the implementation of the selected remedy, and the slight risks to the environment can be reduced by implementing standard procedures, such as erosion and sedimentation controls.

10.2.5 **Preference for Treatment as a Principal Element**

Because treatment of the principal threat at AREEs 2, 4, 28-5, and 31 was not found to the practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy.

11.0 **HIGHLIGHTS OF COMMUNITY PARTICIPATION**

The Proposed Plan for AREEs 2, 4, 28-5, and 31 was released to the public on March 26, 1998 (see Attachment 1). This document was made available for public review in the Information Repository at the following location:

Fauquier County Library  
Warrenton Branch - Reference Section  
11 Winchester Street, Warrenton, VA  
(540) 347-8750  
Monday - Wednesday: 10:00 a.m. to 9:00 p.m.  
Thursday - Saturday: 9:00 a.m. to 5:00 p.m.  
Sunday: 1:00 p.m. to 5:00 p.m.

The notice of availability of the Proposed Plan (see Attachment 3) was published in The Fauquier Citizen, the Fauquier Times-Democrat, and the Manassas Journal Messenger during the week of March 23, 1998. A public comment period was held from March 26, 1998, through April 24, 1998. In addition, a public meeting was held on April 9, 1998, to present the Proposed Plan for AREEs 2, 4, 28-5, and 31 and to answer questions and receive public comments. The public meeting minutes have been transcribed, and a copy of the transcript is available to the public at the aforementioned location. A Responsiveness Summary, included as part of this DD, has been prepared to respond to the significant comments, criticisms, and new relevant information received during the comment period. Upon signing the DD, the U.S. Army will publish a notice of availability of this DD in The Fauquier Citizen, the Fauquier Times-Democrat, and the Manassas Journal Messenger, and place the DD in the Information Repository.

12.0 **RESPONSIVENESS SUMMARY**

The purpose of this Responsiveness Summary is to provide the public with a summary of citizen comments, concerns, and questions about AREEs 2, 4, 28-5, and 31. A public meeting was held on April 9, 1998, to present the Proposed Plan and to answer questions and receive comments. At the public meeting, one citizen had a question regarding the Proposed Plan. No written public comments were received during the March 26, 1998, through April 24, 1998, comment period.

The Responsiveness Summary is divided into the following sections:

- Selected newspaper notices announcing dates of the public comment period and location and time of the public meeting;
- Comments raised during the public meeting on April 9, 1998;
- Public meeting attendance roster; and
- Restoration Advisory Board Members.
All comments and concerns summarized in this document have been considered by the U.S. Army in making a decision regarding the selected alternative.

12.1 Selected Newspaper Notices

A public notice announcing the availability of the Proposed Plan and the public meeting was published in The Fauquier Citizen, the Fauquier Times-Democrat, and the Manassas Journal Messenger during the week of March 23, 1998. This public notice is provided in Attachment 3.

12.2 Comments Raised During the Public Meeting on April 9, 1998

One citizen raised a comment during the public meeting. The citizen’s question and the U. S. Army’s response are presented below:

CONCERNED CITIZEN: Is AREE 31 located directly under the trees or beyond the stand of trees?

ARMY RESPONSE: AREE 31 is located within the tree line.

12.3 Public Meeting Attendance Roster

The public meeting was held on April 9, 1998, at the Warrenton Middle School. The members of the community that attended the public meeting included Owen Bludau.

12.4 Restoration Advisory Board Members

1. Debra Reedy, Community Co-Chair
2. Richard Reisch, U.S. Army Co-Chair
3. Dean Eckelberry
4. John Mayhugh
5. Jeff Lippincott
6. Owen Bludau
7. Tim Tarr
8. Norris Goff
9. Erich Meding
10. Kevin Bell
11. Mark Stevens
12. Nancy Inger
13. Joanne Smith
14. Henry Ross
15. Steve Mihalko
16. Robert Stroud
17. Steve Maddox
18. William Downey
19. Gina Tyo
20. Joe Phelan
21. Mike Molloy
22. Denny Adams
23. Joe Wilts
24. Bob Root
25. Georgia Herbert
26. Robert Kibe
27. Kimberly Davis
28. George Rosenberger
29. Adrienne Garreau
30. Susan Dove
31. James Tucker
32. John Williams

13.0 REFERENCES


U.S. Army Environmental Center (USAEC). 1996. Site Inspection Report with Supplemental Hydrogeologic
INTRODUCTION

The U.S. Army has identified a preferred alternative to address contaminated soil at selected Areas Requiring Environmental Evaluation (AREEs) located on Vint Hill Farms Station (VHFS). The major characteristics of the U.S. Army’s preferred alternative (Alternative 2 in this Proposed Plan) include excavation of contaminated soil and off-site disposal at a permitted facility.

This Proposed Plan is based on site-related documents contained in the VHFS Information Repository. The Information Repository can provide you with important information about the site and the four AREEs. The Information Repository is located at:

Fauquier County Library
Warrenton Branch - Reference Section
11 Winchester Street, Warrenton, VA
(540) 347-8750
Monday -Wednesday: 10:00 a.m. to 9:00 p.m.
Thursday - Saturday: 9:00 a.m. to 5:00 p.m.
Sunday: 1:00 p.m. to 5:00 p.m.

The U.S. Army needs your comments and suggestions. The U.S. Army, the U.S. Environmental Protection Agency (USEPA) Region III, and the Virginia Department of Environmental Quality (VDEQ) encourage the public to review and comment on both of the alternatives presented in the Proposed Plan. The public comment period begins on March 26, 1998, and closes on April 24, 1998. Please send your comments postmarked no later than April 24, 1998, to:

Kevin Bell, Public Affairs Officer
Public Affairs Office (Bldg. 2500)
Vint Hills Farm Station
Warrenton, VA 20187-5001

In addition, you are invited to a public meeting regarding the investigation and cleanup of contamination at the selected AREEs at VHFS. Representatives from the U.S. Army will report on cleanup alternatives considered and the U.S. Army’s preferred alternative. The meeting is scheduled for:

Thursday, April 9, 1998 at 7:00 p.m.
Warrenton Middle School Auditorium
244 Waterloo Street, Warrenton, VA

Special provisions will be made for the handicapped and hearing impaired.

The remedy described in this Proposed Plan is the U.S. Army’s preferred alternative for the selected AREEs. The U.S. Army may modify the preferred alternative or select another remedial alternative if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The U.S. Army, in consultation with USEPA and VDEQ, will make a remedy selection for the AREEs in a Decision Document after the public comment period has ended and the comments and information submitted during that time have been reviewed and considered.

The U.S. Army is issuing this Proposed Plan as part of its public participation responsibilities under Sections 113(k) and 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act.
(CERCLA), as amended, commonly known as the “Superfund Program”, and the National Environmental Policy Act of 1969 (NEPA). This Proposed Plan focuses on AREES 2, 4, 28-5, and 31. Other areas of VHFS that the U.S. Army plans to remediate are addressed by separate Proposed Plans.

SITE BACKGROUND

VHFS is part of the U.S. Army Communications - Electronics Command (CECOM) and, while active, primarily functioned as an Army installation engaged in communications intelligence. VHFS is located approximately 40 miles southwest of Washington, D.C., in Fauquier County, Virginia, as shown on Figure 1. The installation occupies approximately 701 acres of land near the town of Warrenton, Virginia. Approximately 150 acres of the installation are improved grounds in the southern portion of the property used for industrial operations, administration buildings, and residential housing. Approximately 94 acres in the eastern portion of the property are mature hardwood forest, and the majority of the remaining 457 unimproved and semi-improved acres in the northern portion of the property are used for stationary and mobile antenna operation sites.

The facility was designated for closure in March, 1993, under the Base Realignment and Closure (BRAC) Act. Pursuant to the decision to close the installation, an Enhanced Preliminary Assessment (ENPA) and a Community Environmental Response Facilitation Act (CERFA) investigation of VHFS were conducted by Science Applications International Corporation (SAIC) to assess the environmental condition of the installation. The ENPA and CERFA investigations were completed in April and May, 1994, respectively. The ENPA identified 42 AREEs from the review of installation records, aerial photographs, installation personnel interviews, federal and state regulatory records, and visual inspection. Of these 42 AREEs, 27 were recommended for further investigation.

These 27 AREEs were investigated from September, 1994, to June, 1995, as part of the Site Inspection (SI) conducted by SAIC. The objective of the SI was to determine the presence or absence of contamination and the chemical nature of any detected contamination. The final SI Report, which was completed in June, 1996, identified 24 AREEs which required further investigation. In addition, four new AREEs were identified during site reconnaissance to warrant further investigation subsequent to the SI. AREEs that were determined to warrant further investigation and are located in the Phase II reuse area (shown on Figure 2) were investigated between February and April, 1997, as part of the Phase II reuse area Remedial Investigation (RI) conducted by ICF Kaiser Engineers, Inc. (ICF KE). The purposes of the RI were to evaluate: 1) the nature and extent of contamination; and 2) the level of risk posed to human health and the environment. The draft RI Report for the Phase II reuse area was completed in January, 1998, and is currently undergoing regulatory review.

Four AREEs were identified in the RI as having soil contamination which poses unacceptable human health risks and/or significant adverse ecological effects:

- AREE 2 - Sewage Treatment Plant;
- AREE 4 - Auto Craft Shop;
- AREE 28-5 - Former Service Station Abandoned Underground Storage Tanks (USTs); and
- AREE 31 - Construction Debris Pile #1.

The locations of these AREEs are shown on Figure 2.

RESULTS OF THE REMEDIAL INVESTIGATION

The RI for these four AREEs was conducted to evaluate the nature and extent of contamination associated with past site activities. Environmental samples collected and analyzed during the RI were used in conjunction with the results from the SI to assess the condition of each of the AREEs. The environmental media investigated included surface soil (0 to 2 feet below ground surface [bgs]).
subsurface soil (2 feet to approximately 10 feet bgs), surface water, sediment, and groundwater. Analytical results were compared to background concentrations and regulatory screening levels to determine if environmental media had been adversely impacted by site activities. A brief description of each of the four AREEs and the significant findings of the RI and SI are presented in the following paragraphs. A detailed presentation of the samples collected and the analytical results can be found in the draft Phase II Reuse Area RI Report, now available in the Information Repository at the Fauquier County Library.

**AREE 2- Sewage Treatment Plant**

AREE 2 is the sewage treatment plant (STP) which serves approximately 70 VHFS permanent residents and 500 daily employees and has been in service since 1952. The plant has treated sanitary wastewater, industrial wastewater from VHFS operations (photographic, painting, laboratory, vehicle washing, and metal etching), and surface water runoff. The facility discharges treated effluent to South Run under a Virginia Pollutant Discharge Elimination System (VPDES) permit. Before 1980, sludge was stored in piles on the ground near South Run.

Surface soil, subsurface soil, sediment, surface water, and groundwater samples were collected at AREE 2 as shown on Figure 3. Metals were detected in surface soil above residential soil risk-based concentrations (RBCs) established by USEPA Region III for screening analytical results. Mercury (4.3 parts per million [ppm]) was detected above the residential soil RBC of 2.3 ppm in surface soil sample SS-02-002. Benzo(a)pyrene, a polynuclear aromatic hydrocarbon (PAH), was present above residential soil RBCs in one surface soil sample downgradient of the former sludge pile. Based on the results of the subsurface soils samples, subsurface soil has not been impacted by AREE 2 activities.

**AREE 4 - Auto Craft Shop**

The Auto Craft Shop (Building 306 and former Building 308) was used as the motor pool from 1943 to 1967, and as a vehicle maintenance area where military personnel performed maintenance on their private vehicles from 1968 to 1994. The buildings were used to store oil, solvents, and lubricants for vehicle maintenance activities as well as spent solvent and waste oil filters. The buildings have concrete floors with no curbs or floor drains. Gasoline and oil spills have been recorded in this area and were cleaned up using absorbents. A 1,000-gallon UST was used to store waste oil prior to its removal in July, 1990. A plume of petroleum contamination currently lies under the shop as a result of leaks from the UST. A corrective action for this plume has been implemented. Three areas where surface runoff/discharge from AREE 4 occurs have been identified (see Figure 4). An outdoor vehicle wash rack near former Building 308 drained into a grit chamber, which has been removed. The grit chamber was used to settle the solids prior to discharge of water from the vehicle wash rack via a ceramic pipe into the wooded area south of former Building 308. The floor of the grit chamber and the associated contaminated soil were removed during the Phase II reuse area RI field investigation. A storm sewer drain located west of Building 306 and former Building 308 discharged surface runoff to the field south of the Auto Craft Shop. Surface runoff also drains south of the Auto Craft Shop near the former hydraulic lift.

Surface soil, subsurface soil, and groundwater samples were collected at AREE 4 as shown on Figure 4. Total petroleum hydrocarbon (TPH) contamination, exceeding the Virginia TPH soil action level for USTs of 100 ppm, was present in surface soil samples collected near the storm sewer discharge area, former hydraulic lift surface runoff area, and wash rack discharge area. The maximum TPH concentration (1,860 ppm) was detected in surface soil sample SS-04-002 collected at the former hydraulic lift surface runoff area. Metals were detected in surface soil above residential soil RBCs at all three surface runoff/discharge areas. Lead contamination exceeding the USEPA screening level for lead in residential soil of 400 ppm was detected in surface soil at all three surface runoff/discharge areas. The maximum lead concentration (1,700 ppm) was detected in a surface soil sample collected from the storm sewer discharge area. Four PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, and indeno[1,2,3-cd]pyrene) exceeding the residential soil RBCs are present in surface soil at the wash rack discharge area. Only benzo(a)pyrene is present in surface soil above the residential soil RBC (0.088 ppm) in all three surface runoff/discharge areas. The maximum benzo(a)pyrene concentration of 1.52 ppm was detected in surface soil sample RISS4-5.
FIGURE 3
SI AND RI SAMPLE LOCATIONS
FOR AREE 2 - SEWAGE TREATMENT PLANT

LEGEND:
- IMPACTED SURFACE SOIL AREA (APPROXIMATE)
- BUILDING
- VFBS BOUNDARY
- PAVED ROAD
- FENCE
- STREAM
- TRIBUTARY
- 380' TOPOGRAPHIC CONTOUR (FT MSL)
- SI SURFACE SOIL SAMPLE LOCATION
- EXISTING MONITORING WELL
- PHASE II RI MONITORING WELL
- PHASE II RI SOIL BORING LOCATION
- PHASE II RI SURFACE WATER/SEDIMENT SAMPLE LOCATION

NOTES:
1. SURFACE SOIL LOCATIONS (RISB2-1 AND RISB2-2) ARE CO-LOCATED WITH THE SOIL BORING LOCATIONS (RISB2-1 AND RISB2-2).
2. MONITORING WELL NUMBERS 2MW-1 THROUGH 2MW-3 HAVE BEEN MODIFIED FROM THE NUMBERS REPORTED IN THE ORIGINAL FIELD INVESTIGATIONS IN ORDER TO PROVIDE UNIQUE WELL NUMBERS FOR THIS REPORT.
NOTES:
1. SURFACE SOIL SAMPLE LOCATIONS (RSB4-3 THROUGH RSB4-11) ARE CO-LOCATED WITH THE SOIL BORING LOCATIONS (RSB4-3 THROUGH RSB4-11).
2. MONITORING WELL NUMBERS MWK-1 THROUGH MWK-3 HAVE BEEN MODIFIED FROM THE NUMBERS REPORTED IN THE ORIGINAL FIELD INVESTIGATIONS IN ORDER TO PROVIDE UNIQUE WELL NUMBERS FOR THIS REPORT.

LEGEND:
- IMPACTED SURFACE SOIL AREA (APPROXIMATE)
- FENCE
- BUILDING
- ROAD
- STORM DRAIN
- TOPOGRAPHIC CONTOUR (FT MSL)
- SI SOIL BORING LOCATION
- SI SURFACE SOIL SAMPLE LOCATION
- PHASE II RI SOIL BORING LOCATION
- EXISTING MONITORING WELL
- PHASE II RI MONITORING WELL

FIGURE 4
SI AND RI SAMPLE LOCATIONS FOR AREAS 4 - AUTO CRAFT SHOP
located in the wash rack discharge area. Based on the results of the subsurface soil samples from the three surface runoff/discharge areas, subsurface soil has not been impacted by AREE 4 activities.

**AREE 28-5 - Former Service Station Abandoned USTs**

AREE 28-5 consists of the Former Service Station Abandoned USTs located under the asphalt parking lot approximately 60 ft northwest of the former service station (Building 220). Three 5,000-gallon steel USTs were used for the storage of gasoline and diesel fuel products. The USTs were approximately 30 years old and were in service until 1983. Environmental Restoration Company (ERC) removed the USTs and associated pipelines in December, 1994.

Subsurface soil and groundwater samples were collected at AREE 28-5 as shown on Figure 5. TPH contamination, exceeding the Virginia TPH soil action level for USTs of 100 ppm, was detected in subsurface soil in the vicinity of the former pump island at depths ranging from 2 ft bgs to at least 10 ft bgs. The maximum TPH concentration (5,273 ppm) was detected at a depth of 8-10 ft bgs in soil boring RISB28-5-1.

**AREE 31 - Construction Debris Pile #1**

AREE 31 is a construction debris pile located approximately 200 to 300 ft northwest of the southernmost tip of the VHFS property boundary in a predominantly wooded and vegetated area. The pile consists of construction debris including, but not limited to, concrete pipe, corrugated steel pipe, steel footers, antennae pillars, roofing paper, bricks, cinder blocks, cement slabs, and insulation material. The debris pile has an area of approximately 15 ft by 150 ft.

Surface and subsurface (from a test pit) soil samples were collected at AREE 31 as shown on Figure 6. Metals (cadmium, copper, and lead) and PAH contamination is present in surface soil sample RISS31-2. The lead concentration of 3,610 ppm exceeded the USEPA screening level for lead in residential soil of 400 ppm. Cadmium and copper concentrations of 7.59 ppm and 1,880 ppm exceeded their respective residential soil RBCs of 3.9 ppm and 310 ppm. Five PAHs (benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, and indeno[1,2,3-cd]pyrene) exceeded the residential soil RBCs by one or more orders of magnitude in surface soil sample RISS31-2. For example, benzo(a)pyrene was detected at 34.6 ppm compared to its residential soil RBC of 0.088 ppm. Subsurface soil has not been impacted by the debris present at AREE 31.

**HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT**

A Baseline Risk Assessment (BRA) was conducted as part of the RI to assess the human health and ecological problems that could result if the contamination at the AREEs was not remediated. The Human Health Risk Assessment (HHRA) was prepared to evaluate the magnitude of potential adverse effects on human health associated with current and potential future (assuming residential development of the property) exposures to site-related chemicals at the AREEs. The Ecological Risk Assessment (ERA) was conducted to characterize the potential threats to ecological receptors posed by contaminants at the AREEs.

The HHRA follows a four-step process:

- **Selection of Chemicals of Potential Concern** - identifies the contaminants of potential concern based on their toxicity, frequency of occurrence, and concentration by comparing the maximum concentrations of detected chemicals with RBCs which are health-protective chemical concentrations that are back-calculated using toxicity criteria, a 1x10^6 target carcinogenic risk or a 0.1 hazard quotient (defined below), and conservative exposure parameters:

- **Exposure Assessment** - identifies the potential pathways of exposure, and estimates the concentrations of contaminants to which people may be exposed as well as the frequency and duration of these exposures:

- **Toxicity Assessment** - determines the toxic effects of the contaminants; and

- **Risk Characterization** - provides a quantitative assessment of the overall current and future risk to people from site contaminants based on the exposure and toxicity information.
LEGEND:
- IMPACTED SURFACE SOIL AREA (APPROXIMATE)
- BUILDING
- WLF'S BOUNDARY
- PAVED ROAD
- FENCE
- 420 TOPOGRAPHIC CONTOUR (FT MSL)
- PHASE II RI TEST PIT LOCATION
- PHASE II RI TEST PIT SAMPLE
- PHASE II RI SURFACE SOIL SAMPLE LOCATION

FIGURE 6
RI SAMPLE LOCATIONS FOR AREE 31 - CONSTRUCTION DEBRIS PILE #1
The HHRA evaluated health effects which could result from exposure to soil, groundwater, surface water, and sediment contamination in the Phase II reuse area of VHFS. The HHRA evaluated potential risks to current workers who could be exposed to contaminants in surface soil, and to current trespassers who could be exposed to contamination in surface soil, surface water, and sediment. In addition, the HHRA evaluated potential risks to hypothetical future adult residents who could be exposed to contaminants in groundwater and surface soil and to hypothetical future child residents who could be exposed to contaminants in groundwater, surface soil, surface water, and sediment. Potential risks to future excavation workers who could be exposed to contaminants in subsurface soil were also evaluated in the HHRA.

Potential carcinogenic (cancer-related) effects and noncarcinogenic effects (including various impacts on different organ systems, such as lungs, liver, etc.) were evaluated in the HHRA. Carcinogenic effects are expressed as the probability that an individual will develop cancer from exposure to the contaminants from each AREE. The evaluation of noncarcinogenic effects is based on the hazard index (HI), which is the summation of the hazard quotients for individual chemicals. The hazard quotient is a comparison of chemical-specific chronic exposure doses with the corresponding protective doses derived from health criteria. The USEPA recommends that remedial actions may be warranted at sites where the carcinogenic risk to any person is greater than $1 \times 10^{-4}$ or the HI is greater than 1. A carcinogenic risk of $1 \times 10^{-4}$ means that there is a potential of one additional person in a population of 10,000 developing cancer from exposure to contaminants at an AREE if the AREE is not remediated. A HI greater than 1 indicates a potential for noncarcinogenic health effects if the AREE is not remediated.

The ERA also follows a four-step process:

- **Problem Formulation** - develops information that characterizes habitats and potentially exposed species and identifies contaminants of concern, exposure pathways, and receptors;
- **Exposure Assessment** - estimates exposure point concentrations for selected indicator species;
- **Ecotoxicologic Effects Assessment** - identifies concentrations or doses of contaminants that are protective of indicator species; and
- **Risk Characterization** - estimates potential adverse effects from exposure to contaminants based on exposure and toxicity information.

The ERA evaluated ecological effects which could result from exposure to surface soil, surface water, and sediment contamination in the Phase II reuse area of VHFS. The ERA evaluated potential adverse ecological effects to terrestrial plants and terrestrial invertebrates (represented by earthworms) exposed to contaminants in surface soil. In addition, potential adverse ecological effects to mammals (represented by shrews) and birds (represented by robins) through bioaccumulation in the food web and exposure to contaminants in surface soil were evaluated. Potential adverse ecological effects to aquatic life from exposure to contaminants in surface water and sediment were also evaluated in the ERA. Further, the potential adverse ecological effects to mammals (represented by minks) and birds (represented by herons) through bioaccumulation in the food web and exposure to contaminants in sediment were evaluated.

The evaluation of significant potential adverse ecological effects is based on the Environmental Effects Quotient (EEQ). The EEQ is the ratio of the estimated exposure concentrations/doses for the chemicals of potential concern and the toxicity reference values (TRVs) for the ecological receptors. If the EEQ is greater than 1, there is a potential for adverse ecological effects to occur. As the magnitude of the EEQ becomes greater than 1, the potential for adverse ecological effects becomes more significant.

The results of the BRA for the four AREEs are presented in the following paragraphs. A detailed presentation of the BRA can be found in the draft Phase II Reuse Area RI Report, now available in the Information Repository at the Fauquier County Library.

**AREE 2 - Sewage Treatment Plant**

The HHRA determined that, under both current and future land-use conditions, the risks to workers, trespassers, residents, and excavation workers are acceptable for exposure to site-related contaminants at AREE 2. Discounting naturally-occurring metals that were statistically determined to be within background...
concentrations, the highest estimated upper-bound excess lifetime cancer risk (8\times 10^{-6}) is for adult residents exposed to site-related contaminants in surface soil by dermal absorption, and the highest noncarcinogenic risk (HI=0.2) is for child residents exposed to site-related contaminants in surface soil by incidental ingestion.

The ERA determined that contaminants in surface soil at AREE 2 pose significant potential adverse ecological effects. The significant potential adverse ecological effects result primarily from mercury. Mercury results in significant potential adverse ecological effects for terrestrial plants, earthworms, robins, and shrews, with the greatest potential adverse ecological effects occurring to robins (EEQ of 3,500).

The mercury contamination downgradient of the former sludge pile is recommended for remediation. The impacted area has approximate dimensions of 75 ft by 25 ft by 2 ft deep, as shown on Figure 3.

**AREE 4 - Auto Craft Shop**

The HHRA concluded that, under both current and future land-use conditions, the risks to workers, trespassers, residents, and excavation workers are acceptable for exposure to site-related contaminants, except for lead, in soil at AREE 4. Discounting naturally-occurring metals that were statistically determined to be within background concentrations, the highest estimated upper-bound excess lifetime cancer risk (5\times 10^{-5}) is for adult residents exposed to site-related contaminants in surface soil by dermal absorption, and the highest noncarcinogenic risk (HI=0.3) is for child residents exposed to site-related contaminants in surface soil by dermal absorption.

The human health risks associated with exposure to lead contamination in surface soil at AREE 4 were evaluated using the Integrated Exposure Uptake Biokinetic (IEUBK) Model recommended by USEPA for evaluating lead exposures for young children in residential settings. The IEUBK Model calculates blood lead levels which result from exposures to lead which may then be compared to blood lead levels of toxicological significance for purposes of risk evaluation. The IEUBK Model run for AREE 4 predicted a geometric mean blood lead level of 6.9 µg/dL, with 19.81 percent of the population exceeding the blood lead level of concern (10 µg/dL). The USEPA currently finds 5 percent of the population exceeding the blood lead level of concern acceptable. Therefore, the IEUBK model results indicate that if AREE 4 was developed for residential use in the future, the lead concentrations in the surface soil may be a potential problem for young children.

The ERA determined that metals in surface soil at AREE 4 pose significant potential adverse ecological effects. The significant potential adverse ecological effects result primarily from lead, selenium, mercury, and zinc. Lead, selenium, and zinc result in significant potential adverse ecological effects to terrestrial plants with EEQs of 34, 38, and 15, respectively. Mercury results in significant potential adverse ecological effects to robins (EEQ of 210) and shrews (EEQ of 13).

The metals contamination in the surface soil at the three surface runoff/discharge areas is recommended for remediation. The approximate dimensions of the impacted area at each of the three surface runoff/discharge areas are 15 ft x 15 ft x 2 ft deep, as shown on Figure 4.

**AREE 28-5 - Former Service Station Abandoned USTs**

The ERA did not evaluate AREE 28-5 because this area is covered with asphalt, thus eliminating the potential for exposure to ecological receptors.

The HHRA determined that contamination at AREE 28-5 does not pose an unacceptable human health risk under either current or potential future land-use conditions. In fact, no chemicals of potential concern were identified in subsurface soil at AREE 28-5 in the HHRA. However, risks associated with exposures to TPH could not be assessed in the BRA because this analytical parameter represents a mixture of chemical constituents. Since TPH measurements give no indication of the chemical constituents present or their respective concentrations, they cannot be used to predict risks. Although risks associated with TPH cannot be estimated, TPH contamination in Subsurface soil in the vicinity of the former pump island at AREE 28-5 exceeds the Virginia TPH soil action level for USTs and is, therefore, recommended for remediation. The impacted area is approximately 20 ft x 20 ft x 10 ft deep (minimum), as shown on Figure 5.
AREE 31 - Construction Debris Pile #1

The HHRA determined that, under current land-use conditions, the risks to workers are unacceptable for exposure to contaminants in surface soil at AREE 31. Under future land-use conditions, assuming that AREE 31 is not remediated, the risks to potential adult and child residents are also unacceptable for exposure to contaminants in surface soil at AREE 31. The highest estimated upper-bound excess lifetime cancer risk is for adult residents exposed to contaminants in surface soil by dermal absorption; this risk is $1 \times 10^{-3}$ (i.e., 1 in 1,000 residents may develop cancer caused by exposure to contaminants in surface soil at AREE 31). Cancer risks were due primarily to exposures to benzo(a)pyrene and other PAHs. The highest noncarcinogenic risk is for child residents exposed to contaminants in surface soil by incidental ingestion; the HI is estimated to be 2, indicating that adverse effects could occur if child residents were exposed to contaminants in surface soil. The critical effect caused by exposure to noncarcinogenic contaminants in surface soil at AREE 31 is gastrointestinal irritation due to copper and iron (which was statistically determined to be within background concentrations). It should be noted that major uncertainties exist regarding the assessment of dermal absorption exposures (particularly associated with dermal absorption factors); therefore, estimated risks are likely to be over-estimated for the dermal absorption exposure route.

As explained in the AREE 4 discussion, lead contamination in surface soil at AREE 31 was evaluated using the IEUBK Model which predicted a geometric mean blood lead level of 15 µg/dL, with 78.4 percent of the population exceeding the blood lead level of concern (10 µg/dL). Again, the USEPA currently finds 5 percent of the population exceeding the blood lead level of concern acceptable. Therefore, the IEUBK Model results indicate that if AREE 31 was developed for residential use in the future, the lead concentrations in the surface soil may be a potential problem for young children.

The ERA determined that contaminants in surface soil at AREE 31 pose significant potential adverse ecological effects. The significant potential adverse ecological effects result primarily from metals (copper, lead, mercury, and selenium) and one PAH (benzo[a]pyrene). Mercury results in significant potential adverse ecological effects for robins and shrews, with the greatest potential adverse ecological effects occurring to robins (EEQ of 250). Copper results in significant potential adverse ecological effects for terrestrial plants and earthworms, with the greatest potential adverse ecological effects occurring to earthworms (EEQ of 38). Selenium and lead result in significant potential adverse ecological effects for terrestrial plants with EEQs of 25 and 72, respectively. Benzo(a)pyrene results in significant potential adverse effects to earthworms with an EEQ of 13.

The most significant contamination at AREE 31 is in surface soil in the vicinity of surface soil sample RISS31-2 located in the northeastern portion of the debris pile, which is recommended for remediation. The impacted area has approximate dimensions of 50 ft x 15 ft x 2 ft, as shown on Figure 6.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives are specific goals to protect human health and the environment. The remedial action objective for the four AREEs is to minimize the potential for contaminated soil to pose unacceptable risks to human or ecological receptors.

CLEANUP LEVELS ESTABLISHED FOR THE PREFERRED ALTERNATIVE

USEPA has established soil cleanup levels for the contaminants that contribute to the unacceptable risk determination at each of the four AREEs. The soil cleanup levels are presented in Table 1. The soil cleanup level for AREE 2 is based on concentrations which are protective of ecological receptors (EEQ=10). The soil cleanup level for lead in surface soil at AREEs 4 and 31 is based on the USEPA screening level for lead in residential soil of 400 ppm. The soil cleanup levels for other metals at AREE4 are based on concentrations which are protective of ecological receptors. The soil cleanup level for AREE 28-5 is based on the Virginia TPH soil action level for USTs of 100 ppm. USEPA established the soil cleanup levels for PAHs at AREE 31 based on a $1 \times 10^{-6}$ (one in 1,000,000 people) upper-bound excess lifetime cancer risk for the potential future.
Table 1

Cleanup Levels Established for Soil at the Four AREEs

<table>
<thead>
<tr>
<th>Constituents</th>
<th>Cleanup Levels (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AREE 2 - SEWAGE TREATMENT PLANT</strong></td>
<td></td>
</tr>
<tr>
<td>Mercury (Ecological risk)</td>
<td>0.192 (a)</td>
</tr>
<tr>
<td><strong>AREE 4 - AUTO CRAFT SHOP</strong></td>
<td></td>
</tr>
<tr>
<td>Lead (Human Health &amp; Ecological risk)</td>
<td>400 (d)</td>
</tr>
<tr>
<td>Mercury (Ecological risk)</td>
<td>0.534 (a)</td>
</tr>
<tr>
<td>Selenium (Ecological risk)</td>
<td>10 (a)</td>
</tr>
<tr>
<td>Zinc (Ecological risk) (c)</td>
<td>500 (a)</td>
</tr>
<tr>
<td><strong>AREE 28-5 - FORMER SERVICE STATION ABANDONED USTs</strong></td>
<td></td>
</tr>
<tr>
<td>TPH</td>
<td>100 (e)</td>
</tr>
<tr>
<td><strong>AREE 31 - CONSTRUCTION DEBRIS PILE #1</strong></td>
<td></td>
</tr>
<tr>
<td>Benzo(a)anthracene (Human Health risk)</td>
<td>0.87 (b)</td>
</tr>
<tr>
<td>Benzo(a)pyrene (Human Health &amp; Ecological risk)</td>
<td>0.087 (b)</td>
</tr>
<tr>
<td>Benzo(b)fluoranthene (Human Health risk)</td>
<td>0.87 (b)</td>
</tr>
<tr>
<td>Benzo(k)fluoranthene (Human Health risk) (c)</td>
<td>8.7 (b)</td>
</tr>
<tr>
<td>Copper (Ecological risk)</td>
<td>500 (a)</td>
</tr>
<tr>
<td>Indeno(1,2,3-cd)pyrene (Human Health risk)</td>
<td>0.87 (b)</td>
</tr>
<tr>
<td>Lead (Human Health &amp; Ecological risk)</td>
<td>400 (d)</td>
</tr>
<tr>
<td>Mercury (Ecological risk)</td>
<td>0.48 (a)</td>
</tr>
<tr>
<td>Selenium (Ecological risk)</td>
<td>10 (a)</td>
</tr>
</tbody>
</table>

TPH - total petroleum hydrocarbons
USTs - underground storage tanks

(a) Based on a concentration which is protective of ecological receptors (EEQ=10).  
(b) Human health cleanup levels are based on a $1 \times 10^{-6}$ upper-bound excess lifetime cancer risk for the potential future residential land-use scenario.  
(c) These compounds contribute to but do not drive unacceptable risk.  
(d) USEPA screening level for lead in residential soil.  
(e) Virginia TPH soil action level for USTs.
SUMMARY OF REMEDIAL ALTERNATIVES

Two remedial alternatives were evaluated to address soil contamination at AREEs 2, 4, 28-5, and 31. The range of remedial alternatives considered was limited by the nature and extent of the contamination. Since the amount of soil requiring remediation is relatively small (approximately 400 cubic yards), it was not practical to consider active treatment or containment options in terms of cost-effectiveness and implementability. The following remedial alternatives were evaluated:

- Alternative 1 - No Action; and
- Alternative 2 - Soil Removal.

Alternative 1 - No Action

The National Contingency Plan (NCP) and CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), require that a No Action alternative be considered as a baseline for comparison to other alternatives. No action would be taken to address site contamination under this alternative. In accordance with Section 121 of CERCLA, each AREE would be reviewed at least once every five years to re-evaluate site conditions and to determine the need for remedial action to protect human health and the environment.

Alternative 2 - Soil Removal

Under this alternative, all contaminated soil exceeding the established cleanup levels would be excavated, transported off site by truck, and disposed using a combination of permitted off-site hazardous waste, construction debris, and/or municipal landfills or incinerators, as appropriate based on analytical results. Approximately 400 cubic yards of impacted soil would be excavated as part of this alternative, followed by confirmation sampling to assure adequate removal of all soil exceeding the cleanup levels. Upon completion of the soil excavation, disturbed areas would be backfilled, regraded, and either vegetatively stabilized or paved (AREE 28-5). The five-year review does not apply to this alternative because hazardous substances above risk-based cleanup levels would not remain on site.

EVALUATION OF ALTERNATIVES

CERCLA requires a comparison of the alternatives using nine evaluation criteria: overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements (ARARs); long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; cost and regulator and community acceptance. The first two criteria are considered by USEPA to be threshold criteria which must be met by each alternative. The nine evaluation criteria are described below:

- **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with ARARs** addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and requirements or provides grounds for invoking a waiver.

- **Long-term effectiveness and permanence** refers to the ability of a remedy to maintain reliable protection of human health over time, once cleanup goals have been met.
• Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies a remedy may employ.

• Short-term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

• Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

• Cost includes estimated capital and operation and maintenance costs, and net present worth costs.

• Regulator acceptance indicates whether, based on their review of the RI and Proposed Plan, the regulators (VDEQ and USEPA) concur, oppose, or have no comment on the preferred alternative at this present time.

• Community acceptance will be assessed in the Decision Document following a review of the public comments received on the RI and the Proposed Plan.

The comparative analysis of the alternatives was conducted based upon these evaluation criteria, and is described below.

**Overall Protection of Human Health and the Environment**

The no action alternative (Alternative 1) is not protective of human health or the environment because the risks to potential future residents and the potential adverse effects to ecological receptors remain unchanged, which is unacceptable. Therefore, the no action alternative was eliminated from further consideration and will not be discussed further.

Alternative 2 provides adequate protection of human health and the environment by removing contaminated soil, thereby eliminating the potential for exposure.

**Compliance with ARARs**

Alternative 2 has been designed to achieve or comply with ARARs. This alternative will satisfy the established cleanup levels since all soil that is contaminated above applicable cleanup levels will be removed. In addition, the removal and disposition of contaminated soil during implementation of Alternative 2 would be done in accordance with federal and Virginia solid and hazardous waste regulations. During soil excavation, Virginia Regulations for the Control and Abatement of Air Pollution may apply. Ambient air conditions would be monitored during excavation activities to assure acceptable air quality. As necessary based on the ambient air monitoring, water sprays would be used to keep dust levels down.

**Long-term Effectiveness and Permanence**

Alternative 2 would provide for the permanent removal of contaminated soil to a permitted off-site location designed to prevent contaminant migration and exposures to human and ecological receptors.

**Reduction of Toxicity, Mobility, or Volume Through Treatment**

Alternative 2 provides reduction of contamination at the AREEs by removing contaminated soil. The toxicity and volume of the contaminated soil would not be affected by this alternative, however, the mobility of the contaminants would be reduced because the off-site disposal facilities used would be designed to prevent contaminant migration.

Because treatment of the contaminated soil at the AREEs was not found to be practicable due to the small volume of impacted soil, Alternative 2 does not satisfy the statutory preference for treatment as a principal element of the remedy.
**Short-term Effectiveness**

Alternative 2 is considered to be effective in the short term because the volume of soil to be excavated is relatively small and would result in limited negative impacts to human health or the environment. Dust exposure to workers and adjacent residents would be controlled during excavation activities by water sprays as needed. Prior to excavation operations, temporary erosion control structures would be installed to prevent entry of storm water into the soil excavation areas and prevent erosion and movement of soil from contaminated areas. Although truck traffic would be increased during implementation of Alternative 2, the implementation period (approximately one month) is short and the number of trucks per day would be less than 20.

**Implementability**

Alternative 2 is considered readily implementable. Licensed transporters and permitted disposal facilities are currently available.

**Cost**

The cost to implement Alternative 2 is estimated at $260,000.

**Regulator Acceptance**

VDEQ and USEPA are currently reviewing this Proposed Plan. VDEQ and USEPA comments will be addressed in the Decision Document.

**Community Acceptance**

Community acceptance of the preferred alternative will be evaluated at the close of the public comment period by considering both oral and written comments received during the public comment period.

**PREFERRED ALTERNATIVE**

Alternative 2, Soil Removal, is recommended by the U.S. Army as the preferred alternative for AREEs 2, 4, 28-5, and 31. This remedial alternative is a permanent solution that offers long-term effectiveness since the contaminated soil is removed to cleanup levels and transported off site for proper disposal. This remedial alternative would be designed to comply with ARARs. The excavation and disposal of contaminated soil would be done in accordance with federal and Virginia solid and hazardous waste regulations. The estimated cost to implement this alternative is $260,000, and the on-site activities would require approximately one month to complete.
The United States Army
at Vint Hill Farms Station, Virginia

Invites Public Comment
ON A PROPOSED ENVIRONMENTAL CLEANUP
Concerning Four Sites Identified Above:

Purpose: To Discuss and Present the Remedial Alternatives for the Sites Identified Above.

Thursday, April 9, 1998, 7:00 p.m.
Warrenton Middle School Auditorium

Kevin Bell, Public Affairs Officer
Public Affairs Office (Bldg. 2500)
Vint Hill Farms Station
Warrenton, VA 20187-5001

PUBLIC INVOLVEMENT INFORMATION

Thurs., April 9, 1998, 7:00pm

- Educational Presentations
- Meet officials from USEPA, VDEQ and others
- Meet Citizen Members of the Restoration Advisory Board
- Question & Answer Session
ATTACHMENT 2
CLEANUP LEVEL DEVELOPMENT DOCUMENTS
Risk-based remediation goals for VHFS based on human exposures at the site were calculated for selected chemicals detected in surface soil in areas proposed for remediation (i.e., surface soil at AREEES 4 [Auto Craft Shop] and 31 [Construction Debris Pile #1]). Based on a review of the exposure pathways evaluated in the risk assessment, risk-based remediation goals were calculated for chemicals contributing to pathway upper-bound excess lifetime cancer risks greater than $1 \times 10^{-4}$ and/or hazard indices (HIs) greater than or equal to 1. The development of risk-based remediation goals focused on the incidental ingestion exposure pathway only. Risk-based remediation goals did not incorporate exposures through the dermal route of exposure due to the great uncertainties associated with assessing dermal exposures. For example, major uncertainties exist in the extent to which chemicals are percutaneously absorbed and in the extent to which chemicals partition from soil to skin leading to uncertainty in the use of default dermal absorption factors in the evaluation of risk. Uncertainties also exist in the use of adjusted oral toxicity criteria to evaluate dermal exposure pathways depending on how closely the factors used to adjust oral toxicity criteria reflect the difference between the oral and dermal routes.

In the VHFS human health risk assessment (HHRA), surface soil incidental ingestion pathways with upper-bound excess lifetime cancer risks greater than $1 \times 10^{-4}$ and/or HIs greater than or equal to 1 were associated with adult and child resident exposures at AREE 31. In addition, the U.S. Environmental Protection Agency's (USEPA's) residential soil screening level for lead (USEPA, 1994) was exceeded at AREEES 4 and 31. The risk-based remediation goals for selected chemicals in surface soil were developed based on the more conservative residential receptor, consistent with USEPA Region III methodology for calculating risk-based concentrations (i.e., using combined child/adult residential exposure parameters for carcinogenic compounds and using child residential exposure parameters for noncarcinogenic compounds).

Risk-based remediation goals were calculated for carcinogenic chemicals associated with chemical-specific risks greater than or equal to $1 \times 10^{-6}$ and noncarcinogenic chemicals contributing to a HI of 1 for a specific target organ. Risk-based remediation goals were not calculated for inorganic compounds that were statistically determined to be within background levels in the risk assessment. For selected carcinogenic chemicals, risk-based remediation goals were developed using a target risk level of $1 \times 10^{-6}$, which is at the low end of USEPA’s target risk, range for health-protectiveness at Superfund sites. For selected noncarcinogenic chemicals, risk-based remediation goals were calculated to correspond to a target hazard quotient of 1. If any of the noncarcinogenic compounds for which remediation goals were calculated had similar target organs/critical effects, then the risk-based remediation goal for that noncarcinogenic compound was divided by the number of compounds having the same target organ/critical effect (i.e., if three noncarcinogenic compounds had “liver” as the target organ, the individual remediation goals would be divided by three). For chemicals that exhibit both carcinogenic and noncarcinogenic effects, the selected remediation goal represents the lower of the two calculated goals.

The following sections present the exposure assumptions and equations used to calculate the risk-based remediation goals for chemicals in surface soil. Table 1 presents the toxicity criteria used to calculate the risk-based remediation goals for chemicals in surface soil.

### Surface Soil Risk-Based Remediation Goals

Risk-based remediation goals were calculated for chemicals in surface soil based on combined child/adult resident exposures for carcinogens and on child resident exposures for noncarcinogens, for the incidental soil ingestion pathway. The equations and exposure assumptions used to calculate risk-based remediation goals for surface soil are presented below. Equations are presented separately for chemicals exhibiting carcinogenic and noncarcinogenic effects.
### TABLE 1

**CHRONIC ORAL TOXICITY CRITERIA**

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<thead>
<tr>
<th>Chemical</th>
<th>Oral Slope Factor (mg/kg-day)</th>
<th>Weight-of-Evidence Class (a)</th>
<th>Slope Factor Source</th>
<th>Oral Toxicity Criteria for Carcinogens</th>
<th>Chronic Oral Reference Dose (RfD) (mg/kg-day)</th>
<th>Uncertainty Factor (b)</th>
<th>Target Organ/Critical Effect (c)</th>
<th>RfD Source</th>
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<tr>
<td><strong>Organics</strong></td>
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<td>IRIS</td>
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<td>--</td>
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<td>B2</td>
<td>IRIS</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Indeno(1,2,3-c,d)pyrene</td>
<td>7.3E-01</td>
<td>B2</td>
<td>IRIS</td>
<td></td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Inorganics</strong></td>
<td></td>
<td>B2</td>
<td>CNS IRIS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td>--</td>
<td>B2</td>
<td>IRIS</td>
<td></td>
<td>--</td>
<td>--</td>
<td>CNS</td>
<td>IRIS</td>
</tr>
</tbody>
</table>

(a) USEPA weight-of-evidence classification scheme for carcinogens:

A = Human Carcinogen, sufficient evidence of carcinogenicity in humans;
B1 = Probable Human Carcinogen, limited human data are available;
B2 = Probable Human Carcinogen, sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans;
C = Possible Human Carcinogen, limited evidence from animal studies in the absence of human studies; and
D = Not classified as to human carcinogenicity, inadequate or no evidence.

(b) Uncertainty factors presented are the products of specific uncertainty factors and modifying factors. Uncertainty factors used to develop reference doses generally consist of multiples of 10, with each factor representing a specific area of uncertainty in the data available. The standard uncertainty factors include:

- a 10-fold factor to account for the variation in sensitivity among the members of the human population;
- a 10-fold factor to account for the uncertainty in extrapolating animal data to the case of humans;
- a 10-fold factor to account for the uncertainty in extrapolating from less-than-chronic NOAELs to chronic NOAELs; and
- a 10-fold factor to account for the uncertainty in extrapolating from LOAELs to NOAELs.

Modifying factors are applied at the discretion of the RfD reviewer to cover other uncertainties in the data and range from 1 to 10.

(c) A target organ or critical effect is the organ/effect most sensitive to the chemical exposure. RfDs are based on toxic effects in the target organ or critical effects. If an RfD is based on a study in which a target organ or critical effect was not identified, the organ/effect listed is one known to be affected by the chemical.

(d) The cancer slope factor for benzo(a)pyrene was used to evaluate carcinogenic PAHs, along with the toxic equivalency factor (TEF) approach. The TEFs used are as follows:

- benzo(a)anthracene, 0.1;
- benzo(b)fluoranthene, 0.1;
- benzo(k)fluoranthene, 0.01; and
- indeno(1,2,3-c,d)pyrene, 0.1.

**NOTE**

IRIS = Integrated Risk Information System - USEPA, 1997a
-- = No information available
CNS = Central Nervous System.
The equation used to calculate risk-based remediation goals for chemicals exhibiting carcinogenic effects, using the combined child/adult exposure parameters based on USEPA (1991), is as follows:

\[
C_s = \frac{TR \times AT_c \times 365 \text{ days/year}}{EF \times IFA \times SF_o \times 10^{-6} \text{ kg/mg}}
\]

where:

- \( C_s \) = chemical concentration in surface soil (mg/kg),
- \( TR \) = target excess individual lifetime cancer risk (1 x 10^{-6}),
- \( AT_c \) = averaging time for carcinogenic effects (70 years),
- \( EF \) = exposure frequency (350 days/year),
- \( IFA \) = adjusted integrated factor (see below) (114.3 mg-year/kg-day), and
- \( SF_o \) = oral cancer slope factor [(mg/kg-day)^{-1}] (see Table 1).

The combined child/adult resident exposure parameters used to calculate carcinogenic risk-based remediation goals for incidental ingestion of surface soil incorporate an age-adjusted factor, which approximates the integrated exposure from birth until age 30 by combining contact rates, body weights, and exposure duration for both children and young adults (USEPA 1997b). The age-adjusted factor was calculated as follows, using exposure parameters from USEPA (1991):

\[
IFA = \frac{ED_c \times IR_c}{BW_c} + \frac{(ED_{tot} - ED_c) \times IR_a}{BW_a}
\]

where:

- \( IFA \) = age-adjusted integrated factor (mg-year/kg-day),
- \( ED_c \) = child's exposure duration (6 years),
- \( IR_c \) = child's soil ingestion rate (200 mg/day),
- \( BW_c \) = child's body weight (15 kg),
- \( ED_{tot} \) = total exposure duration (30 years),
- \( IR_a \) = adult's soil ingestion rate (100 mg/day), and
- \( BW_a \) = adult's body weight (70 kg).

The equation used to calculate risk-based remediation goals for chemicals exhibiting noncarcinogenic effects, using the child exposure parameters obtained from USEPA (1991), is as follows:

\[
C_s = \frac{THI \times BW \times AT_{nc} \times 365 \text{ days/year}}{EF \times ED \times (1 / RfD_o) \times 10^{-6} \text{ kg/mg} \times IR_{soil}}
\]
where:
\[ C_s = \text{chemical concentration in soil (mg/kg)}, \]
\[ \text{THI} = \text{target hazard index (1)}, \]
\[ \text{BW} = \text{body weight (15 kg)}, \]
\[ \text{AT}_{nc} = \text{averaging time for noncarcinogenic effects (6 years)}, \]
\[ \text{EF} = \text{exposure frequency (350 days/year)}, \]
\[ \text{ED} = \text{exposure duration (6 years)}, \]
\[ \text{RfD}_o = \text{oral chronic reference dose (mg1kg-day) (see Table 1)}, \]
\[ \text{IR}_{soil} = \text{ingestion rate (200 mg/day)}. \]

**Summary of Risk-Based Remediation Goals**

Risk-based remediation goals for AREEs 4 and 31 were calculated for selected chemicals in surface soil. Specifically, risk-based remediation goals were calculated for all chemicals associated with chemical-specific risks greater than or equal to \(1 \times 10^{-6}\) or chemicals contributing to a HI greater than or equal to 1 for a specific target organ for the incidental ingestion exposure pathway. Risk-based remediation goals were not calculated for inorganic compounds that were statistically determined to be within background levels. Risk-based remediation goals for all selected chemicals in surface soil were developed based on conservative child/adult resident receptors for carcinogens and child resident receptors for noncarcinogens. Risk-based remediation goals for surface soil are presented in Table 2.

Based on a review of the chemicals and pathways evaluated in the risk assessment, risk-based remediation goals for surface soil were calculated for: lead detected at AREE 4; and benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-c,d)pyrene, and lead detected at AREE 31. USEPA’s residential soil screening level for lead was developed using the Integrated Exposure Uptake Biokinetic (IEUBK) model (USEPA, 1994) and is based on residential exposures by the most sensitive members of the population (i.e., young children). Since a risk-based remediation goal cannot be calculated for lead due to a lack of available quantitative carcinogenic and noncarcinogenic toxicity criteria, the 400 mg/kg residential soil screening level for lead is presented in Table 2 as the remediation goal for lead in surface soil.

**References**


## TABLE 2
REMEDIATION GOALS FOR CHEMICALS IN SURFACE SOIL (a)

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Toxicity Criterion</th>
<th>Calculated Remediation Goal (mg/kg)</th>
<th>Selected Remediation Goal (mg/kg)(d)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Carcinogenic (mg/kg-day)</td>
<td>Noncarcinogenic (mg/kg-day)</td>
<td>Carcinogenic (b)</td>
</tr>
<tr>
<td>AREE 4</td>
<td>Resident Ingestion</td>
<td>Lead</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Benzo(a)anthracene</td>
<td>7.3E-01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Benzo(a)pyrene</td>
<td>7.3E+00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Benzo(b)fluoranthene</td>
<td>7.3E-01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Benzo(k)fluoranthene</td>
<td>7.3E-02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Indeno(1,2,3-c,d)pyrene</td>
<td>7.3E-01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lead</td>
<td>–</td>
</tr>
</tbody>
</table>

Remediation goals were calculated for predominant chemicals (i.e., chemicals with risks exceeding $1 \times 10^{-6}$ or chemicals contributing to a HI greater than or equal to 1 for a specific target organ) for the Incidental ingestion pathways associated with a total excess lifetime cancer risk exceeding $1 \times 10^{-4}$ or a HI greater than or equal to 1.

The calculated remediation goals for carcinogenic chemicals were based on a target risk level of $1 \times 10^{-6}$ and were calculated using combined child/adult exposure parameters.

The calculated remediation goals for noncarcinogenic chemicals were calculated using child resident exposure parameters and were based on a hazard quotient of 1.

The selected remediation goal represents the lower of the calculated carcinogenic and noncarcinogenic remediation goals.

The selected remediation goal is USEPA’s residential soil screening level for lead (USEPA, 1994).
Results of the Ecological Risk Assessment (ERA) conducted as part of the Phase II Reuse Area Remedial Investigation (RI) at VHFS (USACE, 1998) indicate the potential for adverse effects to ecological resources at several on-site locations. Surface soils at AREEs 2, 4, and 31 were identified as having the greatest potential to adversely affect ecological resources and were selected for remediation. The following ecological receptors were identified as having the greatest potential to be adversely affected in each of these areas:

- **AREE 2 (Sewage Treatment Plant)**
  - Terrestrial plants from the presence of mercury in surface soil;
  - Earthworms from the presence of mercury in surface soil; and
  - Robins and shrews from the presence of mercury in surface soil.

- **AREE 4 (Auto Craft Shop)**
  - Terrestrial plants from the presence of lead, selenium, and zinc in surface soil; and
  - Robins and shrews from the presence of mercury in surface soil.

- **AREE 31 (Construction Debris Pile #1)**
  - Terrestrial plants from the presence of copper, lead, and selenium in surface soil;
  - Earthworms from the presence of benzo(a)pyrene and copper in surface soil; and
  - Robins and shrews from the presence of mercury in surface soil.

The objective of this document is to identify the reduction in chemical concentrations necessary to be protective of these ecological resources. Because of the conservative nature of the toxicological values and exposure estimates, cleanup levels were derived based on an EEQ of 10. The following sections derive cleanup levels for each of these areas based on the ecological resources at risk.

**AREE 2 (Sewage Treatment Plant)**

**Terrestrial Plants**

Results of the ERA indicate the potential for adverse effects to terrestrial plants from the presence of mercury in surface soil at AREE 2. A literature-based toxicity value of 0.3 mg/kg, derived by Will and Suter (1995a) and used in the ERA to evaluate the potential for adverse effects to terrestrial plants, was used to derive the cleanup level for mercury in surface soil. Using this toxicity value and a target EEQ of 10, the cleanup level for mercury in surface soil for terrestrial plants at AREE 2 is 3 mg/kg.

---

1The Environmental Effects Quotient (EEQ) is the ratio of the estimated exposure concentration/dose for the chemical of concern and the toxicity reference value (TRV) for the ecological receptor of concern.
The toxicity values used in the ERA are based on no observed adverse effects levels (NOAELs) derived by Oak Ridge National Laboratory (ORNL, 1996).

Earthworms

Results of the ERA indicate the potential for adverse effects to earthworms from the presence of mercury in surface soil at AREE 2. A literature-based toxicity value of 0.1 mg/kg, derived by Will and Suter (1995b) and used in the ERA to evaluate the potential for adverse effects to earthworms, was used to derive the cleanup level for mercury in surface soil. Using this toxicity value and a target EEQ of 10, the cleanup level for mercury in surface soil for earthworms at AREE 2 is 1 mg/kg.

Terrestrial Wildlife

Results of the ERA indicate the potential for adverse effects to robins and shrews from the presence of mercury in surface soil at AREE 2. Attachment A outlines the screening model and input parameters used in the ERA to estimate the potential for adverse effects to robins and shrews. Assumptions in this model were designed to provide a highly conservative estimate of the potential for adverse effects to robins and shrews. In the model, it is assumed that robins and shrews would be exposed to the estimated average mercury concentrations detected at AREE 2 (2.79 mg/kg). However, as discussed in the RI, samples were biased to areas of likely contamination, and samples from these areas are likely to over-estimate actual levels of contamination throughout the facility. Further, the highest mercury concentrations were detected within a very localized area of AREE 2. The area of mercury contamination in surface soil at AREE 2 is immediately downgradient of the former sludge pile, and is estimated to be approximately 75 feet by 25 feet in size. Accordingly, robins and shrews are likely to be exposed to mercury in only a limited proportion of their total foraging area and, because of the biased sampling methodology, using an average of the mercury concentrations detected in surface soil at AREE 2 will likely over-estimate the potential for exposure and adverse effects.

Cleanup levels were determined by backcalculating through the risk model used in the ERA. Two approaches were used to develop cleanup levels for robins and shrews. The first approach assumes the foraging range of robins and shrews falls entirely in the contaminated areas of AREE 2. This approach is consistent with that used in the ERA and simply requires determining, by backcalculating through the equations presented in Attachment A, an average exposure concentration which is equal to 10 times the toxicity value used in the ERA (i.e., an EEQ of 10). However, this approach is likely to over-estimate risks because it assumes the average AREE 2 exposure concentration, estimated by averaging the concentrations of chemical detected at surface soil sample locations, is an accurate indicator of chemical concentrations throughout the receptor’s foraging range. The second approach applies a spatial factor to adjust for the area of actual contamination. This latter approach is expected to provide a more realistic estimate of exposure.

The spatial factor used for the second approach was derived by first estimating the total area over which a robin or shrew is likely to forage. Pitts (1984) estimated an average territory size of 0.42 hectares (equal to 45,208 square feet) for robins on a college campus in Tennessee. Meanwhile, Buckner (1966) estimated an average territory size of 0.39 hectares (equal to 41,978 square feet) for shrews. Cleanup levels for AREE 2 were calculated assuming that robins and shrews would not be exposed to mercury at any location outside of AREE 2. This assumption was made because mercury was not detected at any other locations within the foraging range of these species.

The total area of potential mercury contamination to which a robin or shrew foraging at AREE 2 could be exposed was estimated to be 1,875 square feet by assuming a maximum area of contamination in AREE 2 of 75 feet by 25 feet. The proportion of the total foraging area at which a robin or shrew associated with AREE 2 could be exposed to mercury was then estimated by dividing the estimated total area contaminated with mercury by each species’ estimated territory size. Using this approach, a proportion of 0.041 was...
estimated for robin and a proportion of 0.045 was estimated for shrew. This proportion was then used as a multiplier in equations (2) and (5) of Attachment A.

Cleanup levels derived using the approaches described above are presented in Table 1. The approach which accounts for the limited distribution of mercury in the territorial range of robins and shrews results in higher cleanup levels. However, these cleanup levels are expected to be more realistic and are recommended for use as the final cleanup levels. Consistent with the ERA, cleanup levels were also derived for both inorganic and organic mercury (methylmercury). Although it is likely only a proportion of the mercury detected in surface soil is present in the organic form, it is recommended that the more conservative methylmercury cleanup level be selected as the cleanup level for AREE 2.

**AREE 4 (Auto Craft Shop)**

**Terrestrial Plants**

Results of the ERA indicate the potential for adverse effects to terrestrial plants from the presence of lead, selenium, and zinc in surface soil. Literature-based toxicity values for lead, selenium, and zinc of 50 mg/kg, 1 mg/kg, and 50 mg/kg, respectively, derived by Will and Suter (1995a) were used in the ERA to evaluate the potential for adverse effects to terrestrial plants. Using these toxicity values and a target EEQ of 10, the cleanup levels for lead, selenium, and zinc in surface soil for terrestrial plants at AREE 4 are 500 mg/kg, 10 mg/kg, and 500 mg/kg, respectively.

**Terrestrial Wildlife**

Results of the ERA indicate the potential for adverse effects to robins and shrews from the presence of mercury in surface soil at AREE 4. Attachment A outlines the screening model and input parameters used in the ERA to estimate the potential for adverse effects to robins and shrews. Assumptions in this model were designed to provide a highly conservative estimate of the potential for adverse effects to robins and shrews. In the model, it is assumed that robins and shrews would be exposed to the average of the mercury concentrations detected at AREE 4 (0.167 mg/kg). However, as discussed in the RI, the elevated mercury concentrations were detected in very localized areas at AREE 4. The areas of mercury contamination driving the risk to terrestrial wildlife are comprised of the runoff areas from the storm sewer discharge, the former hydraulic lift and the wash rack discharge. Each of the areas of mercury contamination are estimated to be no greater than 15 feet by 15 feet in size. Accordingly, robins and shrews are likely to be exposed to this chemical in only a very limited proportion of their total foraging area, and the use of an average AREE 4 mercury concentration will likely over-estimate the potential for exposure and adverse effects to robins and shrews.

Cleanup levels for mercury were calculated for AREE 4 using the same methods described earlier to derive cleanup levels for mercury at AREE 2. The contaminated proportion of the total territory was estimated to be 0.015 for robins and 0.016 for shrews assuming the contaminated area of AREE 4 is 675 square feet in size. Only AREE 4 was factored into the calculation because mercury was not detected at any other locations within the foraging range of these species. The cleanup levels derived for mercury are summarized in Table 1. It is recommended that the cleanup level derived using the approach which accounts for the spatial distribution of mercury be used as the cleanup level for AREE 4. Although it is likely only a proportion of the mercury detected in surface soil is present in the organic form, it is recommended that the more conservative methylmercury cleanup level be selected as the cleanup level for AREE 4.
Table 1
Surface Soil Cleanup Levels for the Protection of Terrestrial Wildlife
(Concentrations in mg/kg)

<table>
<thead>
<tr>
<th>Area</th>
<th>Mercury (inorganic)</th>
<th>Methylmercury</th>
<th>Biological</th>
<th>Ecological</th>
<th>Ecological</th>
<th>Ecological</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10.7</td>
<td>0.008</td>
<td>259</td>
<td>0.192</td>
<td>117</td>
<td>2.620</td>
</tr>
<tr>
<td></td>
<td>117</td>
<td>0.132</td>
<td>2.620</td>
<td>2.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AREA 2</td>
<td>Mercury (inorganic)</td>
<td>10.7</td>
<td>718</td>
<td>0.534</td>
<td>117</td>
<td>7.275</td>
</tr>
<tr>
<td></td>
<td>Methylmercury</td>
<td>0.008</td>
<td>0.132</td>
<td>8.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AREA 3</td>
<td>Mercury (inorganic)</td>
<td>10.7</td>
<td>645</td>
<td>0.48</td>
<td>117</td>
<td>6.550</td>
</tr>
<tr>
<td></td>
<td>Methylmercury</td>
<td>0.008</td>
<td>0.132</td>
<td>7.40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
AREE 31 (Construction Debris Pile #1)

Terrestrial Plants

Results of the ERA indicate the potential for adverse effects to terrestrial plants from the presence of copper, lead, and selenium in surface soil. Literature-based toxicity values for copper, lead, and selenium of 100 mg/kg, 50 mg/kg, and 1 mg/kg, respectively, derived by Will and Suter (1995a) were used in the ERA to evaluate the potential for adverse effects to terrestrial plants. Using these toxicity values and a target EEQ of 10, the cleanup levels for copper, lead, and selenium in surface soil for terrestrial plants at AREE 31 are 1,000 mg/kg, 500 mg/kg, and 10 mg/kg, respectively.

Earthworms

Results of the ERA indicate the potential for adverse effects to earthworms from the presence of benzo(a)pyrene and copper in surface soil. Literature-based toxicity values for benzo(a)pyrene and copper of 2.57 mg/kg and 50 mg/kg, respectively, derived by Achazi et al. (1995, as cited in van Brummelen et al., 1996) and Will and Suter (1995b) were used in the ERA to evaluate the potential for adverse effects to earthworms. Using these toxicity values and a target EEQ of 10, the cleanup levels for benzo(a)pyrene and copper in surface soil for earthworms at AREE 31 are 25.7 mg/kg and 500 mg/kg, respectively.

Terrestrial Wildlife

Results of the ERA indicate the potential for adverse effects to robins and shrews from the presence of mercury in surface soil at AREE 31. Attachment A outlines the screening model and input parameters used in the ERA to estimate the potential for adverse effects to robins and shrews. Assumptions in this model were designed to provide a highly conservative estimate of the potential for adverse effects to robins and shrews. In the model, it is assumed that robins and shrews would be exposed to the average of the mercury concentrations detected at AREE 31 (0.198 mg/kg). However, as discussed in the RI, elevated mercury concentrations were detected in a very localized area of AREE 31. The area of mercury contamination in surface soil that is driving the risk to terrestrial wildlife is the northeastern portion of the debris pile, which is estimated to be no greater than 15 feet by 50 feet in size. Accordingly, robins and shrews are likely to be exposed to this chemical in only a very limited proportion of their total foraging area, and the use of an average AREE 31 mercury concentration will likely over-estimate the potential for exposure and adverse effects to robins and shrews.

Cleanup levels for mercury were calculated for AREE 31 using the methods described earlier to derive cleanup levels for mercury at AREEs 2 and 4. The contaminated proportion of the total territory size was estimated to be 0.017 for robins and 0.018 for shrews assuming the contaminated area of AREE 31 is 750 square feet in size. Only AREE 31 was factored into the calculation because mercury was not detected at and other locations within the foraging range of these species. The cleanup levels derived for mercury are summarized in Table 1. It is recommended that the cleanup level derived using the approach which accounts for the spatial distribution of mercury be used as the cleanup level for AREE 31. Although it is likely only a proportion of the mercury detected in surface soil is present in the organic form, it is recommended that the more conservative methylmercury cleanup level be selected as the cleanup level for AREE 31.

Summary of Cleanup Levels

Table 2 presents the cleanup levels for chemicals of significant ecological concern in surface soil for AREEs 2, 4, and 31. For chemicals that pose potential adverse ecological effects to more than one receptor, the cleanup level presented in Table 2 is for the most sensitive receptor. It should be noted that the recommended cleanup level derived for mercury at AREEs 4 (0.53 mg/kg) and 31 (0.48 mg/kg) are higher than the maximum detected concentrations in these AREEs (i.e., 0.393 mg/kg at AREE 4, and 0.208 mg/kg)
## Table 2
### Cleanup Levels for Chemicals In Surface Soil

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Cleanup Level (Mg/Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AREE 2</strong></td>
<td></td>
</tr>
<tr>
<td>Mercury</td>
<td>0.192</td>
</tr>
<tr>
<td><strong>AREE 4</strong></td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td>500</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.534</td>
</tr>
<tr>
<td>Selenium</td>
<td>10</td>
</tr>
<tr>
<td>Zinc</td>
<td>500</td>
</tr>
<tr>
<td><strong>AREE 31</strong></td>
<td></td>
</tr>
<tr>
<td>Benzo(a)pyrene</td>
<td>25.7</td>
</tr>
<tr>
<td>Copper</td>
<td>500</td>
</tr>
<tr>
<td>Lead</td>
<td>500</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.48</td>
</tr>
<tr>
<td>Selenium</td>
<td>10</td>
</tr>
</tbody>
</table>
at AREE 31), indicating that remediation of mercury at these AREEs may not be required when its areal extent is considered.

References


ATTACHMENT A
ESTIMATION OF ROBIN AND SHREW EXPOSURE TO CHEMICALS
FOR THE DERIVATION OF CLEANUP LEVELS

The following sections present the methods used to calculate the potential ingestion of chemicals by robins and shrews from the ingestion of food (i.e., earthworms) and surface soil. The equations given below were derived based on equations presented by USEPA (1989). Table A-1 presents specific exposure parameter values used in these equations.

Total Dose

The total dietary exposure levels for robins and shrews to chemicals was determined using the following equation:

\[
Dose_{\text{total}} = Dose_{\text{worm}} + Dose_{\text{soil}}
\]  

(1)

where:
- \(Dose_{\text{worm}}\) = amount of chemical ingested per day via ingestion of earthworms (in mg/kg bw-d, use equations 2, 3, and 4 to calculate); and
- \(Dose_{\text{soil}}\) = amount of chemical ingested per day from soil (in mg/kg bw-d, use equation 5 to calculate).

Dose From Earthworms

The following equation was used to calculate the dose of chemicals that robins and shrews would be expected to obtain from the ingestion of earthworms:

\[
Dose_{\text{worm}} = Fl \cdot C_{\text{diet}}
\]  

(2)

where:
- \(Fl\) = food ingestion rate (kg/kg bw-d); and
- \(C_{\text{diet}}\) = estimated chemical concentration in diet (in mg/kg, use equation 3 to calculate).

The estimated dietary concentration \((C_{\text{diet}})\) was calculated using the following equation:

\[
C_{\text{diet}} = P_e \cdot C_e
\]  

(3)

where:
- \(P_e\) = proportion of diet consisting of earthworms (unfitness); and
- \(C_e\) = estimated concentration of chemical in earthworms (in mg/kg, use equation 4 to calculate).
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Robin Value</th>
<th>Shrew Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food ingestion rate (FI; kg/kg bw-d)</td>
<td>1.52 (a)</td>
<td>0.62 (g)</td>
</tr>
<tr>
<td>Proportion of diet consisting of earthworms (Pe; unitless)</td>
<td>0.18 (b,c)</td>
<td>0.314 (h)</td>
</tr>
<tr>
<td>Bioconcentration factor for chemical in earthworms (BCF; unitless)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>inorganic mercury = 0.96 (d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>methylmercury = 27 (e)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil ingestion rate (SI; kg/kg bw-d)</td>
<td>0.158 (f)</td>
<td>0.058 (f)</td>
</tr>
</tbody>
</table>

(c) Howell (1942) as cited in USEPA (1993).
(d) Bayer and Stafford (1993).
(e) Ostier (1987).
(f) Bayer et. al. (1994).
(g) Morrison et al. (1957) as cited in USEPA (1993).
The concentration of chemical in an earthworm ($C_e$) as fresh weight was determined using the following equation:

$$C_e = C_{soil} \times BCF$$

(4)

where:

- $C_{soil}$ = average concentration of chemical detected in surface soil (mg/kg); and
- BCF = bioconcentration factor for chemical in earthworms (unfitness).

**Dose From Soil**

The following equation was used to calculate the dose of chemicals that robins and shrews would be expected to obtain from the ingestion of surface soil:

$$Dose_{soil} = SI \times C_{soil}$$

(5)

where:

- SI = soil ingestion rate (kg/kg bw-d); and
- $C_{soil}$ = average chemical concentration in surface soil (mg/kg).

**References**


The United States Army
at Fort Jurgens Station, Virginia
Invites Public Comment
ON PROPOSED ENVIRONMENTAL IMPACT STATEMENT
FOR PROPOSED DEVELOPMENT ACTIVITIES
including:
Development of: 1. Recreational Use Area
Development of: 2. Environmental and Cultural Resource Management Area

Please Come To Our
PUBLIC MEETING.

Thursday, April 5, 1990 - 7:00 p.m.
Warren County Middle School Auditorium
14446 N. 49th Street - Warrenton, VA
(1002-01-01) 00-00-00-00-00-00-00-00

PURPOSE: TO DISCUSS AND PRESENT THE RECOMMENDED SITES TO DEVELOP OR IMPROVE.

The U.S. Army, in coordination with the U.S. Environmental Protection Agency (EPA) Region 3 and the Virginia Department of Environmental Quality (DEQ), invites public comment on its Proposed Plan for developing and improving certain areas at the following locations: Recreational Use Area on Fort Jurgens Station, Virginia.

1. Warren County Middle School Auditorium (closed to the public)
2. The Warren County Middle School Auditorium (closed to the public)
3. The Virginia Department of Environmental Quality (open to the public)

WASHINGTON, D.C., March 24, 1989

A written comment may be submitted to:

Address:
Keith A. Parks
Public Affairs Office
Public Affairs Office
Warrenton, VA 22016

BACKGROUND

VRS is a part of the U.S. Army Communications - Electronics Command (CECOM) and, while active primarily in the Washington, D.C., area, it is also active throughout the country. The installation supports approximately 1400 acres of land near the town of Warrenton, Virginia. Approximately 800 acres of the installation is to be developed as a residential, commercial, or industrial area. The property is set aside for use by the Installation for the purpose of supporting the installation's mission.

PROPOSED

The facility was designated for closure in March, 1992, under the Base Realignment and Closure (BRAC) Act.

ALTERNATIVE 1: No Action
ALTERNATIVE 2: Soil Removal

ALTERNATIVE 1: No Action
ALTERNATIVE 2: Soil Removal

based on site-specific information, VRS proposes Alternative 1, which involves excavation and removal of the soil in situ as a remedial action. This remedial action is designed to remove the contaminated soil from the site and to prevent further contamination of the site. The excavation and removal of the contaminated soil will be conducted using standard excavation equipment and techniques. The work will be performed in accordance with the requirements of the Virginia Department of Environmental Quality and the US Army Corps of Engineers.

FOR MORE INFORMATION
You can obtain an Environmental Impact Statement and a list of the documents to be reviewed at the following location:

Fairfax County Library - Warrenton Branch
13801 Main Street - Warrenton, VA (301) 295-3100
Open 9:00 a.m. to 9:00 p.m. on Monday through Friday
and 9:00 a.m. to 6:00 p.m. on Saturday